

**Table 1.** Final weight and carcass traits according to the supplementation strategy

	Conc. suppl.				P-value				
	Dry season		Compensatory gain		Continuous	CV, %	Conc	Continuous or tactical conc.	Season of tactical suppl.
	Control	Control	Control	Control					
ADG, kg/d	0.460	0.487	0.533		0.590	10.1	0.005	0.006	0.144
Loin eye area, cm <sup>2</sup>	62.5	64.1	65.1		66.9	7.52	0.221	0.356	0.734
Fat thickness, mm									
at the 12th rib	3.65	4.02	3.67		3.77	17.4	0.597	0.822	0.368
at the P8 rump site	3.15	3.25	3.78		4.53	18.2	0.037	<0.01	0.184

**Key Words:** carcass, ultrasound, tropical production

**M260 Determination of net energy requirements of growing Nellore cattle.** S. L. Posada<sup>1</sup>, A. L. C. C. Borges<sup>\*2</sup>, R. R. Noguera<sup>1</sup>, N. M. Rodríguez<sup>2</sup>, R. R. Silva<sup>2</sup>, C. G. Pancoti<sup>2</sup>, and H. F. Lage<sup>2</sup>, <sup>1</sup>Universidad de Antioquia, Medellín, Antioquia, Colombia, <sup>2</sup>Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil.

In 1968 Lofgreen and Garrett introduced a net energy (NE) system designed for use in beef cattle, adopted by NRC (1996). Their equations were developed using *Bos Taurus* cattle. The objective of this study was to determine the NE requirements for maintenance and weight gain in growing Nellore cattle by calorimetry. Five Nellore bulls were confined at the Federal University of Minas Gerais (Belo Horizonte, Brazil), receiving *Cynodon* spp. hay, corn and soybean meal, from 200 to 450kg BW. Heat production (HP) was quantified by open circuit indirect calorimetry at 3 feeding levels: ad libitum, restricted and fasting. The Brouwer (1965) equation was used to estimate HP resulting from respiratory exchange and urinary nitrogen excretion:  $HP \text{ (kcal)} = 3.866 O_2 + 1.200 CO_2 - 0.518 CH_4 - 1.431 N$ . NE<sub>m</sub> requirement was determined by linear regression between the log of HP and the metabolizable energy intake (MEI) for the ad libitum and restricted levels and also by measuring the fasting heat production (FHP) of the animals. The NE<sub>g</sub> requirement was calculated by the difference between MEI and HP during ad libitum feeding. Data were analyzed by a repeated-measures design, using the PROC MIXED procedure of SAS (2001). The NE<sub>m</sub> and NE<sub>g</sub> requirements are shown in Table 1. Lofgreen and Garrett (1968) found 77 kcal/kg EBW<sup>0.75</sup> for NE<sub>m</sub>, which was lower than the values found. NE<sub>m</sub> requirements showed a decreasing trend with increasing BW. That could be explained by lower weight proportion of organs and body protein as age increases. Retained energy (ER, NE<sub>g</sub>) values (kcal/kg EBW<sup>0.75</sup>) obtained were within the range described by Lofgreen and Garrett (1968).

**Table 1.** Energy requirements (in kcal/kg EBW<sup>0.75</sup>) for maintenance (NE<sub>m</sub>) and gain (NE<sub>g</sub>) in experimental periods

Item	Period							
	1		2		3		4	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
NE <sub>m</sub> <sup>1</sup>	116.03 <sup>a</sup>	15.03	92.36 <sup>b</sup>	15.95	91.97 <sup>b</sup>	10.68	84.14 <sup>b</sup>	26.44
NE <sub>m</sub> <sup>2</sup>	123.53 <sup>a</sup>	25.64	93.92 <sup>b</sup>	3.45	98.07 <sup>b</sup>	7.02	83.19 <sup>b</sup>	9.30
NE <sub>g</sub>	11.54 <sup>b</sup>	12.81	24.79 <sup>ab</sup>	14.84	39.23 <sup>a</sup>	18.34	26.41 <sup>ab</sup>	13.45

<sup>a,b</sup>In a row, means without a common letter differ ( $P < 0.05$ ).

<sup>1</sup>Obtained by regression.

<sup>2</sup>Obtained by respirometric technique.

**Key Words:** zebu, tropical conditions, respirometry

**M261 Supplementation of fattening steers on Marandu pasture in the summer: intake and digestibility.** J. W. K. Koscheck<sup>1,\*</sup>, J. T. Zervoudakis<sup>1</sup>, L. K. Hatamoto-Zervoudakis<sup>1</sup>, L. S. Cabral<sup>1</sup>, A. A. Oliveira<sup>1</sup>, J. M. B. Benatti<sup>1</sup>, D. M. G. Carvalho<sup>1</sup>, R. P. Silva<sup>1</sup>, and R. G. F. Silva<sup>1</sup>, Federal University of Mato Grosso, Cuiabá, MT, Brazil.

The objective was to evaluate intake and digestibility on fattening cattle on Marandu grass pastures supplemented with different levels of the total digestible nutrients (TDN). Four cattle, with an initial average weight of 512kg, rumen fitted and distributed in 4 paddocks, in 4x4 Latin square design, were used. The supplements were composed of mineral mixture, ground grain corn, soybean hulls, toasted soybean grain, and urea. Supplements to levels of 800, 1600 and 2400 g/animal/day, containing respectively 500, 1000 and 1500g of TDN, called S500, S1000, S1500, were provided to fulfill 300 g of crude protein (CP)/animal/day, besides the control group which received only mineral mixture. Each period lasted 17 d, 5 d for adaptation and forage collecting and 9 d for evaluation of the intake and digestibility. To estimate the intake, chromium oxide was used as external indicator and the indigestible NDF as internal indicator. Collecting of feces was made in 3 d at different collection times. SNK test was used for averages comparison. There was no statistical difference in the total dry matter intake (TDMI) and dry matter intake of pasture; however, there was a numerical increase in the TDMI with a trend to the replacement in the intake of forage for supplement. The intake of ethereal extract (EE) and non-fibrous carbohydrates (NFC) was higher for the animals fed with S1500 ( $P < 0.10$ ), which can be explained by the increased supply of supplement.

**Table 1.** Intake and digestibility of cattle supplemented with levels of TDN

	Supplements				CV (%)
	MM	S500	S1000	S1500	
Intake, kg/d					
Total DM	10.22	10.86	11.15	12.11	25.59
Pasture DM	10.15	10.06	9.55	9.71	27.98
CP	1.22	1.51	1.45	1.46	25.25
EE	0.41 <sup>b</sup>	0.51 <sup>ab</sup>	0.55 <sup>ab</sup>	0.61 <sup>a</sup>	27.06
NFC	1.46 <sup>b</sup>	1.64 <sup>b</sup>	2.03 <sup>b</sup>	2.51 <sup>a</sup>	31.70
Digestibility					
OM	53.2	52.1	54.1	54.5	9.91
NDF	49.8	49.7	50.2	50.6	9.86

<sup>a,b</sup>Means within the row with different letters differ ( $P < 0.10$ ).

**Key Words:** grazing animals, supplement

**M262 Performance, feed efficiency and ultrasound carcass traits of Nellore cattle with different classes of residual gain.** M. H. A. Santana<sup>\*1</sup>, R. C. Gomes<sup>2</sup>, S. L. Silva<sup>1</sup>, J. B. S. Ferraz<sup>1</sup>, and P. R. Leme<sup>1</sup>, <sup>1</sup>College of Animal Science and Food Engineering, University of São Paulo, Pirassununga, SP, Brazil, <sup>2</sup>State University of Londrina, Londrina, PR, Brazil.

The residual gain (RG) was proposed as a measure that estimates the weight gain according to feed intake and body weight (Koch et al., 1963; J. Anim. Sci., 22:486). With the objective to verify the differences between RG classes in performance, feed efficiency and ultrasound carcass traits in Nellore cattle (bulls n = 141, 21-mo old 385 kg initial BW; steers n = 224, 20-mo old, 350 kg initial BW), we computed the average daily gain (ADG), dry matter intake (DMI), feed conversion ratio (F:G), residual feed intake (RFI) and the gain of ribeye area (GREA), gain of backfat thickness (GBFT) and gain of rumpfat thickness (GRFT) measured by ultrasound. Residual gain was calculated by regression of ADG in DMI, metabolic BW (BW superscript 0.75), contemporary

group, and sex. The animals were divided into 2 classes according to the standard deviation of RG (high > 0.5 SD and low < 0.5 SD). The RG class effect was analyzed by ANOVA and the means were compared with Tukey test with a 5% probability level. Only the DMI, as expected, did not differ ( $P > 0.05$ ) between the RG classes as well as GREA. The high RG group had ( $P < 0.05$ ) higher ADG, GBFT and GRFT and lower F:G and RFI when compared with low RG group. An improvement in the RG may increase the deposition of fat on the carcass, the weight gain and improving feed efficiency without affecting the feed intake.

**Key Words:** growth, *Bos indicus*, intake

**M263 Effect of diet type on the expression of genes regulating ruminal epithelium function of cattle.** A. K. Kelly<sup>\*1</sup>, S. M. Waters<sup>2</sup>, K. Keogh<sup>1,2</sup>, E. O'Shea<sup>1,2</sup>, and D. A. Kenny<sup>2</sup>, <sup>1</sup>*School of Agriculture and Food Science, University College Dublin, Dublin, Ireland*, <sup>2</sup>*Teagasc, Animal Bioscience Department, Dunsany, Co. Meath, Ireland*.

The objective of this study was to investigate the effect of varying dietary concentrate to forage content on the expression of genes encoding for enzymes involved in the absorption and metabolism of VFA, ion transporters and transcription factors in ruminal epithelial tissue of cattle. Forty-eight Holstein-Friesian bull calves were assigned to one of 3 post-weaning dietary regimens; namely, grazed pasture only (n = 17; G); pasture plus 2 kg DM of concentrate (n = 16; GC) or ad-libitum concentrate plus 1 kg of straw (n = 15; C), fed indoors. Animals were slaughtered at 8 mo of age and ruminal epithelial tissue was harvested from the ventral sac of the rumen. Tissue from 10 animals per treatment was then selected for use in the current study. Total RNA was extracted and primers were designed to amplify specific regions of 25 genes involved in ruminal absorptive metabolism. Samples of rumen digesta were also collected at slaughter for VFA analysis, determined using gas chromatography. Ruminal VFA concentration was greatest for C and similar for G and GC. Acetic acid was highest for G and lowest for C (63.1 v 55.3 mol/mol VFA;  $P < 0.05$ ). Conversely, propionic acid concentrations were greatest for C and lowest for G (32.1 v 23.2 mol/mol VFA;  $P < 0.05$ ). The ratio of acetic:propionic was highest for G and lowest for C. There was no difference between dietary treatments ( $P > 0.10$ ) for N-butyric, Iso-valeric or N-valeric acids. mRNA expression for Acetyl-CoA-Synthetase was greatest for C, intermediate for GS and lowest for the G treatments. Differences in expression was also detected between treatments ( $P < 0.05$ ) for key genes involved in the ketogenesis pathway viz. Acetyl-CoA-Trans, HMGL, BDH1 and BDH2. An effect of diet type ( $P < 0.05$ ) was also observed for genes involved in cholesterologenic homeostasis, namely ACAT2, HMGCS2 and ABCA1, with higher expression detected for C compared with GC, which in turn was higher than G. Interestingly, similar dietary effects were also observed for transcription factors PPAR- $\alpha$  and SREBP2 believed to regulate these biochemical events. Moreover, the relative expression values for the ion transporters NHE2, and NHE3 were greatest for C, lowest for G and intermediate for GC. These results suggest that the biochemical pathways involved in ion exchange and VFA metabolism, in particular ketogenesis and associated regulatory transcriptional coordinators were upregulated in rumen epithelial tissue, in a linear fashion, with increased concentrate allowance. This study provides further evidence for the elucidation of the molecular mechanism regulating ruminal absorptive metabolism.

**Key Words:** VFA metabolism, rumen, nutrient absorption

**M264 Correlations between arrival plasma amino acid concentrations and feedlot performance and effects of arrival sex and antibiotic treatments in high-risk calves.** C. L. Maxwell<sup>\*1</sup>, S. J. Terrill<sup>1</sup>, J. W. Dillwith<sup>2</sup>, R. D. Madden<sup>2</sup>, M. L. May<sup>3</sup>, G. K. Kim<sup>3</sup>, S. L. Parr<sup>3</sup>, C. W. Booker<sup>3</sup>, C. R. Krehbiel<sup>1</sup>, and L. O. Burciaga-Robles<sup>3</sup>, <sup>1</sup>*Department of Animal Science, Oklahoma State University, Stillwater*, <sup>2</sup>*Department of Entomology and Plant Pathology, Oklahoma State University, Stillwater*, <sup>3</sup>*Feedlot Health Management Services Ltd., Okotoks, AB, Canada*.

Data from 2 experiments was pooled and used to determine correlations between arrival plasma AA concentrations and 60 d feedlot performance, and the effects of arrival sex (Bull vs. Steer) and antibiotic treatment (Trt vs. No Trt) on arrival AA concentrations. Beef calves (n = 281; BW = 259  $\pm$  9.5 kg) were processed and administered metaphylactic treatment for control of BRD. Bulls were elastrated and all animals were allocated to individual feed intake systems (40 animals/pen; GrowSafe Systems, Ltd., Airdrie, Canada) and fed for 60 d. Cattle were observed by trained personnel for detection and treatment of disease. Twenty-three calves were administered an antibiotic treatment, and 33 bulls were elastrated. Pearson correlation coefficients were calculated using PROC CORR (SAS 9.3, Cary, NC) examining the relationship between arrival AA concentration and 60 d feedlot performance. The effects of sex and antibiotic treatment on AA concentration were analyzed using PROC GLIMMIX. Animal was the experimental unit, and the model included the fixed effect of treatment and the random effects of pen and sex nested within trial. For all cattle, glutamic acid had a negative correlation to DMI, ADG, and G:F (-0.185, -0.307, -0.272, respectively;  $P < 0.05$ ) for the 60 d period. Serine, alanine, and 4-hydroxyproline had negative correlations ( $P < 0.05$ ), and glycine, leucine, ornithine, and histidine had positive correlations ( $P < 0.05$ ) to d 0–60 G:F. For calves treated, leucine and isoleucine concentrations tended to be increased ( $P \leq 0.12$ ) compared with calves never treated. Calves that arrived as bulls had higher total, gluconeogenic, branched-chain, aromatic, and non-essential AA concentrations ( $P < 0.05$ ) than those that arrived as steers. These data indicate that a relationship exists between arrival AA concentrations and feedlot performance, and AA concentrations are increased in bulls compared with steers. However, there appears to be no relationship between arrival AA concentrations and subsequent antibiotic treatment.

**Key Words:** amino acid concentration, BRD, feedlot performance

**M265 Evaluation of the acid insoluble ash technique as a method for determining apparent diet digestibility in beef cattle.** E. J. Mc Geough<sup>\*1,2</sup>, D. A. Kenny<sup>2</sup>, and P. O'Kiely<sup>1</sup>, <sup>1</sup>*Teagasc Animal & Grassland Research and Innovation Centre, Grange, Dunsany, Co. Meath, Ireland*, <sup>2</sup>*School of Agriculture, Food Science and Veterinary Medicine, University College Dublin, Dublin, Ireland*.

The objective was to determine if the acid-insoluble ash (AIA) method provided accurate estimates of in vivo apparent diet digestibility compared with the standard total fecal collection (TFC) method. Twelve Holstein-Friesian steers, mean LW 328 (SD 27.3) kg, were assigned to 1 of 3 blocks on a descending LW basis and randomly allocated, from within block, to 1 of 4 diets based on either whole-crop wheat (WCW) or grass silage (GS) in a 4  $\times$  4 Latin square design. The 3 WCW silages were based (DM basis) on ratios of grain to straw plus chaff as follows: 11:89, 26:74 and 47:53. The fourth treatment was GS. Each period within the Latin square was 28 d, with all silages offered for ad libitum consumption for 15 d after which time, the amount of silage offered to each animal was limited to 0.90 of its ad libitum intake. A concentrate supplement (2.60 kg) was offered to each animal in a single feed daily.