

Data collected in two published Latin Square studies were utilized (JDS 85:1947: A, JDS 86:2433: B). Ruminal pH was continuously measured in each period for 5 d in A and 3 d in B using indwelling electrodes and averaged by hour such that each cow had 24 observations per day. Average treatment pH, calculated using the hour by treatment least square means within experiment, ranged 0.27 pH units for A and 0.50 pH units for B. In trial A equal portions of TMR were fed every 12 h, where in B 65% of the TMR was fed in the morning and 35% 12 h later. Effect of forage particle size (FPS), grain fermentability (GF) and their interaction were tested in both studies. In both studies an effect of GF was observed ( $P < 0.05$ ). The effect of FPS was significant in A, but not in B. The GF by FPS interaction was not significant in either study. Data were re-analyzed using 3 abbreviated sampling schedules within day and for 1, 3 or 5 (only for A) consecutive days within period, utilizing rumen pH measured: 1) 8 h post am feeding, 2) every

4 h for 24 h, and 3) and every 2 h for 12 h after the am feeding. Data were analyzed as Latin Square designs utilizing the mixed procedure of SAS with repeated measures. Sampling schedules were compared by the capability to detect a treatment effect ( $P < 0.05$ ). In study A, sampling for either 3 or 5 d utilizing either of the 3 sampling schedules produced similar results. When only 1 d was utilized in the analysis, sampling every 2 h over a 12 h period detected both treatment effects ( $P < 0.05$ ). In study B, 3 d of multiple within day samples were required to detect a GF effect ( $P < 0.05$ ). In contrast to the published analysis, sampling only once a day (1 or 3 d) or every 4 h for 3 d resulted in a GF by FPS interaction ( $P < 0.05$ ). It is recommended to sample ruminal pH across multiple days and hours. It is important to consider post prandial pattern of ruminal pH when choosing the sampling schedule that will maximize the probability to detect a treatment effect.

## Ruminant Nutrition: Growing/Finishing Nutrition – Beef

**T179 Intake, digestibility, and performance of crossbred steers fed diets containing high levels of urea<sup>a</sup>.** F. H. M. Chizzotti<sup>1,2</sup>, O. G. Pereira<sup>1</sup>, L. O. Tedeschi<sup>2</sup>, S. C. Valadares Filho<sup>1</sup>, M. L. Chizzotti<sup>1,2</sup>, L. M. Moura<sup>1</sup>, I. C. S. Belo<sup>1</sup>, and D. H. Pereira<sup>1</sup>, <sup>1</sup>Universidade Federal de Vicosa, Vicosa, MG, Brazil, <sup>2</sup>Texas A & M University, College Station.

True protein supplements are the most expensive ingredients in diets of beef cattle. Therefore, substitution of a true protein supplement with a non-protein N source may significantly reduce the diet costs. Studies have demonstrated that animal performance is not affected by using high levels of urea and/or replacing the true protein source by urea. A trial was conducted with twenty-four crossbred steers (Holstein x Zebu), averaging 350 kg BW, distributed in six randomized blocks to evaluate intake and digestibility of nutrients and performance. Steers were fed with four diets (TRT) containing high levels of urea. Diets consisted of 70% corn silage and 30% concentrate, formulated to be isonitrogenous (12% CP, DM basis). Treatments consisted of 0, 0.65, 1.3, and 1.95% of dietary urea (DM basis), which replaced cottonseed meal in the concentrate mixture. The experiment was conducted for 99 d (15 d for diet adaptation and 3 periods of 28 d). For each animal, the DMI was measured daily and samples of feces were collected to determine the diet digestibility using indigestible ADF as a marker. There were no differences ( $P > 0.05$ ) in the intakes of DM, OM, ether extract (EE), CP, NDF, non-fiber carbohydrates (NFC), and TDN among treatments. Additionally, no effects of levels of urea were observed on apparent total digestibility of DM, OM, NDF, EE, and NFC, which were, on average, 70.1, 71.3, 54.0, 84.3 and 86.8%, respectively. CP apparent digestibility increased linearly ( $P < 0.05$ ) with increasing levels of urea, but ADG was not influenced ( $P > 0.05$ ) and averaged 1.14 kg/d. This experiment suggested that levels of urea (up to 1.95% DM) might be fed to crossbreds receiving high forage diets without affecting their growing performance.

<sup>a</sup>Sponsored by CAPES, Brazil

**Key Words:** Feedlot, Non-protein nitrogen, Protein supplementation

**T180 Effect of corn density on growing steer intake and performance.** D. M. Larson\*, M. L. Bauer, and G. P. Lardy, *North Dakota State University, Fargo.*

A trial was conducted to evaluate the effect of corn density on intake and performance of growing steers (288 ± 11 kg initial weight). Previous research indicates a negative effect of decreasing corn density on finishing steer gain efficiency. Sixty crossbred and purebred beef steers were assigned randomly by weight to one of four dietary treatments. The treatments consisted of low density (50.4 kg/L; 39.1 lb/bushel; LD) corn replacing 0%, 33%, 67%, or 100% of high density corn (72.1 kg/L; 56 lb/bushel; HD). The steers were individually fed once daily using a Calan Broadbent feeding system. Body weight was measured every 28 d, individual feed offered recorded daily, and individual feed refusal was recorded weekly. The diet DM was composed of dry-rolled corn (42%), corn silage (35%), mixed hay (15%), concentrated separator byproduct (5%), and supplement (3%) that provided 27.5 mg/kg monensin (DM basis). Calves were implanted with Synovex S on d 0 and were fed for 96 d. Data were analyzed with the MIXED model of SAS with linear and quadratic contrasts of LD level ( $P \leq 0.05$ ). In addition, G:F was analyzed with PROC REG of SAS to determine the effect of % LD inclusion ( $P \leq 0.05$ ). There was no effect of treatment on final BW (455 ± 13 kg,  $P = 0.90$ ), ADG (1.74 ± 0.06 kg/d,  $P = 0.71$ ), or DMI (10.05 ± 0.30 kg/d,  $P = 0.57$ ) or DMI as a percentage of BW (2.73 ± 0.08 %,  $P = 0.44$ ). Calculated apparent NE<sub>g</sub> increased linearly with increasing inclusion of LD corn in the diet (1.13, 1.18, 1.19, and 1.25 ± 0.03 Mcal/kg; 0, 33, 67, 100% LD, respectively,  $P = 0.02$ ). Inclusion of LD corn also improved G:F (167, 174, 173, and 182 ± 5 g/kg; 0, 33, 67, and 100% LD respectively,  $P = 0.03$ ). Regression analysis of G:F indicates an intercept of 167.2 ± 4.8 g/kg ( $P < 0.001$ ) and a regression coefficient of 0.138 ± 0.062 g/kg/% of LD ( $P = 0.03$ ). We conclude that corn with a density of 50.4 kg/L is a suitable substitute for regular density corn. The increase in G:F may be due, in part, to less inhibition of ruminal fiber fermentation due to the decrease of starch content in the LD corn.

**Key Words:** Steers, Corn density, Growing

**T181 Optimal level of corn distillers dried grains in a no roughage diet for pre-conditioned calves.** J. E. Williams\*, F. Farias, J. M. Wilson, and M. S. Kerley, *University of Missouri, Columbia*.

Two studies were conducted to determine the optimal inclusion rate of corn distillers dried grains with solubles (DDGS) for pre-conditioned calves. In yr 1 and 2, seventy-two and ninety, respectively, Angus Simmental crossbred calves (38 steers and 34 heifers; initial BW = 249.4 ± 13.5 kg) and (44 steers and 46 heifers; initial BW = 242.2 ± 20.8 kg) were used the study. Calves were allotted by weight to eight pens and randomly assigned to one of five and one of eight treatment diets in yr 1 and 2, respectively. In both yrs, diets were a control (C) containing basal diet (38 % corn, 40 % soyhulls, 20 % wheat midds, and 2 % minerals/vitamins premix), a fat control diet (PC) containing soybean oil added to the C diet with a lipid equivalency of the high DDGS diet, and increasing levels of DDGS. In yr 1 three levels of DDGS were added (D1, D2, and D3) and in yr 2 six levels of DDGS were added (D1, D2, D3, D4, D5, and D6). The D2 (yr 1) and D4 (yr 2) diets were formulated to optimize the amino acid to energy ratio. Individual intakes were measured using the Grow Safe feed intake System and weights were taken on consecutive days at initiation and termination of the experiment. Based on DM intake for yr 1, calves consumed 1.0, 2.1, and 2.9 kg of DDGS daily in D1, D2, and D3 diets, respectively; for yr 2, calves consumed 0.8, 1.2, 1.6, 1.4, 1.8, and 2.1 kg of DDGS daily from D1, D2, D3, D4, D5, and D6 diets, respectively. In yr 1, the D2 treatment had the highest ( $P < .007$ ; 1.5 kg/d) and PC had the lowest (1.1 kg/d) ADG as compared to D1, D3, and C (1.28, 1.33, and 1.29 kg, respectively). Likewise, the calves fed the D2 diet had the best feed conversion ratio (4.8) and the calves fed the PC had the poorest ( $P < 0.05$ ) feed conversion ratio. In yr 2, the D3 treatment had the highest ( $P < 0.07$ ; 1.71 kg/d) ADG and the best ( $P < 0.03$ ) feed conversion ratio (4.14) as compared to other treatments. In yr 2, the predicted optimal dietary level of DDGS, D4, had a lower feed intake and ADG than expected. The growth response to DDGS is dependent upon the level of DDGS fed, most likely due to providing absorbable amino acids to the small intestine.

**Key Words:** Corn distillers grains, Gain, Pre-condition

**T182 Effect of bacterial inoculants or ammonia on aerobic stability of high moisture ear corn and finishing performance of steers.** E. Diaz\*<sup>1</sup>, A. Amyot<sup>2</sup>, C. Thivierge<sup>1</sup>, R. Berthiaume<sup>3</sup>, and D. R. Ouellet<sup>3</sup>, <sup>1</sup>Laval University, Quebec, QC, Canada, <sup>2</sup>IRDA, Deschambault, QC, Canada, <sup>3</sup>Dairy and Swine R&D Centre, Agriculture and AgriFood Canada, Lennoxville, QC, Canada.

High-moisture ear corn (HMEC) was treated with bacterial inoculants or ammonia to investigate their efficiency in maintaining silage quality after air exposure and their effects on finishing performance of steers. These treatments were compared 1) untreated HMEC (Control) 2) *Lactobacillus plantarum* and *Enterococcus faecium* (HOB: Homolactic bacteria;  $0.91 \times 10^5$  cfu/g of fresh HMEC); 3) *Lactobacillus buchneri* (HEB: Heterolactic bacteria;  $1.0 \times 10^5$  cfu/g of fresh HMEC); 4) aqueous solution of ammonia (AMMO; 16 g/kg of fresh HMEC). In the fermented material, HEB and AMMO exhibited the lowest counts of yeasts (4.2 and 4.6 log<sub>10</sub> cfu/g of fresh weight; SEM=1.21 and SEM=1.29 respectively) and molds (2.8 and 2.3 log<sub>10</sub> cfu/g of fresh weight; SEM=0.96 and SEM=0.54 respectively) and HEB presented the lowest aerobic instability index (15.3°C/day; SEM=7.4). A growth trial using 36 steers (BW 427 kg) grown over 142 d according to an incomplete block design and a digestion trial using 4 additional steers (BW 423 kg) according to a 4x4 Latin square design were conducted.

In both trials, steers fed either treated or control HMEC had similar DM intake expressed in % of BW (1.98%; SEM=0.02). Treatments had no effect on BW gain, feed efficiency, hot carcass weight, carcass yield and quality grade ( $P > 0.10$ ). In HOB compared to control, apparent digestibility of nitrogen and ADF was increased (74.0% and 42.2% respectively; ( $P < 0.05$ ) and DE and ME tended to be higher ( $P < 0.10$ ). Nitrogen retention was increased ( $P < 0.05$ ) with HOB and AMMO (34.4% and 33.9% of N intake, respectively). This study supports previous observations that bacterial inoculants and ammonia are not detrimental to growth performance, but some may be more appropriate in maintaining silage quality and avoiding biodegradation of dry matter.

**Key Words:** High moisture ear corn, Additives, Finishing steers performance

**T183 Performance of young Angus × Nellore cattle fed with high-moisture corn or high-moisture sorghum.** M. S. Igarasi, M. D. B. Arrigoni, C. L. Martins, H. N. Oliveira, A. C. Silveira, D. D. Millen\*, R. D. L. Pacheco, and L. A. L. Chardulo, *FMVZ/UNESP, Botucatu, Sao Paulo, Brazil*.

The objective was to determine differences in the performance of young cattle fed high-moisture corn or high-moisture sorghum. The study had two treatments, in which the total diet was composed mainly of high-moisture corn (HMC) or high-moisture sorghum (HMS). The diet composition (dry mater basis) was: HMC - Cynodon sp hay 21%, corn silage 7%, high-moisture corn 44%, cottonseed whole 10%, and mineral protein mix 18%; HMS - Cynodon sp hay 20%, corn silage 8%, high-moisture sorghum 45%, cottonseed whole 10%, and mineral protein mix 17%. The experiment was conducted at the experimental feedlot of the Veterinary Medicine and Animal Science College, Sao Paulo State University, Botucatu campus (UNESP-Botucatu), Brazil. Ninety 8-month-old Angus x Nellore crossbred steers (240± 19 kilos) were divided in two experimental treatments (HMC and HMS), and fed during 172 days. Treatments did not affect ( $P > 0.05$ ) ADG (HMC=1.41 kilos, HMS=1.43 kilos), total weight gain (HMC=186.74 kilos, HMS=189.23 kilos), and final weight (HMC=482.54 Kilos x HMS=486.81 Kilos). Treatments did not affect ( $P > 0.05$ ) Longissimus dorsi area (HMC=73.67 cm<sup>2</sup>, HMS=73.81 cm<sup>2</sup>) or subcutaneous fat thickness (HMC=4.28 mm, HMS=4.16 mm). In conclusion, high-moisture corn should be able to be totally substituted for high-moisture sorghum without altering the performance or carcass characteristics of young Angus x Nellore cattle. The use of high-moisture sorghum instead of high-moisture corn should be able to reduce feed costs by as much as 10% without impacting performance.

**Key Words:** Nellore, Red Angus, High-moisture

**T184 Evaluation of chop length in two brown midrib sorghum hybrids silage on feedlot animal performance.** G. J. Depetris\*, M. D. Montiel, F. J. Santini, A. Chicatún, and E. L. Villareal, *EEA INTA Balcarce-Fac. Cs. Agrarias, UNMdP, Balcarce, Buenos Aires, Argentina*.

This trial was designed to study the effects of brown midrib (BMR) sorghum hybrids silages with different chops length on feedlot performance steers. Experimental design was randomized blocks with 2x2 factorial arrangement: two chops length (short fiber: SH (3mm) and large fiber: LO (15mm)) and two BMR hybrids (CH and DM), adding 4 treatments. Sixty Aberdeen Angus steers (215±13.5 BW) were blocked by weight (light, medium and heavy) and fed with TMR

(79.2% silage, 20% sunflower meal and 0.8% urea) offered *ad libitum* once a day for 87-d. Dry matter intake (DMI) was recorded daily and animals were weighed at the start and the end of the trial and at 2-wk intervals to obtain ADG. Ultrasound subcutaneous backfat (SBF) was measured to estimate fat deposition rate (FDR). The ADG and FDR were estimated individually by linear regression. When the interactions were not significant, hybrids and chops length factors were analyzed like a principal effect and the means were compared using Tukey. Use of BMR hybrids did not affect ( $P>0.05$ ) neither of variable evaluated. ADG and DMI were affected ( $P<0.05$ ) by the chop length, and were higher in SH than LO (0.98 vs. 0.90 kg/d and 9.55 vs. 8.79 kg/d, respectively). Feed efficiency (feed/gain) was not affected ( $9.68\pm 0.035$ ;  $P=0.86$ ) for chop length. BMR-hybrids x chops length interaction was significant ( $P<0.05$ ) for FDR. CH hybrids SH resulted in higher FDR than LO (1.006 vs. 0.634 mm/30d, respectively). We conclude that chop length is the principal factor that affects animal performance, increasing ADG and DMI when chop length of BMR sorghum silage is short.

**Key Words:** Brown midrib sorghum hybrid, Chops length, Feedlot performance

**T185 Feedlot performance of heifers fed with three sorghum hybrids silage or one corn silage diets.** G. D. Depetris\*, M. D. Montiel, F. J. Santini, A. Chicatun, and E. L. Villarreal, *EEA INTA Balcarce- Fac. Cs. Agrarias, UNMdP, Balcarce, Buenos Aires, Argentina.*

The objective of this study was to examine dietary effects on performance of heifers fed with three different sorghum silages and one corn silage. Sixty Aberdeen Angus heifers ( $184\pm 13.7$  kg BW) were blocked by weight (light, medium, heavy) and randomly assigned to one of four dietary treatments: BMR (brown midrib sorghum), HT (high tannin sorghum), WS (white sorghum) and C (corn silage). The TMR consisted of: 79.2% silage, 20% sunflower meal and 0.8% urea and were offered *ad libitum* once a day for 87 d. During the experiment DMI was recorded daily and animals were weighed at the start and the end of the trial and at 2-wk intervals during the trial to obtain ADG. Ultrasound subcutaneous backfat (SBF) was measured on 2 consecutive days at the start and at the end of the experiment to estimate fat deposition rate (FDR). A randomized block design was utilized; data were analyzed with SAS and means were compared with Tukey. The results of least squares mean comparisons are detailed in the table below. These results show treatments effects on animal performance. The diet containing high tannin sorghum silage was clearly inferior for LWG and presented the worst feed efficiency (FE). Corn silage showed the highest final SBF and FDR and there were not difference among sorghum silages for this two traits.

**Table 1.**

Item	BMR	HT	WS	C	SEM
DMI, kg/d	8.37	8.52	8.90	8.49	0.28
Initial BW, kg	184	184	184	183	2.34
Final BW, kg	244 <sup>a</sup>	236 <sup>b</sup>	251 <sup>a</sup>	251 <sup>a</sup>	2.83
LWG, kg/d	0.69 <sup>ab</sup>	0.59 <sup>b</sup>	0.76 <sup>a</sup>	0.79 <sup>a</sup>	0.28
FE, feed/gain	12.2 <sup>ab</sup>	14.2 <sup>a</sup>	11.7 <sup>b</sup>	10.7 <sup>b</sup>	0.44
Initial SBF, mm	3.68	3.41	3.40	3.69	0.17
Final SBF, mm	4.36 <sup>b</sup>	3.99 <sup>b</sup>	4.73 <sup>b</sup>	6.02 <sup>a</sup>	0.22
FDR, mm/30d	0.26 <sup>b</sup>	0.31 <sup>b</sup>	0.46 <sup>b</sup>	0.81 <sup>a</sup>	0.07

<sup>ab</sup>Means within a row with unlike superscripts differ ( $P < 0.05$ ).

**Key Words:** Sorghum and corn silage, Sorghum hybrids, Feedlot performance

**T186 Performance of feedlot heifers fed with high-tannin high-moisture sorghum treated with urea compared with high moisture corn.** M. D. Montiel\*, G. J. Depetris, F. J. Santini, A. Chicatun, and E. L. Villarreal, *EEA INTA Balcarce-Fac. Cs. Agrarias, UNMdP, Balcarce, Buenos Aires, Argentina.*

Condensed tannins are responsible for low digestibility of sorghum grain and reduce animal performance. This trial was designed to determine the effects of adding urea to a high tannin high moisture sorghum diets on feedlot heifer performance. Sorghum was harvested with 35% moisture content and treated with two levels of urea (either 0 or 1.4% urea on DM basis), and conserved under anaerobic conditions. Corn was harvested and conserved under similar conditions to sorghum. Forty-five Angus heifers ( $179\pm 13$  kg BW) were blocked by weight (light, medium, heavy) and randomly assigned to one of three treatments: sorghum with urea (1.4U), sorghum without urea (0U) and high moisture corn (C), and fed *ad libitum* a TMR comprising 70% high moisture grain, 12% corn silage and 18% sunflower meal for 63 d. To obtain similar CP (15%) content in all diets 0U and C were supplemented with urea. Feed intake (DMI) was recorded daily and animals were weighed at the start and end of the trial and at 2 wk intervals to obtain live weight gain (LWG). Fat deposition rate (FDR) was estimated measuring ultrasound subcutaneous backfat depth (SBF). A randomized block design was utilized; data were analyzed with SAS and means were compared with Tukey. The least squares mean comparisons are detailed in the table below. Adding urea was effective to reduce the anti-nutritional effects of tannins because DMI and LWG were greater for 1.4U than 0U. Moreover, 1.4U and C treatments presented similar LWG. However, there were not differences in feed efficiency (FE), final SBF and FDR between treatments.

**Table 1.**

Item	1.4U	C	0U	SEM
DMI, kg/d	6.79 <sup>a</sup>	6.20 <sup>b</sup>	6.11 <sup>b</sup>	0.10
DMI, kg/d	6.79 <sup>a</sup>	6.20 <sup>b</sup>	6.11 <sup>b</sup>	0.10
DMI, kg/d	6.79 <sup>a</sup>	6.20 <sup>b</sup>	6.11 <sup>b</sup>	0.10
Initial BW, kg	182	179	174	2.47
Final BW, kg	245 <sup>a</sup>	237 <sup>a</sup>	228 <sup>b</sup>	3.39
LWG, kg/d	0.89 <sup>a</sup>	0.84 <sup>ab</sup>	0.78 <sup>b</sup>	0.03
LWG, kg/d	0.89 <sup>a</sup>	0.84 <sup>ab</sup>	0.78 <sup>b</sup>	0.03
LWG, kg/d	0.89 <sup>a</sup>	0.84 <sup>ab</sup>	0.78 <sup>b</sup>	0.03
FE, feed/gain	7.66	7.39	8.01	0.22

<sup>a,b</sup>Means within a row with unlike superscripts differ ( $P < 0.05$ )

**Key Words:** High moisture sorghum and corn, Urea, Feedlot performance

**T187 Effect of corn processing and soybean meal treatment on performance of finishing beef steers fed corn silage based diet.** D. R. Ouellet\*<sup>1</sup>, M. D'Amours<sup>2</sup>, R. Berthiaume<sup>1</sup>, L. Faucitano<sup>1</sup>, and D. Pellerin<sup>2</sup>, <sup>1</sup>Dairy and Swine R&D Centre, AAFC, Lennoxville, Quebec, Canada, <sup>2</sup>Laval University, Quebec, Canada.

Forty crossbred steers ( $456 \pm 14$  kg BW) were used in a study with a  $2 \times 2$  factorial arrangement of treatments to determine the effect of corn particle size (cracked or ground) and soybean meal processing (solvent extracted 48% CP soybean meal or lignosulfonate treated soybean



meal; Soypass™) on feed intake, weight gain and feed-to-gain ratio during the finishing phase. Corn silage (31.7, 8.4, and 47.6% of DM, CP, and NDF, respectively) was offered for *ad libitum* consumption, while corn and soybean meal were fed at 6.6 and 0.54 kg DM/d, respectively. Animals received the corn silage individually once a day and half of the supplement was added on the top of the silage in the morning and the remainder in the afternoon. Dry matter offered andorts were recorded daily. Animals were treated against internal parasites (Ivermectin) and received an ionophore (Bovatec®), and growth stimulant (Revalor S®). Steers were weighed on three consecutive days at the beginning and at the end of the experiment. Animals were slaughtered when ultrasound backfat thickness was between 4 - 10 mm (Canada grade A). Duration of the experiment was not affected ( $P > 0.10$ ) by treatment and averaged 99 d (SEM = 4). Dry matter intake, ADG, and feed-to-gain ratio were not affected ( $P > 0.10$ ) by treatment and averaged  $11.1 \pm 0.3$  kg/d,  $1.65 \pm 0.08$  kg/d, and  $6.7 \pm 0.3$  kg DMI/kg gain, respectively. No interaction between soybean meal treatment and corn processing was observed. During a digestion trial run concomitantly, results indicated that reducing particle size of corn increased apparent total tract digestibility of starch ( $0.96$  vs  $0.91 \pm 0.01$ ;  $P < 0.01$ ) while neutral detergent fiber digestibility tended to decrease ( $0.24$  vs  $0.37 \pm 0.06$ ;  $P < 0.07$ ). In conclusion, although starch was more digestible, reducing corn particle size had no effect on performance of finishing steers fed a corn silage-based diet. This could be partly explained by reduction in fiber digestion. No effect soybean meal sources or interaction between supplements was observed when performance of finishing steers was compared.

**Key Words:** Corn processing, Soybean meal, Finishing steers

**T188 Influence of supplements on performance of grazing steers during the dry season in Brazil.** C. E. S. Baroni\*<sup>1</sup>, R. P. Lana<sup>1,2</sup>, A. B. Mâncio<sup>1</sup>, D. M. Lambertucci<sup>1,2</sup>, and B. P. C. Mendonça<sup>1</sup>, <sup>1</sup>Universidade Federal de Viçosa, Viçosa, MG, Brazil, <sup>2</sup>CNPq, Brasília, DF, Brazil.

Two experiments were conducted to evaluate the effects of supplements on performance of finishing cattle on pasture of *Brachiaria brizantha* Stapf. The supplements were fed at levels of 0.05, 0.25, 0.5, 1.0, 2.0, and 4.0 kg/animal/day, and were based on mineral mixture (100, 25, 15, 10, 5, and 2.5%, respectively), urea (0, 25, 15, 10, 5, and 2.5%, respectively), corn meal and soybean meal. The protein sources were used in the amount necessary to reach approximately 10 and 13% CP levels in the total diet of the first and second experiment, respectively. This was possible based in estimatives of pasture and supplement intakes, in which the last one was controlled by the mineral and urea levels in the supplements. Each experiment contained 48 Nellore steers ( $412 \pm 16$  kg) allotted at random in six paddocks of 90,000 m<sup>2</sup>. The animals and supplements switched three times among the paddocks at each 21 days. The average daily gain (ADG) and carcass weight (CW), both in kilograms, responded linearly to supplement intake (SI), in kg, as follow: 1st Experiment:  $ADG = 0.207 + 0.0739 SI$ ,  $r^2 = 0.43$ ;  $CW = 240 + 3.83 SI$ ,  $r^2 = 0.21$ . 2nd Experiment:  $ADG = 0.174 + 0.0994 SI$ ,  $r^2 = 0.45$ ;  $CW = 239 + 6.20 SI$ ,  $r^2 = 0.41$ . The supplement conversions (kg of supplement as fed/kg of ADG), obtained by the reciprocal of the coefficients of the linear regressions, were 13.5 and 10.1 for the experiment 1 and 2, respectively. The carcass yield was  $56 \pm 0.7\%$  and fat thickness  $2.0 \pm 0.4$  mm, with low effect of supplementation. The high cost of concentrate feeds compared to the pasture and the low efficiency of the concentrate conversion in weight gain even under tropical pastures can explain the low use of concentrate by

Brazilian farmers, which can have greater profitability in spite of low cattle performance.

**Key Words:** Carcass characteristics, Concentrate conversion, Daily gain

**T189 Effects of different growing systems on performance of feedlot cattle.** J. T. Vasconcelos\*<sup>1,2</sup>, J. E. Sawyer<sup>1</sup>, L. O. Tedeschi<sup>1</sup>, L. W. Greene<sup>2</sup>, and F. T. McCollum, III<sup>2</sup>, <sup>1</sup>Texas A&M University, College Station, <sup>2</sup>Texas A&M University, Amarillo.

Forty eight steers (BW =  $296 \pm 16.7$  kg) were individually fed to evaluate the effects of different growing diets on performance of feedlot cattle. Steers were fed one of four treatments for 56d: 1 - limit fed (LF) high starch, 2 - ad lib (AL) low starch, 3 - AL intermediate starch, and 4 - AL high starch. On d57, steers were placed on treatment 4 for finishing until d140. Orthogonal contrasts were used to compare LF to all other treatments. Linear and quadratic contrasts were applied across increasing starch content of the diets within AL treatments. During d0-56, LF reduced ADG ( $P < 0.01$ ) compared to AL treatments. Increasing starch concentration increased ADG quadratically in AL treatments ( $P = 0.04$ ; 1.86, 2.40,  $2.32 \pm 0.12$  kg/d for 2, 3, and 4, respectively). By design, LF resulted in reduced DMI ( $P < 0.01$ ). Increasing starch content resulted in a quadratic DMI response ( $P < 0.01$ ; 10.0, 11.6,  $10.2 \pm 0.28$  kg/d). LF tended to increase G:F, and increasing starch resulted in a linear increase in G:F ( $P = 0.02$ ; 0.17, 0.21, and  $0.22 \pm 0.01$ ). During d57-140, LF steers had ADG similar to AL treatments ( $P = 0.9$ ). Increasing starch resulted in a quadratic ADG response in AL treatments ( $P = 0.06$ ; 1.88, 1.63,  $1.70 \pm 0.07$ ). DMI was reduced for previously LF steers ( $P = 0.04$ ) but was not different among AL treatments ( $P > 0.5$ ; 10.6, 10.5,  $10.9 \pm 0.4$ ). LF resulted in increased G:F ( $P = 0.04$ ) and increasing starch resulted in a linear decrease in G:F ( $P = 0.02$ ; 0.18, 0.15,  $0.15 \pm 0.004$ ). Across the 140-d trial, LF reduced ADG ( $P < 0.01$ ), reduced DMI ( $P < 0.01$ ), and tended to improve G:F ( $P = 0.07$ ), while minimum separations were observed among AL treatments. LF enhanced feed efficiency at the expense of productivity. These data suggest that growing systems relying on low starch diets do not affect productivity of feedlot cattle when compared to intermediate and high starch based growing systems.

**Key Words:** Steers, Starch, Finishing

**T190 Influence of Ractopamine-HCl and ground white corn or steam-flaked white corn based-diets on growth performance of finishing Brahman cross bulls.** R. Barajas\*<sup>1</sup>, J. M. Romo<sup>1</sup>, B. J. Cervantes<sup>1</sup>, R. J. Virgilio<sup>2</sup>, and J. J. Lomeli<sup>1</sup>, <sup>1</sup>FMVZ-Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, Mexico, <sup>2</sup>Tecnología de Máxima Producción, S.A. de C.V., Culiacan, Sinaloa, Mexico.

With the objective of determine the influence of Ractopamine-HCl and ground white corn or steam-flaked white corn based diets on growth performance of finishing Brahman cross bulls, fifty six bulls proximately 75% Brahman (BW  $383.75 \pm 5.47$  kg) were used in a 33 days feedlot experiment. Agreement with its BW animals in groups of seven was housed in ground flour pen (6 x 12 m). Accord to a complete randomly block design experiment with a 2 x 2 factorial arrangement, animals were designed to receiving or not 300 mg of ractopamine-HCL per head per day from Optaflexx 100® (Elanco), during 30 to 36 days before slaughter (RAC), and receive white ground corn (WGC) based-diet (68% grain; CP 13.17%; NEM 2.048 Mcal/kg) or steam-flaked white corn (SFC) based-diet (68% grain; CP 13.17%; NEM 2.15 Mcal/kg). Ractipamine increased ( $P = 0.02$ ) 14.9% ADG (1.34 vs.

1.54 kg/d), not affected ( $P = 0.15$ ) DMI, and enhanced ( $P = 0.04$ ) 18% feed/gain ratio (6.77 vs. 5.5 kg/kg). Ractopamine supplementation improved ( $P = 0.02$ ) 12% NEm (2.13 vs. 2.38 Mcal/kg) and 15% NEg (1.458 vs. 1.684 Mcal/kg) retained from the diet. SFC had no effect ( $P = .73$ ) on ADG, diminished ( $P = 0.04$ ) 7.5% DMI (8.5 vs. 7.86 kg/day), without changes in feed/gain ratio. SFC increased ( $P = 0.05$ ) 8.7% the NEm (2.165 vs. 2.353 Mcal/kg) and 10.8% NEg (1.489 vs. 1.65 Mcal/kg) of the diet. Interactions ractopamine x corn processing method were not observed ( $P > 0.10$ ). It is concluded that, ractopamine supplementation improves feedlot performance, in cross Brahman bulls eating either ground or steam flaked white corn-based finishing diets.

**Key Words:** Ractopamine, Corn processing method, Feedlot performance

**T191 Effect of Ractopamine-HCl and ground white corn or steam-flaked white corn based-diets on carcass characteristics of finishing Brahman cross bulls.** R. Barajas<sup>\*1</sup>, J. M. Romo<sup>1</sup>, B. J. Cervantes<sup>1</sup>, R. J. Virgilio<sup>2</sup>, and J. J. Lomeli<sup>1</sup>, <sup>1</sup>FMVZ-Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, Mexico, <sup>2</sup>Tecnología de Máxima Producción, S.A. de C.V., Culiacan, Sinaloa, Mexico.

With the objective of determine the effect of Ractopamine-HCl and ground white corn or steam-flaked white corn based-diets on carcass characteristics of finishing Brahman cross bulls, fifty six bulls proximately 75% Brahman (BW 383.75 ± 5.47 kg) were used in a 33 d feedlot experiment. Agreement with its BW animals in groups of seven was housed in ground flour pen (6 x 12 m). Accord to a complete randomly block design experiment with a 2 x 2 factorial arrangement, were designed to receiving or not 300 mg of ractopamine-HCL per head per d from Optaflexx 100<sup>®</sup> (Elanco), during 30 to 36 d before slaughter (RAC), and receive white ground corn (WGC) based-diet (68% grain; CP 13.17%; NEm 2.049 Mcal/kg) or steam-flaked white corn (SFC) based-diet (68% grain; CP 13.17%; NEm 2.15 Mcal/kg). Mean ractopamine supplementation period was 33 d, after that, bulls were sacrificed in a slaughterhouse. Ending weight (428.68 ± 7.38 kg) was not affected ( $P > 0.35$ ) by treatments. Ractopamine increased ( $P = 0.06$ ) 2.6% hot carcass weight (264.91 vs. 271.79 kg), and improved ( $P = 0.04$ ) 0.7% carcass dressing (62.13 vs. 62.59%). Back fat thickness (0.69 ± 0.08 cm) was similar ( $P > 0.32$ ) across treatments. Longissimus dorsi area (68.67 ± 2.99 cm<sup>2</sup>) was not modified by treatments ( $P > 0.20$ ). Marbling score was not influenced by RAC or corn processing method. Ractopamine diminished ( $P = 0.05$ ) 6.5% KPH fat (2.43 vs. 2.27%). Corn processing method, had no effect ( $P > 0.30$ ) on any studied variables. Interactions ractopamine x corn processing method were not found ( $P > 0.20$ ). It is concluded that, ractopamine supplementation improves hot carcass weight and carcass dressing, in cross Brahman bulls eating either ground or steam flaked white corn-based finishing diets.

**Key Words:** Ractopamine, Corn processing method, Carcass characteristics

**T192 Effect of Synovex-S and ractopamine on serum concentration of IGF-I, performance and carcass characteristics of finishing steers.** A. J. M. Rosa<sup>\*</sup>, J. L. Clapper, A. M. Sanborn, S. L. Lindblom, C. Smith, D. M. Wulf, C. L. Wright, and J. A. Clapper, *South Dakota State University, Brookings.*

Twenty-nine Angus yearling steers (BW=417.3 ± 31.3 kg) were used in a 2X2 factorial experiment conducted over 105 d feeding period

to determine the effects of Synovex-S and ractopamine on serum concentration of IGF-I, performance and carcass characteristics. Traits analyzed were ADG from 0 d to 105 d after implant (ADG1) and ADG from 70 d to 105 d (ADG2), after starting ractopamine administration, HCW, LM area (LMA), back fat thickness (BF), marbling score (MARB), KPH and Yield Grade (YG), IGF-I and estradiol-17β (E2) concentrations. Treatments included: 1) control (C), 2) ractopamine (R), 3) Synovex-S implant (I) and 4) ractopamine and implant (RI). Weights were collected monthly, while blood samples were drawn on 0, 7, 35, 79 and 105 d. No interactions were found for any trait analyzed. ADG1 were 1.42, 1.55, 1.70 and 1.72 kg/d while ADG2 were 1.43, 1.73, 1.67 and 1.81 kg/d for C, R, I and RI respectively. Synovex-S affected ADG1 ( $P=0.02$ ) but did not affect ADG2 ( $P=0.17$ ). Ractopamine tended to increase ADG2 ( $P=0.06$ ). No significant differences were found for HCW, LMA, BF, MARB, KPH or YG. Average carcass traits were HCW=357.8kg, LMA=83.1cm<sup>2</sup>, BF=1.12cm, MARB=415 (SM15), KPH=1.93% and YG=2.87. Synovex-S increased mean serum concentrations of E2 by 44% at 7 d ( $P=0.0003$ ), by 42% at 35 d ( $P=0.0001$ ), by 46% at 79 d ( $P=0.0001$ ) and 13% at 105 d ( $P=0.012$ ). Synovex-S increased mean serum concentrations of IGF-I by 43% at 7 d ( $P=0.036$ ), by 51% at 5 d ( $P=0.007$ ), by 60% at 79 d ( $P=0.011$ ) and 25% at 105 d ( $P=0.063$ ). Ractopamine did not alter serum concentration of E2 or IGF-I. Results indicate an effect of Synovex-S on IGF-I concentrations as well as on ADG1. Reduced increase on E2 and IGF-I might explain the lack of significance on ADG2 from the implant. Gene expression analysis using microarray will be performed on mRNA extracted from muscle biopsies (79 d) to identify changes in response to ractopamine and Synovex-S.

**Key Words:** Beef cattle, Implant, Ractopamine

**T193 Effects of ractopamine and implant regimens containing trenbolone acetate and estradiol on growth and carcass characteristics of feedlot steers.** T. C. Bryant<sup>\*1,2</sup>, J. J. Wagner<sup>2</sup>, S. B. Laudert<sup>3</sup>, and M. L. Galyean<sup>4</sup>, <sup>1</sup>Five Rivers Cattle Feeding, Loveland, CO, <sup>2</sup>Colorado State University, Fort Collins, <sup>3</sup>Elanco Animal Health, Greenfield, IN, <sup>4</sup>Texas Tech University, Lubbock.

Beta-adrenergic agonists and steroidal implants elicit responses via separate modes of action to increase protein deposition. Yearling steers (n = 486; initial BW = 305 kg ± 10.4 kg) were used to evaluate the effects of ractopamine (Optaflexx; Elanco; RAC) and implant/reimplant (IMP) regimen on performance and carcass traits. Steers were blocked by initial BW into six replicates and assigned randomly to treatments (9/pen). The 3 x 3 factorial arrangement included RAC doses of 0 (R0), 100 (R1), or 200 (R2) mg•steer<sup>1</sup>•d<sup>-1</sup> and IMP regimens of None/None (N/N), Revalor-S/None (S/N), or Revalor-IS/Revalor-S (I/S). Except for KPH and skeletal maturity, no RAC x IMP interactions were noted ( $P > 0.10$ ). Compared with R0, steers fed R2 had 26% ( $P < 0.001$ ) greater ADG and 27.6% ( $P < 0.001$ ) greater G:F during the final 28-d supplementation period, resulting in 4.7% ( $P = 0.009$ ) greater G:F from d 0 to slaughter. Carcasses from R2 were 6.3 kg ( $P = 0.042$ ) heavier than those from R0. Marbling, empty body fat (EBF), and quality grade did not differ among RAC treatments ( $P > 0.10$ ). For IMP, I/S cattle had 7.7% ( $P < 0.001$ ) and 23.8% ( $P < 0.001$ ) greater ADG and 4.6% ( $P = 0.007$ ) and 12.3% ( $P < 0.001$ ) greater G:F over the 168-d feeding period than S/N and N/N, respectively. The I/S steers had 12.6 kg ( $P = 0.001$ ) and 41.1 kg ( $P < 0.001$ ) greater HCW than S/N and N/N, respectively. Despite no difference ( $P > 0.10$ ) in EBF, marbling score was decreased for I/S ( $P < 0.001$ ) and S/N ( $P = 0.001$ ) relative to N/N, resulting in 14.6 and 11.4 percentage unit fewer Prime and Choice carcasses with I/S ( $P = 0.002$ ) and S/N ( $P = 0.012$ ) than

with N/N. These data suggest that the effects of IMP and RAC are independent. Further research is needed to elucidate the lipogenic and/or lipolytic effects of these classes of growth-enhancing products among the multiple fat depots.

**Key Words:** Carcass, Implants, Ractopamine

**T194 Influence of live weight at first implanting on growth performance and carcass characteristics of calf-fed Holstein steers.** R. A. Zinn<sup>1</sup>, N. Torrentera<sup>\*2</sup>, and F. Calderon<sup>2</sup>, <sup>1</sup>University of California, Davis, <sup>2</sup>UABC, Mexicali, BC, MX.

Ninety-six calf-fed Holstein (264 ± 2.8 kg) were used in a 224-d growing-finishing trial to evaluate effects of live weight (LW) at first implanting on growth performance and carcass characteristics of calf-fed Holstein steers. Treatments were: control (non-implanted) versus first implanting (Revalor-S) when calves achieve LW of 264, 295, or 327 kg. All calves were reimplanted (Revalor-S) on d 112. Steers were fed a steam-flaked corn-based growing-finishing diet. Over the 224-d feeding period, implanting increased ( $P < 0.01$ ) ADG (9%), DMI (5.3%), gain efficiency (10.3%), and dietary NEM (7.3 %) and NEg (8.8%). As LW at first implanting increased, ADG during the initial 56 d tended (linear effect;  $P < 0.10$ ) to decrease. This effect was attenuated over time. Overall, LW at first implanting did not affect ( $P > 0.20$ ) ADG. Hip height explained 70 to 81% of the variation in LW. At slaughter, implanted calves were heavier than non implanted calves, at similar HH, indicative of a greater muscle:bone ratio. There were no treatment effects on dressing percentage, averaging 62.3%. The LW at first implanting did not affect ( $P > 0.20$ ) carcass characteristics. Adjusting to a constant carcass weight, longissimus muscle area was greater (7%,  $P < 0.05$ ) for implanted than for non-implanted steers. Yield grade, fat thickness, and marbling score were not different ( $P > 0.10$ ) for implanted vs non-implanted steers. Although, implanting tended to decrease (14%,  $P < 0.10$ ) KPH. We conclude that in delay-implant programs, applying the first implant between 260 and 300 kg LW will optimize ADG and gain efficiency. When calf-fed Holsteins are slaughtered at a similar final degree of finish (fat thickness) implanting effects on growth performance efficiency are appreciable, whereas, effects on carcass quality grade are small.

**Key Words:** Holstein, Implant, Growth

**T195 Effects of supplement type and feeding frequency on performance and physiological responses of yearling Brahman-crossbred steers.** R. F. Cooke\*, C. R. Staples, X. Qui, and J. D. Arthington, University of Florida, Gainesville.

The objective of this experiment was to investigate the effects of supplement type and feeding frequency on BW gain, plasma metabolites and hormones, and voluntary forage DMI of yearling steers. Twenty four steers (Brahman x British; avg. age = 12 mo) were stratified by initial BW and randomly allocated to 12 pens (2 steers/pen). Pens were randomly assigned to one of three treatments: 1) molasses-based supplement fed 3x/wk (ML), 2) citrus pulp-based supplement fed 3x/wk (CT), or 3) citrus pulp-based supplement fed daily (CD). Treatments were formulated to be iso-caloric and iso-nitrogenous and fed at 2.1 kg of DM/steer/d. Limpoglass (Hemarthria altissima) hay was offered in amounts to ensure ad libitum intake. Steer shrunk BW was obtained at the beginning and at the end of the experiment. During the first 3 wk (d 1 to d 21), blood samples were collected immediately prior to and 4, 8, 24, 32 and 48 h after the first

supplement feeding of the week for determination of glucose, blood urea nitrogen (BUN), insulin, IGF-I, and GH concentrations. For the second phase of the experiment (d 22 to d 40), forage DMI was recorded daily. Mean BW gain was greater ( $P < 0.05$ ) for CD vs. ML, tended to be greater for CD vs. CT ( $P < 0.15$ ), but did not differ for CT vs. ML (0.30, 0.18 and 0.10 kg/d for CD, CT and ML respectively; SEM = 0.05). Forage DMI did not differ among treatments, however, a treatment x day interaction was observed ( $P < 0.05$ ) revealing a difference in forage intake pattern among treatments, whereas during non-feeding days forage DMI was greater for CT vs. ML and CD. Mean plasma concentration of glucose was lesser for CD vs. ML and CT ( $P < 0.05$ ). Mean insulin was greater for CT vs. CD and ML ( $P < 0.05$ ). Forage-fed steers offered a citrus pulp-based supplement daily had greater BW gain compared to steers offered a molasses-based supplement 3x/wk and tended to have greater BW gain compared to steers fed citrus pulp-based supplements 3x/wk.

**Key Words:** Steers, Supplement, Frequency and performance

**T196 Relative abundance of mRNA UCP2 and UCP3 in skeletal muscle and their relationship to metabolic rate in three breeds of beef heifers.** K. M. Brennan, J. J. Michal, K. A. Ross, and K. A. Johnson\*, Washington State University, Pullman.

The relative abundance of UCP2 and UCP3 mRNA from skeletal muscle of three breeds of cattle was measured to examine the variation among breeds and to relate these differences to measures of whole animal metabolic rate. Ten-month old Angus (A), Holstein (H), and Wagyu (W) heifers (N=8/breed) were used. Muscle biopsies were obtained from the biceps femoris and immediately placed in liquid nitrogen. Tissue was pulverized in liquid nitrogen and total RNA was extracted with Trizol and reverse transcribed into cDNA with Superscript III according to manufacturer's instructions. Gene specific primers for UCP2 (Forward: 5'-GTGCTGAGCTGGT-GACCTAC-3'; Reverse: 5'- CCCGAAGGCAGAAGTAAAGT-3') and UCP3 (Forward: 5'- GGGAGGCAACAGAAAGTACA-3'; Reverse: 5'- ATGTTGGCAGAATTCCTTT-3') were designed based on available bovine sequences (Accession #AF127029 and AF092048, respectively). Relative abundances of UCP2 and UCP3 were quantitated by real-time PCR using SYBR green fluorescence and normalized to expression of  $\beta$ -actin. Open-circuit, indirect respiration calorimetry was used to determine oxygen consumption ( $O_2$ ), heat production (HP) at maintenance and fasting, and MEM requirements. There were no breed differences in abundance of UCP2 or UCP3 mRNA and breed explained less than 10% of the variance observed. Relative abundance of UCP2 for A, H, and W was 0.71, 0.57, 0.58 ± 0.08, respectively. Relative abundance of UCP3 for A, H, and W was 2.02, 1.80, and 1.35 ± 0.37, respectively. Angus (113.5 kcal/kg<sup>75</sup>) and Wagyu (105.2 kcal/kg<sup>75</sup>) had lower ( $P < 0.01$ ) MEM requirements than Holstein (137.1 kcal/kg<sup>75</sup>). There was more variation in MEM between breeds (72%) than within breed (28%). When mRNA abundance was related to individual whole animal metabolic rate measurements across all breeds both UCP2 and UCP3 tended to be related to  $O_2$  consumption at maintenance ( $r = .32$ ;  $P > .13$ ). Within breed, UCP3 mRNA was correlated to MEM ( $r = -.76$ ;  $P > .02$ ) and  $O_2$  consumption ( $r = .83$ ;  $P > .06$ ) in W only. Breed differences in whole animal metabolic rate are not reflected in mRNA abundance of UCP2 and UCP3.

**Key Words:** Beef, Energetics, Uncoupling



### **T197 Physical and chemical traits of cattle carcasses from different genetic groups slaughtered at three back fat thickness end points.**

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The objective was to study the physical and chemical traits of the carcasses of 75 steers from the breeds Caracu (16), Gir (10), Guzera (19), Nellore Selection (18), which were submitted for selection of weight at 375 days of age, and 12 steers from the Nellore control group. The animals were slaughtered at three back fat thickness end points (3.0, 5.0, and 7.0 mm), assessed by ultrasound. As the animals reached the desired fat end point, they were slaughtered and their carcasses were evaluated. The Caracu animals had larger ( $P<0.05$ ) percentage of muscle (Caracu=62.16; Gir=58.75; Guzera=58.42; Nellore Control=56.69; Nellore Selection=56.34), a smaller percentage of fat (Caracu=22.58; Gir=26.16; Guzera=27.10; Nellore Control=29.28; Nellore Selection=29.09) and a higher muscle/fat ratio (Caracu=2.75; Gir=2.24; Guzera=2.16; Nellore Control=1.94; Nellore Selection=1.94). The greatest proportion of fat was observed in the Nellore Selection and Nellore Control animals. As the fat end point got thicker (7.0 mm), the proportions ( $P<0.05$ ) of muscle decreased and the percentage of fat increased (muscle/fat ratio at: 3.0mm=2.44; 5.0mm=2.11; 7.0mm=2.02). The subcutaneous fat thickness (in mm) estimated by ultrasound (US) and the actual (AC) subcutaneous fat thickness, obtained by direct carcass measurement (Caracu - US=4.51, AC=4.57; Gir - US=5.29, AC=5.88; Guzera - US=5.91, AC=5.86; Nellore Control - US=5.24, AC=5.22; Nellore Selection - US=5.39, AC=6.17) did not differ ( $P>0.05$ ) within groups, with the exception of Nellore Selection group ( $P<0.05$ ). The same was observed in the rib eye area (measured in cm<sup>2</sup>), by ultrasound, and in the actual loin eye area, obtained by direct carcass measurement, which, with exception of Guzera group, did not differ ( $P>0.05$ ) within groups (Caracu - US=72.02, AC=77.92; Gir - US=64.61, AC=64.19; Guzera - US=73.44, AC=69.83; Nellore Control - US=68.97, AC=70.25; Nellore Selection - US=71.80, AC=71.06). In conclusion, ultrasonography is a reliable tool to assess carcass characteristics in live animals across groups and back fat end points.

**Key Words:** Ultrasound, Rib eye area, Subcutaneous fat thickness

### **T198 Comparison of net protein requirements for growth of bulls, steers, and heifers of Nellore x Red Angus crossbreds.**

M. L. Chizzotti\*<sup>1,2</sup>, S. C. Valadares Filho<sup>1</sup>, L. O. Tedeschi<sup>2</sup>, G. E. Carstens<sup>2</sup>, F. H. M. Chizzotti<sup>1,2</sup>, P. M. Amaral<sup>1</sup>, T. I. Rodrigues<sup>1</sup>, D. M. Oliveira<sup>1</sup>, and P. D. B. Benedeti<sup>1</sup>, <sup>1</sup>Universidade Federal de Vicosa, Vicosa, MG, Brazil, <sup>2</sup>Texas A & M University, College Station.

Net protein requirement for gain (NPg) depends on the lean tissue content of the empty body gain (EBG), which may vary among gender, breed, and growth rate. A comparative slaughter trial was conducted at the Federal University of Vicosa in Brazil with 36 F1 Nellore x Red Angus calves (12 steers, 12 bulls, and 12 heifers), averaging 274 kg BW. Three animals from each gender were slaughtered at the beginning of the trial to determine the initial body composition. The remaining calves (3 animals of each gender) were randomly assigned to three treatments: maintenance level (70% of corn silage, DM basis) or fed at 0.75 or 1.5% of BW with corn silage being offered ad libitum. The diets were isonitrogenous (12.5% CP, DM basis). After three growing periods of 28 d, all animals were slaughtered. The cleaned gastrointestinal tract, organs, carcass, head, hide, tail, feet, blood and tissues were weighed to assess empty BW (EBW). These parts were ground separately and subsampled for chemical analyses. For each animal, within a period, the DMI was measured daily. There were no

differences ( $P>0.05$ ) in the NPg among genders. The NPg (g/kg EBG) equation of the pooled data was  $0.5795 \times \text{EBG} \times \text{EBW}^{-0.2425}$ , indicating an NPg requirement of 148 and 128 g for animals with 250 and 450 kg BW, respectively. The percentage of RE deposited as protein (REp) increased as content of RE in the gain (REc, Mcal/kg EBG) decreased. The REp equation of the pooled data was  $0.3671 - 0.0461 \times \text{REc}$ . Our findings support the hypothesis that REp is negatively correlated with REc. However, our data indicated no differences in NPg for bulls, steers and heifers of Nellore x Red Angus crossbreds fed high levels of forage.

Sponsored by FAPEMIG/CAPES, Brazil.

**Key Words:** Cattle, Comparative slaughter, Growth

### **T199 Comparison of energy requirements for maintenance and growth of steers, bulls, and heifers of Nellore x Red Angus crossbreds.**

M. L. Chizzotti\*<sup>1,2</sup>, S. C. Valadares Filho<sup>1</sup>, L. O. Tedeschi<sup>2</sup>, G. E. Carstens<sup>2</sup>, F. H. M. Chizzotti<sup>1,2</sup>, D. M. Oliveira<sup>1</sup>, P. D. B. Benedeti<sup>1</sup>, P. M. Amaral<sup>1</sup>, and T. I. Rodrigues<sup>1</sup>, <sup>1</sup>Universidade Federal de Vicosa, Vicosa, MG, Brazil, <sup>2</sup>Texas A & M University, College Station.

The Beef Cattle National Research Council recognizes the effect of species (*Bos Taurus* and *Bos Indicus*) and gender (steers, bulls, and heifers) on energy requirements for maintenance and growth. A comparative slaughter trial was conducted at the Federal University of Vicosa in Brazil with 36 F1 Nellore x Red Angus calves (12 steers, 12 bulls, and 12 heifers), averaging 274 kg BW. Three animals from each gender were slaughtered at the beginning of the trial, to determine the initial body composition. The remaining calves (3 animals of each gender) were randomly assigned to three treatments: maintenance level (70% of corn silage, DM basis) or fed at 0.75 or 1.5% of BW of concentrate with corn silage being offered ad libitum. The diets were isonitrogenous (12.5% CP, DM basis). After three growing periods of 28 d, all animals were slaughtered. The cleaned gastrointestinal tract, organs, carcass, head, hide, tail, feet, blood, and tissues were weighed to assess empty BW (EBW). These parts were ground separately and subsampled for chemical analyses. For each animal within a period, the DMI were measured daily and samples of feces were collected to determine the diet digestibility, using indigestible ADF as a marker. There were no differences ( $P>0.05$ ) in the energy requirements for maintenance and growth among genders. The combined data indicated a NEM of 71.25 kcal/kg<sup>0.75</sup> EBW and a MEM of 100.4 kcal/kg<sup>0.75</sup> EBW, with a partial efficiency of use of ME to NE for maintenance of 0.71. The average partial efficiency of use of ME to NE for growth was 0.52. The RE (Mcal/d) equation of the pooled data was  $\text{RE} = 0.0575 \times \text{EBW}^{0.75} \times \text{EBG}^{1.1030}$ . These findings suggest the energy requirement of crossbred *Bos Indicus* x *Bos Taurus* for maintenance might be lower than that of pure *Bos Taurus*.

Sponsored by FAPEMIG/CAPES, Brazil.

**Key Words:** Cattle, Comparative slaughter, Growth

### **T200 Maintenance energy requirements of Nellore bulls in Brazil.**

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It is well established that the net energy required for maintenance of *Bos taurus* beef cattle is approximately 77 kcal.kg<sup>-0.75</sup>. However, for *Bos indicus* cattle, particularly the Nellore breed that comprises more

than 85% of the Brazilian herd, the energy required for maintenance appears to be lower. The maintenance energy requirements of Nellore cattle have been estimated in Brazil, but little effort has been made to gather data from different studies and to analyze them as a whole to increase confidence in the estimates. Therefore, the objective in this study was to estimate the energy required for maintenance of Nellore cattle, using data obtained from the Brazilian literature. Individual observations were collected from seven different trials comprising 135 intact Nellore males that averaged 303 kg (SD = 62.0 kg) empty body weight. Retained energy (RE) was obtained by comparative slaughter, metabolizable energy (ME) intake (MEI) was measured directly, and heat production was calculated as the difference between MEI and RE. Metabolizable energy intake ranged from 122 kcal.kg<sup>-0.75</sup> (maintenance level) to 352.02 kcal.kg<sup>-0.75</sup> (high energy intake). The ME required for maintenance (ME<sub>m</sub>) was estimated using traditional and orthogonal regressions. The orthogonal regression equation obtained for RE on MEI was: RE = - 0.0457 + 0.398 \* MEI (r<sup>2</sup> = 0.67). Rearranging and solving for RE = 0, ME<sub>m</sub> = 0.114 Mcal.kg<sup>-0.75</sup>.d<sup>-1</sup>. Considering efficiency of utilization of ME for maintenance as 0.64 (the mode of the 7 experiments), a value of NE<sub>m</sub> = 0.73 Mcal.kg<sup>-0.75</sup>.d<sup>-1</sup> was obtained, which is 18% lower than the NRC (2000) recommendation for intact males (0.77 x 1.15 = 0.89 Mcal.kg<sup>-0.75</sup>.d<sup>-1</sup>). It can be concluded that Nellore cattle indeed have lower endogenous energy expenditures than *Bos taurus* cattle.

**Key Words:** Beef cattle, Energy, Nellore cattle

**T201 Predicting dry matter intake of Nellore cattle in Brazil.** P. V. R. Paulino<sup>\*1</sup>, S. C. Valadares Filho<sup>1</sup>, E. Detmann<sup>1</sup>, J. A. G. Azevêdo<sup>2</sup>, D. S. Pina<sup>1</sup>, M. I. Marcondes<sup>1</sup>, M. A. Fonseca<sup>1</sup>, and R. D. Sainz<sup>3</sup>, <sup>1</sup>Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil, <sup>2</sup>Universidade Estadual de Santa Cruz, Ilhéus, Bahia, Brazil, <sup>3</sup>University of California, Davis.

Dry matter intake (DMI) is a factor that must be estimated before an animal's diet can be properly calculated. Given the fact that it is almost

impossible to account for the many factors that control feed intake, empirical equations have been developed for its prediction. Almeida et al. (2005) published an equation to predict feed intake of Nellore cattle in Brazil, based on BW and NE<sub>m</sub>, (Eq. 1), but limited validation has been conducted. Thus, the objective in this study was to test that equation and to develop an alternative one that could be largely adopted by the Brazilian beef cattle industry. A data set of 144 individual observations (8 experiments) was used to challenge Eq. 1. A second data set comprised of 155 records on Nellore males (14 trials) was used to develop the new equation, which was validated using a third independent data set of 66 animals. Eq. 1 did not precisely predict the DMI of Nellore cattle, as evidenced by both the slope (β<sub>1</sub>) and intercept (β<sub>0</sub>) of the regression of observed on estimated values, which were significantly different from 1 and 0 (P<0.01) respectively. The evaluation of the MSPE indicated that Eq. 1 was accurate but lacked in precision. The equation overpredicted DMI when actual DMI was low. Conversely, as DMI increased it was underestimated by the equation, showing a not precise prediction pattern. The equation developed using the backward regression procedure of SAS was: DMI (kg/d) = 0.872 + 5.1645 \* ADG - 1.6624 \* ADG<sup>2</sup> + 0.00002882 \* BW<sup>2</sup> (r<sup>2</sup> = 0.79); where ADG = average daily gain (kg/d) and BW = body weight (kg). The variables presented in the model are easily measured and are frequently available, making the adoption of this equation by the Brazilian cattle industry a more practical approach. The validation of this new equation showed that β<sub>1</sub> and β<sub>0</sub> were not statistically different from 1 and 0 respectively (P>0.22). The correlation between predicted and observed values (r=0.89) was high. It can be concluded that the equation based on ADG and BW predicts DMI of individual Nellore cattle more accurately and precisely than the Eq. 1. Depending upon the purpose, nutritionists have another alternative to estimate DMI.

**Key Words:** Beef cattle, Feed intake, Validation

## Ruminant Nutrition: Minerals & Vitamins

**T202 Net requirements of macrominerals for growth of steers, bulls, and heifers of Nellore x Red Angus crossbreds.** M. L. Chizzotti<sup>\*1,2</sup>, S. C. Valadares Filho<sup>1</sup>, L.O. Tedeschi<sup>2</sup>, G. E. Carstens<sup>2</sup>, F. H. M. Chizzotti<sup>1,2</sup>, M. A. Fonseca<sup>1</sup>, L. F. C. Silva<sup>1</sup>, and M. I. Marcondes<sup>1</sup>, <sup>1</sup>Universidade Federal de Vicosa, Vicosa, MG, Brazil, <sup>2</sup>Texas A & M University, College Station.

A comparative slaughter trial was conducted at the Federal University of Vicosa in Brazil aiming to determine the net requirements of Ca, P, Na, K and Mg. Thirty-six F1 Nellore x Red Angus calves (12 steers, 12 bulls, and 12 heifers), averaging 274 kg BW, were utilized. At the beginning of the trial, three animals from each gender were slaughtered to determine the initial body composition. Three animals of each gender were randomly assigned to two treatments in which diets were offered at 0.75 or 1.5% of BW of concentrate. The diets were based on corn silage and were isonitrogenous (12.5% CP, DM basis). After three growing periods of 28 d, all animals were slaughtered. The cleaned gastrointestinal tract, organs, carcass, head, hide, tail, feet, blood, and tissues were weighed to determine the empty BW (EBW). These parts were ground separately and subsampled for chemical analyses. The log of the contents of each mineral in the empty body was regressed on the log of the EBW to estimate the net requirement for each mineral per kg of empty body gain (EBG). There were no differences (P>0.05) in the net requirements for growth of all macrominerals among genders.

The equations of the pooled data of the net requirements for growth (g/kg EBG) were: 0.33256×EBW<sup>-0.63666</sup> for Ca, 0.11214×EBW<sup>-0.56146</sup> for P, 0.01085×EBW<sup>-0.39924</sup> for Na, 0.00401×EBW<sup>-0.15304</sup> for K, and 0.00359×EBW<sup>-0.46205</sup> for Mg. The mean EBW was 0.9244×BW. Our findings indicated that an animal of 250 kg BW would require 9.342, 4.804, 1.155, 1.698, and 0.269 g/kg EBG of Ca, P, Na, K, and Mg, respectively, and an animal of 450 kg BW would require 6.426, 3.453, 0.913, 1.552, and 0.205 g/kg EBG of Ca, P, Na, K, and Mg, respectively. The net requirements of Ca, P, Na, K, and Mg for growth decrease as BW increase.

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**Key Words:** Cattle, Comparative slaughter, Growth

**T203 Dietary factors affecting phosphorus digestion in lactating cows.** T. H. Yang<sup>\*1</sup>, K. F. Knowlton<sup>1</sup>, C. Shang<sup>1</sup>, E. Schwab<sup>2</sup>, D. Berry<sup>1</sup>, L. Zelazny<sup>1</sup>, N. Whitehouse<sup>3</sup>, K. Pence<sup>1</sup>, and C. Schwab<sup>3</sup>, <sup>1</sup>Virginia Polytechnic Institute and State University, Blacksburg, <sup>2</sup>University of Wisconsin, Madison, <sup>3</sup>University of New Hampshire, Durham.

The objective of the study was to evaluate the effect of forage and non-fiber carbohydrate content on duodenal and fecal P flow. Eight