

Beef Species

699 Evaluation of selecting half-sibling beef cows to increase calf crop uniformity. B. Nichols,* R. Reuter, and B. Cook, *The Samuel Roberts Noble Foundation Inc., Agriculture Division.*

Increasing calf crop uniformity has long been regarded as a means to increase sale price in beef cattle operations. A lack of uniformity has also been reported as one of the top quality defects in the US beef industry according to the National Beef Quality Audit. In 2004, 200 half-sibling (HS) yearling heifers and 200 yearling heifers of similar phenotype (PS) but unknown genetic relationship were used to determine if selection of half-siblings would increase uniformity of the calf crop under commercial management. Females were bred by AI to either Angus or Limousin bulls and exposed to full brothers of the AI bull. Cows were managed in one herd under commercial conditions. Calf weaning weights were measured for 5 calf crops (calves born in 2005 – 2009). Adjusted weaning weights (BIF adjustments) were available for 853 calves (393 calves from 158 HS cows; and 460 calves from 156 PS cows). These adjusted weaning weights were evaluated in a repeated-measures ANOVA (PROC MIXED) with year, cow type, calf sire breed, calf sex and their interactions as fixed effects and cow as the repeated subject with an autoregressive covariance structure. Least squares means for adjusted weaning weight were 506 and 526 lb for HS and PS cows, respectively. Adjusted weaning weight residuals from the model were evaluated for homogeneity of variance with Levene's test in PROC GLM of SAS. Adjusted weaning weight SD was 49.4 and 47.7 for HS and PS cows, respectively ($P = 0.56$). Lifetime weaning weight production was calculated for each cow by summing all observed actual weaning weights across all 5 years. Lifetime production was 1358 ± 706 lb for HS cows and 1635 ± 705 lb for PS cows, and variances were not different ($P = 0.97$). A subset of calves from each year was finished in a commercial feedlot. Variance of HCW and REA of calves from HS cows tended to be less ($P < 0.14$) than variance of calves from PS cows. The opposite was true for finishing-period ADG variance ($P = 0.14$). Considering half-sibling relationships when selecting commercial cows, over and above phenotypic selection, appears to have limited ability to reduce variability of calf crops.

Key Words: calf crop uniformity, beef cows

700 Performance, residual feed intake, and carcass quality of progeny from Red Angus sires divergent for maintenance energy EPD. C. M. Welch*¹, J. K. Ahola³, G. K. Murdoch¹, D. H. Crews³, J. I. Szasz¹, L. C. Davis¹, M. E. Doumit¹, W. J. Price², L. D. Keenan⁴, and R. A. Hill¹, ¹Department of Animal and Veterinary Sciences, University of Idaho, Moscow, ²Statistical Programs, University of Idaho, Moscow, ³Department of Animal Sciences, Colorado State University, Fort Collins, ⁴Red Angus Association of America, Denton, TX.

The maintenance energy (ME_M) EPD was developed by the Red Angus Association of America and is used as an indicator of energy expenditure, which may be closely associated with residual feed intake (RFI). The objectives of this study were to evaluate and quantify the following using progeny of Red Angus (RA) sires divergent for ME_M EPD: 1) post-weaning RFI and finishing phase feed efficiency (FE), 2) post-weaning RFI and carcass quality, and 3) post-weaning RFI and sire ME_M EPD. Studies were conducted over a period of 3 years (cohorts), and sires divergent for ME_M EPD were identified before breeding. Post-weaning RFI and finishing phase FE of steer progeny tended to be

positively correlated ($r = 0.38$; $P = 0.06$) in cohort 1 and were positively correlated ($r = 0.50$; $P = 0.001$) in cohort 3. In addition, post-weaning RFI was not correlated ($P > 0.05$) with any carcass traits. Sire ME_M EPD was correlated ($P < 0.05$) with carcass traits in cohort 1 (HCW, LM area, KPH, fat thickness, and yield grade) and cohort 2 (KPH and fat thickness). Most correlations between sire ME_M EPD and carcass quality were explained by the genetic potential of the sires; however, variation in measured LM area was not explained by the genetic potential of ribeye area EPD, and therefore, the observed correlation between sire ME_M EPD and measured LM area may suggest an association between ME_M EPD and LM area. In addition, no relationship was observed ($P > 0.05$) between progeny post-weaning RFI and sire ME_M EPD. Therefore, results suggest the following: 1) RFI measured during the post-weaning growth phase is indicative of FE status in the finishing phase, 2) neither RFI nor sire ME_M EPD negatively affected carcass quality, and 3) RFI and sire ME_M EPD are not associated.

Key Words: maintenance energy, residual feed intake, carcass quality

701 The effect of limiting feed intake on concentration of proteins associated with energy balance in the pregnant beef cow. K. M. Wood*¹, C. J. Fitzsimmons^{2,3}, S. P. Miller¹, B. W. McBride¹, and K. C. Swanson⁴, ¹Dept. of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada, ²Agriculture and Agri-Food Canada, Edmonton, AB, Canada, ³Dept. of Agriculture, Food and Nutritional Science, University of Alberta, Edmonton, AB, Canada, ⁴Dept. of Animal Sciences, North Dakota State University, Fargo.

Twenty-two multiparous pregnant beef cows were used to investigate the effect of dietary restriction on the abundance of selected proteins regulating energy metabolism. Cows were fed at either 85% ($n = 11$; LOW) or 140% ($n = 11$; HIGH) of NEM. The diet consisted of a haylage-based total mixed ration containing 20% wheat straw. Cows were slaughtered by block (date of parturition), beginning on 83 d after the initiation of dietary treatments and every wk thereafter for 6 wks, such that each block was slaughtered at approximately 250 d of gestation. Tissue samples from liver, kidney, sternomandibularis muscle, ruminal papilli (ventral sac), pancreas, and small intestinal mucosa were collected at slaughter and snap frozen in liquid N_2 . Western blots of total protein isolated from these tissues were conducted to quantify abundance of: PCNA, ATP synthase, ubiquitin, and Na/K+ ATPase for all tissues; PGC1 α , PPAR γ , AMPK α and phosphorylated AMPK α for liver, muscle, and rumen; and PEPCK for liver and kidney. Statistical analysis was conducted using proc Mixed in SAS and included the fixed effects of dietary treatment, cow age, block, and the random effect of pen. Pearson correlations were conducted within treatment to investigate relationships between protein abundance and performance characteristics. Dietary treatments resulted in cows fed HIGH having greater ($P \leq 0.04$) ADG and final BW than cows fed LOW. Abundance of ubiquitin in muscle was greater ($P = 0.009$) in cows fed LOW, and PCG1 α in liver was greater ($P = 0.03$) in cows fed HIGH. In cows fed HIGH, DMI was negatively correlated ($P < 0.03$) with small intestinal PCNA, ATP synthase and Na/K+ ATPase abundance. This data indicates that feed intake can influence the quantity of important metabolic proteins. These results will further the understanding of maintenance requirements and feed efficiency in pregnant beef cows.

Key Words: beef cows, cellular energy metabolism, feed intake

702 Heifers with low antral follicle counts have low birth weights and produce progeny with low birth weights. A. F. Summers^{*1}, R. A. Cushman², and A. S. Cupp¹, ¹University of Nebraska-Lincoln, Lincoln, ²USDA-ARS U.S. Meat Animal Research Center, Clay Center, NE.

Research has demonstrated that heifers with increased numbers of ovarian antral follicle counts (AFC) have improved hormonal profiles and improved fertility. Interestingly, heifers with low AFC had lower birth weights, suggesting that genes influencing growth and development also influence the development of the reproductive tract and establishment of the ovarian reserve. To determine the relationship of AFC to heifer BW, reproductive tract characteristics, and first calf performance, composite (MARC III x Red Angus) heifers (n = 362) were used over a 4 yr period. In yr 1 heifers grazed winter range or corn stalk residue and were offered no supplement or 0.45-0.90 kg/d (31%CP, DM Basis) during development. In yr 2 and 3 heifers grazed winter range and were fed a dried distillers grain-based (DDG) or corn gluten feed-based supplement offered at 0.59% and 0.78% BW, respectively, throughout development. Supplements were formulated to be isocaloric but differed in undegradable protein. In yr 4 heifers were fed either 0.59% or 0.46% BW of the DDG based supplement offered in yr 2 and 3. All heifers in yr 2 to 4 were fed ad libitum meadow hay while grazing dormant pasture. Prior to breeding, heifers were transrectally ultrasounded to determine AFC and classified as high (≥ 26 follicles; HIGH) moderate (16–25; MOD) or low (≤ 15 ; LOW). There was no diet x AFC classification interaction. HIGH heifers have greater ($P \leq 0.05$) birth, weaning, and adjusted 205-d weaning BW compared with LOW. Pre-breeding BW, total AFC, and proportion of mature BW at breeding were greater ($P < 0.01$) for HIGH compared with LOW heifers. Overall pregnancy rate was similar ($P = 0.36$) among AFC classifications. Progeny birth BW was greater ($P = 0.03$) for calves born to HIGH compared with LOW heifers. Taken together these data indicate a relationship between AFC and BW through the first breeding season and progeny calf BW. The low birth BW in heifers with low AFC and in their progeny continues to support a possible link between genes that influence growth and development and establishment of the ovarian reserve. USDA is an equal opportunity provider and employer.

Key Words: beef, progeny, antral follicle count

703 Prediction of HCW of individual steers from partial live weight collected with an in-pen weighing device. R. Reuter^{*} and C. Moffet, *The Samuel Roberts Noble Foundation Inc., Agriculture Division.*

Accurately and precisely predicting HCW of individual cattle several days before slaughter would enable more efficient management and marketing of slaughter cattle. Technology (GrowSafe Beef system, GrowSafe, Inc.) has been developed that estimates a partial body weight (pBW) by weighing the fore feet of an animal as it drinks water. Weights are measured at 1-s intervals. Our objective was to determine the degree to which pBW could predict HCW in steers. Four hundred and five steers (BW: 309 ± 28.5 kg) were fed in a commercial feedlot near Calgary, AB in the winter of 2010 – 2011. Steers were housed in dirt-surfaced pens equipped with the pBW measuring device. Cattle were slaughtered (HCW: 360 ± 33 kg) in 2 groups (n = 203 and 202). Cattle were on feed for 209 d, and recorded ADG of 1.21 kg, indicative of commercial management. Number of pBW observed ranged from 0 to 4,620 and averaged 602/steer per day. These pBW were filtered to remove extreme 1-s data points. The filtering algorithm removes 1-s observations where the residual pBW is more than 200 kg from the predicted pBW predicted from the linear regression of pBW over time. The filtering algorithm

continues iteratively refitting the linear regression, decreasing the residual threshold in 5-kg increments in each iteration, and discarding the extreme observations until all the observed pBWs are within 25 kg of the predicted pBW. For each steer, this filter was applied to pBW from d -40 to -10 (relative to slaughter = d 0), and used to predict pBW at d 0 (slaughter). On average, this filtering algorithm removed 12% of the pBW data. Predicted pBW was then regressed on measured HCW ($r^2 = 0.86$). The Limit of Agreement was 25.2 kg, indicating that a 30-d history of pBW measurements could predict HCW of an individual steer 10 d before slaughter within 25.2 kg, 95% of the time. Theoretically, using this device and prediction method, mean HCW of a group of 100 steers could be predicted within 2 kg of the actual HCW 10 d before slaughter, 95% of the time. Further, if a large population of steers were available such that 100 steers could be identified that all had the same predicted pBW, mean HCW of that group would still be within 2 kg of the prediction and 95% of the steers would have a HCW within 25.2 kg of the predicted HCW.

Key Words: partial body weight, carcass weight prediction, technology

704 Effect of various feeding regimens pre-shipment on shrink and subsequent weight recovery in feeder calves. J. Starnes^{*} and D. Rankins, *Auburn University, Auburn, AL.*

Shrink is a major factor in the marketing of feeder cattle. It is especially important for long hauls (20+ h) from southeastern backgrounders to Midwestern feedlots. Shrink occurs in 2 forms: 1) loss of body fill and 2) loss of tissue fluids, which is observed during longer periods of transport. Objectives of this research were to compare the effects of various pre-shipment feeding regimens on shrink and subsequent BW gain in shipped and unshipped feeder calves. Forty-eight British cross steers (initial BW 351 kg) were fed high moisture (HM) or dry feed (DF) for 45 d and then offered hay or no hay 48 h before shipment. Factors were imposed factorially (2×2), 3 pens/group and 4 steers/pen. Daily gain during the backgrounding period was not different for HM versus DF ($P > 0.10$) and averaged 0.93 kg/d. On d 45, 2 steers from each pen were shipped, while their 2 pen-mates remained in the pen of origin (24 shipped; 24 un-shipped). Steers were loaded on 2 trailers (11.3m²; 12 steers/trailer; one from each pen) with an average stocking density of 413kg/m². Average shipping BW was 393 kg. Transported calves remained on the trailers for 21 h during which the minimum temperature was 7.2°C and the maximum temperature was 11.6°C. Upon arrival, BW were decreased ($P = 0.02$) for transported steers (365 kg) versus their pen mates (392 kg). Neither HM nor DF or hay affected shrink ($P > 0.10$). Within 12 h, BW were similar for the shipped and un-shipped calves ($P = 0.08$; 371 and 392 kg, respectively). Pre-shipment diets or 48-h hay offering did not affect BW post-shipment ($P > 0.10$). Within 5 d of shipment BW of the transported calves (384 kg) and un-transported calves (393 kg) remained similar ($P = 0.36$). Following 21 h of trailer transportation feeder calves shrank 7.1% during mild temperatures (7.2°C to 11.6°C). Feeding HM or DF or offering hay 48 h before shipment had no effect on shrink or subsequent BW gain after transportation.

Key Words: shrink, transportation, feeder calves

705 Comparison of different feed additives for backgrounding of weaned beef calves. A. Imler¹, M. Hersom^{*1}, T. Thrift¹, J. Yelich¹, and J. Arthington², ¹University of Florida, Department of Animal Sciences, Gainesville, ²Range Cattle Research and Education Center, Ona, FL.

The use of feed additives in supplements is one means to positively affect the health status of newly weaned calves during backgrounding.

Our objective was to evaluate the response of weaned calves to different feed additives in a supplement (CP = 14.6%, TDN = 67%) to improve calf performance and mitigate the stress response observed during the backgrounding period. Following stratification by BW, calf gender, previous castration status, and breed, 160 calves (203 ± 2.3 kg) were randomly allotted to 1 of 4 treatments (n = 40 calves/treatment): 1) control (CON) were supplemented without additives; 2) supplement with added chlortetracycline, 350 g/d (CTC); 3) supplement with added Rumensin, 175 mg/d (RUM); 4) supplement with added Actigen, 10 g/d (ACT). Calves were held in 1 of 4 drylot treatment pens (n = 40 calves/pen) for 1 wk and offered ad libitum access to hay and 1.8 kg of supplement before placement in 1 of 32 0.8-ha pens (5 calves/pen) for a total of 8 pens/treatment. Calves had BW and blood samples collected on d 0, 1, 4, 7, 11, 14, 51 and 52. Data were analyzed by the MIXED procedure of SAS. The model included the main effects of treatment. All variables quantified by day were analyzed using repeated measures. Over the 52-d period, ACT resulted in the greatest ($P = 0.002$, 0.325 kg/d) gain response. CTC calves exhibited similar ($P = 0.35$) gains to ACT, which were both greater ($P \leq 0.005$) than RUM (0.228 kg/d). CON calves were similar ($P \geq 0.13$) to both medicated treatments, but did not gain more ($P = 0.02$) than ACT. Plasma concentrations of haptoglobin and ceruloplasmin were similar ($P \geq 0.70$) among treatments; however, a day effect ($P \leq 0.001$) was observed in both acute phase proteins measured. Feed cost of gain was not significantly different ($P = 0.19$, mean = \$2.93/kg) among treatments. Profitability for ACT and CTC were similar ($P = 0.16$, mean = \$23.84/calf) and more ($P = 0.002$) profitable than RUM (\$-3.66/calf), CON was intermediate. ACT may improve calf performance as effectively as CTC during a backgrounding period of this duration, but neither additive was effective at mediating stress post-weaning.

Key Words: backgrounding, stress, supplement

706 Comparison of different feeding levels of a recycled-product supplemented to weaned beef calves. M. Hersom,* T. Thrift, and J. Yelich, *University of Florida, Department of Animal Sciences, Gainesville.*

The objective of this study was to evaluate different feeding levels of dehydrated food products and recycled poultry bedding supplemented to weaned beef calves. In Exp. 1, 160 Angus and Brangus steers and heifers (218 ± 2.2 kg) were utilized. In Exp. 2, 160 steers and heifers (245 ± 3.6 kg) of Angus, Brahman, and 4 combinations of Brahman \times Angus were utilized. For both experiments all calves grazed 0.81 ha bahiagrass-bermudagrass pastures and supplement was offered as a percent of initial pen mean BW. Treatments were 1) no supplementation (CON); 2) 1.0% of BW; 3) 1.5 of BW; 4) 2.0% of BW and calves were fed daily in the morning. In both experiments calves were stratified by BW, breed, gender, and implant status in Exp. 1, and randomly allotted to 1 of 4 treatments. Each treatment was replicated in 4 pastures for each experiment. All pastures were fertilized 7 d before the initiation of the experiment with 56 kg/ha of N. Calf BW were collected on d -7 for allotment, and d -1, 0, 22, 46 and 47. Data were analyzed as a randomized complete block design with a split-plot; supplement treatment was the whole plot and implant or breed type was the split-plot for Exp. 1 and 2, respectively. Forage mass decreased linearly ($P < 0.05$) from 3,839 to 1,998 kg/ha across the 46 d experiment. In both Exp. 1 and 2, final BW was greater ($P < 0.05$) for supplemented compared with CON. In Exp. 1, 46-d ADG was greater ($P < 0.05$) for supplemented compared with CON and calves supplemented at 2.0 had greater ($P < 0.05$) ADG than the 1.0 and 1.5 level. In Exp. 2, 46-d ADG was different ($P < 0.05$) among all treatment levels. Breed type affected 46-d ADG; 0.5:0.5 and 0.25:0.75 Angus:Brahman crossbred calves had greater ($P < 0.05$) compared with Angus, Brangus and 0.75:0.25. In both Exp. 1 and 2, final calf value (\$/calf) and profit/loss (\$/calf) were greater ($P \leq 0.005$) for supplemented compared with Con calves (Exp. 1: \$644.25 vs 601.64 and \$35.16 vs 6.33, respectively; Exp. 2: \$725.74 vs 648.31 and \$54.56 vs 6.36, respectively). Available forage and supplement level had a direct effect on calf BW gain, value, and weaned calf profitability.

Key Words: backgrounding, pasture, supplement