140 Effects of metabolic imprinting on growth performance and gene expression of early-weaned beef heifers. P. Moriel*[1], V. Mercadante[2], A. D. Aguiar[1], S. E. Johnson[2], M. J. Hersom[2], J. M. B. Vendramini[1], and J. D. Arthington[1], *[1]Range Cattle Research and Education Center, University of Florida, Ona, FL, [2]University of Florida, Gainesville.*

The study evaluated the effects of calf management system after early-weaning (EW) on performance and liver gene expression of beef heifers. On d 0, Brahman × British heifers (n = 40; BW = 83 ± 10 kg; age = 69 ± 9 d) were stratified by age and BW, and randomly assigned to a control treatment that was normally weaned (NW) on d 177, or 1 of 3 EW treatments, (1) EW and grazed on ryegrass pastures for 67 d then on bahiagrass pastures until NW (Ryegrass), (2) EW and fed a high-concentrate diet in drylot until NW (Drylot), or (3) EW and metabolically imprinted by feeding a high-concentrate diet for 94 d then grazed on bahiagrass pastures until NW (MI). Heifers were assigned to 1 of 2 pens per treatment. On d 177, heifers were grouped by treatment and grazed on bahiagrass pastures until the start of breeding season (d 335). Heifers on pastures were supplemented at 1.0% BW until NW and 1.5% BW from NW to d 335. On d 177 and 335, Ryegrass heifers were lightest ($P < 0.01$) and Drytlot heifers heaviest ($P < 0.001$) compared with all other treatments and Control and MI heifer BW did not differ ($P \geq 0.64$; BW = 212 and 300, 178 and 264, 216 and 302, and 261 and 333 for Control, Ryegrass, MI, and Drylot on d 177 and 335, respectively; SEM = 7.8). On d 94, liver GHR-1A mRNA was greatest ($P < 0.01$) for Control, but similar ($P = 0.64$) among the other treatments, whereas liver IGF-1 mRNA was least ($P = 0.004$) for Ryegrass, but similar ($P > 0.90$) among the other treatments. On d 177, liver GHR-1A was greater for Control and Drylot ($P < 0.03$) than Ryegrass and MI, whereas liver IGF-1 mRNA was greatest for Drylot than all other treatments and greater ($P < 0.07$) for Control than Ryegrass and MI. On d 260, liver GHR-1A mRNA was least ($P < 0.08$) for Ryegrass, whereas liver IGF-1 was greater ($P < 0.04$) for Drylot compared with Ryegrass. Thus, heifer management systems following EW result in significant differences on BW at NW and at the start of breeding season. These impacts appear to affect liver gene mRNA expression, which may persist despite placing heifers on a same plane of nutrition.

Key Words: beef steers, high-concentrate, metabolic imprinting

141 Effects of metabolic imprinting on growth performance of early-weaned beef steers. P. Moriel*[1], V. Mercadante[2], A. D. Aguiar[1], S. E. Johnson[2], M. J. Hersom[2], J. M. B. Vendramini[1], and J. D. Arthington[1], *[1]Range Cattle Research and Education Center, University of Florida, Ona, [2]University of Florida, Gainesville.*

This study evaluated the effects of calf management system after early weaning (EW) on performance of beef steers. On d 0, Brahman × British steers (n = 40; BW = 90 ± 12 kg; age = 72 ± 14 d) were stratified by age and BW, and randomly assigned to a normally-weaned treatment (NW; d 177) or 1 of 3 EW treatments, (1) EW and grazed on ryegrass pastures for 67 d then on bahiagrass pastures until feedlot entry (d 260; Ryegrass), (2) EW and fed a high-concentrate diet in drylot until d 260 (Drylot), or (3) EW and metabolically imprinted by feeding a high-concentrate diet for 94 d then grazed on bahiagrass pastures until d 260 (MI). Within each treatment, steers were assigned to 1 of 2 pens. Concentrate was limit fed at 1% of BW from d 177 to 260, 7 to 260 and 94 to 260 for NW, Ryegrass and MI steers, respectively. Shrunk BW was measured at normal weaning and feedlot entry. Carcass ultrasound was measured on d 260. At normal weaning, Drylot steers were heavier ($P = 0.006$; SEM = 16) than all other treatments, and Control and Ryegrass steers had similar BW (215 and 196 kg, respectively; $P = 0.14$; SEM = 13), but were lighter ($P < 0.04$) than MI steers (243 ± 13 kg). Similarly, at the time of feedlot entry (d 260), Drylot steers were heavier (359 ± 16 kg; $P = 0.0002$) than all other treatments, and Control and Ryegrass steers had similar BW (228 and 230 kg, respectively; $P = 0.94$; SEM = 16), but were lighter ($P < 0.01$) than MI steers (277 ± 16 kg). On d 260, back fat thickness was similar ($P > 0.35$; largest SEM = 0.01) among Control, Ryegrass and MI steers (0.14, 0.14 and 0.15 cm, respectively), but was less ($P < 0.0001$) than Drylot steers (0.18 cm). Area of LM was least (30.4 cm^2; $P < 0.09$; largest SEM = 1.33) for Ryegrass steers, similar ($P = 0.20$) between MI (32.0 cm^2) and Control (30.4 cm^2) steers, and the greatest ($P < 0.001$) for Drylot steers (41.6 cm^2). Thus, feeding a high-concentrate diet to EW steers for at least 94 d (Drylot and MI) increased BW at the time of NW and at feedlot entry compared with calves weaned at a normal age or early-weaned and grazed on pasture with 1% concentrate supplement.

Key Words: beef steers, high-concentrate, metabolic imprinting

142 Correlation of feed intake and efficiency with small intestinal angiogenic factor and receptor expression in finishing cattle born to dams fed varying levels of nutrients during early to mid-gestation. A. M. Meyer*[1], K. M. Cammack[1], K. J. Austin[1], J. M. Kern[1], M. Du[1], J. S. Caton[2], and B. W. Hess[1], *[1]Department of Animal Science, University of Wyoming, Laramie, [2]Department of Animal Sciences, North Dakota State University, Fargo.*

We hypothesized that gestational nutrition would affect calf feed intake and efficiency as well as small intestinal development, and that feed intake and efficiency would be correlated with small intestinal measures. Multiparous beef cows (n = 36) were fed 1 of 3 diets from d 45 to 185 of gestation: a control (CON) diet of grass hay and supplement to meet NRC recommendations, a nutrient restricted (NR) diet providing 70% of CON NE_m, or an NR diet with a ruminally undegradable protein (NRP) supplement to provide similar essential AA as CON. Individual feed intake of calves was measured with the GrowSafe System during finishing. At slaughter (552 ± 10.2 kg BW), the jejunum was sampled for real time RT-PCR analysis of angiogenic factors (vascular endothelial growth factor [*VEGF*], VEGF receptor-1 [*FLT1*], VEGF receptor-2 [*KDR*], endothelial nitric oxide synthase 3 [*NOS3*] and soluble guanylate cyclase [*GUCY1B3*; nitric oxide receptor]). Data were analyzed as a mixed model with calf sex as block. It was previously reported that maternal nutrition affected calf small intestinal length, but not other measures of intestinal growth, intake, or feed efficiency. Jejunal *GUCY1B3* mRNA expression was affected by maternal nutrition ($P = 0.03$), where calves born to NRP dams had greater ($P < 0.03$) *GUCY1B3* than CON and NR (4.59 vs. 2.85 and 2.56 ± 0.54 relative mRNA expression). There was no effect ($P \geq 0.34$) of maternal nutrition on *VEGF*, *FLT1*, *KDR*, or *NOS3* expression. Feed intake was positively correlated with jejunal mRNA expression of *KDR* (r = 0.37; $P = 0.05$) and *NOS3* (r = 0.35; $P = 0.06$) and tended to be negatively correlated with *VEGF* (r = −0.30; $P = 0.11$). Residual feed intake and G:F were not correlated ($P \geq 0.20$) with angiogenic factor mRNA expression. Results indicate that offspring intestinal gene expression may be affected by gestational nutrition even when apparent tissue growth is unchanged. Additionally,

changes in intestinal expression of *VEGF* and *NOS3* systems are associated with feed intake and may alter intestinal vasculature.

Key Words: feed efficiency, gestation, small intestine

143 Reproductive and productive responses to suckling-restriction treatments and flushing in primiparous grazing beef cows. P. Soca*[1], M. Carriquiry[1], D. Keisler[2], M. Claramunt[1], M. Do Carmo[1], J. Olivera- Muzante[1], M. Rodriguez[1], and A. Meikle[1], *[1]University of Uruguay, Paysandu, Uruguay, [2]University of Missouri, Columbia.*

The objectives of this experiment were to analyze the reproductive and productive responses to suckling management treatments and flushing in primiparous grazing beef cows. During 3 years, 153 primiparous anestrous cows were assigned randomly to 4 treatments in a 2 × 2 factorial arrangement of suckling management treatments and flushing. Suckling management treatments started at 61 ± 10 d postpartum and consisted of applying nose plates to calves for 12 d (i.e., TS treatment) or 5 d of isolation of the cow-calf pair followed by applying nose plates to calves for 7 d as calves were reunited with their mothers (i.e., IS treatment). Nutritional treatments (flushing vs. control) started at the beginning of the breeding season immediately after the suckling management treatments were finished (73 ± 10 d postpartum) with cows being offered or no 2 kg/day of whole-rice middling for 22 d. Weather, pasture quantity and quality, calving date, and cow body condition score BCS were recorded every 20 d from calving until definitive weaning (140 ± 10 d postpartum). Calf weight was recorded at birth, at 73 d of age, and at definitive weaning. Duration of postpartum anestrus (PPA) and probability of cyclicity were estimated by plasma progesterone concentrations analyzed in weekly samples. Pregnant cows were determined by ultrasound at 45 d after bull introduction (early pregnancy; EP) and at the end of the breeding period (total pregnancy; TP). The year affected BCS at calving and changes in BCS (ΔBCS), which were indicative of forage availability and weather conditions. Increased cow BCS at calving decreased PPA (b = −41 d; $P < 0.0001$) and in interaction with ΔBCS increased EP ($P < 0.008$) and TP ($P < 0.003$). No interaction was found between suckling and flushing. Isolated suckling (IS) reduced PPA by 11 d when compared with TS ($P < 0.004$). Flushing increased EP by 40%, which was also affected by BCS at calving and was greater in cows that gained, than maintained or lost BCS. We conclude that flushing was a low cost and environmentally tool that was useful in improving pregnancy rates of primiparous beef cows with "suboptimal" body condition (lower than 4.5) at calving and grazing native pasture.

Key Words: body condition score, primiparous beef cows, suckling and flushing

144 Use of an injectable mineral in beef cattle: Mineral status. O. N. Genther* and S. L. Hansen, *Iowa State University, Ames.*

The objective of this study was to examine the effect of trace mineral (TM) status and response to mineral injection in beef cattle. Forty steers were stratified by weight (323 ± 14.8 kg) and assigned to treatments for an 84 d depletion period: 1) a corn silage-based diet supplemented with Cu, Mn, Se and Zn at NRC recommendations (CON), or 2) CON diet without supplemental Cu, Mn, Se or Zn, plus Fe and Mo as dietary TM antagonists (DEF). Liver Cu and Se concentrations in DEF steers were lower than CON steers before injection ($P < 0.05$) indicating mild deficiencies of these TM. To mimic shipping stress steers were shipped for 20 h on d −3 and received back on d −1. On d 0 an equal number of steers from both dietary treatments were injected with sterilized saline (SAL) or Multimin®90 (MM; containing 15, 40, 10 and 5 mg/mL of Cu, Zn, Mn and Se, respectively) at a dose of 1 mL/68 kg BW. Steers were fed a common finishing diet supplemented with Cu, Mn, Se and Zn at NRC recommendations for the 90 d repletion period. Blood samples were taken on d 0, 1, and blood and liver biopsy samples were collected on d 8, 15, 29, 57, and 85 post-injection. Data were analyzed as repeated measures. Red blood cell lysate (RBCL) Mn superoxide dismutase activity was higher in MM steers ($P = 0.02$), suggesting incorporation of injectable TM into a biological process. Diet or injection did not affect RBCL glutathione peroxidase activity ($P > 0.20$), but plasma Se in MM steers was elevated through d 15 ($P < 0.05$). For liver Se there was an interaction between diet, injection and day where the magnitude of the increase was greater in CON vs. DEF ($P = 0.02$), suggesting that TM from injection were utilized rather than stored in DEF steers. Liver Se and Cu ($P < 0.05$) were elevated through at least d 30 by TM injection. Liver Zn was slightly higher in DEF steers vs. CON ($P < 0.01$) and TM injection tended ($P < 0.10$) to increase Zn liver concentration on d 8 and 15 regardless of previous diet. Interestingly, by d 57 liver TM were higher in DEF steers ($P < 0.05$) suggesting differential TM utilization between CON and DEF steers. Overall, TM from an injectable mineral were utilized differently between TM adequate and mildly deficient steers.

Key Words: cattle, trace minerals

145 Use of an injectable mineral in beef cattle: Growth and carcass characteristics. O. N. Genther* and S. L. Hansen, *Iowa State University, Ames.*

Trace minerals (TM) are vital for growth in cattle. To examine the effect of TM status and mineral injection on performance in beef cattle, 40 steers were used in a growing and finishing study. Steers were stratified by weight (323 ± 14.8 kg) and assigned to one of 2 treatments for an 84 d depletion period: 1) a corn silage-based diet supplemented with Cu, Mn, Se and Zn at NRC recommendations (CON), or 2) CON diet without supplemental Cu, Mn, Se or Zn, and supplemented with Fe and Mo as dietary TM antagonists (DEF) to induce mild deficiencies. To mimic shipping stress steers were shipped for 20 h on d 88 and were received back on d 89. On d 91 an equal number of steers from both dietary treatments were injected with sterilized saline (SAL) or Multimin 90 (MM; containing 15, 40, 10 and 5 mg/mL of Cu, Zn, Mn and Se, respectively) at a dose of 1 mL/68 kg BW. Steers were fed a common finishing diet supplemented with Cu, Mn, Se and Zn at NRC recommendations for the 90 d repletion period. Steers were harvested 94 d post-injection and carcass data were collected. During the depletion period diet did not affect ADG ($P = 0.72$). During shipping, DEF steers tended to lose more weight per day than CON steers ($P = 0.06$) and had lower DMI after shipping ($P < 0.05$), suggesting that TM status is important in the stress response. During the repletion period ADG of DEF-MM steers was greater ($P = 0.02$) compared with DEF-SAL, and was not different ($P = 0.91$) among CON-MM and CON-SAL steers. There was no effect of diet or injection on HCW or dressing percentage ($P > 0.20$). Within the CON group TM injection decreased yield grade ($P = 0.03$) but did not affect yield grade of DEF steers ($P > 0.20$). MM steers had larger rib eye area ($P = 0.04$) regardless of previous diet. Interestingly, both diet and injection affected marbling scores (MS), where CON steers had greater MS than DEF steers ($P = 0.01$), and MM steers had greater MS than SAL steers ($P = 0.04$). These results indicate that TM are essential for marbling development, during both the growing and finishing phases. Overall, an injectable mineral improved rib eye area and MS regardless of TM status, and improved growth of mildly TM deficient steers.

Key Words: cattle, trace minerals

146 Effects of restricted versus conventional dietary adaptation over periods of 9 and 14 days on feedlot performance and carcass traits of Nellore cattle. R. S. Barducci[1], M. D. B. Arrigoni[1], C. L. Martins[1], D. D. Millen*[2], L. M. N. Sarti[1], M. C. S. Franzói[1], L. C. Vieira Júnior[1], T. L. de Jesus[1], T. C. Putarov[1], M. T. Cesar[1], A. S. Pereira[1], E. T. Macedo[1], A. Perdigão[1], F. A. Ribeiro[1], A. L. N. Rigueiro[2], *[1]São Paulo State University (UNESP), Botucatu, São Paulo, Brazil, [2]São Paulo State University (UNESP), Dracena, São Paulo, Brazil.*

This study, conducted at the São Paulo State University feedlot, Botucatu Campus, Brazil, was designed to determine effects of restricting intake of the final finishing diet (REST) as a means of dietary adaptation compared with diets increasing in concentrate (STEP) over periods of 9-d and 14-d on overall feedlot performance and carcass traits. The experiment was designed as a completely randomized block with a 2 × 2 factorial arrangement, replicated 6 times (5 bullocks/pen), in which 120 22-mo-old yearling Nellore bulls (361.3 ± 30.2 kg) were fed in 24 pens for 84-d according to the treatments: STEP for 9-d and 14-d, REST for 9-d and 14-d. The STEP program consisted of ad libitum feeding of 3 adaptation diets over periods of 9-d or 14-d with concentrate level increasing from 55% to 85% of diet DM. The REST program consisted of restricted intake of the final diet (85% concentrate) with programmed increases in feed offered until yearling bulls reached ad libitum access over periods of 9-d or 14-d. No significant ($P > 0.05$) days main effect was observed for any of feedlot performance and carcass characteristics variables evaluated. No significant ($P > 0.05$) protocol main effect was observed for final BW, ADG in kg (STEP = 1.71, REST = 1.73; 9-d = 1.74, 14-d = 1.70) and total weight gain (STEP = 143.29, REST = 145.79; 9-d = 146.04, 14-d = 143.05) from 0-d to 84-d. However, significant ($P < 0.05$) protocol main effect was observed for DMI in kg from 0-d to 28-d (STEP = 9.67, REST = 9.01); DMI in % of BW from 0-d to 28-d (STEP = 2.52, REST = 2.36), and from 0-d to 56-d (STEP = 2.58, REST = 2.47); G:F ratio from 0-d to 84-d (STEP = 0.157, REST = 0.165); and cost to gain 1 kg of BW from 0-d to 84-d (STEP = $3.77, REST = $3.59). With respect to carcass traits, no significant ($P > 0.05$) protocols and days main effects were observed for kidney-pelvic fat in kg, HCW, and dressing %. Animals in REST protocol were more efficient than those in STEP protocol. The adaptation in 9-d did not negatively impact the overall feedlot performance and carcass traits of Nellore cattle. Grant provided by São Paulo Research Foundation (FAPESP), São Paulo, Brazil.

Key Words: adaptation, feedlot, Nellore

147 Effect of dietary energy density and control of meal size on growth performance, eating pattern, and carcass and meat quality in Holstein steers fed high-concentrate rations. S. Marti*[1], M. Pérez-Juan[2], A. Aris[1], A. Bach[3,1], and M. Devant[1], *[1]IRTA-Ruminant Production, Animal Nutrition, Management, and Welfare Research Group, Torre Marimon, Caldes de Montbui, Barcelona, Spain, [2]IRTA-Monells, Girona, Spain, [3]ICREA, Barcelona, Spain.*

A total of 121 steers (116 ± 3.7 kg of BW and 97 ± 2.4 d of age) were used to study the effect of dietary energy density and meal size limitation on intake and growth, hormones associated with the regulation of nutrient intake, and carcass and meat quality. Steers were randomly allocated to 3 treatments: a concentrate of moderate energy density (CTR, 3.16 Mcal of ME/kg, 6.1% EE) fed ad libitum with no control on meal size, a concentrate of high energy density (HE, 3.36 Mcal of ME/kg, 8.3% EE) fed ad libitum with no control on meal size, and a HE concentrate offered ad libitum but limited to a maximum meal size of 0.7 kg (HELM), with no total daily concentrate intake limit. Live BW was recorded every 14 d and concentrate consumption and eating pattern were recorded daily with a computerized concentrate feeder. At d 163, blood samples were collected to determine leptin, ghrelin, GLP-1, CCK, glucose and insulin serum concentrations After slaughter, the 9-10-11th rib section was removed to estimate separable bone, lean and fat. Muscle pH and color, WBSF and i.m. fat were analyzed in the LM. Data were analyzed using a mixed-effects model including diet as a main effect. Steers in the HELM had a less ($P < 0.01$) final BW and ADG than CTR and HE steers. Concentrate intake was greater ($P < 0.001$) in CTR steers (6.6 ± 0.1 kg/d) than in HE steers(5.7 ± 0.1 kg/d), and HELM (5.1 ± 0.1 kg/d) ate less than in CTR and HE steers. However HE and HELM steers were more efficient ($P < 0.01$) than CTR steers. Mean daily meals and eating rate were less ($P < 0.05$) in HE and HELM than in CTR steers. Serum concentrations of GLP-1, CCK and insulin were lower ($P = 0.05$) in HELM than CTR and HE steers; also leptin and glucose concentration tended to be less ($P = 0.10$ and $P = 0.08$, respectively) in HELM steers, indicating different satiety levels among treatments. Carcass conformation and HCW were less ($P < 0.05$) in HELM steers than in CTR. No differences were observed in carcass fat cover and i.m. content among treatments. In conclusion, HELM steers reduced total energy intake and performance, however, fat deposition was not affected.

Key Words: beef, hormones, meal size

148 Dataset-specific dry matter intake prediction equation determination for growing calves. M. F. Wilken,* L. L. Berger, G. E. Erickson, M. K. Nielsen, M. L. Spangler, and S. D. Kachman, *University of Nebraska-Lincoln, Lincoln.*

Four years of data collected at the University of Illinois-Urbana were utilized to create a data set-specific model for dry matter intake (OBSm). Previous analysis (Wilken et al., 2011) showed significant inaccuracies between observed intakes and that of 3 intake prediction equations (NRC, 1996; Galyean et al., 2009; Owens et al., 2002) leading to the objective of effectively determining a data set-specific intake prediction model. Individual intakes of calf-fed steers were measured over the feeding period by use of GrowSafe feeding system (GrowSafe Systems Ltd.). While 13 diets were fed over the 4 yr collected, varying in diet NE_m (dNE_m) values, only 3 diets (n = 481) were utilized in the analysis to add minimal dNE_m variation and greater statistical power without being statistically different in energy composition. Treatments were 1) 75% corn and 15% corn silage; 2) 50% corn, 25% dry distillers grains plus solubles, and 15% corn silage; and 3) 40% modified corn distillers grains plus solubles, 35% soyhulls, and 15% corn silage. All diets contained a 10% fine ground corn-based supplement. Because the NRC model for intake {NRCm; DMI = $SBW^{0.75} \times [0.1493 (dNE_m) - 0.0460 (dNE_m^2) - 0.0196]$} is the most widely used and verified prediction equation, the current analysis utilized metabolic body weight and dNE_m as parameters for analysis also. Feedstuff NE_m values were obtained from the NRC (1996) and used to calculate dNE_m for analysis in both the NRCm and OBSm. After fitting different models, OBSm was determined to be DMI = $SBW^{0.75} \times [23.3078 (dNE_m) - 5.6287 (dNE_m^2) - 24.0203]$. With OBSm defined, this data set-specific model was then compared with that of NRCm. Difference between OBSm and NRCm were significant ($P < 0.01$). The NRCm was determined to overestimate intake which coincides with previous research. These findings allow us to conclude that, while the NRCm is currently the standard equation for dry matter intake prediction, more accurate prediction equations are warranted and can be developed.

Key Words: dry matter intake, feedlot cattle, prediction equation

149 The use of biometric measures to assess body fat composition of F1 Nellore × Angus bulls and steers. M. A. Fonseca*[1,2], L. O. Tedeschi[2], S. C. Valadares Filho[1], H. J. Fernandes[3], N. F. De Paula[1,2], M. G. Machado[1], F. A. C. Villadiego[1], and J. M. Silva Junior[4], *[1]Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil, [2]Texas A&M University, College Station, Texas, United States, [3]Universidade Estadual do Mato Grosso do Sul, Aquidauana, Mato Grosso do Sul, Brazil, [4]Universidade Federal Rural de Pernambuco, Garanhuns, Pernambuco, Brazil.*

This study was conducted to assess the body fat composition using biometric measures (BM) and postmortem measurements of 40 F1 Nellore x Angus bulls (B) and steers (S). The animals were 12.5 ± 0.51 mo old, with a shrunk BW (SBW) of 233.03 ± 23.47 and 238 ± 24.58 kg for B and S, respectively. Animals were fed 60% corn silage and 40% concentrate. The trial was design with at 2 × 3 factorial arrangement of treatments (2 genders and 3 slaughter weights). The Animals were slaughtered at the beginning of the trial (4B and 4S), and when the group reached an average BW of 380 (6B and 5S), 440 (6B and 5S), and 500 kg (5B and 5S). Before the slaughter, each animal was lead through a squeeze chute where BM were taken, including hook bone width (HBW), pin bone width (PBW), abdomen width (AW), body length (BL), rump height (RH), height at withers (HW), pelvic girdle length (PGL), rib depth (RD), girth circumference (GC), rump depth (RuD), body diagonal length (BDL), and thorax width (TW). Additionally, the postmortem measurements were collected, including subcutaneous fat (SF), internal fat (InF), intermuscular fat (ImF), carcass physical fat (CF), empty body physical fat (EBF), fat thickness at the 12th rib (FT), and 9 – 11th rib section fat (HHF). The equations were developed using a stepwise procedure to select the variables with the best goodness-of-fit and the least root mean square error (RMSE). Due to differences ($P < 0.05$) in gender the following equations were developed: EBF (kg) = 0.2769 × SBW - 1.0138 × RD ($r^2 = 0.994$ and RMSE = 3.93) for steers, EBF (kg) = −55.0900 + 0.0873 × SBW + 0.0446 × PBW −1.1608 × PGL + 0.3524 × TW + 0.4296 × BDL ($r^2 = 0.992$ and RMSE = 1.28) for bulls, CF (kg) = - 19.2136 - 0.1027 × SBW ($r^2 = 0.924$ and RMSE = 3.09 kg) for steers, and CF (kg) = 26.7893 + 0.1232 × SBW - 1.3067 × PGL ($r^2 = 0.921$ and RMSE = 2.37) for bulls. The main BM observed which affected the CF and EBF in this database were RD for S, and PBW, GC, TW, BDL and PGL for B.

Key Words: carcass fat estimation, empty body fat estimation, modeling

150 Evaluation of volatile fatty acid stoichiometries and methane predictions for high grain fed beef cattle within a mechanistic digestion model. J. L. Ellis*[1,2], J. Dijkstra[2], A. Bannink[3], E. Kebreab[4], S. Archibeque[5], and J. France[1], *[1]Centre for Nutrition Modelling, Department of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada, [2]Animal Nutrition Group, Wageningen University, Wageningen, the Netherlands, [3]Wageningen UR Livestock Research, Lelystad, the Netherlands, [4]Department of Animal Science, University of California-Davis, Davis, [5]Animal Sciences, Colorado State University, Fort Collins.*

Mechanistic modeling can provide insight into dietary strategies aimed at reducing CH_4 emissions from ruminants, but requires appropriate representation of aspects of underlying rumen fermentation and digestion. Proper prediction of the production of volatile fatty acids (VFA) is central to accurate CH_4 prediction within these models. Previous analysis showed the Dijkstra model to perform poorly in terms of CH_4 predictions on beef cattle data, while it performed well on dairy cow data. The purpose of this study was therefore to evaluate prediction of CH4 emissions from high grain fed beef cattle data using the Dijkstra model with pH-independent and pH-dependent VFA stoichometries, as well as with a new VFA stoichiometry which adjusts for the use of monensin, to see if prediction improvements could be made. Also, several improvements were made to the model to adapt it for typical high-grain beef cattle and their diets. Adaptations included new equations to predict fluid volume and fractional rate of passage of fluid and solids in the rumen and the hindgut, as adjustment to the kinetics of fiber fermentation in the hindgut and changes to the recycling of urea to the rumen. The evaluation database consisted of 98 individual datapoints from 6 studies of high grain fed beef cattle where the average CH_4 (MJ/d) was 5.6 ± 2.19, bodyweight was 425 ± 68.7 kg, DMI was 7.8 ± 1.93 kg/d and roughage % was 11.8 ± 5.62. Root mean square prediction error for CH_4 (MJ/d) prediction was reduced from 49.3% for the pH-independent stoichiometry to 47.2% with the pH-dependent stoichiometry, and was further reduced to 44.0% when monensin stoichiometry was included. While the majority of error was from random sources, all VFA stoichiometries tended to over-predict low observed CH_4 (MJ/d) values for the beef cattle database. Results indicate that progress to-date has made incremental improvements in predictions, but that further work is still required.

Key Words: feedlot beef, modelling, methane

151 Supplemental vitamin C alleviates negative effects of high sulfur diets on beef quality. D. J. Pogge,* S. M. Lonergan, and S. L. Hansen, *Iowa State University, Ames.*

High S (HS) diets may contribute to antemortem oxidative stress in cattle, hindering live performance and expressing residual effects on meat quality. The objective of this study was to examine the effects of a supplemental rumen-protected vitamin C (VC) on meat quality of cattle receiving varying concentrations of dietary S. Angus type steers (n = 120) were blocked by initial BW (355 ± 23 kg) and assigned to treatments including: 1) low S corn diet (LS; 0.18% S), 2) LS + VC, 3) medium S (MS), 40% DDGS diet (0.32% S), 4) MS + VC, 5) HS (0.56% S), MS + sodium sulfate, and 6) HS + VC. An average of 10.3 g supplemental VC·h^{-1}·d^{-1} was consumed. A rib steak, collected from each carcass after a 24 h chill, was stored at −20°C and homogenized before analysis. Data were analyzed on a pen mean basis (n = 5 pens per treatment). By design, increasing dietary S linearly increased ($P < 0.01$) g of S consumed. Increasing dietary S resulted in steaks with a lesser ($P < 0.01$) percent lipid. The proportion of the catalytic subunit of μ-calpain present as the unautolyzed 80 kDa band was increased ($P < 0.05$) as dietary S increased. The abundance of the unautolyzed μ-calpain band tended to decrease ($P < 0.10$) in the HS + VC treatment compared with HS. Addition of VC, regardless of dietary S, tended to increase ($P < 0.10$) the proportion of the catalytic subunit present as the 76 kDa autolysis product of the protease μ-calpain, but was specifically increased ($P < 0.05$) in the MS + VC and HS + VC treatments. This suggests that VC provided a reducing environment that allowed activation of the calpains. Increasing dietary S decreased ($P < 0.05$) troponin-T degradation and protein carbonylation ($P < 0.01$), while added VC, regardless of dietary S, decreased ($P < 0.05$) protein carbonylation. TBARS values were greater ($P < 0.05$) in VC treatments, which may relate to a tendency ($P < 0.10$) for increased Fe content in steaks from VC cattle. In conclusion, supplemental VC appears to negate the negative effects of HS on oxidation of the protease μ-calpain and muscle protein degradation. This may translate to an enhancement in meat quality and potential increases in tenderness of the final meat product.

Key Words: cattle, meat quality, vitamin C