

Ruminant Nutrition: Growing Cattle and Beef Breeding Herd

127 Relationship between metabolizable protein balance, purine derivative excretion, 3-methyl histidine excretion, to feed efficiency in individually-fed heifers. W. A. Griffin*, G. I. Crawford, K. M. Rolfe, T. J. Klopfenstein, G. E. Erickson, P. S. Miller, and R. M. Diedrichsen, *University of Nebraska, Lincoln.*

Data from an experiment utilizing 78 individually fed heifers (407 ± 32 kg) were used to determine relationships of G:F and residual feed intake (RFI) to metabolizable protein balance (MPB), purine derivative excretion to creatinine excretion (PD:C) and 3-methyl histidine excretion to creatinine excretion (3MH:C). Heifers were fed steam-flaked corn based diets containing either 0 (NEG) or 1.5% (POS) urea for 95 d, resulting in CP levels of 9.6 and 13.7% for NEG and POS, respectively. Animal BW and urine samples were collected at 3 different times (28, 56, and 84 d) and urine was analyzed for PD: C and 3MH: C. To determine MPB, ADG, DMI, and final BW adjusted to equal (28%) empty body fat were used as inputs for the 1996 NRC model. Data were analyzed from 3 periods: early (d 1 to 55; urine 28 d), late (d 56 to 95; urine 84 d), and overall (d 1 to 95; urine d 28, 56, and 84). Relationships between MPB and RFI were inconsistent and poor. A positive relationship between PD: C and G: F was observed within both NEG ($r_2 = 0.54$; $P < 0.01$) and POS ($r_2 = 0.38$; $P = 0.02$) treatments during the early period. No relationship between 3MH: C and G: F was observed ($P > 0.10$). A negative relationship between MPB and G: F was observed for both POS ($r_2 = -0.79$; $P < 0.01$) and NEG ($r_2 = -0.65$; $P < 0.01$) in all periods. The more negative MPB was primarily due to greater ADG for cattle with greater G: F. The positive relationship between early period PD: C and G: F suggests that increased microbial protein leads to greater G: F. The lack of a relationship between 3MH: C and G: F suggests that protein turnover does not impact G: F and perhaps differences in G: F related to protein metabolism are due to differences in microbial efficiency.

Key Words: cattle, feed efficiency, metabolizable protein

128 Residual feed intake in Nellore heifers selected for growth. R. H. Branco¹, S. F. M. Bonilha¹, D. P. D. Lanna^{*2}, L. A. Figueiredo¹, L. Calegare³, and A. G. Razook¹, ¹*Instituto de Zootecnia, Agência Paulista de Tecnologia dos Agronegócios, Sertãozinho, São Paulo, Brazil,* ²*Departamento de Zootecnia, Esalq/USP, Piracicaba, São Paulo, Brazil,* ³*Nutron Alimentos LTDA, Toledo, Paraná, Brazil.*

Recent studies of beef cattle feed efficiency suggest an opportunity to select animals to reduce required inputs. Proposed feed efficiency parameters suggested a statistical model to adjust feed intake for differences in average BW and gain (residual feed intake - RFI) or gain adjusted for feed intake (residual gain). RFI is an alternative measurement of feed efficiency, which is theoretically independent of production level and body size. RFI is established by the difference between observed and estimated feed intake based on BW and ADG. The objective of this work was to evaluate the effect of 30 yr selection for post-weaning growth in Nellore on ADG, feed intake, feed conversion efficiency, and RFI. The experiment was conducted at CAPTA Pecuária de Corte - Instituto de Zootecnia, Sertãozinho - São Paulo/Brazil. Feedlot test used 128 heifers from 24 and 25th calf crops, selected for BW and ADG at 550 d of age, from the Selection Program for Zebu Breeds of Sertãozinho. Final BW and ADG were different between lines of selection (control Nellore - NeC; and selected Nellore - NeS), being NeS heifers greater in BW (280 vs 214 kg, $P < .001$) and ADG (1.033 vs 0.777 kg/d, $P < .001$) than NeC. DMI expressed in kg (6.90 vs 5.08 kg/d, $P < .01$) and in BW percentage (2.82 vs 2.68%BW, $P < .001$) were significantly different.

Feed efficiency parameters did not differ ($p > .05$): feed:gain ratio (7.12 vs 6.93); gain:feed ratio efficiency (154 vs 157) and RFI (0.045 vs -0.009 kg/d) for lines NeS and NeC, respectively. RFI was favorably correlated to BW, although not different between NeS and NeC lines. Selection for growth did not have influence on efficiency parameters of Nellore heifers.

Key Words: efficiency, feed conversion, selection

129 Relationships between residual feed intake and apparent nutrient digestibility, in vitro methane producing activity and VFA concentrations in growing Brangus heifers. W. K. Krueger^{1,2}, G. E. Carstens^{1,2}, R. R. Gomez^{*2}, B. M. Bourg², P. A. Lancaster², L. J. Slay², J. C. Miller², R. C. Anderson³, S. M. Horrocks³, N. A. Krueger³, and T. D. A. Forbes⁴, ¹*Intercollegiate Faculty of Nutrition - Texas A&M University, College Station,* ²*Department of Animal Science - Texas A&M University, College Station,* ³*USDA, ARS, Food and Feed Safety Research Unit, College Station, TX,* ⁴*Texas AgriLife Research - Texas A&M University, Uvalde.*

The objective of this study was to determine if animal variation in residual feed intake (RFI) was associated with variation in apparent nutrient digestibilities, in vitro methane producing activity (MPA), and VFA concentration. A four-year study was conducted with Brangus heifers ($N = 114$ -116/yr) with initial BW of 273 ± 28 kg. Heifers were fed a high-roughage diet ($ME = 2.1$ Mcal/kg DM), and individual DMI and BW measured for 70 d. RFI was calculated as the residual from the linear regression of DMI on mid-test BW^{0.75} and ADG. Within year, heifers were ranked by RFI and those with the lowest ($n = 18$ -20) and the highest ($n = 18$ -20) RFI selected to measure nutrient digestibilities, MPA, and VFA. Daily fecal and ort samples were collected for 7 or 10 consecutive d and AIA used to estimate nutrient digestibilities. Rumen samples were collected for MPA and VFA analysis in yr 2, 3, 4. RFI was not correlated with initial BW or ADG, but was correlated ($P < 0.001$) with DMI (0.70) and feed:gain ratio (0.68). Heifers with low RFI ($n = 78$) consumed 23% less DMI and had 20% lower feed:gain ratios than heifers with high RFI ($n = 77$). RFI was negatively correlated ($P < 0.001$) with DM, NDF, ADF, CP, P, Ca, Zn, and Cu digestibilities. Heifers with low RFI had higher DM (762.2 vs. 734.7 \pm 33 g/kg DM) and NDF, ADF, CP and P digestibilities that were 4.0 to 5.5 percentage units higher ($P < 0.05$) compared to heifers with high RFI. Heifers with low RFI had lower ($P = 0.04$) propionate concentrations and higher ($P = 0.03$) acetate:propionate ratio than high RFI heifers. Differences in acetate and butyrate concentrations, and MPA were not detected between heifers with divergent RFI. Estimates of fecal nitrogen and P excretion rates, and methane emissions (Blaxter and Clapperton, 1965) were 36, 32 and 16% lower ($P < 0.001$), respectively, in heifers with low vs. high RFI. Results from this study suggest that inter-animal variation in apparent digestibility and ruminal VFA concentrations contributes to observed phenotypic differences in RFI of growing Brangus heifers.

Key Words: residual feed intake, nutrient digestibility, methane

130 Relationship between residual feed intake, temperament, blood constituents and serum cortisol in growing Brangus heifers. R. R. Gomez*, G. E. Carstens, T. H. Welsh, P. A. Lancaster, W. K. Krueger, and L. J. Slay, *Texas A&M University, College Station.*

The objective of this study was to examine the relationships between residual feed intake (RFI) and temperament traits in growing heifers.

A 4 yr study (N = 114-119 hd/yr) was conducted with Brangus heifers (Camp Cooley Ranch). Heifers were weaned for 25.5 ± 8.6 d prior to transport to the TAMU research facility where they were adapted to the diet for 28 d before the start of the studies. Average initial BW was 273 ± 28 kg. Heifers were fed a high roughage diet (ME = 2.0 Mcal/kg DM) using Calan gate feeders and individual DMI and BW were measured for 70 d. Exit velocity (EV) was measured as the rate of distance traveled (m/s) while exiting a confined area at weaning and d 0. Blood samples were collected on d 0 of the studies. RFI was calculated as the residual from the linear regression of DMI on mid-test BW^{0.75} and ADG. Within year, heifers were ranked by RFI; the 20 lowest and 20 highest heifers assayed for serum cortisol, glucose and complete cell counts. RFI was positively correlated with DMI (0.66) and feed:gain ratio (0.52), but not with ADG. Heifers with low RFI (n = 80) consumed 18.6% less DMI and had 16% lower feed:gain ratio than heifers with high RFI (n = 80). Across all heifers, weak correlations ($P < 0.05$) between EV at weaning and d 0 and initial BW (-0.17, -0.12) and DMI (-0.10, -0.15) were found. However, EV was not correlated with ADG or RFI. For heifers in the divergent RFI groups, initial glucose was correlated ($P < 0.05$) with ADG (-0.29), and DMI (-0.24) but was not correlated with feed:gain or RFI. Initial cortisol was correlated ($P < 0.05$) with weaning EV and d 0 EV (0.31, 0.24) and correlated ($P < 0.06$) with initial BW and DMI (-0.15, -0.15) but not final BW, feed:gain or RFI. Low RFI heifers had lower ($P < 0.05$) WBC (9.4 vs. $10.6 \pm .27 \times 10^3/\mu\text{L}$), higher RBC (10.2 vs. $9.8 \pm 0.1 \times 10^6/\mu\text{L}$), and Hb (13.1 vs. 12.6 ± 0.1 g/dL) than high RFI heifers. These results suggest that heifers with excitable temperaments tended to have smaller initial BW, consumed less feed and had higher serum cortisol than calm heifers. However, EV and serum cortisol were not associated with RFI in growing heifers.

Key Words: RFI, cortisol, temperament

131 Frequency of supplementation of a soyhull/corn gluten feed mix does not affect performance of growing cattle fed hay. M. E. Drownoski* and M. H. Poore, *North Carolina State University, Raleigh.*

A mixture of soyhulls and corn gluten feed (SH/CGF) has become a common feed supplement in the Southeastern US. The labor cost of hand feeding supplements is often very high therefore feeding a supplement less frequently would potentially increase profit depending on the resulting performance. The objective of this study was to determine the effect of reducing supplementation frequency on steer performance when supplementing hay with SH/CGF. The supplement contained 47% soyhull pellets, 47% corn gluten feed pellets and 2% limestone. The 86-d feeding trial was replicated over 4 years. Each yr, 40 steers (~ 270 kg) were stratified by weight assigned to 8 groups which were randomly assigned to treatment. During yr 1 and 2, treatments consisted of ad-libitum medium quality fescue hay that was supplemented daily (7X) with 2.73 kg/hd, supplemented on Monday, Wednesday and Friday (3X) with 6.36 kg/hd, or not supplemented (Hay). During yr 3 and 4, a fourth treatment was added in which steers were supplemented on Monday and Thursday with 9.55 kg/hd of SH/CGF (2X). Average daily gain was greater in supplemented steers compared to non-supplemented steers, but did not differ due to supplementation frequency. Hay intake was reduced by supplementation, was greater for 7X compared to 3X and did not differ between 3X and 2X. Gain to feed was improved by feeding supplement, and was also improved with less frequent supplementation. These results suggest that when given the same amount of

supplement weekly, supplementation of growing steers with SH/CGF as little as two times a week will not reduce rate of gain, while improving feed efficiency.

Table 1.

Item	Hay	Treatment			SEM
		7X	3X	2X	
Model 1					
n	8	10	10	-	
ADG, kg/d	0.24 ^b	0.75 ^a	0.73 ^a	-	0.01
Hay intake, kg•hd ⁻¹ •d	5.95 ^a	5.33 ^b	4.68 ^c	-	0.10
Gain to feed	0.042 ^c	0.099 ^b	0.107 ^a	-	0.002
Model 2					
n	4	4	4	4	
ADG, kg/d	0.31 ^b	0.85 ^a	0.84 ^a	0.85 ^a	0.02
Hay intake, kg•hd ⁻¹ •d	5.25 ^a	4.53 ^b	4.03 ^c	3.81 ^c	0.14
Gain to feed	0.058 ^c	0.120 ^b	0.129 ^{ab}	0.135 ^a	0.003

Treatment effect ($P < 0.01$). n=group of 5 steers. Model 1 includes hay, 7x and 3x across all yrs. Model 2 includes all treatments in yr 3 and 4. Means within a row not sharing a superscript differ ($P < 0.05$).

Key Words: supplementation frequency, growing cattle

132 Effect of energy source on leucine utilization and nitrogen retention in growing steers. K. S. Spivey*, E. C. Titgemeyer, and M. L. Jones, *Kansas State University, Manhattan.*

Previous research demonstrated that energy supplementation increases the efficiency of leucine utilization in growing cattle. We studied the effects of energy source on leucine utilization and nitrogen retention in growing steers. Six ruminally cannulated Holstein steers (134 kg) housed in metabolism crates were used in a 6x6 Latin square. All steers were limit-fed a soybean hull based diet (2.3 kg/d DM) and received basal ruminal infusions of 150 g/d acetate, 150 g/d propionate, and 50 g/d butyrate, and abomasal infusions of a mixture (215 g/d) that contained all essential AA except leucine. Treatments were arranged in a 2x3 factorial with 2 levels of leucine (0 and 4 g/d) and 3 energy treatments: 1) control, 2) ruminal infusion of an additional 150 g/d acetate, 150 g/d propionate, and 50 g/d butyrate, and 3) abomasal infusion of 420 g/d glucose. Leucine supplementation increased N retention when no additional energy was supplied (34.8 g/d and 39.2 g/d for 0 and 4 g/d leucine), indicating that leucine was the most limiting nutrient. Both energy sources as well as leucine supplementation decreased urinary N excretion ($P < 0.05$). Glucose supplementation numerically ($P = 0.29$) increased N retention when either 0 or 4 g/d of leucine was provided (35.9 g/d and 40.7 g/d, respectively). VFA infusion tended ($P = 0.07$) to increase N retention when no leucine was supplemented (37.9 g/d), but not when 4 g/d of leucine was provided (38.6 g/d). Leucine supplementation tended to reduce plasma urea concentrations (2.2 vs. 2.5 mM; $P = 0.11$). Plasma urea concentrations were less ($P < 0.01$) for the cattle receiving glucose (1.9 mM) than for control steers (2.7 mM), whereas plasma urea concentrations were not affected by the VFA treatment (2.5 mM). Data support previous observations that increased energy supply may slightly improve the efficiency of leucine utilization, but the response was not large. *This project was supported by National Research Initiative Competitive Grant no. 2007-35206-17848 from the USDA Cooperative State Research, Education, and Extension Service.*

Key Words: leucine, N retention

133 Steer performance and digestibility when fed stocker diets with soyhull, corn gluten feed and distillers grain. G. M. Hill^{*1}, V. A. Corriher², D. J. Renney¹, and A. J. Nichols¹, ¹The University of Georgia, Tifton, ²Texas AgriLife Ext. Ctr., Overton, TX.

Steers were fed corn silage (CS; 40% DM, 7.6% CP) or Tifton 85 hay (T85; 91.7% DM, 11.8% CP) with supplements (SUP) of pelleted soyhulls (SH), corn gluten feed (CGF) or distillers dried grains with solubles (DG) with respective DM and CP (%) of : 89.7, 13.7; 88.5, 20.8; 87.8, 32.6. Exp. 1. After weaning, 48 steers (311.5 ± 34.5 kg; 27 Brangus; 21 Angus sired) were randomly assigned to treatments (TR). Steers were fed SUP of corn/SH [CSH; 47% SH, 38% soybean meal (SBM), 15% corn], corn gluten feed (CGFL) or corn/DG (CDG; 36.4% corn, 63.6% DG), top-dressed on CS fed free-choice in sheltered feed bunks for 60 d. The SUP DMI, total DMI, 60-d ADG (kg) and gain/feed, respectively, by SUP TR, were: CSH 2.24, 8.06, 1.64, 0.203; CGFL 2.00, 8.31, 1.40, 0.169; and CDG 1.99, 7.30, 1.46, 0.200; ADG ($P=0.331$), SE 0.10. Exp. 2. In an 18-d digestion trial, 28 steers (265.9, SE 5.8 kg; 10 mo old; 19 Angus sired, 9 Brangus) were randomly assigned to SUP TR: corn/SBM (CSB; 77.8% corn, 22.2% SBM); SH/SBM (SHS; 80% SH, 20% SBM); CGF/corn (CGC; 75% CGF, 25% corn), DG/corn (DGC; 59% DG, 50% corn). Steers were individually-fed SUP with T85 hay; chromic oxide was fed (10 g/steer, d 8 to d 18), and fecal samples (11/steer, d 14 to d 18) were analyzed to determine apparent digestion. The SUP DMI, total DMI (kg) and dietary CP (%), respectively, for CSB, SHS, CGC, and DGC, were: 1.83, 5.4, 14.0; 2.05, 5.8, 14.8; 1.60, 5.3, 13.8; 1.64, 5.3, 13.3; total DMI ($P < 0.10$; SE 0.14). Digestibility (%) for CSB, SHS, CGC, and DGC, respectively, were: OM 65.8, 70.6, 68.6, 69.3, ($P < 0.05$; SE 1.09); CP 65.2, 70.0, 70.1, 69.2, ($P < 0.01$; SE 0.90); ADF 42.4, 60.6, 50.7, 50.8, ($P < 0.01$; SE 1.90); NDF 50.8, 63.5, 56.1, 57.9, ($P < 0.01$; SE 1.85). Steers had similar ADG for TR in Exp. 1; and CSB had lower OM, CP, ADF and NDF digestibility than other SUP TR in Exp. 2.

Key Words: steer, digestion, distillers grain

134 Effects of supplemental energy and protein on forage digestion. E. A. Bailey^{*}, E. C. Titgemeyer, K. C. Olson, K. S. Spivey, D. W. Brake, D. E. Anderson, and M. L. Jones, Kansas State University, Manhattan.

We quantified effects of supplemental energy from differing sources on nutrient digestibility at 2 levels of DIP supply. The study was a 6x6 Latin square with treatments as a 3x2 factorial. Energy treatments included control, 600 g glucose (GLC) dosed ruminally once daily, and 480 g VFA (192 g C2, 144 g C3, 144 g C4) infused ruminally over 8 h daily. Casein (120 or 240 g) was dosed once daily as the DIP supplement. Six ruminally and duodenally cannulated steers had ad libitum access to prairie hay (5.8% CP). Each period had 9 d for adaption, 4 d for total fecal collection, and 1 d for rumen and duodenal collections. ADIA was used to determine ruminal digestion. VFA infusion decreased ($P<0.01$) forage intake by 27%; decreases in forage intake due to glucose (7%) and increases due to increasing casein (4.5%) were not significant. GLC decreased total tract NDF digestibility ($P<0.01$) and tended to decrease ruminal NDF digestibility; these depressions in response to GLC tended to be greater at the low level of casein. Duodenal N flow tended ($P=0.15$) to be increased by increasing casein, but was not affected by supplemental energy ($P=0.55$). Increasing DIP decreased ruminal pH ($P<0.02$). GLC decreased pH 2 h after dosing, and VFA infusion decreased pH during the infusions, but not at other times. Increasing casein increased and GLC decreased ruminal NH_3 ($P<0.01$). Ruminal acetate and propionate concentrations decreased and butyrate increased when GLC was

supplemented. VFA infusion increased ruminal propionate and butyrate concentrations during the infusion period ($P<0.01$). Increasing casein increased ($P<0.01$) concentrations of acetate, propionate, isobutyrate, and isovalerate. Overall, provision of supplemental energy decreased forage intake and/or digestion, but had no impact on duodenal N flow. GLC supplementation may have exacerbated a ruminal NH_3 deficiency. *This project was supported by National Research Initiative Competitive Grant no. 2007-35206-17848 from the USDA Cooperative State Research, Education, and Extension Service.*

Key Words: forage, energy, protein

135 Feeding dried distillers grains in lieu of standard range cubes to pregnant beef cows consuming low quality roughages improved economic returns with limited impacts on serum urea nitrogen or trace mineral status of the cows or their offspring. K. L. Swyers^{*1}, M. J. Jarosz¹, L. W. Douglass², and S. L. Archibeque¹, ¹Colorado State University, Department of Animal Sciences, Fort Collins, ²University of Maryland, Department of Animal and Avian Sciences, College Park.

The effects of dried distillers grains with solubles (DDGS) on performance, serum urea nitrogen (SUN), and trace mineral status of pregnant beef cows and their offspring was evaluated. Two-hundred sixteen cross-bred, multiparous beef cows in the last third of pregnancy were blocked by age (young cows, < 3 vs mature cows, > 3 yrs of age) and randomly assigned to one of six pasture replicates, with 3 pastures per treatment. The dietary factor was either range cube (CON; 33.7% CP (DM basis)) or DDGS (DDG; 37.1% CP (DM basis)) supplementation, fed thrice weekly at 3.5 and 3.4 kg DM × cow⁻¹ × feeding⁻¹, respectively. Cows had access to pasture, hay, and ad libitum mineral (target intake of 110 g × cow⁻¹ × d⁻¹ (DM)). Treatments were fed from d 200 of gestation through calving. Samples were collected on individuals on d -8, 28, 54, and 77 of the study. Disappearance of mineral was 127 and 162 g × cow⁻¹ × d⁻¹ for CON and DDG cows, respectively. Young cows had reduced BW (545 vs. 627 kg), and higher BCS (4.93 vs. 4.85) and SUN (9.24 vs. 7.63 mM; young vs. mature cows, respectively; $P < 0.05$) than mature cows. Cows fed DDGS had higher BW on d 77 and BCS on d 28 and 54 (treatment × day, $P < 0.01$), and higher ($P = 0.01$) ADG than CON cows. There was no effect of treatment ($P = 0.30$) on cow SUN. Cows fed DDGS had increased (treatment × day, $P \leq 0.05$) hepatic Cu, Co, and Mn concentrations, decreased (treatment × day, $P = 0.02$) Fe, and Zn status tended to be higher ($P = 0.08$) by d 77 than CON cows. There was no effect of treatment on calf weaning wt, SUN, or trace mineral status ($P \geq 0.39$), but DDGS tended to increase calf birth wt ($P = 0.10$). Feeding DDGS yielded a savings of \$13.86 per cow over the trial period. These data indicate that supplementing DDGS to pregnant range cows on winter range renders the cow-calf producer with both a cost benefit and improved cow performance at no detriment to SUN or hepatic trace mineral status.

Key Words: dried distiller's grains, beef cows, pasture

136 A meta-analysis evaluation of supplementing dried distillers grains plus solubles to cattle consuming forage based diets. W. A. Griffin^{*1}, V. R. Bremer¹, T. J. Klopfenstein¹, L. A. Stalker², L. W. Lomas³, J. L. Moyer³, and G. E. Erickson¹, ¹University of Nebraska, Lincoln, ²West Central Research and Extension Center, North Platte, NE, ³Southeast Agricultural Research Center, Parsons, KS.

Data from nineteen (12 grazing and 7 confinement) studies utilizing 790 growing steers and heifers supplemented dried distillers grains (DDGS)

were analyzed using mixed models to determine the response to supplementing different levels of DDGS on gain and forage intake. Thirty-eight treatment means (442 hd) were from grazing cattle managed on pasture and supplemented DDGS (range: 0.00 to 1.03% of BW/d). Twenty-eight treatment means (348 hd) were from pen fed cattle consuming forage based diets and supplemented DDGS (range: 0.00 to 1.27% of BW/d). In both the grazing studies and pen studies, statistics of interest were relationships between DDGS intake and ADG or ending BW. Additionally, in pen studies, forage intake was measured and relationships between DDGS intake and forage intake were used to determine forage replacement. In pasture grazing studies, ending BW increased linearly ($P < 0.01$) and tended to increase quadratically ($P = 0.07$) with increasing DDGS supplementation. Daily gain increased linearly ($ADG = 0.37x + 0.70$; $P < 0.01$) with increased DDGS supplementation. Results from pen fed studies indicate that ending BW ($P < 0.01$) and ADG ($ADG = -0.09x^2 + 0.15x + 0.55$; $P < 0.01$) increase quadratically with increasing DDGS supplementation. Intakes measured in the pen studies suggest that increasing DDGS supplementation increases total DMI ($P < 0.01$) quadratically, even though forage intake decreases ($P < 0.01$) quadratically with increased DDGS supplementation. Results from all studies indicate that increasing DDGS supplementation increases ADG and ending BW, additionally, results from pen studies suggest that DDGS intake replaces forage intake in growing cattle consuming forage based diets.

Key Words: dried distillers grains plus solubles, forage intake, supplementation

137 Effects of dam's dietary prepartum energy source on post-natal skeletal muscle development and growth in offspring of beef cattle. A. E. Radunz*, H. N. Zerby, F. L. Fluharty, and S. C. Loerch, *The Ohio State University, Wooster.*

Mature Angus-cross ($n = 180$) beef cows were used to determine prepartum dietary energy source impacts on post-natal skeletal muscle development and growth in offspring of beef cattle. Cows were blocked by location ($n = 3$) and stratified by body weight, body condition score and age (5 pens/treatment). Cows were adapted to diets starting at approximately 200 d of gestation and fed until 1 wk prior to expected calving date. Cows were fed 1 of 3 energy sources: hay (HAY); corn (LFC); or dried distiller grains (DDGS) at isocaloric intakes. Following parturition, cows were fed a common diet and managed as one group per location. Body weight and *Longissimus dorsi* area (LMA) between 12th and 13th rib measured via ultrasonography was collected postpartum at birth (24-72 hr) and weaning (184 ± 7 d). *Longissimus dorsi* muscle biopsy samples posterior to the 13th rib were taken for histology measurements on a subset of male calves (6 calves/trt; $n = 18$) within 7 d of parturition. Muscle samples were measured for muscle fiber width and bundle length. Calves resulting from LFC and DDGS prepartum diets

had greater ($P = 0.003$) birth weight than those from HAY diets (44.6, 43.5, and 39.0 ± 1.3 kg, respectively). The adjusted weaning weights of calves from cows fed LFC, DDGS, and HAY diets were 284.9, 277.8, and 272.4 ± 5.1 kg, respectively; with LFC greater than HAY ($P = 0.01$), and DDGS intermediate and similar to both LFC and HAY. From birth to weaning, ADG tended to be greater ($P = 0.07$) for calves from cows fed LFC than either HAY or DDGS. Ultrasound LMA measurements were not different ($P > 0.20$) among treatments at birth or weaning. Muscle fiber width was greatest ($P = 0.05$) in calves from dams fed LFC and HAY vs DDGS while muscle bundle length was greatest ($P = 0.03$) in calves from dams fed LFC vs HAY and DDGS. Type of energy source in late gestation, even when fed at isocaloric amounts, can impact calf birth weight and skeletal muscle characteristics as well as post-natal growth and weaning weight.

Key Words: prepartum nutrition, muscle development, beef cattle

138 Effect of ZADO[®], as enzymes from anaerobic bacterium, on extent of ruminal fermentation, nutrient digestibilities and average daily gain in steers. H. Gado*¹ and B. E. A. Borhami², ¹*Ain-Shams University, Dept. of Animal Production, Faculty of Agriculture, Cairo, Egypt,* ²*Alexandria University, Dept. of Animal Production, Faculty of Agriculture, Alexandria, Egypt.*

Forty crossbred steers (Baladi x Friesian) were randomly assigned to two groups of twenty animals each. The average initial weight was 153.5 kg. The experiment lasted for 219 days. Two steers fitted with ruminal cannulas were used to take ruminal samples. The objectives were to evaluate the effects of exogenous enzyme supplementation (ZADO[®]) on nutrient digestibilities, ruminal ammonia and volatile fatty acids (VFA) and average daily gain (ADG). The enzyme mixture, which contained mainly xylanase, cellulase, protease and alpha amylase, was added to the concentrate to supply 40 g/ animal/day. The concentrate mixture contained 11% cracked corn, 8.5% agwa (minced date), 26.5% biscuits (bakery waste), 10% sugar cane molasses, 19% sesame cake, 2% soya bean meal, 6% beans, 14.2% rihan straw, 1% salt, 1% limestone and, 0.3 mixture of mineral and vitamins and 0.5% mineral mixture. Total digestibility of nutrients was significantly increased ($p < 0.01$) by ZADO treatment vs control (dry matter, 61.7 vs. 69.1%; crude protein, 60.3 vs. 68.9%, neutral detergent fiber, 41.7 vs. 50.8%; acid detergent fiber, 32.2 vs. 40.8%)., ADG was 1.25 vs. 1.45 kg/d in control vs ZADO ($p < 0.05$). VFA, (mM/100ml) was higher ($p < 0.05$) in the ZADO group in comparison with the control group (120 vs 110, respectively). Ammonia-nitrogen in the rumen (mg/N) was higher ($p < 0.05$) in the ZADO group 65 vs 54 in the control group. Supplementing of steer diets with an enzyme mixture has the potential to enhance ADG and nutrient digestibility of fattening steers.

Key Words: ZADO, enzyme supplement, rumen fermentations

Teaching/Undergraduate and Graduate Education: Symposium: Enhancing the Writing Experience

139 Making the writing experience right. D. K. Aaron*, *University of Kentucky, Lexington.*

Over a decade ago Writing Across the Curriculum programs were initiated in universities across the U.S. Shortly thereafter Writing in the Discipline programs followed. The premise of the former was *writing to learn* course material; for the latter it was *learning to write* using discipline-specific conventions. Both have been successful. However,

as they were first initiated into animal science courses, students and teachers had to change their attitudes about student writing. Students were generally apprehensive and often responded with a "this is *NOT* English" attitude. They were being asked to do something they did not like in courses where they did not expect it. And, past experiences had often reinforced the idea that they did not do it well. Teachers were perhaps more enthusiastic, but most did not know where or how to begin