PRODUCTION AND MANAGEMENT

384 Roughage Levels for Finishing Yearling Steers. I. G. Rush*, B. Weichenthal, and B. Van Pelt, *University of Nebraska, Scottsbluff.*

Finishing Angus crossbred yearling steers averaging 436 kg initially were fed 10, 20 or 39% roughage in the diet dry matter. Using 4 pens of 8 steers on each roughage level, half of the steers were slaughtered after 90 or 118 days on feed. The 10 and 20% roughage diets included dry rolled corn, dry protein supplement, and alfalfa haylage but the 39% roughage diet also included about 28% roughage from corn silage forage. Calculated nutrient contents in the diet dry matter in the same order were 13.3, 14.2 and 12.5% crude protein and 80.2, 77.3 and 70.2% TDN. Significant differences resulted in daily gain (adjusted to a common 62% carcass dress), daily dry matter intake and feed to gain ratio within both slaughter groups. Quality grade increased more from 90 to 118 days on feed with 39% roughage than with the other two diets and there was little difference between 39 and 10% after 118 days.

Days on feed	90				118			
Roughage % of feed DM	39	20	10	*P*	39	20	10	*P*
Daily gain, kg	1.07	1.42	1.45	.003	1.12	1.32	1.37	.04
Daily DM intake, kg	10.3	11.9	11.3	.005	10.4	11.8	11.0	.03
Feed/gain ratio	8.1	7.6	6.9	.05	9.3	8.9	8.0	.12
Quality grade[1]	17.3	18.2	18.4	.13	19.2	18.7	19.6	.10

[1]Quality grades of 18.0 to 18.9 = high Select, 19.0 to 19.9 = low Choice.

Key Words: Roughage levels, Finishing yearling steers

385 Influence of synovex and supplemental roasted soybeans on performance of feedlot cattle. T. S. Rumsey*, S. Kahl, and T. H. Elsasser, *USDA, Agricultural Research Service, Growth Biology Laboratory, Beltsville, MD.*

Two 160-d feedlot trials conducted in the same facility and during the same months of consecutive years compared supplemental soybean meal (SBM) and roasted soybeans (RSB) on the performance of non-implanted (−S) or Synovex-implanted (+S) steers and heifers. Each trial consisted of 20 steers (initial wt: 216 kg, trial 1 and 237 kg, trial 2) and 20 heifers (208 and 222 kg, respectively) fed SBM and RSB diets in ad libitum amounts factorially arranged with implant treatment (Synovex, 20 mg estradiol benzoate with 200 mg progesterone for steers or 200 mg testosterone for heifers). Animals assigned to +S were implanted at 0 and 80 d. The diets consisted (DM basis) of 15% corn silage, 15% orchard grass silage, and 70% corn-based concentrate containing either SBM or RSB (roasted at 127° C for 10 min) to equal 18% dietary CP. Diets approximated an ME of 2.9 Mcal/kg. Gains across trial and sex (kg/d) for SBM, −S; SBM, +S; RSB, −S; RSB, +S, respectively, were 1.35[a], 1.59[b], 1.36[a], and 1.44[a] (S × RSB, P < .05; SEM, .05) from 0 to 80 d and 1.29, 1.48, 1.29, and 1.49 (S, P < .01; SEM, .08) from 80 to 160 d. Respective values for gain/DM intake (g/kg) were 164, 180, 178, and 183 (0-80 d; SEM, 5.7) and 139, 147, 147, and 156 (80-160 d; SEM, 4.4). A N balance trial compared the SBM and RSB diets fed to young steers concurrent with the 0-80 d period. Digestibilities of N and DM were < 1.7 percentage units different between diets, and N balance was 7.6% lower for the RSB. Results suggest RSB compromised the expected growth response to estrogen in young feedlot cattle.

Key Words: Beef Cattle, Soybeans, Estrogen Implant

386 Effect of weaning date and management system on feedlot and carcass characteristics of summer born steers. G. P. Lardy*, M. J. Klemesrud, D. C. Adams, T. J. Klopfenstein, and R. T. Clark, *University of Nebraska, Lincoln and North Platte.*

The effects of weaning date and management system on feeding and carcass characteristics of summer born MARC II steers (avg birth date: July 10) was investigated in a 2 × 2+1 factorial design over two years. Main effects were weaning date (early-Nov 1, late-Jan 10) and management system (calf-fed (SUM CALF) or yearling (YEAR)). A contemporary group of calf-fed spring born steers (SPR CALF, avg birth date: Apr 10) was included as a control. Feedlot entry dates and days on feed were November 15 and 174 d, February 14 and 181 d, and September 14 and 124 d for SPR CALF, SUM CALF, and YEAR, respectively. All steers were implanted with Revalor and fed a common finishing diet based on a blend of dry rolled corn and wet corn gluten feed. Diets included monensin (25g/ton) and tylosin (10g/ton). Yearlings had heavier initial weights, hot carcass weights, DMI, and lower G/F as compared to SUM CALF. Compared to SPR CALF, SUM CALF had lighter initial weights, but were similar in other aspects.

		Summer Born				
Item	SPR CALF	EARLY CALF	LATE CALF	EARLY YEAR	LATE YEAR	Contrast[a]
In Wt (kg)	245.3	201.8	212.0	354.5	352.5	1,2
DMI (kg/d)	9.46	9.37	9.70	11.86	12.17	2
ADG (kg/d)	1.71	1.76	1.75	1.86	1.90	NS
G/F	0.181	0.188	0.180	0.156	0.156	2
HCW (kg)	332.1	322.7	327.2	361.6	364.4	2

[a]Contrasts: 1, Spring vs Summer CALF; 2, CALF vs YEAR, *P* < .001.

Key Words: Calving Season, Feeding, Carcass Characteristics

387 Comparative performance of grazing steers implanted with Revalor-G®, Ralgro®, and Synovex-S®, and subsequent finishing performance and carcass merit. G. L. Kuhl[1]*, C. T. Milton[1], G. L. Stokka[1], and R. T. Brandt, Jr.[2], [1]*Kansas State University, Manhattan and* [2]*Hoechst Roussel Vet, Somerville, NJ.*

Crossbred steers (*n* = 480, 268 kg) were used in a 94-d pasture/ 140-d feedlot study to evaluate several implant strategies on grazing/ finishing performance and carcass traits. Pasture treatments were Control (CON), Revalor-G® (R-G), Ralgro®(RAL), and Synovex-S® (S-S). Subsequently, half of the steers were finished (40 pens of 6 hd) and received either Revalor-S® (R-S) or S-S in the feedlot. R-G, RAL, and S-S improved stocker gains equally (P > .10). Overall, implanted stockers gained 13% faster (.87 vs. 77 kg/d; P < .01) and had 9.2 kg heavier (P < .01) off-grass weights than CON. Feedlot performance (carcass adjusted basis) and overall 234-d steer gains are shown in the table.

Feedlot trt:	Revalor-S				Synovex-S			
Pasture trt:	CON	R-G	RAL	S-S	CON	R-G	RAL	S-S
ADG, kg[a]	1.60	1.59	1.61	1.66	1.46	1.56	1.46	1.50
DMI, kg/d[b]	10.7	10.3	11.0	11.1	10.2	10.9	10.5	10.6
G/F[a]	.149	.154	.146	.149	.144	.143	.140	.142
234-D Gain, kg[a]	298	303	313	312	277	300	288	289

[a]Feedlot implant effect (*P* < .01).
[b]Feedlot implant (*P* < .05), and feedlot × pasture implant interaction (*P* < .01).

A pasture by feedlot implant interaction (P < .01) was observed for DM intake, partially as a result of different feedlot in-weights among treatments. On average, R-S steers consumed 2.3% more (P < .05) feed daily than S-S cattle. Overall, R-S improved (P < .01) steer daily gain 7.9% and gain efficiency 5.1% in the feedlot, and increased (P < .01) total 234-d gain 6.3% compared to S-S. Pasture implant treatment had no effect on feedlot gain or feed efficiency. Carcass weights were 10.4 kg heavier (P < .01) for R-S vs. S-S steers, and tended (8.2 kg; P = .13) to be increased by pasture implants. Carcass quality traits and yield grade were not influenced by implant strategy.

Key Words: Cattle, Implants, Pasture, Feedlot

388   Assessing value of corn gluten feed diets for cattle exposed to environmental stress. J. M. Heemstra[1]*, T. L. Mader[1], and J. B. Gaughan[2], [1]*University of Nebraska, Concord and* [2]*University of Queensland (Qld)-Gatton, Gatton, Qld, Australia.*

One winter and one summer trial were conducted comparing dry rolled corn (DRC) to DRC+35%, DMB, corn gluten feed (CGF) finishing diets. In the 76-d winter trial (three pens/treatment) a 2×2 +1 factorial design was used with diet (DRC vs CGF) and added fat (0 vs. 3%) as factors. Cattle were fed in facilities with minimal shelter provided. An additional treatment included cattle fed the no-fat CGF diet in sheltered pens. In the 106-d summer trial a 2×3 factorial design (five pens/treatment) was used in which DRC or 40% CGF diets were fed as high energy, 8% roughage diets either ad libitum (HE) or restricted to approximately 90% of HE (RE) or fed as moderate energy, 20% roughage diets (HR). For RE and HR diet treatments, respective diets were fed 42 d during the mid-portion of the trial only, corresponding to the period of greatest heat stress; HE diets were fed the balance of the trial. In the winter, the shelterbelt tended to improve efficiency by over 9%. In the minimal sheltered area, differences among diet treatments were not found, however calculated NEg values ranged from 77.8 to 79.4% of NRC values. In the summer trial, feeding LE vs HE diets did not improve efficiency. Feeding CGF diets or lowering ME intake through LE or HR diet regimes did not appear to reduce effects of heat stress, although summer temperature was approximately $2C°$ below normal. Calculated NEg values were 87.4% (DRC) and 92.5% (CGF) of NRC values for cattle fed HE diets. Relative to DRC, CGF diets tended to have greater calculated energy values during the summer only. Also, cattle gains and diet energy values, based on 1996 NRC model, were more accurately predicted in summer than in winter.

Key Words: Environmental Stress, Feedlot Cattle, Energy Intake

389   A comparison of net–returns from stocker cattle grazing Common bermudagrass pasture managed with intensive–early (IES) or season–long stocking (SLS) in Southwest Arkansas. S. A. Gunter*, M. B. Long, and J. M. Phillips, *Southwest Research and Extension Center, University of Arkansas, Hope.*

The objective was to compare the expenses, gross returns, and net–returns of steer calves managed with IES (12.4 steers/ha for the first 70 d) then hay harvested from these pastures during the last 70 days, or SLS (6.2 steers/ha for 140 d). On May 15, 1996, 105 steer calves (BW = 217 ± 1.64 kg) were randomly assigned to one of 15 .81–ha Common bermudagrass pastures fertilized with 168 kg of nitrogen/ha over the entire 140 d. One of the following five treatments was randomly assigned to three pastures: SLS plus no supplement (NS), SLS plus .45 kg of ground corn (CN)/ steer/d, SLS plus .50 kg of cottonseed meal (CSM)/steer/d, IES plus NS, and IES plus .45 kg of CN/steer/d. Total BW gain/ha did not differ (P > .31) among treatments. Steers managed under SLS–CN numerically had greater BW gain/ha (732 kg) compared to SLS–NS (529), SLS–CSM (629), IES–NS (581), IES–CN (542 kg/ha). Hay production did not differ (P = .94) between IES treatments (average = 1,564 kg/ha). Fixed cost (pasture rent plus fertilizer) did not differ (P = 1.0) among treatments ($173/ha), but variable cost (minerals, veterinary supplies, feed, death loss, etc.) were greater (P < .01) for IES than SLS (330, 384, 432, 559, $597/ha for SLS–NS, SLS–CN, SLS–CSM, IES–NS, IES–CN, respectively). The highest (P <.01) gross–return/ha if 217 kg calves were selling for $1.32/kg was with IES–NS ($1,277) and the least (P < .01) was with SLS–NS ($874), with SLS–CN ($1,210), SLS–CSM ($1,039), IES–CN ($1,211) being intermediate. Net–return/ha did not differ (P = .47) among treatment with them ranked as follows: SLS–CN (426), IES–NS (372), IES–CN (281), SLS–CSM (243), and SLS–NS ($212).

Key Words: Beef Cattle, Grazing Systems, Supplementation

390   Carcass characteristics and liver mineral concentrations of steers backgrounded on diets with or without broiler litter (BL), and subsequently finished on a conventional feedlot diet. A. H. Brown, Jr.[1]*, R. B. Simpson[2], J. M. Phillips[2], M. A. Brown[1], and Z. B. Johnson[1], *University of Arkansas,* [1]*Fayetteville and* [2]*Hope.*

The effects of backgrounding diet, with or without BL, on carcass characteristics and liver mineral concentrations of steers were studied in two consecutive years, 1994-95. Angus-sired, crossbred steers (338 ± 3.2 kg; 386 ± 1.4 d of age, n = 95) had previously been backgrounded for 143-d on either ad libitum access to bermudagrass hay and a salt-limited grain sorghum/cottonseed meal mixture (FCHAY; n = 32), ad libitum access to a 1:1 mixture (as fed basis) of grain sorghum and rice hull-based BL (RHBL; n = 31), or an ad libitum access to a 1:1 mixture of grain sorghum and wood shavings based BL (WSBL; n = 32). Steers were transported 880 km to a research feedlot and fed a starter diet for 28-d, after which they were transported 208 km to a commercial feedlot and fed 128-d as a single group. Liver samples were collected at slaughter and analyzed for 22 different mineral elements via inductively coupled argon plasma emission spectroscopy. Hot carcass weight (357 ± 6, 359 ± 6, and 363 ± 6 kg), LMA (85.4 ± 1.7, 86.5 ± 1.7, and 86.4 ± 1.8 cm^2) fat thickness (.21, .22, and $.21 \pm .02$ cm) and marbling score (429, 421, and 419 ± 12; 400 – 499, small) did not differ ($P < .05$) among FCHAY, RHBL, and WSBL steers, respectively. The proportion of steer carcasses having a quality grade of choice was similar ($P > .10$) among FCHAY (23/32), RHBL (22/31) and WSBL (25/31) steers. Liver concentrations (mg/kg of dry tissue) of copper were lower ($P < .05$) in FCHAY (243.8 ± 17.9) than in RHBL (321.5 ± 18.6) and WSBL (314.2 ± 18.6) steers. Liver concentrations of molybdenum were higher ($P < .05$) in FCHAY ($3.75 \pm .08$) than RHBL ($3.49 \pm .09$) and WSBL ($3.50 \pm .09$) steers. No other liver mineral concentrations differed among treatments. In summary, steers that were fed diets containing BL during a 143-d backgrounding period produced carcasses with similar characteristics to steers that received a non-BL diet during backgrounding.

Key Words: Beef Cattle, Poultry, Carcass

391   The effects of extruded cotton by-products on in vitro rumen fermentation. P. J. Defoor, C. R. Richardson, K. J. Sanders, G. B. Salyer*, and D. L. Holthuaus, *Texas Tech University, Lubbock.*

Laboratory analyses in rumen fluid were conducted to determine the effects of extruded cottonseed meal (control), extruded cull cottonseed (ECC) and a combination of extruded cull cottonseed and cotton gin trash (ECC-GT) on dry matter digestibility (DMD), and ammonia concentration during fermentation (AC) rumen fluid pH. The combination treatment of cotton by-products was a 60:40 ratio of cull cottonseed and cotton gin trash. Rumen fluid from a steer receiving an all forage diet was collected, strained through four layers of cheese cloth and mixed with McDougall's buffering solution in a 70:30 ratio. Fermentation substrates were incubated in rumen fluid at 39° C for 4, 8, 12, 16 and 24h. Dry matter digestibility was determined by adding a 1 g sample to a 100 ml digestion tube with 50 ml of rumen fluid and rumen fluid ammonia was determined by adding a 4 g sample to a 250 ml digestion bottle with 200 ml of rumen fluid. The control had the highest DMD (P < .05) as predicted with ECC being higher than ECC-GT across all incubation hours. Dry matter digestibility was higher for ECC after 4 and 8h of incubation than ECC-GT whereas at 12, 16 and 24h of incubation ECC was only numerically higher. No differences were found for rumen ammonia concentration at 4, 8, 16 and 24h of incubation. However, the control and ECC were very similar with ECC having the highest numerical ammonia concentration after 4, 8, 16 and 24h of incubation. But, after 8h ECC and the control were different (P < .05) than ECC-GT. No differences were found for rumen pH. These data show that the ECC and ECC-GT feedstuffs had a different fermentation rate than cottonseed meal and suggests that extruded cotton by-products can be utilized as protein and energy sources if they are more economical and readily available.

Key Words: Extrusion, Cotton By-Products, Digestibility

392   Predictors of dystocia in replacement beef heifers. K. W. Thompson*, J. D. Smalling, A. M. Saxton, and F. N. Schrick, *University of Tennessee, Knoxville.*

The objective of this study was to examine the usefulness of pelvimetry in selection of heifers to reduce dystocia. Preselection of heifers was based upon weaning weight (Angus (AN), n=328, $\bar{x}$=246 kg; Polled Hereford (PH), n=112, $\bar{x}$=243 kg). Prebreeding measures included weaning weight, weaning hip height (WHH), yearling weight, yearling hip height (YHH), and yearling pelvic area (PA). Dystocia scores were assigned at parturition (1=no assistance, 2=hand pull, 3=mechanical assistance and 4=caesarean), and calf birth weight and sex recorded. Calf birth weight was the most important variable associated with dystocia for AN and PH (R^2 = 20 and 21%, respectively). Yearling pelvic area accounted for only 8% of the variation in dystocia score within AN, but 21% for PH. Analyses of AN data indicated sire birth weight EPD, dam birth weight, WHH and YHH as the most discriminating variables within categorization of dystocia. Although these variables were significant (P<.05), Average Canonical Square Correlations per variable ranged from only .05 to .10. Cross validation was utilized in testing the model's (sire birth weight EPD, dam birth weight, WHH and YHH) predictive ability and resulted in an average error rate of 58%. Sire birth weight EPD was the only significant variable identified within PH data. Sire birth weight EPD, dam birth weight, WHH and YHH were utilized for PH cross validation, calculating an average error rate of 79%. In conclusion, the statistical model indicated nonpelvic size measures can be useful in explaining dystocia without the use of yearling pelvic measurements. However, pelvic area within PH heifers accounted for more variation above models including only nonpelvic measures. Predictive analyses indicated nonpelvic size measures were more useful than yearly pelvic area. However, variables included in these analyses were unable to accurately classify heifers within a dystocia score.

Key Words: Beef Heifers, Dystocia, Pelvic Area

393   Effects of monensin and altered forage:concentrate on feed intake and ovarian function in beef heifers. B. K. Reed*, H. Derington, and C. S. Whisnant, *Texas Tech University, Lubbock.*

The objective of this study was to determine the effects of monensin (M) and an altered forage:concentrate ratio (F:C) on feed intake and ovarian function in beef heifers. The study was designed as a 4 × 4 Latin square with a 2 × 2 factorial arrangement of treatments; however, due to animals going off feed, the project was terminated after two periods. Therefore, no statistical analyses were performed. Four ruminally cannulated heifers were maintained in metabolism crates and fed twice daily 0 or 440 mg/d M, a level 2.2 times the recommended dose, in diets containing 75:25 or 25:75 F:C. Diets were limit fed to achieve isocaloric intake of calculated ME. Measurements taken include percent reduction in feed intake (% RFI), follicular waves per estrous cycle (W/C), estrous length (ELD), duration of the corpus luteum (CLDD), and the size of the dominant follicle for waves 1 and 2 (SzDW1 or 2, respectively). Differences in effects are:

Item	+M	−M	75:25	25:75	75:25 +M	75:25 −M	25:75 +M	25:75 −M
% RFI	34.9	6.8	16.0	28.1	21.4	5.1	48.5	7.66
W/C	3.0	3.3	2.7	3.5	2.5	3.0	3.5	3.5
ELD	21.0	22.0	21.3	21.5	20.5	23.0	21.5	21.5
CLDD	15.3	14.3	14.0	15.5	14.5	13.0	16.0	15.0
SzDW1	10.5	9.7	10.0	10.3	11.0	8.0	10.0	10.5
SzDW2	12.3	10.3	11.7	11.3	12.5	10.0	12.0	10.5

We conclude that M, at the level used in this study, may exhibit a greater effect in reducing feed intake when combined with limit-fed, high concentrate diets. Additionally, M and an altered F:C, individually and in combination, may alter ovarian events.

Key Words: Monensin, Forage:Concentrate, Beef Cattle

394   Influence of diet on body composition and reproduction in beef heifers. K. C. Olson*, J. A. Walker, G. R. Holyoak, B. R. Bowman, and R. D. Wiedmeier, *Utah State University, Logan.*

The objective was to compare the influence of a limit-fed high concentrate diet to an all roughage diet fed to attain equal growth from weaning to breeding on body composition and reproductive response of yearling beef heifers. Prepubertal heifers were used during two years (n=59 each year) in a randomized complete block with three replicates of each treatment each year. Treatments were 100% roughage (R) or limit-fed concentrate (C, 80:20 or 60:40 concentrate:roughage during years one and two, respectively). Diets were fed to achieve 65% of mature BW at initiation of breeding. Heifers were weighed every 21 d to adjust intake to maintain equal ADG. Body condition was scored (BCS) at initiation and end of the study to use with BW to estimate body composition. Treatment by date interacted for BW (P<.01) and lipid body % (P=.02) in both years. Heifers receiving C gained weight and lipid % more rapidly than R. Treatment by year interacted for body protein % (P=.02) and BCS (P=.02). In year one, C had higher protein % and BCS than R, but protein % and BCS were similar in year two. Ovaries were examined by ultrasound at 10 d intervals each year for the presence of a corpus luteum (CL), number of follicles, and size of largest follicle. Onset of puberty was estimated as the date the first CL was present. Percentage of heifers displaying a CL (P=.5 and .81 in years one and two, respectively) age of puberty (P=.24), and largest follicle size did not differ (P=.14 and .81 in years one and two, respectively). Heifers receiving C had more (P=.04) follicles than R (13.1, 12.2, respectively) in year 1, but R tended to have more (P=.10) follicles than C (14.6, 13.6, respectively) in year 2. Heifers were bred by AI following observation of standing estrus during a synchronized estrus period, followed by natural service to complete a 45 d breeding season. Conception to AI (P=.82), natural service (P=.88), and total pregnancy rate (P=.72) did not differ. Heifers receiving C gained more weight and percent body lipid, but these differences did not influence age of puberty, fertility, or consistently influence ovarian function.

Key Words: Beef Heifer, Puberty, Body Composition

395   Initiation of luteal activity in early weaned spring calving cows varying in body condition at the time of calving. H. T. Purvis, II*, K. S. Lusby, and R. P. Wettemann, *Oklahoma State University, Stillwater.*

Sixty-six spring calving cows were utilized in a three year study to evaluate the effects of body condition score at calving on return to estrus following early weaning. Cows were assigned to two treatments: 1) to calve at a BCS of 5.0 (NORMAL), 2) calve at a condition score less than 5.0 (THIN). Cows were supplemented individually in a covered stall barn and grazed together in a common native range pasture. NORMAL cows received 1.36 kg of pelleted whole cottonseed daily, and THIN cows received .11 kg daily of the same pellet. Supplementation began in November and ended in April all three years. Calves were weaned from all cows about 65 d post partum. Progesterone was quantified in weekly blood samples and the initiation of luteal activity (LA) was defined as the first of two consecutive weekly samples in which progesterone was greater than 1 ng/ml. BCS at calving was greater for NORMAL cows compared with THIN (5.4 vs 4.1; P<.05). NORMAL cows had shorter (P<.05) postpartum intervals to LA compared with THIN cows (71 vs 83 days postpartum). BCS at calving was negatively correlated (r^2 = −69; P=.01) with days to LA following early weaning, and negatively correlated (r^2 = −.32, P=.05) with days from calving to LA. NORMAL cows exhibited luteal activity sooner (P < .05) following early weaning than THIN cows (13.4 vs 28.4 d). Therefore, increased BCS at the time of calving decreased the time until return to LA following early weaning. Regression analysis of days to LA following early weaning of the calf at 65 d and BCS at calving indicates that: [days to estrus = 76.4 days + -11.2X] (where X is BCS at calving, r^2=.49). Body condition score at calving influences the interval to the onset of luteal activity after early weaning.

Key Words: Early Weaning, Luteal Activity, Body Condition Score

396 Effects of two estrous synchronization systems for early postpartum beef cows. J. B. Hall*, A. DiCostanzo, J. Cassidy, and D. R. Brown, *University of Minnesota, St. Paul.*

The objective was to determine the effectiveness of two recent estrous synchronization methods on estrous induction and/or synchronization in early postpartum suckled beef cows. Twenty-eight Angus beef cows received GnRH + Norgestomet + $PGF_{2\alpha}$ (GnRH-NOR-PG, n = 14) or Norgestomet + estradiol (NOR-E2, n = 14) synchronization treatments. The GnRH-NOR-PG cows received a 6 mg norgestomet implant and an injection of 100 mcg of GnRH (Cystorelin[®]) on d 0. Implants were removed and cows injected with 25 mg of $PGF_{2\alpha}$ 7 d later. The NOR-E2 cows received a 6 mg norgestomet implant on day 0 with removal 7 d later. Estradiol valerate (1 mg, i.m.) was administered to NOR-E2 cows 30 h after implant removal. Cows were observed for estrus for 7 d after implant removal, bred AI 12 h after observed estrus then exposed to a bull for 30 d. Blood samples collected on d −10,0 and 14 were analyzed for progesterone. Therefore, cows served as their own controls for cyclicity. Progesterone concentrations exceeding 1 ng/mL indicated cows were cycling. At initiation of treatments, cows weighed 651.8 ± 14.4 kg with body condition scores of $6.0 \pm .2$, and averaged $38.0 \pm .9$ d postpartum. Both treatments increased ($P < .01$) the number of cows cycling following synchronization. Numbers of cows cycling before and after treatment, estrus response, and AI and total pregnancy rate were not different ($P > .1$) between treatments. We conclude that these methods are effective for inducing estrus in postpartum beef cows.

Treatment	Cycling before, %	Cycling after, %	Estrus response, %	Pregnant to AI, %	Total Pregnant, %
GnRH-NOR-PG	57.2[a]	92.8[b]	85.7	42.8	85.7
NOR-E2	30.8[a]	100[b]	92.8	46.1	76.9

[a,b]$P < .01$.

Key Words: Beef Cow, Estrous Synchronization, Norgestomet

397 Modifications of the Ovsynch estrous synchronization protocol for use in beef cows. T. W. Geary* and J. C. Whittier, *Colorado State University, Fort Collins.*

The Ovsynch protocol, designed for use in dairy cattle, includes an injection of GnRH (G) on d -10, an injection of $PGF_{2\alpha}$ (PG) on d -3, another injection of G on d -1 and timed insemination 24 hr later. This protocol requires handling cattle 4 times, which is not very practical for beef producers. The goal of this research was to evaluate modifications to the Ovsynch protocol that would lead to a more practical method of synchronizing estrus in beef cows. Three trials were designed to compare pregnancy rates of cows synchronized with the Ovsynch protocol and inseminated at the time of the second G injection (Ovsynch + 0 h) or 24 hours later (Ovsynch + 24 h; Trial 1), a G/PG protocol versus two injections of PG (Trial 2), or the G/PG protocol versus the MGA/PG protocol (Trial 3). In Trial 1, 752 cows from three locations were divided by age, days postpartum (PPI), and AI sire into 2 groups that were synchronized using Ovsynch + 0 h or Ovsynch + 24 h. Pregnancy rates (48%) were identical (P > .1) between Ovsynch + 0 h and Ovsynch + 24 h treated cows. In Trial 2, 163 cows were divided by breed, age, PPI, and AI sire into 2 groups that received either 2 injections of PG at 14-d intervals (2× PG) or an injection of GnRH 7 d prior to an injection of PG (G/PG) to synchronize estrus. Synchronization (87% vs 74%), conception (58% vs 57%), and pregnancy rates (51% vs 42%) of 2× PG and G/PG treated cows, respectively, were not different (P > .1). In Trial 3, 141 cows were divided by age, PPI, and AI sire into 2 groups that received either .5 μg MGA/day for 14 days plus an injection of PG 17 days after the last day of MGA feeding (MGA/PG) or the G/PG protocol used in trial 2. Synchronization, conception, and pregnancy rates of MGA/PG versus G/PG treated cows were 64%, 62% and 39%, versus 64%, 71%, and 45%, respectively, and were not different (P > .1). This data demonstrates the effectiveness of modifications to the Ovsynch protocol for synchronizing estrus in beef cows.

Key Words: Estrous Synchronization, GnRH, Postpartum Cows

398 Characteristics and costs associated with estrus detection methods for beef cows. M. L. Borger* and W. A. Greene, *The Ohio State University, Wooster.*

Estrus was detected in 80 beef cows by use of the electronic pressure sensing system HeatWatch™ (HW) and by ½ h visual observation twice daily at 0730 and 1930 for 22 d (VO). Cows were randomly allotted by breed, postpartum interval, and age to two equal groups: Syncro–Mate–B[®] treated (SMB) and controls (C) which spontaneously cycled. A randomly selected half of each treatment group were bred either based on HW (HWB) or VO (VB). AI occurred 8–16 h after first detected mount at either 0800 or 2000. Pregnancy status was determined by rectal palpation and uterine ultrasonography. Overall mean ± SD and (range) for total mounts and length of estrus based on HW were 26.3 ± 20.9 (1–98) mounts and 10.1 ± 5.0 (.4–23.2) h. The percentage of cows with first HW–recorded mount from 0001–0600, 0601–1200, 1201–1800, and 1801–2400 were 17.2, 29.7, 28.2, and 25.0, respectively. The estrus detection rates (EDR) for SMB and C were both 72.5% while pregnancy rates (PR) were 52.5 and 55.0% (P=1.0), respectively. EDR was higher for HW than VO (81.3 vs 65.0%, P=.03). There was no difference (P=.55) in PR between HWB (77.8%) and VB (69.0%). Overall EDR and PR were similar (P=1.0) for HW–C (70%, 55%) and VO–SMB (75%, 50%). PR was lower (P=.03) for cows inseminated < 10 h (50%) and >18 h (58.8%) after the onset of estrus than 10–18 h (92.8%). Estrus detection \$ costs per cow and (per pregnancy) based on an 80 cow herd for VO–only, VO–SMB, and HW–C were 1.84 (3.34), 10.03 (20.05), and 8.56 (15.57), respectively. Estrus synchronization and HW are viable estrus detection aids but may be more costly than a good visual observation program.

Key Words: Beef Cows, Estrus, Detection

399 Comparison of electronic estrous detection with the onset of normal luteal activity of lactating dairy cows. M. H. Campbell, F. N. Schrick*, and J. K. Miller, *The University of Tennessee, Knoxville.*

The objective of this study was to determine if electronic estrous detection could replace blood analysis for estimating the onset of normal luteal activity in lactating dairy cows. Holstein (n = 50) and Jersey (n = 10) cows were fitted with electronic pressure-sensing devices, (HeatWatch™, HW) in the second week of lactation. Blood samples were taken at 7-d intervals and analyzed for plasma concentration of progesterone. The onset of normal luteal activity was determined when progesterone was ≥ 1 ng/mL. First estrous activity as determined by ≥1, ≥2, ≥3, or ≥4 mounts (duration ≥ 2 s) in 24 h, when compared to low progesterone (<1 ng/mL) followed by increased progesterone, correctly detected onset of normal luteal activity 46.4% (n = 26 cows), 35.7% (n = 20 cows), 26.8% (n = 15 cows), and 23.2% (n = 13 cows), respectively ($P =.04$). Days to the onset of normal luteal activity were correlated with days to first estrus (≥4 mounts in 24 h; r =.64; P <.001). Accuracies of HW in determining estrus after 45 d postpartum by mounts of 1, 2, 3, and ≥4 were 30.1%, 24.5%, 44.8%, and 73.9% (P <.001), respectively. Pregnancy status was determined by transrectal ultrasonography between 40 and 47 d after breeding. Retrospectively, HW recorded 48 (1 mount/24 h), 56 (2 mounts/24 h), 7 (3 mounts/24 h), and 10 (≥4 mounts/24 h) periods of mounting activity after conception. Of these periods of mounting activity, 24 cows had 1 mount, 24 cows had 2 mounts, 10 cows had 3 mounts, and 8 cows had ≥4 mounts within a 24-h period. This activity after conception and mounts (≥4) when progesterone indicated anestrus reduced the accuracy. Electronic estrous detection does not provide an adequate substitute for blood sampling in determining the onset of normal luteal activity in lactating dairy cows.

Key Words: Dairy Cattle, Luteal Activity, Estrous Detection

400   Castration and implantation with Ralgro®, Syno-vex-C® or Calf-OID® within five days of birth does not alter growth rates or 180 day weights of steer calves under field conditions. D. L. Fernandez[1]*, D. J. Patterson[2], and K. K. Schillo[1], [1]University of Kentucky, Lexington and [2]University of Missouri, Columbia.

Eighty two, crossbred bull calves born between March 13 and May 7, 1996, were weighed, castrated and implanted within 5 d of birth. Calves were stratified by birth date and randomly assigned to either control (no implant; n = 20), Ralgro® (n = 20), Synovex-C® (n = 21) or Calf-OID® (n = 21) treatment. Calves were weighed again at 97 (WD1) and 187 (WD2) d after the average calving date. Calves were maintained on pasture with their dams. Date of birth and age at WD1 and WD2 did not differ (P>.10) among treatments. Birth weight (BW) and weights of calves on WD1 (WT1) and WD2 (WT2) did not differ among treatments (P>.10). Average daily gains from birth to WD1 or from WD1 to WD2 were not different (P>.10). Overall average daily gain and total weight change were not different (P>.10). Implantation with Ralgro®, Synovex-C® or Calf-OID® within five d of birth does not alter growth rates or 180 d weights of steer calves under field conditions.

Least Squares Means for BW, WT1, WT2, and WTCH for steer calves receiving either Control, Ralgro, Synovex-C or Calf-OID[1]

Treatment	n	BW	WT1	WT2	WTCH
Control	20	31.7 ± .97	121.8 ± 6.4	202.1 ± 7.9	155.3 ± 8.2
Ralgro	20	32.9 ± 1.0	118.9 ± 6.9	194.1 ± 8.5	153.2 ± 8.7
Synovex-C	21	33.0 ± .86	123.7 ± 5.7	206.9 ± 7.0	162.5 ± 7.5
Calf-OID	21	33.4 ± .84	122.2 ± 5.5	203.2 ± 6.8	158.7 ± 7.5

[1]kg ± S.E.M.

Key Words: Beef Cattle, Steer, Growth Promotants

401   A comparison of rolled corn and steam flaked sorghum grain as fed to lactating dairy cattle. L. Spicer[1]*, J. E. Trei[1], M. J. Burrill[1], and H. Hellman[2], [1]California State Polytechnic University, Pomona and [2]Consulting Nutritionist, Upland, CA.

A comparison was made of rolled corn and steam flaked sorghum grain based diets where production (fat corrected milk, milk, monthly fat and % butterfat), somatic cell count (SCC), and body condition scores (BCS) were observed in lactating dairy cattle. Two groups of approximately 160 cows per group were milked twice a day in a herring bone barn and observed for four months. An average of 6kg/head/day, as fed basis, of steam flaked sorghum grain or rolled corn was fed to all cows. Twenty-four hour starch hydrolysis was greater for steam flaked sorghum grain, 82.8% versus 73.8% for rolled corn. Data were analyzed as a 2 × 4 factorial analysis of covariance (days in milk). Fat corrected milk (FCM) averaged 35.9 and 37.3kg/head/day (P>.05) for sorghum grain and corn fed cows over all lactations. Other variables-milk, % butterfat, monthly fat, % solids-non-fat, protein, lactose, milk urea nitrogen, SCC, and L-2 scores were not statistically different. FCM was higher (P<.05) for lactations two through seven for dairy cows fed corn, 38.1 versus 36.2kg/head/day for sorghum fed cows. There was a significant reduction in BCS and a non-significantly higher SCC (both pretrial and during trial) with the steam flaked sorghum grain, 718 versus 486 for rolled corn fed cows over all lactations. It is hypothesized that the higher SCC in the sorghum fed group may have contributed to the lower FCM and BCS as the trial progressed.

Key Words: Grain Processing, Sorghum Grain, Lactation

402   The effect of herd, genotype, and time of calving upon dairy cow performance. E. Szücs[1]*, A. Gáspárdy[2], M. Mészáros[3], J. Sölkner[4], T. A. Tuan[1], and J. Völgyi-Csík[5], [1]Gödöllő University of Agricultural Science, Gödöllő, [2]University of Veterinary Science, Budapest, and [3]National Association of Hungarian Holstein-Friesian Breeders, Budapest, [4]Institute of Livestock Production, University of Agriculture, Vienna, and [5]Research Institute for Animal Breeding and Nutrition, Herceghalom.

A survey on the performance of cows was analyzed in the first (n = 16959), second (n = 8060), third (3113), fourth (1014) and fifth parity (359) from 53, 51, 42, 28 and 13 herds, respectively. The data set covers six genotypes from an upgrading program using Holstein-Friesian genes (purebred HF, as well as ones with HF gene ratios >96.9, between 93.8–96.8, 87.5–93.7, 75.0–87.4 and 50.0–74.9 %, resp.) to improve the local Hungarian Simmental breed. The collection of records lasted for a 5 years period (1989 - 1993). Overall mean and SD for ECM_{305} in the first parity was 5495±1201 kg with higher values in the subsequent ones with limited fluctuations (range: 6213±1464 – 6324±1603 kg). In the first parity butterfat content attained 3.67±0.46 % with decreasing tendency (P<0.001) in the subsequent lactations (3.56±0.45 %). Just the same trend was recorded in milk protein content, as well. The highest and the lowest values were 3.31±0.21 and 3.28±0.20 %, respectively. For all traits highly significant differences (P<0.001) were obtained among herd averages in all parities. With the increasing Holstein-Friesian gene ratio, the mean values for ECM_{305} among genotypes (P<0.001) seemed to increase in all parities. In the first, second, and third parities an opposite tendency was observed for both butterfat and milk protein content. The monthly effect of calving on ECM_{305} was present (P<0.001) in all parities, as well. Cows calved in winter months such as January, February and early spring in March produced more milk than their counterparts with summer calving dates (P<0.001). The least milk production was shown in cows with late summer parturition. An opposite tendency was recorded in butterfat and milk protein percentage. In this study, a clear effect of year was shown for ECM_{305}, butterfat percentage and milk protein content, as well.

Key Words: Dairy Cattle, Environment, Upgrading

403   Effect of increasing levels of magnesium oxide on intake of a monensin-containing self-limited energy supplement by steers grazing winter wheat pasture. S. I. Paisley*, C. J. Ackerman, and G. W. Horn, Oklahoma State University, Stillwater.

The effect of increasing levels of magnesium oxide (Baymag, 58% Mg) on intake of a self-limited energy supplement by growing steers grazing winter wheat pasture was measured. Forty-eight Hereford × Angus steers (249 ± 24.1 kg) were evenly allotted to four pastures equipped with Pinpointer feeders from November 8 through December 20, 1996 (42 days), and had free-choice access to the milo-based energy supplement that contained (as-fed basis) 4% salt, 165 mg/kg monensin and .25, .75, 1.25 and 1.75% magnesium oxide. Steers were given 14 days to adapt to the pastures and Pinpointer feeders, with daily supplement intakes measured during the last 28 days. Daily gain of steers was not affected (0.81kg/d; P=.35) by increasing levels of magnesium oxide. General Linear Model of SAS was used to analyze individual supplement intakes using two statistical models. For Model I, all individual daily intake observations (n=1344) were included in the data set. In Model II, individual supplement intakes were averaged across the 28 d intake period. Linear, quadratic and cubic effects of increasing magnesium oxide levels were analyzed in both models using pre-planned orthogonal contrasts. Least square means for supplement intakes were 0.59, 0.66, 0.58, and 0.87 kg/d, respectively, for .25, .75, 1.25, and 1.75% magnesium oxide for both Models I and II. Contrasts were all significant (P<.001) for Model I, indicating a cubic effect of increasing levels of magnesium oxide on supplement intake. Significance levels for Model II were P=.03, P=.12, and P=.13, respectively, for linear, quadratic and cubic effects, indicating a linear increase in supplement intake. Neither model indicated a significant decrease in supplement intake by increasing levels of magnesium oxide, however, interpretation of the results varies depending on the model used.

Key Words: Magnesium Oxide, Wheat Pasture, Supplement

404   Evaluation of performance and carcass characteristics of pasture- and/or grain-fed steers. P. H. Sapp, M. A. McCann, and S. E. Williams*, *University of Georgia, Athens.*

Angus sired, crossbred steers were assigned to one of three postweaning feeding programs: 1) wheat-ryegrass pasture only, 2) wheat-ryegrass pasture followed by grain feeding, and 3) mixed ration in drylot (ad libitum). Steers were slaughtered at a fat thickness of approximately .9 cm over the 12th rib or live weight of 476.7 kg. Performance characteristics, USDA quality and yield grades, visual and spectrophotometric fat color, retail yields, and fat cellularity were measured. Steers fed the concentrate diet had higher (P<.05) daily gains (1.5 vs 1.17 kg/d) and USDA yield (3.0 vs 2.4) and quality grades (Se+ vs Se−) than pasture-fed steers. Treatment did not affect (P>.05) hot carcass weight, dressing percentage, ribeye area or lean and bone maturity of carcasses. Pasture-fed steers had a more (P<.05) intensely yellow subcutaneous fat visual score (3.3 vs 1.0, where 1 = white and 6 = extremely yellow) than grain-fed steers. Carcasses from pasture/grain-fed steers closely resembled grain-fed steers in visual fat color (1.3 vs 1.0). Total bone, whole muscle cuts and total lean percent were higher (P<.05) for pasture and pasture/grain treatments than grain treatment. The C.I.E. (1978) L^*, a^*, and b^* (yellowness) measurements showed pasture-fed carcasses had yellower (P<.05) fat (19.0 vs 15.2 b^*) than grain-fed carcasses. However, trimming to .64 cm decreased yellowness as inside (closest to muscle) fat color (b^*= 11.4) was less (P<.05) yellow than outside fat color (b^*= 17.0). No cellularity differences between fat layers were found among treatments, indicating no relationship of cell size to fat color differences. These results suggest that management practices utilizing high-quality forages in the southeastern United States appear feasible for finishing cattle.

Key Words: Pasture, Steers, Grazing Systems

405   Performance of steers fed either compressed molasses blocks, liquid molasses or dry protein supplements on Bermudagrass pastures. W. A. Phillips[1] and G. W. Horn[2], [1]*USDA-ARS Grazinglands Research Laboratory, El Reno, OK* and [2]*Oklahoma Agricultural Experiment Station, Stillwater.*

The objective of this experiment was to determine if molasses based supplements containing NPN could increase the performance of summer stocker steers grazing Bermudagrass (Cynodon dactylon 'Midland') pastures as efficiently as a plant protein supplement. Over three grazing seasons, 1989 to 1991, cross-bred steers (n= 420, mean weight = 255 kg) were randomly assigned to either a non-supplemented group or to the following supplemented groups; 1) 3.2 kg of a 38% CP plant protein supplement fed in three equal portions per week during the last half of the grazing season , 2) ad libitum access throughout the grazing season to compressed molasses block containing 37% CP with 16% CP equivalents from NPN (Year 1 only), or 3) limit access to liquid supplement provided in a lick tank (Year 2 and 3 only). The liquid supplement used in Year 2 contained 16% CP with 10% CP equivalents from NPN, while in Year 3 the liquid supplement contained 24% CP with 18.5% protein equivalents from NPN. All supplements contained lasalocid. Data were analyzed within year as a completely randomized design using pasture as the experimental unit. Supplemental protein significantly increased ADG (.51 vs .69 kg), regardless of form. Molasses based supplements fed as compressed blocks or as a liquid supplement were as effective as a dry all plant protein supplement in increasing ADG of steers grazing Bermudagrass pastures during the summer.

Key Words: Beef Cattle, Grazing, Protein Supplements

406   Effect of winter rate of gain on subsequent grazing and finishing performance. D. Downs*, G. E. Erickson, D. C. Adams, and T. J. Klopfenstein, *University of Nebraska, Lincoln and North Platte.*

Eighty yearling crossbred steers(226 kg) were used to evaluate the effect of winter rate of gain on subsequent grazing and finishing performance. During the wintering period (128 d), steers grazed corn stalks followed by bromegrass hay with corn gluten feed to achieve gains of .31 (LG; 40 hd) or .76 kg/d (HG; 40 hd) (P < .001). Twenty LG and 20 HG steers were assigned randomly to graze warm season range in the Nebraska sandhills, while the other 40 grazed bromegrass pasture (123 d). Cattle (10 hd/pen) were then finished on a 7.5% roughage diet to an estimated 50-mm fat thickness. Both LG and HG cattle grazing brome pasture gained slower (P < .05) than those grazing sandhills range. At both locations, LG cattle gained faster (P < .05) than HG cattle during the summer but compensated for only 19.9 (sandhills) and 18.7% (brome) of the weight deficit following the LG treatment. High gain cattle summered on brome exhibited higher (P < .05) finishing ADG and DMI than LG steers at either location. During finishing, LG and HG cattle that grazed brome were more efficient (P < .05) than steers that grazed sandhills range. Quality and yield grade were not affected by treatment or location. During summer grazing, HG cattle maintained approximately 80% of the weight advantage over the LG wintering treatment justifying a rate of winter gain greater than .31 kg/d.

Item	Winter	Sandhills range		Bromegrass pasture	
		Gain:Low	High	Low	High
Winter	Days	128	128	128	128
	ADG	.32[a]	.76[b]	.31[a]	.76[b]
Summer	Days	123	123	123	123
	ADG	.87[a]	.76[b]	.33[c]	.22[d]
Finishing	Days	99	71	124	99
	ADG	1.90[a]	2.08[ab]	2.04[a]	2.29[b]
	G/F[e]	.145[a]	.146[a]	.156[b]	.158[b]
	Final[f]	574[ab]	595[ab]	568[a]	601[b]

[a,b,c,d]Means within a row differ ($P < .05$).
[e]G/F = ADG/DMI.
[f]Carcass weight adjusted to a 62% dress.

Key Words: Compensatory Gain, Beef Cattle, Pasture

407   Influence of corn harvest technique on steer performance and comparison of harvest cost. T. M. Vanzant* and K. S. Hendrix, *Purdue University, West Lafayette, IN.*

The influence of corn harvest technique upon yield, harvest cost, and animal productivity was evaluated. Corn products were harvested from the same field using one of four harvest techniques: whole-plant corn silage (CSP); chopper harvested high-moisture ear corn (EarP); combine harvested high-moisture ground ear corn (CobP); and high-moisture shelled corn (HMCP). On a dry matter basis (DMB), the products contained 43.6%, 84.9%, 88.5%, and 100% corn grain and yielded 12.3, 6.6, 6.3, and 5.8 t/ha for CSP, EarP, CobP, and HMCP, respectively. Labor and fuel cost/ha harvested was $110.93, $26.70, $31.49, and $22.23 for CSP, EarP, CobP, and HMCP respectively. Ninety-six crossbred steer calves (323 kg) were arranged in a randomized complete split-plot block design and allotted within weight block to one of four diets: corn silage grower + finisher (CS); earlage (E); coblage (C); and high-moisture corn (HMC). On a DMB, each diet contained 10% supplement, E and C diets contained 90% EarP and CobP respectively, the HMC diet contained 75% HMCP and 15% CSP and the CS diet contained 90% CSP for the 98 day grower phase and 75% HMCP and 15% CSP for the finishing phase. Steers were fed to a common end point. Average days on feed were 202, 181, 189, and 174 for steers on the CS, E, C, and HMC diets respectively. Average daily gain for steers on the HMC diet (1.53 kg/day) was higher (p<.05) than steers on all other diets (1.35, 1.37, and 1.37 kg/day for CS, E, and C diets respectively). No difference in feed efficiency was observed among treatments. Quality grade for steers on the C diet was higher (p<.05) than steers on all other diets. Yield grade was higher (p<.05) for steers on the HMC diet (3.95) compared to steers on the CS and E diets (3.26 and 3.17 respectively). Live beef gain/ha was 1211, 1055, 1061 and 1050 kg for CS, E, C, and HMC diets respectively. Harvest cost for labor and fuel was $2.16, $1.15, $1.35, and $1.41 per 45.4 kg of beef produced for CS, E, C, and HMC diets respectively.

Key Words: Steers; Corn, Harvest Technique

408   Evaluation of deep stacked turkey litter (DSTL) as an alternative feed for growing and finishing steers. S. K. Varghese*, B. Salem, H. Ritchie, R. Cook, A. Rahn, R. Tempelman, T. Johnson, and I. Krupp, *Michigan State University, East Lansing.*

The objective of this study was to evaluate Deep Stacked Turkey Litter (DSTL) as an alternative feed for growing and finishing beef cattle. 150 Holstein steers with a mean initial weight of 377 kg were randomly divided into three groups and fed rations containing 0, 20 or 40% DSTL for a period of 294 days. DSTL was analyzed for pathogens, pesticides, heavy metals, and nutritive value. Daily gains were 1.15, 1.12 and 1.16 kg for the 0, 20 and 40% DSTL treatments, respectively. Treatments were not different (P<.05). The dressing percentage (58.4, 57.8, 57.8%) for controls differed from both DSTL treatments (P<.01). Backfat thickness was 8.89, 8.38 and 7.62 mm for 0, 20 and 40% DSTL diets, respectively. Backfat thickness for the 40% DSTL diet differed from the other treatments (P<.05). Yield grades were not different between treatments (P<.01). Quality grade of 40% DSTL treatment was lower(P<.01) than the other treatments. Serum urea nitrogen was 14.8, 8.6 and 13.4 mg/dl for 0, 20 and 40% DSTL, respectively. The serum urea nitrogen for the 20% DSTL differed from 0 and 40% DSTL treatments (P<.05). Pesticide and heavy metal concentrations in the diets were within FDA guidelines. Microbial pathogens were not detected. Feed costs per kg of weight gain were $1.43, $1.10 and $1.01 respectively. These results suggest that utilizing DSTL as an alternative feed would be economically beneficial to both beef and turkey producers and would have potential for reducing environmental pollution.

Key Words: Beef Cattle, Alternative Feed, Turkey Litter

409   Optimal feedlot entry weights of beef steers determined by body weight and ultrasonic measurements of marbling scores. J. N. Carter*, P. A. Ludden, M. S. Kerley, and W. O. Herring, *University of Missouri, Columbia.*

Seventy-two Angus crossbred steers (350 kg) were used to determine if body weight can determine a point after which feed energy is dedicated to intramuscular fat deposition. Steers were assigned to one of four treatments in an unbalanced study; treatment groups represented a body weight at which steers would enter the feedlot (363 kg, 409 kg, 454 kg, 499 kg). Live weights and ultrasonic measurements of backfat thickness and marbling scores were taken on each animal at 28 day intervals until slaughter. Steers were grazed on average quality forages until reaching their assigned treatment weight. All steers received two implants of Revalor-S and were supplemented while on pasture with 1.14 kg per head per day of a supplement (ground corn, soyhulls, bloodmeal, molasses, vitamin ADE, and bambermycins). When steers reached their assigned treatment weights, they were adapted to a common feedlot diet (13.4% CP), composed of high moisture corn (27%), cracked corn (13%), whole raw soybeans (20%), cotton gin trash (20%), soyhulls (10%), and a supplement containing monensin (10%). Steers were fed to an average final weight of 568 kg resulting in projected days on feed of 115, 90, 60, and 45 for the four treatment weights respectively. After slaughter, carcass data were collected. No differences in pasture gain (1.0 kg/d) or feedlot gain (1.75 kg/d) occurred among treatments. Regardless of treatment, rate of intramuscular fat deposition began to accelerate at approximately 450 kg body weight based upon regression analysis. Further analysis of data will be performed when all steers have been slaughtered. Pinpointing the body weight at which intramuscular fat deposition is likely to accelerate will help to reduce excess trimmable fat, reduce carcass inconsistencies and reduce production costs.

Key Words: Beef Steers, Feedlot, Ultrasound

410   Separating Tennessee feeder cattle of differing biological types into slaughter outcome groups. D. O. Onks[1]*, J. D. Gresham[2], A. M. Saxton[3], J. Martin[3], D. Rose[3], M. Brown[3], K. Thompson[4], J. Loy[5], and M. Johnson[1], *University of Tennessee, [1]Springfield, [2]Martin, [3]Knoxville, [4]Spring Hill, and [5]Crossville.*

A study was initiated in 1994 to determine if feeder calves of diverse genetic and management backgrounds (CB) could be effectively allotted for feedlot regimes which would produce a uniform slaughter outcome group (SOG). A fractional factorial design with three cow mature weights, cow breeds, and forage availabilities were discretely partitioned across four locations. 116 steer calves produced by five sire breeds in 1994 and 1995 from this design were backgrounded on corn silage and a 1% body weight grain ration (108 days avg.) and then finished on an ad. lib. diet of shelled corn and protein pellets (140 days avg.). Significant production traits collected were weight (IWT) and body condition (ICS) at initiation and weight (EWT) and body condition at the end of the backgrounding phase and slaughter weight (SW) and carcass marbling (CM) following finishing with ultrasound marbling estimates (UME) being collected at each point. SOG's are based on SW and CM. 9 SOG's were created from combinations of 3 SW ranges, 1) < 499 kg, 2) 500 to 567 kg, 3) > 568 kg and 3 CM scores of 1) choice, 2) >choice, 3) <choice. Results show that SW, by itself, can be adequately described using CB (p=.002), IWT (p=.014),(b=.465), EWT (p=.0001),(b=.791) and days on feed (DF) (p=.01),(b=2.684) (R^2=.79). CM, by itself, was less predictable with only IWT (p=.005),(b=−.0096), EWT (p=.08),(b=.0056) and DF (p=.05),(b=−.036) showing significance (R^2=.36). Addition of UME was most useful, at the end of the backgrounding phase (P=.09) through slaughter. Combining these relationships to predict SOG (R^2=.63), indicates that different biological types can be sorted following backgrounding to produce a more uniform SOG. By adjusting cattle management to SOG, increases in carcass uniformity and feed efficiency can be realized.

Key Words: Beef Cattle, Slaughter Outcome Groups, Feedlot, Carcass

411   Effects of limited access time to feed on feedlot performance and carcass characteristics. Z. I. Prawl*, W. J. Hill, F. N. Owens, D. R. Gill, R. L. Ball, and R. Porter, *Oklahoma State University, Stillwater.*

To test effects of limiting the time that cattle have access to feed, 100 crossbred steers (initial wt 349 kg) were given access to feed for 1.5, 3, 6, 9 or 24 h each day for 120 days. Gates in front of the feed bunks were opened at 0800 and closed after the allotted feeding time. Steers were allocated randomly within four weight blocks to treatments with five steers in each of 20 partially covered pens for a total of 20 steers per treatment. All steers were fed a concentrate diet (87% whole corn, 5% cottonseed hulls, and 8% supplement pellets). After 56 d on feed, because cattle limited to a feeding time of 1.5 h had significantly lower DMI (P < .01), ADG (P <.01), and poorer feed efficiency (P < .01) than other treatments, restriction time for these 20 steers was expanded to 9 h. After 120d on feed, cattle restricted to 9 h access to feed for the total trial had greater (P<.05) ADG, dressing percent, and a superior feed to gain ratio, and numerically greater DMI, carcass weight, and ribeye area compared to cattle with ad libitum access to feed. Daily DMI were 8.84, 8.72, 9.29, 9.76, and 9.57 kg ; ADG were 1.20, 1.31, 1.23, 1.54, and 1.38 kg, and feed to gain ratios were 7.38, 6.69, 7.58, 6.35, and 6.93 for access times of 1.5, 3, 6, 9, and 24 h, respectively. Despite differences in performance due to time access to feed, marbling, percent choice, yield grade, backfat and KPH did not differ between treatments. Limiting the time steers had access to feed to 9 h each day improved both rate and efficiency of weight gain with no effects on intake or carcass traits suggesting that slick bunks in a feedlot are not a problem and may in fact be beneficial. Whether or not this is applicable to large pen situations needs further study. While slight restrictions in intake (90-95 % of ad libitum) improve feedlot efficiency, achieving similar restrictions by limiting time animals have access to feed to less than 9 hr does not appear beneficial.

Key Words: Feedlot, Limited-Time, Steers

412   Comparative evaluation of mixing efficiency of three different mixers. K. J. Sanders*, C. R. Richardson, and L. L. Burnham, *Texas Tech University, Lubbock.*

Three horizontal batch type mixers, a 454 kg double ribbon mixer, a 227 kg paddle mixer and a 1818 kg twin screw truck mixer, were utilized to evaluate the differences in mixing uniformity among mixer types. A beef cattle diet containing 48.5% cracked corn, 5.08% cane molasses, 29.5% cottonseed meal, 13.25% dehulled soybean meal (48% CP), 1.8% NaCl, .25% vitamin A premix and .9% $CaCO_3$, added in the respective order, was utilized as the mixing diet. Cracked corn and cane molasses were mixed for 30 s then the additional ingredients were included and mixed for 1, 2, 4, 6, and 8 min. Samples were taken from four predetermined positions, across the depth of the feed, within all the mixers at the designated times. Samples were ground through a 1 mm screen and analyzed for sodium chloride concentration by Quantab chloride titrators. Mixing efficiency was found to be dependent on the relationship between mixer type and time of mixing in a two-way interaction (P = .002). The CV at 1 and 2 min of mixing showed that the ribbon and paddle mixers were more efficient than the truck but were only significant (P < .05) at 1 min. No differences found at 2, 4, and 6 min The paddle mixer more uniformly mixed at 4 min than did the other mixers. The ribbon mixer continued to uniformly mix after 6 min whereas, the paddle mixer and the truck mixer did not. After 8 min of mixing the ribbon mixer and the paddle mixer were more uniformly mixed (P < .05) when compared to the truck mixer (CV, 10.87, 11.06 and 38.54, respectively). The ribbon mixer was more efficient after 1 and 6 min of mixing and the paddle mixer was more efficient after 2 and 4 min of mixing. These data show that the optimum mixing time for all mixers was 4 min.

Key Words: Mixer Efficiency, Ribbon Mixer, Paddle Mixer

413   Feedyard and carcass characteristics of Santa Gertrudis steers subject to seven different implant combinations. N. C. Tipton*, J. C. Paschal, M. De La Zerda, and J. W. Savell, *Texas A&M University, College Station.*

The objective was to determine the effect of several different implant regimes on feedyard and carcass characteristics of Santa Gertrudis steers. Two hundred thirty-nine Santa Gertrudis steers were implanted/re-implanted (TRT) with Compudose/none (COM) (n=34), Synovex-S/Synovex-S (SS) (n=34), Synovex-S/Synovex-Plus (SSP) (n=33), Synovex-Plus/none (SP) (n=34), Revalor-S/none (REV) (n=36), Synovex-S/Revalor-S (SR) or unimplanted controls (CONT). Upon arrival from oat pasture to a commercial feedyard the steers were weighed, implanted, placed on that feedyard's normal finishing regime, re-implanted after 71 DOF and commercially slaughtered at 145 DOF. Warner-Bratzler shear values (WBS) were collected on 16 rib steaks per TRT with steak marbling scores (MARB) between Slight[30] and Slight[70]. TRT was significant for off feed weight, total feedyard gain and average daily gain (ADG). ADG least squares means in kg/day were 1.43±.04, 1.52±.04, 1.51±.04, 1.55±.04, 1.55±.04, 1.58±.04 and 1.55±.04 for CONT, COMP, SS, REV, SP, SR and SSP, respectively. Carcass weight was also heavier for implanted vs CONT steers. All other yield factors were not significantly different. MARB, quality grade (QUAL) and WBS all showed significant differences due to TRT. QUAL least squares means were Select[86], Select[80], Select[65], Select[60], Select[61], Select[58], and Select[68], for CONT, COMP, SS, REV, SP, SR and SSP, respectively, with a standard error of 7. WBS least squares means, in kg, were 3.16±.21, 3.39±.24, 3.62±.21, 3.60±.22, 3.95±.22, 3.46±.22 and 4.12±.22 for CONT, COMP, SS, REV, SP, SR and SSP, respectively. This study indicates that implanting Santa Gertrudis steers leads to higher weights and gains, but could have negative effects on carcass quality and Warner-Bratzler shear force.

Key Words: Santa Gertrudis, Carcass, Implant

414   The use of live animal and carcass automated ultrasound scans to predict carcass composition in pigs. K. D. Miller[1]*, F. Cisneros[1], Y. Hyun[1], F. K. McKeith[1], J. R. Stouffer[2], and M. Ellis[1], *[1]University of Illinois, Urbana and [2]Animal Ultrasound Services Inc., Ithaca.*

Longitudinal ultrasound measurements were taken on the live animal and the carcass on 84 market weight barrows and gilts. Images were taken anterior to the last rib 5 cm off the midline and interpreted automatically using the AUSKey System (V2.0 Auto D) and average fat and longissimus depth measurements were obtained. Following slaughter, fat and longissimus depths were measured at the 10th and last rib, 5 cm off the midline. Lean cut yield (trimmed boneless loin, shoulder and ham) and fat-free lean content were determined using standard procedures. Correlations between ultrasound and carcass (last rib) measures of backfat and longissimus depths were .83 and .26, resp., for live-animal ultrasound and .81 and .48, resp., for carcass ultrasound. Regression analysis was used to develop three-variable (live weight, fat depth, longissimus depth) equations to predict the percent of fat-free lean. Equations based on carcass measurements at the 10th and last rib gave R^2 values of .61 and .67, resp,. Equations based on automated ultrasound measurements to predict percent fat-free lean gave R^2 values of .64 and .58 for scans taken on the live animal and carcass, resp. These data suggest that automated measurements taken from ultrasound images in the live animal or the carcass are relatively accurate at predicting carcass composition in pigs.

Key Words: Automated Ultrasound, Swine, Carcass Composition

415   Evaluation of machine and technician effects on a-mode ultrasonic measures of backfat and longissimus muscle depth in swine. M. T. See and F. Hollowell*, *North Carolina State University, Raleigh.*

To evaluate A-mode ultrasonic machine and technician effects on the measurement of fat and muscle depth 27 market pigs were visually selected for maximum variation in fat depth. Tenth rib fat depth and loin depth were measured at a location 18 cm in front of the last rib and 7 cm from the dorsal midline. Last rib fat depth was measured at the C and K positions. All pigs were measured by three different technicians using five different a-mode ultrasonic machines. Each pig was also evaluated with b-mode ultrasound by a NSIF certified technician. Accuracy of ultrasound measure was described by the absolute values of the difference between the a-mode ultrasound and b-mode ultrasound measurements. For the analysis of |C| and |K| measures the effects of machine, pig and machine × pig were significant (P < .01). Pig and machine × pig interactions may be explained by the overestimating of C and K for leaner pigs and underestimating C and K for fatter pigs. For |Tenth| only the effect of machine was significant (P < .001). For |Loin Depth| the effect of machine was highly significant (P < .001) and the effects of technician and technician × machine interaction were significant (P < .1). For |Loin Depth| technician 3 was the most accurate with machines 3 and 4 and technician 2 was the most accurate with machine 5 (machine × technician interaction, P < .1). The results of this project show that there are significant differences in a-mode machines for the evaluation of fat and loin depth in swine and that there is a difference in measurements compared to b-mode ultrasound. However, in commercial use factors such as price, service, reliability, durability, and ease of operation should also be considered when buying ultrasonic equipment.

Key Words: Pigs, Ultrasonics

416   Effects of feeder type, space allowance and mixing on the growth performance and feed intake pattern of growing pigs. Y. Hyun*, M. Ellis, and R. D. Johnson, *University of Illinois, Urbana-Champaign.*

A total of 256 pigs (Yorkshire × Hampshire crossbred and purebred Duroc)of initial weight of 35.6±4.47 kg were allocated to one of the eight treatment combinations in a $2 \times 2 \times 2$ factorial arrangement [feeder type (conventional feeder vs FIRE system), space allowance (.56 vs .25 m²/pig), and mixing strategy (mixed vs unmixed; mixing at start of weeks 1 and 3)]. Pigs were housed in groups of eight, balanced for genotype and sex (barrows and gilts) and were provided *ad libitum* access to a corn-soybean meal diet (17% crude protein; 3296 Kcal ME/kg). Feeding patterns were monitored using an automated feed intake recording system (FIRE). Animals were allowed a 7-d acclimation period at .56 m²/pig before the start of the 4-wk study period. There was no difference in growth performance between feeder types. Crowding and mixing had no effect on daily feed intake but depressed growth rate by 15.7 and 7.1 %, respectively, with the effects of the two stressors being additive. Gain:feed ratio was not affected by mixing but was depressed by 10.0 % by crowding. On the FIRE system, crowded pigs made fewer (11.2 vs 15.7, sem = .51), and longer (12.5 vs 8.9 min, sem .41) feeder visits and had higher feed intakes per visit (196.2 vs 145.5 g, sem = 5.94) than uncrowded animals. Mixing tended to reduce the number of feeder visits and increase the feeder occupation time and feed intake per visit in the 7-d period following mixing. This research suggests that crowding and mixing pigs had no effect on feed intake but depressed growth rates and crowding altered feeding behavior of pigs on the FIRE system.

Key Words: Swine, Feed Intake Behavior, Stressors

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417   Comparison of four feeding systems for growth, efficiency, and carcass characteristics of finishing swine. M. E. Johnston* and E. R. Wilson, *PIC USA, Franklin, KY.*

The objective of this research was to compare four feeding systems: continuous electronic feed stations (FIRE™), continuous self feeder, alternating FIRE™/self feeder, and two pigs/pen. Pigs (initially 31.6 kg and 77 d of age) were allotted on the basis of weight and gender to one of the treatments. The first three treatments had 15 pigs per pen (.84 m²/pig) and 12 pens per treatment. The fourth treatment used 96 pigs in 48 pens (1.39 m²/pig) with a self feeder in each pen. Pigs were fed a three-phase corn-soybean meal diet. All diets were fed *ad libitum*. Pigs fed two pigs/pen grew faster (P < .05) and had greater feed intake (P < .05). Pigs fed on the alternating FIRE™/self feeder had the best feed conversion (P < .05). Yield was highest (P < .05) for pigs continuously on the self feeder and poorest (P < .05) for two pigs/pen. Two pigs/pen tended to have more backfat (P < .05) and lower lean percent. There was no gender by feeding system interaction. While pigs on these systems achieve different levels of performance, there is no evidence that feeding system would effect the evaluation of different genotypes or treatments.

Trait	FIRE™	Self feeder	FIRE™/Self	Two pigs/pen
ADG, g/d	827 ± 11[a]	827 ± 10[a]	837 ± 8[a]	906 ± 14[b]
ADF, kg/d	2.18 ± .04[b]	2.40 ± .04[c]	2.04 ± .03[a]	2.61 ± .06[d]
G/F	0.38 ± .01[b]	0.35 ± .01[c]	0.42 ± .01[a]	0.35 ± .01[c]
Yield, %	75.5 ± .3[b]	77.0 ± .3[c]	75.3 ± .2[b]	74.0 ± .5[a]
FOM BF, mm	19.4 ± .3[a]	19.0 ± .3[a]	18.9 ± .2[a]	20.0 ± .4[b]
FOM LN, mm	53.4 ± .2[a,b]	53.7 ± .2[a]	53.8 ± .2[a]	53.1 ± .3[b]

[a,b,c,d]Means with different superscripts are different at *P* < .05.

Key Words: Pigs, Feeder, Management

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418   Health and lean growth performance of barrows reared in all-in/all-out or continuous flow facilities with or without antibiotic. A. D. Ice*, A. L. Grant, L. K. Clark, T. R. Cline, T. G. Martin, and M. A. Diekman, *Purdue University, West Lafayette, IN.*

Two identical environmentally regulated rooms were used to compare overall health and lean growth measurements in barrows (York × Landrace) × (Hamp × Duroc) reared in all-in/all-out (AI/AO) or continuous (CONT) management systems. One-half of the barrows in each room received chlortetracycline (110 mg/kg feed) in a 15% CP diet. After four replications, each of the four treatment groups contained 100 barrows. Each room contained 10 pens (1.2 × 2.0 m) with a two-hole feeder. Five barrows from an AI/AO farrowing/nursery were allotted per pen at approximately two months of age. One room was operated as a conventional CONT facility. Carcass lean was estimated at slaughter by total body electrical conductivity. Probabilities in the table describe the AI/AO vs CONT contrasts.

	Age, mo									
	3		4		5		6			
Item	AI/AO	CONT	AI/AO	CONT	AI/AO	CONT	AI/AO	CONT	SEM	P
Slaughter age,d	94.3	91.0	123.7	120.1	151.7	150.8	181.3	180.8	.9	.28
Slaughter wt,kg	41.4	36.4	64.3	55.7	92.4	81.7	114.3	108.0	1.5	.004
Lesion in lungs,%	3.3	5.7	1.5	9.1	1.5	10.6	1.2	10.5	1.2	.02
Lesions % pigs	37.5	69.3	27.7	67.5	22.5	82.5	21.5	80.8	--	.05
Carcass lean,kg	13.7	12.9	22.0	19.6	31.7	28.5	38.4	35.4	.7	.03

Prevalence of lung lesions was reduced in AI/AO and lean content was increased, but neither variable was influenced by antibiotic. Pen ADG was greater in AI/AO than CONT (.78 vs .72; P=.02), but pen F/G was not altered (2.95 vs 3.04; P=.48) by environment or antibiotic. The change in prevalence of mycoplasmal pneumonia (P=.07) from three months to six months increased in CONT, but not in AI/AO. No changes (P=.53) in prevalence of actinobacillus pleuropneumonia were observed. Overall, health and growth performance were improved in the AI/AO facility, and antibiotic failed to enhance performance in either AI/AO or CONT facilities.

Key Words: Swine, Environment, Antibiotic

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419   Effect of antiinfective agents on growth, feed and carcass parameters compared to a control. M. T. See[1], A. Scheidt[2], and P. Liang[1]*, [1]*North Carolina State University, Raleigh* and [2]*Pfizer Inc., Raleigh.*

A study was designed to compare the effects of two different antiinfective agent feeding programs, carbadox (50 g/ton) followed by virginiamycin (10 g/ton) and chlortetracycline (200 g/ton) followed by bacitracin methylenedisalicylate (30 g/ton), compared to a control (no antiinfective). For the period from 4 to 22 weeks of age, barrows and gilts (N = 270) were randomly assigned to one of three treatments by weight and evaluated on growth performance, variation in growth, feed efficiency, feed intake, and carcass lean. Fifteen pens of three pigs were assigned to each antiinfective × gender treatment. Feed was weighed daily and feed and pigs were weighed at each ration change. Animals were fed pelleted diets in a six phase nutritional program. Pigs arrived at the test facility at weaning and were acclimatized for a one week period before the test. Real-time ultrasound was used to estimate backfat depth and longissimus dorsi area on each pig just prior to slaughter. Pigs raised from 5.4 kg to 109 kg showed significant differences across the three programs for feed conversion efficiency (P < .05), average daily feed intake (P < .01) and backfat depth (P < .10). Pigs on the carbadox/virginiamycin program were more efficient and had a lower average daily feed intake than the other treatments. When compared to the control, pigs on the carbadox/virginiamycin program had an advantage of −.07 in FCR and consumed .10 kg of feed less per head on a daily basis.

Key Words: Pigs, Antiinfective Agents, Feed Conversion Efficiency

420   Interaction of feed additives and space allocation on SEW barrow performance from weaning to slaughter. M. C. Brumm[1]* and T. J. Evans[2], [1]University of Nebraska, Concord and [2]Pfizer Animal Health, Lincoln, NE.

In each of two trials, 96 Danbred barrows weaned at 11-15 d (4.2 kg initial wt.) were randomly allocated to 1.2×2.4 m nursery pens (10 or 14 pigs/pen) and fed commercial nursery diets containing no feed additive (N) or a feed additive (F) for a 42-d nursery period. Pens of pigs were then moved to a partially slatted, naturally ventilated finishing facility with pens measuring 1.8×4.7 m. Dietary feed additives (N and F) were maintained by pen as in the nursery. The F treatment was 55 mg/kg carbadox from weaning to 34 kg live weight, followed by 11 mg/kg virginiamycin to slaughter (117.2 kg). Pen sizes were not adjusted in the event of pig death or removal. All grow-finish diets were corn-soybean meal based in meal form and contained 5% added fat. There was no interaction (P > .15) of space (number of pigs/pen) and feed additive on nursery, grow-finish or wean-slaughter performance. Increasing the number of pigs/pen (14 vs 10) reduced ADG in the nursery (.353 vs .389 kg/d; P < .05), grow-finish (.811 vs .843 kg/d; P < .07) and wean-slaughter (.672 vs .701 kg/d; P < .013) phases. ADF was reduced for the 14 vs 10 treatment during the grow-finish (2.265 vs 2.337 kg/d; P < .05) and wean-slaughter phases (1.773 vs 1.825 kg/d; P < .05). The addition of a feed additive (F vs N) to the diet resulted in heavier pigs at 42 (20.6 vs 19.0 kg; P < .05) with reduced within pen weight variation (CV) (11.8 vs 15.2; P < .05). ADG was improved for the F vs N treatment during the nursery (.391 vs .352 kg/d; P < .05) and wean-slaughter phases (.695 vs .678 kg/d; P < .1). There was no effect (P > .1) of feed additive treatment on daily feed intake or gain:feed in any period reported.

Key Words: Pigs, Space

421   Comparison of the feed intake pattern of group-housed Yorkshire and Meishan × Yorkshire pigs. B. Wolter*, Y. Hyun, and M. Ellis, University of Illinois, Urbana-Champaign.

The objective of this study was to investigate feed intake patterns of two genotypes; Yorkshire (Y) and Meishan × Yorkshire (MY) in either single- or mixed-genotype groups. Forty-eight barrows and gilts comprising equal numbers Y and MY were allocated on the basis of litter of origin and weight to 6 feed intake recording stations to give 4 single and 2 mixed-genotype groups of 8 pigs. Animals were given *ad libitum* access to a grower diet (17 % CP and 3,365 kcal/kg ME). The study was carried out over a 5 week period from a starting weight of 28.5 kg. Y had higher daily feed intake (1.62 vs 1.48 kg, sem = .08, P<.001), more feeder visits/day (17.7 vs 12.6, sem = .87, P<.001), lower feeder occupation time per visit (7.0 vs 8.4 min, sem = .44, P<.05), and lower feed intake/visit (98 vs 124 g, sem = 5.4, P<.001) compared to MY pigs. This study shows significant effect of genotype on feeding behavior in both single- and mixed-genotype groups.

Key Words: Swine, Feed Intake Behavior, Genotype

422   Grower pig performance as influenced by diet form, pelleting conditions and corn particle size. G. R. Frank*, B. Sorenson, S. G. Cornelius, and G. M. Willis, Purina Mills, Inc., St. Louis, MO.

Particle size reduction of grains and pelleting of diets are generally considered to improve feed efficiency in growing pigs. However, the responses reported in the literature are quite variable, likely due to the highly variable nature of feed wastage and the wide range of possible process conditions employed in the pelleting process. This study was conducted to evaluate the effects on grower pig performance of: a) corn mean particle size (MPS; C: 1220 μm, I: 950 μm, F: 440 μm) and b) conditioned meal temperature (CMT: 71°C or 99°C) of pelleted diets. Two meal dietary treatments, using C or I MPS corn, were also included. A total of 12 pigs (individually-penned; 6 barrows and 6 gilts; initial weight: 24.5 kg, final weight: 73.7 kg) were fed each of the eight dietary treatments for 49 d. For the entire trial period, ADG (mean for all treatments: 1.00 kg) was unaffected (P > .20) by dietary treatments. Feed efficiency (gain/feed ratio [G/F]) was unaffected by MPS in pelleted (P > .20; C: .494, I: .494, F, .508) and meal (P > .20; C, .483, I, .468) diets. In diets containing C or I MPS corn, G/F was improved by pelleting (P < .05; pelleted: .494, meal: .476). However, CMT also affected G/F (P < .05; 71°C: .507, 99°C: .490). Thus, MPS had little or no effect on G/F. In contrast, pelleting can improve G/F, but, the pelleting process conditions can have a marked impact on the G/F benefit realized from pelleting.

Key Words: Pigs, Particle Size, Pelleting

423   Effect of PG600 on ovulation rates in PIC gilts. J. L. Roth*, K. D. Cross, J. D. Muegge, J. Symanowski, and D. B. Anderson, Eli Lilly and Company, Greenfield, IN.

An experiment was conducted to determine the effect of PG600 (400 IU PMSG, and 200 IU HCG; Intervet Inc.) on corpora lutea (CL) number following pubertal estrus in PIC gilts. Seventy-six Camborough 15 PIC gilts completed the trial. These gilts were monitored twice daily for estrus, assigned to one of four treatment groups based on signs of estrus consisting of pubertal estrous (E1), second estrus (E2), third estrus (E3), and pubertal estrus + PG600 (E1/PG). For E1/PG, gilts were randomly selected following transportation to the gestation barn and injected with PG600 prior to estrus detection. Gilts were fed 2.72 kg per day of a 16% corn-soy diet. Gilts were euthanized between 9 to 13 days post-treatment estrus at which time the number of follicles, CL, and corpora albicans (CA) were determined. Data were analyzed using mixed models based on restricted maximum likelihood estimation. Data are shown in the summary table.

Treatment	N	Wt. at estrus (kg) $\pm$ SEM	CL $\pm$ SEM	CA $\pm$ SEM
E1	18	123 ± 1.1	13.3 ± 0.81	0
E2	19	$137^b \pm 1.1$	$15.1^a \pm 0.79$	13.1 ± 1.40
E3	18	$150^b \pm 1.1$	$15.1^a \pm 0.80$	18.8 ± 1.50
E1/PG	21	122 ± 1.0	$19.8^b \pm 2.00$	0

[a]P < .05, [b]P < .01. Significantly different from E1.

Ovulation rate was increased in the E1/PG gilts when compared to E1 gilts (P < .01). Ovulation rate increased 1.8 CL from pubertal to second estrus (P < .05); however, ovulation rate remained constant from second to third estrus cycles. No CA were found in treatments E1 and E1/PG verifying pubertal heat. As expected CA in the E2 gilts were similar to the CL in the E1 gilts (13.1 vs. 13.3, respectively). The PG600 treatment increased the variability in ovulation (CV = 43.8% compared to 17.5, 16.5 and 15.4% for the E1, E2, and E3, respectively). Distribution of follicle size was unaffected by estrous cycle. As expected body weight at estrous and slaughter weight were increased in E2 and E3 groups. CL number tended to be positively related to body weight at estrous for E1, E2, and E1/PG and negatively related to body weight for E3. In conclusion, PG600 increased ovulation rate in pubertal gilts, but substantially increased variability of ovulation rate.

Key Words: Swine, PG600, Ovulation Rate

424   A model system for neutrophil-killing of *Streptococcus suis*. R. M. Dyer, L. G. Griffiths, J. A. Johnson*, and L. A. Gubbine, *University of Delaware, Newark.*

The objective was to determine the components of the nonspecific immune system necessary for effective killing of *Streptococcus suis*. Carried on the tonsils of pigs, *S. suis* proliferates under conditions of stress resulting in clinical disease. The neutrophil is a short-lived, highly phagocytic cell which infiltrates to the site of *S. suis* infection. The macrophage, another phagocytic cell, is capable of repeated efforts in killing and is longer lived than the neutrophil. To determine which components are needed to kill *S. suis*, blood was taken from adult pigs and neutrophils were isolated. Serum was extracted from the blood of adult swine carrying high titers to *S. suis* and stored at 56°C. Components evaluated for bactericidal activity were aliquoted and plated on sheep blood agar at T0 and 60 min later (T60). The number of bacterial colonies were counted 24 h later, and the number at T60 was compared to T0. In a RCBD, data were analyzed using the GLM procedure from SAS. Least-squares means are reported. When comparing neutrophils (N), serum (S), and neutrophils and serum (NS), it was found that NS resulted in a decrease (P<.05) in the number of bacterial colonies of *S. suis* at T60 (−56.78), while the number of colonies increased for N (28.79) and for S (20.90). Neutrophils and heat-inactivated serum (NH) resulted in an increase (P<.05) in the number of bacterial colonies at T60 (23.00) when compared to NS (−52.31), indicating a heat-labile component of the serum was necessary for killing. Further, when intact fresh serum was added to the heat inactivated serum (NHF), opsonin activity was restored and killing (P<.05) took place (−50.94 vs 24.67). Experiments using alveolar macrophages lavaged from the lungs of adult swine indicate that macrophages and serum (MFS) are not as efficient (P<.05) at killing *S. suis* as NS (15.36 vs −58.08). In conclusion, neutrophils, antibody, and a heat-labile component of serum are necessary for neutrophil-killing of *S. suis*.

Key Words: *Streptococcus suis*, Swine, Neutrophil

425   Effects of trilostane, an inhibitor of 3β-hydroxy-steroid dehydrogenase, on the onset and duration of parturition in sows and gilts. R. K. Chandolia[1], R. N. Kirkwood[2], and P. A. Thacker[1]*, [1]*University of Saskatchewan, Saskatoon and* [2]*Alberta Pork Research Centre, Edmonton, Canada.*

Greater control over the timing of parturition may be useful in reducing preweaning mortality in commercial swine herds as a greater proportion of farrowings could be attended and steps taken to improve piglet survival. A decrease in serum progesterone in the maternal circulation is considered to be one of the main factors precipitating the normal induction of farrowing. The objective of the present study was to determine the effects of Trilostane (an inhibitor of 3β-hydroxysteroid dehydrogenase) on progesterone concentration and on farrowing parameters of sows and gilts. The study employed 22 gilts and 40 sows divided equally into treatment and control groups. At 0830 h on day 113 of gestation, the animals in the treatment group received a single oral dose (750 mg/sow) of Trilostane dissolved in ethanol while the control sows received vehicle. All sows then received an injection of $PGF_{2\alpha}$ 3 h later. Sows were monitored for piglet production during the subsequent 36 hours. Blood samples were taken at the time of Trilostane feeding, $PGF_{2\alpha}$ injection and 4 and 20 h after $PGF_{2\alpha}$ injection. Progesterone values in treated sows decreased significantly 3 hrs after treatment compared with control animals (P < 0.05) while progesterone concentrations 24 hrs after treatment did not differ (P > 0.05). The mean time of the onset of farrowing in trilostane treated sows was earlier than controls (25.7 ± 0.5 vs 28.8 ± 0.9 h; P < 0.05). However, the duration of farrowing (191.3 ± 11.0 vs 178.3 ± 8.9 min) interval between piglets (16.4 vs 17 min) and mean number of piglets born (11.2 vs 11.8) were not significantly different between treated and control sows. More sows farrowed during the normal working day in the Trilostane treated group than the control (83.9% vs 64.5%). These results show that the Trilostane treated sows farrowed earlier than control animals and this effect was due to a decrease in progesterone concentrations with no adverse effect on piglets or sows.

Key Words: Trilostane, Progesterone, Farrowing

426   Techniques for applying odor reducing chemicals and on-site evaluation of anaerobic lagoon odor. C. S. Darroch* and R. Shadden, *University of Tennessee, Knoxville.*

This study describes the development of a chemical spray apparatus that was suspended over an anaerobic lagoon at a finishing unit from a large multi-site farrow to finish swine operation in west Tennessee. The study also describes methodology to evaluate the effectiveness of potential odor reducing chemicals sprayed over the lagoon surface from the spray apparatus. Panelists were used to evaluate on-site lagoon odors and an ion-selective probe was used to quantitate hydrogen sulfide in effluent and air collected at the lagoon surface. Panelists evaluated odor intensity and offensiveness before and after application of an odor reducing chemical in a completely randomized design in a 2(dates)×4(sampling sites)×2(chemical) factorial arrangement. Date of sampling, sampling site around the lagoon and application of chemical significantly affected panelists' scores for odor intensity and offensiveness but there were no significant interaction effects. Differences in wind speed on the two sampling dates were largely responsible for the noted differences in odor intensity and offensiveness. Sampling sites downwind from lagoon had higher odor intensity (P<0.05) and offensiveness (P<0.05) scores than upwind sampling sites. Application of an odor reducing chemical for 2 h reduced odor intensity by 19% (P=0.001) and odor offensiveness by 14% (P=0.006). Fifty-one percent of panelists indicated that they would complain about the lagoon odor before application of the odor reducing chemical and 36% of panelists indicated they would complain after application of the lagoon odor. The reduction in number of complaints was not significant in this trial (chi-square=2.44, P=0.22). The chemical spray apparatus and odor evaluation techniques used in this study may be used to study effects of nutritional systems that reduce potential odor producing chemicals in swine manure.

Key Words: Pigs, Anaerobic Lagoons, Odor, Methodology

427   Ozonation of stored swine waste slurry for elimination of odor. S. H. Park, J. J. Wu, S. M. Hengemuehle, M. T. Yokoyama, and S. J. Masten, *Michigan State University, East Lansing.*

Odors emanating from livestock waste is a problem of environmental concern. Ozone is an effective agent for treating sewage, industrial effluents and water. Ozone was used to treat swine waste slurry previously stored for one month at dose levels of 0, 0.25, 0.5, 0.75 and 1.0 g ozone/L of slurry. Based on an odor panel evaluation, the effective treatment dose for odor elimination was 0.5g ozone/L or higher. Aerobic counts for the 0, 0.25, 0.5, 0.75, and 1.0g ozone/L dosages were respectively: $84×10^6$, $76×10^6$, $45×10^6$, $54×10^6$, and $47×10^6$. The anaerobic counts were respectively: $207×10^6$, $130×10^6$, $97×10^6$, $107×10^6$, and $123×10^6$. The coliform counts were respectively: $333×10^5$, $333×10^5$, $333×10^3$, 10^5, and $66×10^3$. The E. coli counts were respectively: 10^6, 10^6, 10^5, 10^5, and 10^4. Addition of hydrogen peroxide to the ozone treatment did not significantly benefit the odor elimination or affect the microbial population. These results show that ozone treatment is effective for eliminating the odor of stored swine waste slurry.

Key Words: Ozone, Odor, Swine Waste

428 **Effects of administering the thyroid blocker methimazole during gestation and lactation on thyroid hormones, LH and milk traits of ewes.** L. A. Donovan*, D. M. Hallford, F. A. Schneider, R. T. Kridli, L. W. Miller, and J. Hernandez, *New Mexico State University, Las Cruces.*

Eighteen pregnant Debouillet ewes (77±3 kg) were assigned to one of three treatments (6/group) at approximately d 90 (Jan 18) of gestation to examine effects of methimazole (MT, reported thyroid blocker) on serum thyroxine (T_4), triiodothyronine (T_3), LH, and milk traits. Treatments were administered (sc) daily through 30±3 d (mean±range) after parturition. Ewes received a daily injection containing either 0, 50, or 100 mg of MT (Sigma M8506) suspended in 3 mL of sterile water. Ewes were weighed during the trial and serum was collected before and at 15-min intervals after treatment for 6 h on the first day of MT treatment and 42 d later. Additional samples were collected 7 and 16 d after lambing. Milk production was estimated on d 30 postpartum (PP) using a 3-h oxytocin-induced (40 USP units, iv) handmilking procedure. By 56 d after the initial treatment, ewes receiving 100 mg MT weighed 79.8±3.2 kg compared with 87.4 and 88.0 (±3.2) kg for those treated with 0 and 50 mg MT, respectively (P=.13). Animals treated with 100 mg MT continued to weigh numerically less than the other two groups although differences were not significant. Serum T_4 was not affected by MT on any of the 4 d (P>.20) and values were 61, 64, and 58 (±10) ng/mL for ewes receiving 0, 50, and 100 mg MT/d, respectively, on d 16 PP. Serum T_3 was also similar (P>.80) among treatments averaging 3.1, 3.2, and 3.1 (±.2) ng/mL in the three respective groups 42 d after treatment began. Although PP LH remained low in all animals, a quadratic response (P<.05) was observed on both d 7 and 16 after lambing. Serum LH values on d 16 PP were .34, .48, and .33 (±.06) ng/mL in ewes receiving 0, 50, and 100 mg MT, respectively. Lamb BW and ewe milk production were not influenced (P>.20) by maternal MT treatment. MT does not lower serum T_3 or T_4 in pregnant/lactating ewes and is not an appropriate model compound for studying thyroid effects on reproduction in sheep.

Key Words: Sheep, Thyroid, Reproduction

429 **Comparison of reproductive performance of ¼ Finn-¼ Dorset-½ Targhee ewes bred for either fall or spring lambing.** T. P. Lundeen* and A. L. Slyter, *South Dakota State University, Brookings.*

A study was conducted to compare the reproductive performance of ¼ Finn-¼ Dorset-½ Targhee ewes bred for either fall or spring lambing. A total of 828 ewe exposures occurred yielding 1,042 lambs born and 882 lambs weaned over six lambing periods in 3 yr. Ewes were allocated to either the fall or spring lambing flock as ewe lambs. Replacements were chosen from within their birth flock to maintain each flock size at approximately 150 head. Both flocks were managed as a typical farm flock at Brookings, SD. Data for percentage of ewes lambing, ewes weaning lambs per ewe exposed, lambs born and weaned per ewe exposed and per ewe lambing were analyzed using least squares means procedures of SAS (1996). Main effects were lambing season and age of ewe at lambing. Performance of the spring group was significantly greater in all criteria compared to the fall group. Within each lambing season performance improved with age. In the fall group, the percentage of ewes lambing as yearlings and 2-yr-olds was similar (71.7 ± 2.54 vs 68.8 ± 2.76, respectively, P > .05) and both were different than 3- and 4-yr-olds (87.0 ± 4.71 vs 100.0 ± 7.83, respectively). Lambs born per ewe exposed followed a similar trend. Performance also improved with age in the spring group. Lambs weaned per ewe lambing in the spring was similar among the 2-, 3-, and 4-yr-olds (1.78 ± .039, 1.78 ± .051, and 1.79 ± .071 respectively, P > .05). When comparing ewes of similar age between the fall and spring groups, 4-yr-olds performed similarly in all criteria except lambs born/ewe lambing (spring = 2.32 ± .089 vs fall = 1.88 ± .104, P > .001). In general, the 2- and 3-yr-olds differed between lambing groups in all traits evaluated. In summary, the reproductive performance of crossbred ewes lambing in the fall was lower than those lambing in the spring. However, this difference was less with increasing age.

Key Words: Ewe, Reproductive Performance, Out of Season Lambing

430 **Predicting weight gain of twin lambs from ewe milk production and composition.** D. K. Aaron*, D. G. Ely, L. A. Appeddu, W. P. Deweese, and E. Fink, *University of Kentucky, Lexington.*

Sixteen, multiparous, fall-lambing Polypay ewes nursing twin lambs (one ewe, one wether) were machine-milked and their lambs individually weighed on d 19, 26, 33, 42, and 54 postpartum to assess usefulness of ewe milk production (MP), percent milk fat (F), percent milk protein (P) and fatty acid composition of milk fat as predictors of twin lamb weight gain (LG). Regression coefficients (kg/kg) of LG on MP in period 1 (d 19 to 26), period 2 (d 26 to 33), period 3 (d 33 to 42), and overall (d 19 to 54) were .17 ± .07 (P < .05), .15 ± .05 (P < .01), .13 ± .05 (P < .05), and .08 ± .03 (P < .05), respectively. Coefficients of determination for periods 1 through 3 and overall were moderate in size (30.5, 39.8, 37.4, and 32.4%, respectively), suggesting other independent variables might be useful in predicting LG. Milk production and LG were not linearly related in period 4 (d 42 to 54). The addition of P to the model containing MP improved the precision of predicting LG during period 3 (R^2 = 50.5%). No improvement was achieved with the addition of F during any period. When fatty acids 14:0, 16:0, 16:1, 18:0, 18:1, 18:2, and 18:3 (carbon chain length-to-number of unsaturated bonds ratio) were added singly to the model containing MP, improvements were small and inconsistent across periods. The most improvement in prediction occurred when 18:3 was added to the model in period 1 (R^2 = 49.4%), 18:2 in period 2 (R^2 = 59.8%), and 18:1 in period 3 (R^2 = 63.5%). Inclusion of fatty acids did not improve the precision in predicting LG during period 4. Overall, adding 14:0 to the model containing MP increased R^2 to 48.7%. At no time did composition terms replace MP in the model without significant sacrifice in precision. These results indicate MP is more important than F, P, or fatty acid composition of milk fat in predicting LG. Furthermore, results indicate increasing gain of twin lambs by increasing MP becomes more difficult as lactation progresses.

Key Words: Lamb Gain, Milk Production, Milk Composition

431 **Influence of supplemental monensin on productivity of gestating and lactating ewes.** R. K. Peel*, W. S. Ramsey, L. W. Greene, and G .E. Carstens, *Texas A&M University, College Station, Texas.*

Twenty-five multiparous Rambouillet ewes were to determine the effects of feeding monensin during late gestation and early lactation on prepartum and postpartum ewe weight maintenance, milk production, blood glucose levels, and lamb production in either single or twin bearing ewes. Ewes were grouped into singles and twins by sonogram results, allotted to pens in pairs and assigned to either an ionophore (70 mg daily) or non-ionophore treatment groups in a 2×2 factorial arrangement. All ewes were fed according to NRC (1985) diet one or two beginning an average of 56 d prepartum. There were no differences in weight gain prepartum or weight loss postpartum between treatments (P>.05). There were no differences in lamb weights for birth, 4, 10, 20, 30, or 40 d (P > .05). Milk collection was done prior to morning feeding. Lambs were removed and ewe injected with 1ml (5 USP) oxytocin intrajugalarly, evacuated by milking machine and milk discarded. Three hours later the procedure was repeated and milk was measured, and sampled for analysis of protein, fat, and lactose. All milk samples were analyzed by the DHIA lab at Texas A&M University using the Milko-Scan 605. Between single bearing treatment and single bearing non treatment ewes, monensin increased milk volume 35% for 4 d (P < .07), 35% for 10 d (P < .10), 80% for 20 d (P < .05), 16% for 30 d (P < .5) and no difference in 40 d. Between twin bearing treatment and non treatment twin bearing ewes, monensin increased milk volume on 10 d 11% (P < .3), but there were no differences in the other collections. There were no differences in milk fat, protein, or lactose. Data collected from this study show that monensin increased milk production in single bearing ewes when fed prior to lambing and supplemented during lactation.

Key Words: Ewes, Monensin, Lactation

432 Subjective assessment versus objective measurement of staple length in greasy wool. F. A. Pfeiffer* and C. J. Lupton, *Texas Agricultural Experiment Station, San Angelo.*

Two experiments were conducted to determine the difference between subjective (S) assessment and objective (O) measurement of staple length (SL) in commercial lots of greasy wool. The mean SL is one of the more important factors influencing wool sale prices. Currently in the U.S., SL is assessed subjectively in most commercial transactions, a situation that many producers find unsatisfactory. In Exp. 1, 26 commercial wool lots were sampled using a semi-automatic grab-sampling machine to obtain representative sale samples. Following subjective assessment by a single woolbuyer, each sale sample was objectively measured for mean SL by measuring 50 individual staples per lot using ASTM Test Method D1234. In Exp. 2, 48 lots were subsampled by warehouse personnel to obtain sale samples. These were subjectively assessed by five woolbuyers and subsequently objectively measured by lab personnel. Paired T tests and simple linear regression analyses were used to compare the S and O data. In Exp. 1, overall SSL < OSL by .38 cm (P = .02). However, the two data sets were significantly correlated (r^2 = .60). In Exp. 2, the r^2 value for SSL (average of five buyers) vs OSL was .72 (ranging from .27 to .65 for individual buyers). Again, SSL < OSL (P < .01) by an average of .51 cm (ranging from .20 to .61 cm). Many individual assessments underestimated SL by > 1.3 cm (2.5 cm being the extreme). Conversely, less frequent overestimation of SL was generally in the range .2 to .8 cm. In conclusion, domestic woolbuyers tended to underestimate SL of greasy wool sale lots. More equitable sales could be achieved if objectively measured SL values were made available at sale time. Whether or not these could be provided in a cost-effective manner remains to be established.

Key Words: Wool, Staple Length

433 Effect of time and duration of zeranol implants on growth, carcass, and bone characteristics in wethers. K. J. Rozeboom*, M. G. Thomas, L. Hillman, F. Chanetsa, R. J. Lipsey, and D. H. Keisler, *University of Missouri-Columbia.*

Sixty-six crossbred wether lambs were used to determine the effects of time and duration of zeranol implants (12 mg; Ralgro®, Mallinckrodt Vet.) on growth, carcass, and bone characteristics. Wether lambs (≤ 2 wk of age) were assigned by breed-type to control (CON) or one of three implant groups. Implant groups were: Z0 (implanted d0, d45, and d90), Z45 (implanted d45, and d90), and Z90 (implanted d90). Subgroups of lambs from each treatment group (n ≥ 4 lambs per subgroup) were subjected to dual-energy x-ray absorptiometry (DXA; to determine whole body composition) and then slaughtered 28d after implant or at d135. A weight-matched control (n = 5; CONWT) was concurrently scanned and slaughtered at the same weight as the heaviest implant group (42.6 ± 1.5 kg at d135). CONWT lambs were 160d of age at slaughter. Average daily gain was 17.3% and 14.1% greater (P < .1) in the Z45 and Z90 lambs between d90 and d135 relative to CON [(Z45).28 ± .02 and (Z90).27 ± .02 > (CON) .23 ± .01 kg · d⁻¹]. Dressing percentage was lower (P < .01) in Z0 and Z90 than CON lambs [(Z0) 44.6 ± .8 and (Z90) 43.8 ± 1 < (CON)46.6 ± .6] and relative body fat, was greater (P < .1) in CONWT lambs at d135 than Z45 and Z90 lambs [(CONWT) 4184.3 ± 418.4 g > (Z45) 3557.4 ± 954.4 g and (Z90) 3316.2 ± 396.4 g], even though weights were similar (P = .7). Bone mineral density and content were greater (P < .05) in Z90 lambs relative to CON lambs at d135 (.97 ± .03 > .88 ± .03 g · cm⁻² 926.4 ± 67.4 g > 672.4 ± 70.3 g). These data provide evidence that lambs implanted with zeranol have improved growth performance, increased bone mineralization, and enhanced propensity for lean growth. Implanting lambs after d45 was most effective at enhancing these responses. Work supported in part by USDA Postdoc Grant 95-37206-2119.

Key Words: Zeranol, Carcass Composition, Lamb

434 Effects of breed and management on milk yield and composition at two stages of lactation in goats in a meat production system. S. Wildeus and S. M. Lacey*, *Agricultural Research Station, Virginia State University, Petersburg.*

Milk production at peak lactation (WK3) and weaning (WK9) was evaluated in Myotonic (M), Nubian (N), and Spanish (S) goats (10 animals/breed). Does kidded in April and were maintained either on improved pasture with a moderate stocking rate (IP) or on permanent pasture with a high stocking rate (PP). Milk was harvested through hand milking after oxytocin injection (1 IU; iv), allowing a 3 hr accumulation following the initial milking. Milk yield was adjusted to 24 hr and percent protein, fat, and total solids were determined by standard DHIA procedures. Udder volume was determined from measurements of longitudinal and lateral semicircumference. Effects of breed, stage of lactation, and management were evaluated by repeated measures analysis and values are presented as least squares means. BW ranged from 31.2 kg in M to 53.1 kg in N (P<.001) and decreased (P<.001) from WK3 to WK9. Body condition (5-pt scale) was not affected by breed, but was higher (P<.05) in IP (2.81) than PP (2.48). Milk yield differed (P<.001) between breeds (M: 851 g, N: 2072 g, and S: 1606 g), decreased (P<.001) by 44% from WK3 to WK9, and tended to be higher (P<.05) in IP than PP. Udder volume reflected changes in milk yield and ranged from 1139 cm³ in N to 478 cm³ in M (P<.001). Fat was not affected by breed or stage of lactation, but was higher (P<.05) in IP (6.11%) than PP (4.97%). Protein was higher (P<.01) in M (3.71%) than in N and S (<3.30%), but not affected by stage of lactation or management. Total solids were lower (P<.01) in N (8.6%) than the other breeds (>9.1%) and decreased (P<.01) from WK3 to WK9. The results indicate a significant decline in milk yield at weaning under both management systems. Further research is needed to address the rate of decline, to establish appropriate weaning ages for meat goat production.

Key Words: Goat, Milk Yield, Milk Composition

435 Spring kidding performance of five meat-type breeds of goats. T. A. Gipson, *Virginia State University, Petersburg.*

Spring kidding records on 298 kids from 31 Brush, 19 Myotonic, 18 Nubian, 14 Pygmy and 46 Spanish does were analyzed to determine the effects of breed, sex of kid and litter size on reproductive efficiency and on preweaning growth. Myotonic, Nubian and Brush does had slightly higher kidding rates than did Pygmy or Spanish does (200%, 200% and 223% vs. 140% and 174%, respectively). Average birth weight was significantly (P<.05) heavier for Nubian, Spanish and Brush kids than for Myotonic kids, which were heavier than Pygmy kids (2.8, 2.8 and 2.5 vs. 2.0 vs. 1.3 kg). At weaning Nubian kids were significantly heavier than Spanish and Brush kids which were heavier than Myotonic kids which in turn were heavier than Pygmy kids (11.1 vs. 9.8 and 9.0 vs. 6.4 vs. 4.3 kg). Nubian kids had the fastest preweaning gain at 142 g/d followed by Spanish at 122 g/d, Brush at 113 g/d, Myotonic at 77 g/d and Pygmy at 51 g/d. Nubian does were significantly heavier at weaning and weaned a heavier litter weight than the other breeds. When litter weight was expressed as a percentage of doe weight at weaning, Spanish and Brush does weaned a greater percentage (43% and 39%) than did Myotonic, Nubian or Pygmy (33%, 34% and 28%). Male kids were significantly heavier at birth (2.4 vs. 2.1 kg), heavier at weaning (8.7 vs. 7.5 kg) and had a faster daily gain (100 vs. 93 g/d) than female kids. Singletons were significantly heavier at birth than either twins or triplets (2.5 vs. 2.2 and 2.1 kg). Singletons were also heavier at weaning than twins (9.5 vs. 7.9 kg) which were heavier than triplets (7.0 kg). Singletons grew faster than twins (122 vs. 97 g/d) which grew faster than triplets (84 g/d). Litter weight at weaning was greatest for triplets (17.1 kg) and least for singletons (8.8 kg). Twin weaning weight was intermediate at 14.0 kg. Does weaning twins and triplets weaned a significantly higher percentage of their body weight than did does that weaned singletons (38% and 43% vs. 27%). Brush and Spanish does appear to be more efficient producers than Myotonic, Nubian or Pygmy does.

Key Words: Goats, Production, Growth

436   Effects of genotype and sex on pork quality. J. W. Frank[1]*, B. T. Richert[1], A. P. Schinckel[1], B. A. Belstra[1], M. Ellis[2], and A. L. Grant[1], [1]*Purdue University, West Lafayette and [2]University of Illinois, Urbana.*

One hundred forty-two pigs were used to evaluate the interactive effects of production system, genetic potential for lean gain, and antibiotic treatment on carcass composition and meat quality. Littermate barrows (B) and gilts (G) were either segregated-early-weaned at 13 d of age (BW = 4.8 kg) to an off-site nursery and finisher or conventionally weaned at 26 d of age (BW = 7.25 kg) to on-site nursery and finisher. Genotypes were York-Landrace cross (YL) and European terminal sire cross (ETS). Pigs were fed a diet with or without antibiotics (Mecadox® and BMD®) from weaning to market. All diets were formulated to meet or exceed all nutrient requirements. The YL pigs had higher 24 h pH values (P < .001) and higher 24 h color scores (P < .05) while having a lower drip loss (P < .001). HunterLab® L* and b* values were higher for B (L*, P < .01; b*, P < .05) than G while L* values were also higher for ETS pigs (P < .001) compared to YL pigs. Values for a* were not significant. Gilts had lower marbling scores (P < .01) than B. The main antibiotic treatment effect was an increased drip loss (P < .05). Shear force and cooking loss between genotypes and sexes were not significant. These results indicate that a more discriminatory evaluation system needs to be implemented to evaluate pork quality and its potential effects on consumer acceptance.

Genotype	ETS		YL				
Sex	B	G	B	G	Avg SE	Sig[a]
24 h pH	5.5	5.4	5.6	5.7	.03	g***
24 h Color[b]	2.0	2.1	2.3	2.4	.12	g*
Firmness[b]	2.7	2.6	2.8	2.8	.09	NS
Marbling[b]	1.3	1.1	1.4	1.2	.06	s**
Drip loss, %	6.0	6.2	4.5	4.4	.37	g***

g,s = genotype and sex differences.
[a]NS, *, **, *** = not significant, P < .05, P < .01, P < .001, respectively. [b]Subjective score from 1 = pale, soft, and devoid of marbling to 5 = dark, firm, abundant marbling.

Key Words: Pigs, Carcass Characteristics, Meat Quality

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437   The impact of age and site of weaning on pig performance under high health conditions. J. F. Patience[1]*, H. W. Gonyou[1], E. Beltranena[1], D. L. Whittington[1], and C. S. Rhodes[2], [1]*Prairie Swine Centre Inc., Saskatoon and [2]Univ. of Saskatchewan, Saskatoon, Canada.*

A key issue appearing to drive the growth of site-segregated early weaning (SSEW) in North America is disease management. The question remains whether SSEW is beneficial under high health conditions. An experiment was therefore conducted to evaluate the impact on pig performance of SSEW using pigs derived from a breeding herd free of infectious respiratory disease, internal and external parasites and most infectious gastrointestinal diseases. A second objective was to compare early weaning without site segregation against conventional 3-week weaning or SSEW. Using 4 replicate farrowing groups, 16 litters were weaned at 12±2 days of age and housed in an all-in-all-out nursery room at the Prairie Swine Centre (OSEW), 16 litters were weaned at 12±2 days of age (SSEW) and moved to an off-site location 17 km away and 16 litters were weaned at 21±3 days and retained on-site (Control). Facilities and animal management were kept as uniform as possible across treatments. Control pigs were heavier at 21 days of age (6.12 kg) than OSEW (5.17 kg) or SSEW (5.35 kg) pigs (P<0.05). At 56 days of age, the SSEW pigs were heavier (23.04 kg) than OSEW (20.39 kg) or Control (20.79 kg) pigs (P<0.05). There were no differences due to treatment in the variation of body weight at 56 days of age. During the period from 22 to 40 days of age, much of the enhanced growth rate of the SSEW pigs could be attributed to feed intake (P<0.05). From 41 to 56 days of age, feed efficiency was significantly better in the SSEW pigs than in the OSEW or control pigs (P < 0.05). While further research is required to understand the physiological basis of site segregated early weaning, it is clear that benefits in terms of pig performance can be achieved even under conditions of high health breeding stock.

Key Words: Swine, Early Weaning

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438   Environmental effects on the growth of finisher pigs. J. T. Holck[1]*, A. P. Schinckel[2], J. L. Coleman[3], V. M. Wilt[4], E. L. Thacker[1], M. Spurlock[2], A. L. Grant[2], P. V. Malven[2], M. K. Senn[1], and B. J. Thacker[1] [1]*Iowa State University, Ames, [2]Purdue University, West Lafayette, IN, [3]Monroe City, MO, and [4]Paris, MO.*

Forty-eight, 77 d old crossbred barrows were selected from a single site commercial herd. The pigs were allocated at 11 wk of age at a mean live weight of 30 kg to be raised in the commercial herd's grower and finishing facilities (COM, n=24) or in a research facility (RES, n=24). COM pigs were reared in one pen. The RES pigs were reared in 8 pens. COM pigs were raised in the grower building providing .51 m[2]/hd for 8 wk and then moved to the finishing building (.71 m[2]/hd). RES pigs were housed in a facility which provided 2.14 m[2]/hd. Pigs were weighed at biweekly intervals. Backfat thickness and loin eye area were measured by B-mode ultrasound every 28 d from 77 d of age to 90 kg live weight and then biweekly to 118 kg, at which time, the entire group went to slaughter. Fat-free carcass lean and total carcass fat were predicted using equations including live weight, ultrasonic backfat and loin eye measurements. Live weight gain on test (WTG) was fit to the nonlinear Bridges function. Predicted lean mass data were fit to augmented allometric equations $(Y=aX^b(c-x)^d$ where Y=component mass (kg) and X is live weight (kg). Serum collected at 11, 13, 15, 19 and 23 wk of age were evaluated for alpha-1-acid glycoprotein, IGF-1 and haptoglobin. RES pigs had higher (P<.001) average daily live weight (1.04 vs .73 kg), fat-free lean (.34 vs. .24) and fat gain (.35 vs .24 kg). RES pigs were fatter than COM pigs (24.9 vs 27.9 mm backfat, p < .10). The advantage of the RES pigs over the COM pigs for live weight and lean growth were immediate and consistent at each live weight. Daily lean gain increased from 30 kg to 52 kg and then declined in both environments. Overall, from 13 to 23 wk of age, RES pigs had lower AGP (461.6 vs 597.9 ug/ml, P<.02) and higher IGF-1 (196.8 vs 170.0 ng/ml, P<.10) concentrations. Haptoglobin levels were not different (COM=17.6 vs RES=14.5, P>.10) between the two environments. In conclusion, commercial environments substantially reduce pig growth potential and alter serum factors.

Key Words: Environment, Pig Growth, Acute Phase Protein

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439   Performance, carcass and muscle quality traits of centrally tested segregated early weaned and farm reared pigs. K. D. Ragland, L. L. Christian*, J. D. McKean, and T. J. Baas, *Iowa State University, Ames.*

Crossbred pigs (N=919) were used in two trials designed to evaluate performance and muscle quality differences of segregated early weaned (SEW) and farm reared pigs fed high protein and lysine and moderate protein and lysine diets. Forty groups of 24 pigs each were consigned by producers for utilization in this project. Trial one consisted of 22 pig groups and trial two 18 pig groups. Each group of 24 pigs was blocked by litter to form three uniform sets of eight pigs each. One set from each group was subsequently randomly assigned to one of three treatments: farm reared, high protein (T1); SEW, high protein (T2); or SEW, moderate protein (T3). Sixteen pigs from each group were entered into a central SEW unit at 8-15 d of age. The remaining eight pigs from each group remained on their respective farms through the nursery stage. All 24 pigs from each group were moved to a central testing station at approximately 60 d of age. Pigs randomly allocated to the high protein diet were fed a 21.5% protein, 1.2% lysine diet and an 18% protein, .95% lysine diet between 60 and 120 d of age and 120 d and the conclusion of the test, respectively. Pigs randomly allocated to the moderate protein diet were fed a 17.5% protein, .92% lysine diet and a 14% protein, .67% lysine diet between 60 and 120 d of age and 120 d and the conclusion of the test, respectively. Pigs were weighed off-test on an individual basis at weekly intervals upon reaching a weight ≥ 114 kg. Upon completion of the test, carcass measurements were taken following a rapid chill. Pen means for tenth rib backfat (BF10), loin eye area (LEA), carcass length (LEN), feed efficiency (FE), average daily gain (ADG), average daily lean gain (ADLG), efficiency of lean gain (ELNG), color score (SC), marbling score (SM), firmness score (SF), pH, water holding capacity (WHC) and Minolta reflectance (MIN) were calculated. Residual correlations between ELNG and FE, ADG, and ADLG after accounting for the fixed effects of treatment, sex, year and the interaction and the linear effect of live weight were .86 (p<.01), −.48 (p<.01) and −.71 (p<.01), respectively. Farm reared pigs significantly outperformed SEW reared pigs for BF10 (p<.10), ADG (p<.01), ADLG (p<.01) and ELNG (p<.05). Pigs fed the moderate diet significantly excelled those that received the high diet for pH (p<.05), ADG (p<.01) and ADLG (p<.01).

Key Words: Swine, Segregated Early Weaning, Protein

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440   Effect of management strategy during rearing on grower/finisher pig performance and indicators of immune system activation. L. Dionissopoulos*, C.F.M. de Lange, R. M. Friendship, C. Dewey, and J. MacInnes, *The University of Guelph, Ontario, Canada.*

An experiment was conducted to determine the effect of health management strategy during rearing on grower/finisher (G/F) pig performance and corresponding indicators of immune system activation. Three management strategies were studied: Conventional (farrow-to-finish operation with identified health problems in G/F pigs), Segregated Early Weaning (SEW; piglets from 6 sow herds weaned into a common SEW nursery at two weeks of age); and minimum disease (SPF). Pigs had the same genetic background. Per treatment, 48 pigs (half gilts, half barrows) were housed in separate but identical rooms. All pigs were fed the same diet. Performance was monitored between approximately 28kg and 108kg body weight. Blood samples were taken monthly to determine serological and endocrinological profiles. Average daily gain (ADG) was affected by management strategy (P<.001); it was highest in the SPF pigs (.95 kg/day), followed by Conventional (.87 kg/day), and SEW (.80 kg/day). Average daily feed intake (ADFI) was also affected by management strategy (P<.001). ADFI was lowest in the SEW group (1.92 kg/day), followed by Conventional (2.22 kg/day), and SPF (2.23 kg/day). Feed:Gain (F:G) also was affected by management strategy (P<.05). F:G was the lowest in the SPF group (2.34), followed SEW (2.42), and Conventional (2.58). There was no effect of treatment on ham weight, carcass dressing percentage, and estimated lean yield. SEW pigs displayed antibody titres to *Mycoplasma hyopneumoniae* and PRRS as body weight increased (P<.001). There were no significant differences in titres for these antibodies in the other groups for the final bleed (P>.05). In general, Insulin-Like Growth Factor-1 (IGF-1) levels were positively correlated with growth rates in the final bleed (P<.01). SPF pigs displayed the highest levels of IGF-1, followed by the Conventional and SEW groups. This study demonstrates the superiority in performance of SPF over conventional and SEW where piglets from different sow herds are commingled when moved into a common nursery.

Key Words: Management Strategy, Immune System Activation, Performance

441   Removal of market ready pen mates improved growth rate of remaining pigs. R. O. Bates[1]* and M. D Newcomb[2], [1]*Michigan State University, East Lansing* and [2]*University of Missouri, Columbia.*

A randomized block experiment with 3 replications (reps) was conducted to determine the effect of removing market ready pigs from pens of pigs with differing space allocation. Each rep consisted of 20 pens with 7.43 m^2 of floor space per pen. At study initiation, 41.7 kg pigs were randomized within side of test facility to floor space allocations of either .62, .74, .93 m^2. As average pen weight reached 106.6 kg, within space allocation, pens either remained intact (I) or one-half of the pigs were removed (R). The study terminated two weeks later. In reps 2 and 3, B-mode estimates were taken near 106.6 kg and at study completion for tenth rib backfat (BF10-1 and BF10-2, respectively) and loin muscle area (LMA-1 and LMA-2, respectively). Feed intake data were collected the final two weeks in replications 1 and 2. No differences were observed among space allocation treatments for ADG (838, 864 and 888 g/d, respectively) and Feed/Gain (F/G) (3.19, 3.22 and 3.28 respectively) while ADFI and BF10 for pigs allocated to .62 m^2 was lower when compared to pigs allocated .74, and .93 m^2 (2.68, 2.79 and 2.89 kg/d, respectively and 28.7, 31.0 and 31.2 mm, respectively). For R pens, ADFI and ADG was higher than I pens (3.67 vs 3.12 kg/d, respectively and 1,020 and 854 g/d, respectively); however F/G did not differ (3.82 vs 3.96, respectively). An interaction for BF10-2 was observed. It was similar for pigs in either R and I pens and allocated .62 m^2 (30.3 vs 30.7 mm, respectively) or .93 m^2 (31.8 vs 33.8 mm, respectively). However, R pens with pigs allocated .74 m^2 were fatter than I pens (36.6 vs 31.8 mm, respectively). No differences among LMA-1 and LMA-2 were found for the treatments investigated. Subsequent pig growth, as average pen weight reached 105 kg, was improved when market ready pen mates were removed.

Key Words: Pig, Growth, Floor Space Allocation

442   Halothane gene, chromium picolinate supplementation, and sex effects on live animal and carcass characteristics of pigs. B. K. Green*, C. M. Wood, A. F. Harper, J. R. Claus, and P. P. Graham, *Virginia Polytechnic Institute and State University, Blacksburg.*

Two trials were conducted to evaluate the effects of the halothane gene (HAL), chromium picolinate (Cr) and sex on live animal and carcass characteristics. White-cross HAL-free (NN) sows were bred to two heterozygous (Nn) littermate Hampshire boars, and offspring were genotyped. Pigs were assigned to pens based on sex (barrow, gilt) and genotype (NN, Nn). Pens were randomly allotted to two dietary treatments, 0 or 200 ppb Cr added to standard corn-soybean meal diets. The 2×2×2 factorial arrangement was replicated four times in trial 1 (16 pens, 2 pigs/pen; 16 pens, 4 pigs/pen) and 4 times in trial 2 (32 pens; 2 pigs/pen). Average initial weight was 28.7 kg; average final weight was 107.3 kg. Gain/feed (G/F) and average daily gain (ADG) were calculated. Pigs were transported to campus, rested overnight, processed according to Virginia Tech Meats Lab protocols, and chilled 24 hours. Carcasses were measured according to NPPC s Procedures to Evaluate Market Hog Performance. Data included dressing percentage (DP); carcass length (CL); loin muscle area (LMA); first (BF1); last (BFLR), tenth (BF10), and last lumbar (BFLUM) backfat; lean gain (LG); and percent lean (PL). Data were analyzed with SAS procedures, using pen means for live traits and individual pigs for all other traits. For ADG, G/F, DP, CL, and backfat measurements, the final model included main effects only because interactions were not significant. For LMA, PL, and LG the model also included two-way interactions. Barrows gained faster (P<0.001) but gilts were more efficient (P<0.01). ADG was not affected by genotype. Cr had no significant effect on any traits, but means of backfat measurements were consistently higher for pigs fed Cr. There was one interaction, between Cr and genotype for LMA (P<0.05). Nn pigs were leaner, dressed higher, had larger LMA, and greater PL and LG than NN pigs (P<0.05). As expected, gilts were leaner, had greater LG, higher DP and PL, and larger LMA than barrows (P<0.001). Cr appears to have no effect on live animal or carcass composition characteristics of NN and Nn pigs.

Key Words: Pigs, Halothane, Chromium

443   Immunophysiological Responses of Sows and Neonatal Pigs to Vitamin E and Selenium Therapy. C. Okere* and R. R. Hacker, *Dept. of Animal & Poultry Sci., University of Guelph, Ontario Canada.*

Immunophysiological responses of sows and neonatal pigs to vitamin E and Selenium were investigated by monitoring reproductive performance and immunoglobulins (IgG & IgM) in colostrum and serum of sows and offspring. Pregnant Yorkshire sows (76, > parity 2) were randomly allotted to 4 groups in which 2 i.m. injections of 500 IU of vit. E (E), 5 mg of Se (S), both vit. E and Se (E+S) or 5 ml of saline as control (C) were given on gestation d 60 and 100. On d 3 following parturition, pigs received a corresponding booster i.m. injection of either 100 IU of vit.E, 0.1 mg of Se, 100 IU vit.E + 0.1 mg Se or 1 ml of saline. Sows were bled prior to injections, at parturition and at weaning. Pigs were bled 24 h postpartum, on d 7 and at weaning (d 21). The number of pigs born, and the number born alive were (9.26, 8.94, 8.47 vs 9.21; P= 0.43) and (8.47, 8.49, 8.31 vs 8.52; P= 0.03) for E, S, E+S vs C groups respectively. Number of pigs weaned per litter for each group was (7.89, 8.05, 7.94 vs 7.31; P=0.65). Birth weights (1.30, 1.34, 1.31 vs 1.27 kg) and weaning weights (6.07, 6.17, 6.11 vs 5.80 kg) were larger for pigs from treated sows. However, when number of pigs was included as a covariate, birth and weaning weights were similar for each group (P=0.34). Compared to controls, all three treatments resulted in significant (P=0.0001) increases in IgG concentrations in pig serum 24 h after farrowing (1450, 1420, 1523 vs 1031 mg/100 ml), on d 7 (1836, 1614, 1755 vs 1458 mg/100 ml) and d 21 of age (1328, 1342, 1472 vs 960 mg/100 ml). whereas IgM concentrations were unaffected (P=0.30). Significant changes in sows' serum IgG levels were detected prior to parturition (2688, 2760, 2788 vs 2655 mg/100 ml; P = 0.04). Positive and significant correlations were established between neonatal pig serum IgG concentrations 24 h postpartum and d 7 of age (r = 0.76; P=0.0001); and between d 7 and d 21 of age (r = 0.73; P=0.0001). These results indicate that prepartum injections of sows with vitamin E and (or) Se can significantly augment the transfer of immunoglobulin to their progeny. The sustained preweaning high levels of IgG in vit.E + Se treated pigs also suggest that vit.E and Se can act synergistically to promote better immunocompetence in neonatal pigs.

Key Words: Porcine Immunoglobulin, Vitamin E, Selenium

444 Effect of lactation dietary protein on the follicular development and hypothalamic hormone concentrations of early and conventionally weaned sows. B. A. Belstra[1]*, B. T. Richert[1], M. A. Diekman[1], W. L. Singleton[1], and G. D. Weesner[2], [1]*Purdue University, West Lafayette, IN and [2]USDA-ARS, West Lafayette, IN.*

Thirty-eight European York-Landrace first parity sows were fed either a high protein (HP; 1.2% lysine) or low protein (LP; 0.7% lysine) diet during lactation and were either early weaned (EW; 12 d) or conventionally weaned (CW; 26 d). Sows were slaughtered at either d 4, 6, or 8 post-weaning (PW) to collect the hypothalamus, pituitary, adrenals, uterus and ovaries. There were no diet or weaning treatment effects on avg follicle size (P > .27). Sows EW tended to develop fewer total follicles as compared to CW sows (P < .17). Uteri weights of CW sows decreased at a greater rate and to a lower weight by d 8 post-weaning than EW sows (P < .02). Increased dietary CP during lactation tended to increase the number of follicles (P < .18) and had a greater impact on CW (17.2 vs 22.2) than on EW (15.8 vs 16.5) sows. Dietary CP had no effect (P > .4) on hypothalamic gonadotropin releasing hormone (GnRH) concentration. However, EW tended to extend the time to peak GnRH concentrates by 2 days (d 6 vs d 4 PW; P < .13) compared to CW sows. Increased lactation dietary CP increased the number of follicles and EW tended to reduce potential ovulatory follicles by approximately 2, indicating both management practices can greatly affect sow reproductive performance.

	EW	CW	LP	HP
No. of Sows	26	12	19	19
No. of Follicles				
d 4 PW	20.3 ± 1.9	22.8 ± 2.6	17.7 ± 2.0	24.5 ± 2.0
d 6 PW	13.9 ± 1.7	15.0 ± 3.1	15.6 ± 1.9	12.5 ± 2.0
d 8 PW	15.0 ± 1.9	19.5 ± 2.6	15.7 ± 2.0	17.3 ± 2.0
Uterus				
Weight, g				
d 4 PW	636.4 ± 55.0	660.1 ± 77.8	612.4 ± 66.3	676.2 ± 66.3
d 6 PW	602.0 ± 49.2	405.9 ± 77.8	610.1 ± 61.4	481.9 ± 61.4
d 8 PW	506.3 ± 55.0	389.8 ± 77.8	441.2 ± 66.3	493.7 ± 66.3

Key Words: Follicular Development, Lactation, Weaning Age

445 Effect of feeding strategies on feed intake response and performance in lactating sows. J. L. Snow*, P. Ku, D. Rozeboom, and N. L. Trottier, *Michigan State University, East Lansing.*

Forty-seven lactating sows (Yorkshire, Yorkshire × Landrace, n=34 and Pietrain × Hampshire × Duroc, n=13) were used in a study to evaluate the effect of two feeding strategies on feed intake level, weight change and litter performance. Sows were either allowed ad libitum access to feed (AL, n =23) or subjected to a stair-step feeding regimen (SS, n = 24). Both treatments (AL and SS) used a corn-soybean meal diet containing 17.3% CP. The SS regimen was modeled after a Danish feeding system. Sows fed SS were provided maintenance level on d 1 of lactation, followed by a progressive increase in ration: the feeding regimen was increased by .75 kg from d 2 to 5, .5 kg from d 8 to 11, .5 kg from d 14 to 17, and .75 kg from d 20 to 21. Sows fed AL were provided ad libitum access to feed daily, starting on d 1 of lactation. Sow feed intake was measured daily and sow and litter weights were measured on d 0, 7, 14, and 21 of lactation. Weekly ADFI for sows in SS compared to sows in AL was different (*P* < .01) for wk 1 (4.0 ± .19 vs 5.8 ± .18 kg), but similar (*P* > .1) for wk 2 (6.3 ± .26 vs 6.5 ± .25 kg), and wk 3 (7.0 ± .61 vs 6.6 ± .59 kg). Weekly sow BW change for SS compared to AL was different (*P* < .01) for wk 1 (− 6.4 ± 1.9 vs 8.4 ± 1.8 kg), but not different (*P* > .1) for wk 2 (−.91 ± 2.3 vs −3.3 ± 2.2 kg), and for wk 3 (1.9 ± 1.7 vs 4.4 ± 1.6 kg). Total litter weight gain for SS and AL, respectively, was 36.7 ± 3.2 and 36.1 ± 2.8 kg, (*P* > .1). Weekly litter weight gain for SS compared to AL was not different (*P* > .1) for wk 1 (9.4 ± .99 vs 9.7 ± .96 kg), for wk 2 (14.0 ± .89 vs 13.5 ± .87 kg), and for wk 3 (15.1 ± 1.4 vs 14.0 ± 1.4 kg). Results suggests that the stair-step feeding regimen employed in this study limits the ability of the sow to consume sufficient amount of feed during early lactation, but tends to increase feed intake capacity during the last week of lactation compared to sows allowed ad libitum access to feed.

Key Words: Sow, Feed Intake, Lactation

446 Effect of source of winter supplement on growth and puberty among breeds of beef heifers. C. C. Chase, Jr.[1]*, A. C. Hammond[1], M. J. Williams[1], and T. A. Olson[2], [1]*USDA, ARS, Brooksville, Florida and [2]University of Florida, Gainesville.*

Spring-born heifers from three consecutive calf crops were weaned in September and stratified by sire, age and BW to receive either 2.3 kg/d of a 75% wheat middlings and 25% soybean meal mixture (WM) or 2.3 kg/d of a 70% soybean hull and 30% soybean meal mixture (SH). All heifers were fed 1.8 kg/d of molasses, and bahiagrass hay and minerals were offered free choice. Each winter treatment was replicated and lasted until spring when forage availability was adequate. At 28-d intervals, BW were collected. Throughout the study, heifers were exposed to fertile Angus bulls. Puberty was defined as age at first conception and was determined from calving date minus 284 d. Data were collected from 49 Angus (A), 106 Brahman (B), 9 Hereford (H), 12 Romosinuano (R), 67 Senepol (S), 20 H×S, 10 S×H, 43 B×A, 37 S×A, and 51 Tuli (T) ×A, with initial age (d) and BW (kg) of 249 and 186, 228 and 218, 241 and 207, 201 and 178, 236 and 234, 225 and 228, 234 and 203, 252 and 222, 256 and 208, and 257 and 204, respectively. There was no treatment effect on BW change during winter, but there was a trend for a year effect (P < .10). Breed and breed × treatment affected (P < .05) BW change during winter. Body weight changes (kg) over the 224 d winter period by breed were 110 ± 2.6 (A), 99 ± 1.6 (B), 121 ± 5.8 (H), 95 ± 5.0 (R), 93 ± 2.0 (S), 118 ± 4.1 (H×S), 122 ± 5.5 (S×H), 135 ± 2.7 (B×A), 124 ± 2.9 (S×A), and 118 ± 2.5 (T×A). Breed, but not winter treatment, affected (P < .001) age and BW at puberty. Age (d) and BW (kg) at puberty by breed were 459 ± 11.5 and 286 ± 6.5 (A), 592 ± 7.2 and 366 ± 4.1 (B), 413 ± 24.8 and 297 ± 14.2 (H), 427 ± 21.2 and 270 ± 12.1 (R), 481 ± 8.9 and 335 ± 5.1 (S), 384 ± 17.5 and 315 ± 10.0 (H×S), 427 ± 23.6 and 309 ± 13.4 (S×H), 478 ± 11.5 and 350 ± 6.6 (B×A), 475 ± 12.7 and 329 ± 7.3 (S×A), and 466 ± 10.7 and 309 ± 6.1 (T×A). Results indicate breed differences in BW change during winter as well as breed differences in age and BW at puberty in heifers developed under subtropical conditions in central Florida.

Key Words: Beef Heifers, Management, Puberty

447 Effects of sire, dam, fetal genotype and zinc supplementation on dystocia and zinc concentrations in beef heifers. R. A. Bellows[1]*, E. E. Grings[1], D. T. Brophy[2], N. R. Bellows[3], S. E. Bellows[1], and D. A. Phelps[3], [1]USDA-ARS, Miles City, MT, [2]University of Kentucky, Lexington, and [3]Montana Agric. Exp. Sta., Cooperating.

Simmental × Angus-Hereford (39,SAH) and Composite (46,XCP) heifers bred to Hereford (27,H), Limousin (23,L), or Piedmontese (35,P) sires were assigned within fetal genotype and breeding date to a basal diet containing 20 ppm Zn (DM basis) with (Zn) or without (C) 170 mg Zn added daily for 90d prepartum. Data were obtained at start of Zn feeding, 10d prepartum, plus daily blood samples from 40 heifers for 14d prepartum. Dystocia: 0 = no assistance; 4 = major difficulty. Dams and calves were weighed and bled 12 hr and 6 wk postpartum. Analysis was by GLM-SAS. Dam prepartum body wt (559.2 and 528.5 kg) and pelvic area (291.9 and 272.3 cm^2) differed (both P=.08; SAH and XCP). Zn main effects on prepartum data, birth weight and dystocia score were nonsignificant. Sire breed affected dystocia score (P<.05; 1.6, 2.1, and 2.2, H, L, and P). Calf sex affected birth weight (35.8 vs 39.7) and dystocia score (1.5 vs 2.4, both P<.01, female vs male). The Zn × calf sex interaction affected birth weight (P=.07): females from Zn dams were lighter than those from C dams (36.9 vs 34.6 kg); males from Zn dams were heavier than C (38.8 vs 40.6 kg, both C vs Zn). Plasma Zn concentrations were higher: prepartum in Zn dams (1.14 vs 1.06 ppm, P=.07); postpartum in dams that gestated females (.97 vs .87 ppm, P=.07). Zn concentrations at birth were higher in calves from Zn dams (.82 vs .68, P=.09) and in calves from XCP dams (.97 vs .53 ppm, XCP vs SAH, P<.05). Plasma Zn at 6 wk was higher in female than male calves (1.22 vs 1.01 ppm, P<.01). Zn had no effect on prepartum P4, but E2-17β effects were significant (P=.06). We conclude there are breed, fetal genotype, and sex interaction effects on response to Zn supplementation.

Key Words: Dystocia, Zinc Supplement, Beef Cattle

448   Effects of an oral antibiotic on fertility traits in range beef cows in Florida. P. J. Chenoweth[1], C. A. Vargas[1]*, D. O. Rae[1], R. L. Saltman[2], P. C. Genho[3], and G. Crosby[3], [1]University of Florida, Gainesville, [2]Hoffmann-La Roche Inc, Nutley, NJ, and [3]Deseret Cattle and Citrus, St. Cloud, FL.

Two groups (A and B) of crossbred beef females (range 149-214) at each of 3 Florida locations (1, Simmental × Brahman; 2, Hereford × Brahman; 3 Angus × Brahman) were used to assess the effect of an oral antibiotic on fertility traits. Group A (Treated) received chlortetracycline (CTC) at 1.1 mg/kg/d for 15d prior to and 15d after, start of breeding season. Group B (Control) did not receive CTC. Breeding was for 90d at a bull to female ratio (BFR) of 1:33. Pregnancy testing was conducted 90d after the end of breeding. Average cow age and BCS at trial commencement was 10.0 years and 4.8 (1-9), respectively. Cow age differed (P<0.05) between herds at location 1, whereas BCS at trial commencement differed (P<0.05) between herds at location 3. Unadjusted pregnancy rates differed among locations (1=88.3%; 2=74.3%; 3=76.2%; P<0.001). Cow age and the interactions of Location, Treatment and BCS did not influence fertility traits. With Location and Treatment in the model, treated females achieved more pregnancies (83.3%) than control (78.4%)(P<0.05), and achieved pregnancies earlier in the breeding season (P<0.001) than control. BCS, assessed at pregnancy test, was also significantly (P<0.001) associated with pregnancy rate. Inclusion of BCS in the model reduced the effect of treatment on pregnancy rate to a non-significant level (P=0.37), although treated cows still became pregnant earlier than controls (P<0.001). Feeding of CTC to multiparous range beef females for 30 days at start of breeding improved fertility. Females given an oral antibiotic (chlortetracycline) at a period coinciding with the beginning of the breeding season attained pregnancy status earlier in the breeding season than non-treated females, and probably achieved higher pregnancy rates.

Key Words: Cow-Calf, Breeding, Antibiotics

449   Dry cow treatment of beef cows: effects on mammary health and calf growth. C. A. Lents[1]*, R. P. Wettemann[1], J. A. Vizcarra[1], M. L. Looper[1], and M. J. Paape[2], [1]Oklahoma Agricultural Experiment Station, Stillwater and [2]USDA-ARS, Beltsville, MD.

Spring calving Hereford and Hereford × Angus cows (n = 90) were used to determine the effects of intramammary dry cow treatment with penicillin G procaine and novobiocin sodium on mammary health and subsequent calf growth. Quarter milk samples were collected prior to treatment at weaning (October) and at the subsequent calving (February - April). Samples were analyzed for somatic cell counts (**SCC**, reported as log transformed data) and bacteriology. At weaning, cows were blocked by age and randomly assigned to intramammary treatment (n = 45) or untreated controls (n = 45). Treatment at weaning decreased (P < .03) intramammary infection at calving; 55% of control cows were infected compared with 30% of treated cows. Thirty-nine percent of control cows that were not infected at weaning were infected at calving compared with 20% of treated cows (P < .1). Only 40% of treated cows that were infected at weaning were infected at calving compared with 71% of control cows (P < .1). Dry cow treatment reduced the presence of *Coagulase negative staph.* infections at calving from 42% for controls to 18% for treated cows (P < .02). Dry cow treatment did not influence the incidence of *Staphylococcus aureus* infections at calving. Treatment did not alter SCC per cow, but did decrease (P < .06) maximum SCC (MXSCC) per cow after calving compared with control cows (2.16 scc/mL ± .12 vs 1.83 scc/mL ± .13, respectively). Cows with greater SCC at weaning had greater SCC and MXSCC at calving compared with cows that had less SCC at weaning (P < .06). Dry cow treatment did not effect adjusted weaning weight the following fall. Dry cow treatment of beef cows at the time of weaning decreased intramammary infection and SCC at the subsequent calving, but did not influence calf gain.

Key Words: Beef Cow, Mastitis, Weaning Weight

450   Interaction between location and calf genetic type for preweaning traits of cattle varying in percentage Brahman breeding. F. A. Thrift[1]*, S. M. Clark[1], and D. E. Franke[2], [1]University of Kentucky, Lexington and [2]Louisiana State University, Baton Rouge.

Data collected at two locations (Brooksville, FL; Baton Rouge, LA) in the Southern Region were utilized to evaluate interaction between location and calf genetic type for preweaning traits of calves varying in percentage (0, 50, 100) Brahman breeding. Data consisted of birth weight (BW, 3562), preweaning average daily gain (ADG, 3338) and weaning weight (WW, 3338) records on Angus (AA), Brahman ♂ × Angus ♀ (BA) and Brahman (BB) calves. Calves were classified as 0% (AA), 50% (BA) or 100% (BB) Brahman breeding. BW, ADG and WW data were analyzed assuming a mathematical model that included effects for location, year/location, calf genetic type, age of dam, calf sex, calf sex × calf genetic type and location × calf genetic type; weaning age was included as a covariate for ADG and WW. The location × calf genetic type interaction was significant for BW (P<.05) and approached significance for ADG (P<.10) and WW (P<.07). At the FL location, BW, ADG and WW of BA calves exceeded BW, ADG and WW of BB calves by 4.5, .017 and 8 kg, respectively; similarly at the LA location, BW, ADG and WW of BA calves exceeded BW, ADG and WW of BB calves by 6.2, .059 and 17 kg, respectively. At the FL location, BW, ADG and WW of BB calves exceeded BW, ADG and WW of AA calves by 2.9, .074 and 18 kg, respectively; similarly at the LA location, BW, ADG and WW of BB calves exceeded BW, ADG and WW of AA calves by 1.8, .063 and 18 kg, respectively. These results indicate that, for locations in the Southern Region, 50% (BA) Brahman calves are expected to be heavier at birth and weaning than 100% (BB) Brahman calves. Further, the 100% (BB) Brahman calves are expected to be heavier at birth and weaning than 0% (AA) Brahman calves.

Key Words: Brahman, Interaction, Location

451   Use of a molasses-based supplement with fat to improve performance of beef cows and calves grazing endophyte-infected tall fescue. D. G. Ely[1]*, D. K. Aaron[1], J. T. Johns[1], J. Wyles[1], and L. A. Carver[1], [1]University of Kentucky, Lexington and [2]Cargill, Molasses Liquid Products, Elk River, MN.

One hundred and one Angus and ½ Angus ½ Beefmaster cow-calf pairs grazed nine, 10.5-ha KY 31 tall fescue pastures from May 3 to October 29. Three molasses-based supplements were randomly assigned to three replicate pastures: C = control, 64% DM, 20% CP; F = C + 5% fat from soybean oil refinery lipid; FP = F with 30% of the total CP replaced with bypass protein (blood and feather meal). Cows had access to these supplements (20% CP) provided in one commercial lick tank per pasture from May 3 to August 5 (Period 1). The CP content of C, F, and FP supplements was increased to 32% CP on August 5, by adding NPN and holding the amount of bypass protein constant. These supplements were provided in the same lick tanks from August 5 until calves were weaned on October 29 (Period 2). Initial and final cow and calf weights were taken on two consecutive days (May 2, 3 and October 29,30). Interim weights and cow body condition scores (BCS) were obtained at 28 to 35-d intervals. In Period 1, total gain per cow was 23, 13, and 19 kg for C, F, and FP, respectively (C vs F; P = .17). Average BCS were 5.3, 5.1, and 5.5 for C, F, and FP during Period 1 (F vs FP; P =.01). Daily molasses intake/cow in Period 1 was 1.7, 1.5, and 1.8 kg; calf ADG was .96, .91, and .92 kg (C vs F; P = .14) for C, F, and FP. Cows consuming F gained more than C (P=.05) and FP (P = .08) in Period 2. Average BCS of F cows continued to be lower (P = .04) than FP. Daily molasses intake during Period 2 averaged 1.0, .7, and 1.1 kg for C, F, and FP, whereas calf ADG was .70, .80, and .75 kg (C vs F; P = .12). Differences in pregnancy rates at weaning were nonsignificant. These results demonstrate that adding fat to a molasses-based supplement can improve performance of cows and calves grazing endophyte-infected tall fescue. Results from combining fat with bypass protein were less conclusive.

Key Words: Molasses, Fat, Cows

452   Strategic supplementation of range beef cows: split feeding by body condition and stocking rate. J. W. Oltjen* and R. D. Sainz, *University of California, Davis.*

We hypothesize that beef cow supplementation programs aimed at achieving specific targets of body condition enable more efficient use of feed resources and maintain beef cow performance. Our objective is to identify optimal strategies for timing of supplementation. This ongoing experiment examines interactions between cow body condition score (BCS, 1-severely emaciated, 9-very obese), grazing intensity (two stocking rates, Moderate-ca. 1.85 cows/ha and >900 kg/ha residue, Heavy-ca. 2.47 cows/ha and 700-900 kg/ha residue), and feed supplementation strategy (None, Standard-protein supplement fed during entire dry feed season, Strategic-supplement given only to cows with BCS<5.5). Stocking rates are maintained during the critical green forage availability time of year, late Fall and Winter. Cows are weighed and condition scored at approximately August 15, September 30, December 31, and May 31 each year, at which time individual cows assigned to Strategic supplementation are placed with the None or Standard supplementation groups. Cows calve in the fall and are culled when open; new cows enter the trial when they have weaned their first calf on June 1 each year. Thus far 302 cows have been randomly assigned to treatments for the first two years of the study. Calf weaning weights were 6 kg greater (P<.01) for cows stocked moderately than for those at the heavy stocking rate. Cows that were allocated to heavy stocking rates had decreased pregnancy rates (73.2 vs. 89.5%, P<.05). There was a significant pregnancy rate interaction (P<.05) between supplementation treatment and condition at calving: None 43 and 92%, Standard 72 and 100%, Strategic 73 and 85% for BCS<5.25 and BCS>5.25, respectively. It appears that calving BCS was not as important for cows on the strategic supplementation treatment. This suggests that strategic supplementation may be beneficial but needs further refinement.

Key Words: Beef Cattle, Supplementation, Body Condition Score

453   Phenotypic relationships between scrotal circumference and composition traits of yearling Limousin bulls.
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Breeders of Limousin cattle have targeted reproductive fitness for improvement while maintaining inherent breed muscle advantages. Relationships between fertility and composition traits are not well defined. The objective of this study was to model the effects of muscle score (MS) and body condition score (BCS) on scrotal circumference (SC) of yearling bulls. Data collection was initiated in 1990 on 1,472 yearling Limousin bulls at Running Creek Ranch, Elizabeth, CO. Traits measured included yearling weight (YW,kg), SC (cm), BCS, and MS. Dam age (AOD) was categorized for dams 2, 3, 4 to 10, and >10 yr. Percentage Limousin (PL) classes were: 51 to 75, 76 to 87, 88 to 93, 94 to 100. Yearling MS were grouped light (MS<2), average (MS=2) or heavy muscled (MS>2). All bulls had BCS between 4 and 7. Bull age (AGE,days) and YW were related r=.37 (p<.0001). The final model included main effects: year (YR), PL, AOD, AGE, YW, MS, BCS and YR by MS interaction. Additional interactions and PL were not important (P>.1). Regression coefficients for WT and AGE were .0224, cm/kg and .0075, cm/day respectively. Excluding BCS=4 (n=4), bulls with higher BCS values had larger yearling SC. Solutions for SC on BCS increased .6 cm for a BCS increase from 5 to 6 and 1.2 cm for an increase from 5 to 7 (p<.05). Heavier muscled bulls had significantly smaller scrotal measurements than average and light muscled bulls (p<.05). Solutions of SC for light and average muscled bulls were .808 ± .338 and .479 ± .136, cm. Coefficients for SC on WT by MS were .018 ± .005 and .006 ± .003, cm/kg for MS 1 and 2, respectively. These data suggest heavier muscled cattle had smaller scrotal circumferences than their lighter muscled contemporaries, posing selection and management concerns to Limousin breeders wishing to optimize fertility and muscularity.

Key Words: Beef Cattle, Scrotal Circumference, Composition