

Ruminant Nutrition: Beef Cattle

M287 Impact of corn processing method and soy glycerin on fecal shedding from cattle inoculated with *Escherichia coli* O157:H7. D. Paulus*, R. Fink, F. Diez-Gonzalez, J. Jaderborg, G. Crawford, and A. DiCostanzo, *University of Minnesota, St. Paul.*

An experiment was conducted comparing the effects of soy glycerin (GLY), dry rolled corn (DRC), and steam flaked corn (SFC) on *Escherichia coli* O157:H7 shedding in cattle. Twenty-eight Holstein steer calves (160 ± 18 kg) were assigned randomly to one of 4 dietary treatment resulting from a 2 × 2 factorial arrangement (DRC vs. SFC and GLY vs. no GLY) of treatments in a completely randomized design. Diets contained (DM basis): 35% modified distillers grains with solubles, 8% grass hay, 9% supplement, and either 0 or 10% soy glycerin, with the balance of the diet made up of either SFC or DRC. Soy glycerin replaced corn in the 10% soy glycerin treatments. Cattle were inoculated with a dose of 10¹¹ cfu per calf with a cocktail of 4 *E. coli* O157:H7 strains resistant to 2 specific antibiotics (nalidixic acid and rifampin) at the start of the 20-d experiment. Individual fecal samples from each animal were collected 3 times weekly over the course of the experiment. Concentrations of *E. coli* O157:H7 in fecal samples were determined through enumeration on selective medium and reported in cfu/g. Data were analyzed using the Proc Mixed procedure of SAS. No significant differences ($P \geq 0.05$) in *E. coli* O157:H7 concentrations were found between the treatments. Overall average fecal counts of *E. coli* O157:H7 decreased ($P \leq 0.05$) over time from 4.5 to less than 1.0 log cfu/g 20 d after inoculation. Results from this experiment indicate that neither soy glycerin inclusion nor corn processing method stimulated the shedding of artificially inoculated *E. coli* O157:H7. Therefore, under the conditions of our experiment, we conclude that feeding soy glycerin and processed corn had little impact on the colonization of cattle by *E. coli* O157:H7.

Key words: cattle, *Escherichia coli*, glycerin

M288 Different levels of urea in concentrate supplementation of grazing cattle during the transition period of dry to rainy seasons under tropical conditions. A. G. Silva¹, H. J. Fernandes², L. O. Tedeschi³, M. F. Paulino¹, S. A. Lopes¹, and A. A. Rocha¹, ¹Federal University of Viçosa, Viçosa, MG, Brazil, ²State University of Mato Grosso do Sul, Aquidauana, MS, Brazil, ³Texas A&M University, College Station.

The objectives of this study were to evaluate the effect of concentrate supplementation and of levels of urea in this concentrate on the nutrient intake and nutrient digestibility of grazing animals during the transition period of dry to rainy seasons. Five young bulls with average BW of 286 ± 21 kg were used in a 4 × 4 Latin square design, with an extra animal. The animals were housed in *Brachiaria decumbens* stapf. pasture and received one of the following supplements during each period: ad libitum mineral (control) or 1.5 kg/d of concentrated supplements (32% of CP) formulated with corn, soybean meal, and 0, 4, or 8% of urea. Each experimental period had 9 d for adaptation and 3 d for consumption and digestibility evaluation. A commercial isolated, purified, and enriched lignin product (LIPE[®]) was used as the fecal excretion marker and the indigestible NDF was used as an indicator of intake. The concentrate DMI was measured directly. The pastures were hand sampled. The feces samples were collected during 3 d at different times. The effect of the concentrate supplementation and the linear and quadratic effects of the urea levels were evaluated by orthogonal contrasts. The concentrate supplementation reduced the

pasture DM and the NDF intakes and increased the CP intake without affect the total DMI. These results showed a substitution effect of the concentrate consumption, reducing the pasture consumption. The digestibility was not affected by the concentrate supplementation. The urea level did not affect the intake or the digestibility of any nutrient.

Table 1. Intake and digestibility in animals supplemented with concentrate with different urea levels

	Supplements					P-value		
	Control	Urea level in concentrate			CV (%)	Concentrate effect	Linear effect of urea	Quadratic effect of urea
0%		4%	8%					
Intake, kg/d								
DM	6.45	6.67	6.52	6.75	9.24	0.562	0.852	0.588
Pasture DM	6.45	5.27	5.13	5.39	11.0	0.005	0.758	0.564
CP	1.08	1.37	1.33	1.39	12.7	0.009	0.839	0.606
NDF	3.76	3.30	3.20	3.34	8.57	0.016	0.856	0.362
Digestibility, %								
OM	65.3	68.8	68.0	69.7	5.82	0.126	0.723	0.591
NDF	63.9	67.4	66.8	67.5	4.97	0.708	0.959	0.709

Key words: grazing animals, supplementation

M289 Effects of monensin on rumen metabolism of steers fed 60% dried distillers grains diets. T. L. Felix¹, N. A. Pyatt², and S. C. Loerch¹, ¹The Ohio State University, Wooster, ²Elanco Animal Health, Greenfield, IN.

The S in dried distillers grains with solubles (DDGS) may cause sulfide toxicosis either by inhalation of hydrogen sulfide gas (H₂S) or absorption of sulfides across the rumen wall. Inhalation of H₂S causes S-induced polioencephalomalacia (PEM). Therefore, methods of mitigating H₂S production are needed. Monensin affects acetogenic bacteria by reducing acetate and hydrogen ions. Reduction in hydrogen ions may decrease H₂S formation. Results are conflicting regarding the role of ionophores on H₂S production in vitro. The objectives of this study were to determine the effects of monensin on ruminal pH, H₂S, and organic acids. Eight ruminally fistulated steers (BW = 610 ± 56 kg) were used in a replicated 4 × 4 Latin Square design and assigned to 1 of 4 treatments: 1) 0 mg monensin/kg diet, 2) 22 mg monensin/kg diet, 3) 33 mg monensin/kg diet, and 4) 44 mg monensin/kg diet. The diet was 60% DDGS, 10% corn silage, 15% supplement, and 15% corn on a DM basis and was offered once per day. Calculated dietary S concentration was 0.48%. Periods were 14 d for diet adjustment and 1 d for sample collections (0, 1.5, 3, 6, 9, 12 and 18 h post-feeding). There was no effect ($P = 0.99$) of monensin on DM intake. There was no effect ($P = 0.40$) of monensin on ruminal H₂S concentration. Ruminal H₂S increased from an average of 1913 ppm at 0 h to 4682 ppm within 1.5 h after feeding and remained elevated up to 12 h after feeding for all treatments. Rumen pH was not affected by treatment; however, mean rumen pH dropped from 6.04 to 5.09 within 1.5 h after feeding and was below 5.0 for all treatments up to 12 h after feeding. Despite the low rumen pH and high H₂S concentrations, steers did not suffer clinical symptoms of acidosis or PEM. Rumen liquid sulfide was not affected by time or treatment (range: 14.0 to 38.7 ppm). Rumen concentrations of acetate (A), propionate (P), and A:P were not affected ($P > 0.05$) by monensin supplementation (means at 3 h post-feeding: 53.9 μmol/mL, 57.0 μmol/mL, and 0.95, respectively). Contrary to some in

vitro data, our study suggests that monensin does not increase the risk of S-induced PEM when cattle are fed 60% DDGS diets.

Key words: cattle, dried distillers grains, monensin

M290 Carcass composition of mature cows subjected to a nutritional restriction and two levels of compensatory growth. K. O. Barros¹, H. J. Fernandes^{*1}, G. L. D. Feijó², M. A. Rezende^{2,3}, H. O. A. Santana¹, E. Rosa¹, L. M. Paiva¹, and J. C. Souza⁴, ¹State University of Mato Grosso do Sul, Aquidauana, MS, Brazil, ²EMBRAPA Beef Cattle Center, Campo Grande, MS, Brazil, ³Federal University of Grande Dourados, Dourados, MS, Brazil, ⁴Federal University of Mato Grosso do Sul, Aquidauana, MS, Brazil.

The objective of this study was to evaluate the effect of nutritional restriction followed by 2 ADG rates (0.5 and 1.5 kg/d) during the compensatory growth phase. Fifteen Nellore mature cows were maintained on pasture during May to August in 2010 (dry season). Five cows were kept under maintenance level (i.e., without BW variation) and 10 cows were kept under nutritional restriction by adjusting the stocking rate of the pastures. In August, the animals were moved to a feedlot and had their diet adjusted according to the following 3 treatments: animals in the maintenance group were fed to maintain no BW change (Control) and animals in nutritional restriction group were divided into 2 groups that received diets to allow ADG of 0.5 (T1) or 1.5 (T2) kg/d. Cows were slaughtered after 84 d. The percentage of bone, muscle, and fat tissues were estimated using the composition of the 9–11th rib section (Hankins and Howe procedure). The effects of the nutritional restriction and of the ADG after nutritional restriction were evaluated by orthogonal contrasts. Animals subjected to nutritional restriction (T1 and T2) had more bone tissues (13.4%) than those in the control group (11.5%) ($P = 0.022$). In animals subjected to nutritional restriction, those in T1 had greater (14.5%) content of bone than those in T2 (12.4%) ($P = 0.043$). Animals in T1 and T2 showed a lower content of adipose tissue in the carcass (28.9%) than the control ones (35.5%) ($P = 0.031$). The ADG after nutritional restriction did not affect the fat content in the carcass. The content of muscle in the carcass was not affected by the nutritional restriction or the ADG after this nutritional restriction.

Key words: cattle, nutritional restriction, growth

M291 Combined use of ionophore and virginiamycin on feeding behavior of Nellore steers fed high concentrate diets. A. J. C. Nuñez^{*1}, V. V. Almeida², R. C. Gomes¹, F. T. Mercado¹, I. E. Borges¹, J. Guerra¹, F. Pinese¹, P. R. Leme¹, and J. C. M. Nogueira Filho¹, ¹USP/FZEA, Pirassununga, SP, Brazil, ²USP/ESALQ, Piracicaba, SP, Brazil.

The objective in this research was to evaluate feeding behavior of zebu cattle fed high grain diets and supplemented with salinomycin (SL), virginiamycin (VM) or their combinations. Eight ruminally cannulated Nellore steers, weighing 321 ± 25 kg, were randomly allocated in a 4×4 replicated Latin square design (16-d periods), in a 2×2 factorial arrangement, with 2 SL levels (0 and 13 ppm) and 2 VM levels (0 and 15 ppm). Animals were housed in individual pens and fed a total mixed ration once daily at 0800 h, with 80% concentrate (60.1% dry ground corn) on DM basis. Feeding behavior was monitored visually over a 24-h period, when eating and ruminating activities were noted every 5 min and assumed to persist for the entire 5-min interval. Total chewing time was calculated as the sum of total time spent eating and ruminating, and total resting time was calculated as the difference between

1440 min and total chewing time. A ruminating bout was defined as at least 5 min of ruminating activity followed by at least 5 min of any other activity. Statistical analyses were conducted using the GLM procedure of SAS. There were no interactions between SL and VM levels for any analyzed variable. Total time spent eating (min/d) and number of ruminating bouts per day were not influenced ($P > 0.05$) by treatments. Steers receiving VM spent 47.8 min/d longer ruminating (376.9 ± 62.9 vs. 424.7 ± 52.9 min/d for 0 and 15 ppm of VM, respectively; $P < 0.01$) and tended to spend 2.5 min more per ruminating bout (27.1 ± 2.5 vs. 29.6 ± 2.0 min/bout for 0 and 15 ppm of VM, respectively; $P = 0.06$) when compared with non-supplemented animals. As a result of longer rumination time, VM treated animals also spent more time chewing (580.3 ± 72.6 vs. 625.9 ± 74.8 min/d for 0 and 15 ppm of VM, respectively; $P = 0.03$) and less time resting (859.7 ± 72.6 vs. 814.1 ± 74.8 min/d for 0 and 15 ppm of VM, respectively; $P = 0.03$) in comparison with non-supplemented steers. These results suggest that Nellore steers receiving 15 ppm of VM may spend more time chewing as a consequence of a healthier ruminal environment.

Key words: antibiotics, beef cattle, salinomycin

M292 Performance and carcass traits of beef bulls fed crude glycerin in the diet. J. P. I. S. Monnerat, P. V. R. Paulino*, S. C. Valadares Filho, I. M. De Oliveira, L. H. P. Da Silva, R. Mezzomo, M. S. Duarte, and S. F. Dos Reis, Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil.

The purpose of this study was to evaluate the effect of replacing corn grain with crude glycerin (CG) on performance, carcass traits, and yield of commercial carcass cuts of beef bulls finished on feedlot. The CG used was derived from soybean biodiesel production (84.41% glycerol, 6.94% fat, and 8.64% methanol). Thirty-four Nellore \times Angus bulls were used in the study, with an average initial body weight of 343.9 ± 16.56 kg. Four animals were randomly chosen and slaughtered at the beginning of the experiment to determine initial dressing percent. The remaining animals ($n = 30$) were randomly distributed into 5 treatments (6 replicates): 0, 5, 10, 15 and 20% of CG on diet DM, replacing finely ground corn in the concentrate. The animals were fed isoproteic diets (13% CP) containing 50% corn silage and 50% concentrate, DM basis. At the end of the experiment, all animals were slaughtered, and their gastrointestinal tracts were emptied to determine their empty body weight (EBW). Statistical analyses were conducted using PROC GLM of SAS. No significant effects ($P > 0.05$) of increasing CG levels on the diet were observed for most of the variables evaluated: average daily gain (1.98 kg), dry matter intake (9.56 kg/d), feed efficiency (0.207), EBW gain (2.04 kg/d), carcass daily gain (1.45 kg/d), subcutaneous fat thickness (5.28 mm), rib eye area (75.08 cm²) and dressing (59.72%). On the other hand carcass length increased linearly ($P < 0.05$), chuck yield increased quadratically, while shoulder clod yield decreased in a quadratic manner ($P < 0.05$) as CG inclusion in the diet increased. There was no effect ($P > 0.05$) of CG inclusion on the diet on the yield of other carcass cuts: flank (13.75%), sirloin (17.82%) and round (27.47%). It can be concluded that CG inclusion up to 20% of DM on beef bulls diets (roughage to concentrate ratio of 50:50) of DM does not compromise animal performance and carcass traits.

Key words: biodiesel, by-product, Nellore

M293 Effect of dietary urea-N levels on growth performance and blood biochemical indexes of growth-finishing cattle. L. Jiang*, Y. L. Huo, L. P. Ren, Z. M. Zhou, and Q. X. Meng, State Key Labora-

Journal of Animal Nutrition, College of Animal Science and Technology, China Agricultural University, Beijing 100193, China.

As an economic non protein nitrogen (NPN) source, urea is widely used as a substitute of intact feed proteins in ruminant animals, especially in beef cattle. A 91-d feeding trial was conducted using 60 growing-finishing Limousin crossbred bulls to determine the effect of dietary urea levels on growth performance and blood biochemical indexes in a randomized complete block design. The treatment diets were 6 supplemental urea levels in the diets (% DM basis): 0, 0.4, 0.8, 1.2, 1.6 and 2.0, respectively. All experimental diets (60: 40 ratio of concentrate to roughage) were iso-nitrogenous (14% CP on DM basis) with urea-N accounting for 0, 8, 16, 24, 32 and 40% of total dietary N on DM basis. The concentrations of dietary metabolic energy (ME) were balanced at similar levels (ranged from 2.70 to 2.74 Mcal/kg) by using different level of corn grains, corn starch and cottonseed meal. The results showed that as dietary urea level increased, daily DM intake and feed conversion efficiency were not affected significantly ($P > 0.10$), but ADG was quadratically decreased ($Q; P < 0.01$) with a breaking point appearing at 24% urea-N level, suggesting urea-N level at less than 24% of total dietary N had no adverse effect on growth performance of growing bulls. Increasing dietary urea-N level from 24% to 40% resulted in remarkable increased concentrations of blood biochemical indexes such as serum urea-N ($Q; P < 0.05$), total proteins ($Q; P < 0.01$), free ammonia ($L; P < 0.01$), alanine aminotransferase (ALT) ($L; P < 0.01$), aspartate aminotransferase (AST) ($L; P < 0.001$) and creatine kinase ($L; P < 0.05$), respectively. These observations indicated that when urea included diets with about 2.7 Mcal ME/kg DM and 14% CP were fed growing-finishing crossbred bulls, the dietary urea-N up to 24% of total dietary N may have somewhat adverse effect on their physiological or metabolic functions. In conclusion, when safe and effective utilization of dietary urea-N was considered for growth-finishing cattle, the urea-N supplementation level at less than 24% of total dietary N should be recommended in practice.

Key words: growing-finishing cattle, growth performance, urea

M294 In situ ruminal protein degradability of distiller's grain varying grain source and milling process in beef cattle. C. Li^{1,2}, W. Z. Yang¹, J. Q. Li², Y. L. Li³, and A. Furtado¹, ¹Agriculture and Agri-Food Canada, Research Centre, Lethbridge, AB, Canada, ²College of Animal Science, Inner Mongolia Agricultural University, Hohhot, Inner Mongolia, China, ³Feed Research Institute, Chinese Academy of Agricultural Sciences, Beijing, China.

An in situ study was conducted to determine ruminal protein degradability of grain and dried distillers grains with solubles (DDGS) varying grain sources (corn vs. wheat) and milling processes (traditional vs. fractional) using fistulated steers. Five different batches of wheat, wheat DDGS (WDDGS), corn, corn DDGS (CDDGS) and fractional DDGS (FDDGS) were collected from 3 different plants located in western Canada or USA. The cattle were fed a diet containing 60% barley silage and 40% barley concentrate. Ruminal microbes were labeled using ¹⁵N(NH₄)₂SO₄ to correct the ruminal bacterial contamination. Five grams of feed were incubated in situ in the rumen of 3 steers for 0, 2, 4, 6, 12, 16, 24 and 48 h. The model $y = a + b(1 - e^{-ct})$ was fitted to determine degradation kinetics of CP, where y is CP degraded, a is soluble fraction, b is slowly degradable fraction, c is degradation rate constant, and t is incubation time. Effective degradability (ED) was determined by $ED = a + [bc/(c+k)]$, where $k = 0.06/h$. Protein contents were 16, 38, 8, 29 and 42% of DM, respectively, for wheat, WDDGS, corn, CDDGS and FDDGS. The fraction a was the highest

($P < 0.05$) for wheat (27%), WDDGS (27%), corn (28%), the medium for CDDGS (24%), and the lowest for FDDGS (7%). In contrast, the fraction b was higher ($P < 0.05$) for FDDGS (60%) than for CDDGS (49%), and was not different for other 3 feeds (66 to 72%). The degradation rate varied ($P < 0.01$) substantially from 3 to 23%/h among 3 feeds. The ED of CP was reduced ($P < 0.01$) by 35%, 28% and 45%, respectively, for WDDGS, CDDGS and FDDGS compared with the parent grains. Correction for bacterial CP contamination on the in situ residues increased ($P < 0.01$) 10% of the ED for corn and FDDGS, but had no change in the ED of other 3 feeds. The results indicate that ruminal CP degradability of DDGS vary considerably with grain source and milling process.

Key words: DDGS, in situ, ruminal protein degradation

M295 Effects of monensin and probiotics on finishing Nellore bulls performance, carcass characteristics, and liver abscesses. C. Sitta¹, A. M. Pedrosa², G. B. Mourão¹, R. Carareto¹, J. R. R. Dórea¹, T. G. Neri¹, D. A. Rodrigues¹, W. F. Angolini¹, and F. A. P. Santos^{*1}, ¹University of São Paulo, Piracicaba, SP, Brazil, ²Embrapa Cattle Southeast, São Carlos, SP, Brazil.

The objective of the present study was to determine the effect of feeding no feed additives, monensin, yeast culture and a commercially available combination of yeast and probiotic bacteria, on performance and carcass characteristics of cattle fed high starch diets. Ninety-three Nellore bulls with an initial BW of 320 kg were used in a 109-d randomized complete block design feeding trial. Animals were blocked by initial BW and assigned randomly to 16 pens. Animals were raised on pasture and they were adapted to the final diet during the first 21 d of the experimental period. The final diet contained (%DM): 12% tifton grass hay, 78.1% finely ground corn, 6% sugar cane molasses, 1.4% urea, 2.5% mineral and vitamin premix and respective feed additives. Treatments consisted in: 1) Control (no feed additives); 2) Sodium monensin, 30mg/kg DM; 3) Yeast (*Saccharomyces cerevisiae*), 10 g/animal/day (10^9 cfu/g); 4) Yeast + probiotic bacteria, 3 g/animal/day [*Saccharomyces cerevisiae* (3.33×10^5 cfu/g) + *Bifidobacterium bifidum* (3.33×10^6 cfu/g), *Lactobacillus acidophilus* (3.33×10^6 cfu/g), *Lactobacillus plantarum* (1.66×10^6 cfu/g), *Enterococcus faecium* (1.66×10^6 cfu/g)]. Data were analyzed using the mixed procedure of SAS (1999) with pen as experimental unit. Monensin decreased DMI ($P < 0.1$) compared with the control diet. Average daily gain, feed efficiency and carcass characteristics were not affected by treatments ($P > 0.05$), however, the not significant ($P > 0.05$) 6% better feed conversion for monensin compared with the control diet is in agreement with most of the literature data. The NE values of the diets for BW maintenance and gain (calculated based on DMI, BW and ADG) were not affected by treatments ($P > 0.05$). No liver abscesses were observed.

Table 1. Performance and carcass characteristics of finishing bulls fed differing feed additives for a 109-d period

	Control	Monensin	Yeast	Yeast + bacteria	P-value
Initial BW, kg	321.5	321.5	321.4	321.5	0.587
Final BW, kg	485.71	474.98	488.91	481.2	0.743
DMI, kg	9.35	8.25	9.33	9.20	0.094
ADG, kg	1.50	1.41	1.53	1.46	0.758
DMI/ADG	6.27	5.89	6.09	6.28	0.652
Dressing, %	52.06	55.36	53.56	55.9	0.524
Fat thickness, mm	3.43	3.50	3.60	3.59	0.985
LM area, cm ²	70.81	67.51	69.30	69.0	0.368
NE _m , (Mcal/kg DM)	1.87	1.98	1.90	1.86	0.34
NE _g , (Mcal/kg DM)	1.23	1.33	1.25	1.22	0.31

Key words: additives, feedlot, monensin

M296 Effect of feeding alfalfa hay and starter concentrate containing two different levels of fiber on feed intake, body weight gain and feed efficiency. A. Salary Neya*, M. H. Fathi, H. Naeemipour, and H. Farhangfar, *Birjand University, Birjand, Southern Khorasan, Iran.*

The experiment was conducted to determine the effect of alfalfa hay and starter fiber on feed intake, feed efficiency and daily gain. In this study, 32 male Holstein calves at the age of 3 d were assigned to 4 diets with a 2 × 2 factorial completely randomized design, with 8 replications. The experiment was ended 3 weeks after weaning. Two main factors included adding alfalfa hay to diet and the level of Starter fiber, so the 4 experimental treatments were as follows: T1: starter with low fiber and without hay, T2: starter with low fiber along with hay, T3: starter with high fiber and without hay, and T4: starter with high fiber along with hay. The data were analyzed by a linear model in which the effects of fiber and alfalfa and interaction between them were included. Statistical comparisons among different means were carried out by Tukey-Cramer test. The model was fit by SAS software. Results showed that effect of adding hay to the diet and level of starter fiber had no significant effect on feed intake before weaning, after weaning, and throughout entire trial. The level of fiber on Starter had significant on daily gain of calves in the whole period ($P < 0.05$), so that T2 and T4 had greater weight gain than T1 and T3 as well as feed efficiency after weaning and during the entire period by treatments was affected significantly so that T2 and T4 had a higher efficiency than T1 and T3 ($P < 0.05$). It could be therefore concluded that addition of starter fiber to the diets of young calves appears to favorably alter the rumen environment, resulting in an increased daily gain and feed efficiency.

Key words: male Holstein calves, fiber, starter

M297 Effects of supplementation of organic, inorganic or a 50/50 mix of selenium on gene expression profiles in the longissimus dorsi muscle of maturing Angus beef heifers. K. M. Brennan*, J. A. Boling², R. Xiao¹, D. Mallonee¹, R. F. Power¹, and J. C. Matthews², ¹Alltech Center for Animal Nutrigenomics and Applied Animal Nutrition, Nicholasville, KY, ²Department of Animal and Food Sciences, University of Kentucky, Lexington.

The aim of this study was to investigate gene expression patterns in the longissimus dorsi (LD) muscle of beef heifers in response to different sources of selenium (Se) supplementation. Forty Angus heifers

were assigned ($n = 10$) to 4 Se treatments for 224d. The basal diet contained 0.08 mg Se/d, whereas the mineral supplements provided no additional Se (control, C), or 3 mg Se/d as inorganic (sodium selenite, SS), organic (Sel-Plex, SP), or a 50/50 mix (Mix). On d224, heifers were slaughtered and samples (~1g) were taken from the LD and flash frozen. Se content in the LD was greater in SP and Mix heifers than C or SS ($P \leq 0.01$). Gene expression profiles were evaluated using the Affymetrix bovine genome array. In the LD, 79, 127 and 170 genes were differentially expressed ($P \leq 0.05$, fold-change ≥ 1.2) in SS, SP and Mix heifers, respectively. Of these genes, only 19 were commonly affected by all 3 Se treatments. Ingenuity pathway analysis revealed that heifers supplemented with SS, SP or Mix had both common and differential pathway enrichment. Top biological functions (molecular and cellular function) upregulated with SS supplementation included cell cycle, cell death and amino acid metabolism. Top upregulated biological functions associated with SP included cell morphology, cellular assembly and organization, and cellular development. Top upregulated biological functions associated with Mix supplementation included lipid metabolism, molecular transport and small molecule biochemistry. All 3 Se sources commonly affected the top biological functions: cellular movement, cell cycle and cell to cell signaling and interaction. Taken together these data indicate that gene expression patterns in longissimus dorsi tissue of beef heifers are dependent on both Se supplementation and on Se source.

Key words: selenium, beef heifer, microarray

M298 Effect of zilpaterol hydrochloride supplementation feeding duration on growth performance and carcass characteristics of feedlot heifers. J. C. Robles-Estrada*, H. Dávila-Ramos¹, A. Estrada-Angulo¹, A. Plascencia², F. G. Ríos¹, and R. A. Zinn³, ¹Universidad Autónoma de Sinaloa, Culiacán, Sinaloa, México, ²Universidad Autónoma de Baja California, Mexicali, B.C., México, ³University of California-Davis, El Centro.

Forty-eight crossbred heifers (392.1 ± 24 kg) were used in a 50-d feeding trial (4 pens per treatment in a randomized complete design) to performance and hot carcass weight as covariate in carcass traits) to evaluate the effect of feeding duration of zilpaterol hydrochloride (0.15 mg/kg of live weight daily) on growth performance and carcass characteristics. Heifers were fed a diet based on steam flaked corn (2.07 Mcal of NE_m/kg). Cattle fed zilpaterol for the last 0, 20, 25 or 30 d at the end of the finishing period and withdrawn from zilpaterol for the last 3 d on feed. Daily DMI averaged 8.11 ± 0.73 kg and was not affected ($P \geq 0.84$) by treatments. Compared with the controls, zilpaterol increased ($P = 0.01$) carcass adjusted final live weight (3.62%), ADG (27%, $P = 0.03$), gain:feed ratio (28.4%, $P < 0.01$) and apparent dietary NE_m (17.2%, $P < 0.01$). Zilpaterol supplementation did not affect yield grade ($P = 0.09$), USDA quality grade ($P = 0.17$), fat thickness ($P = 0.30$) and KPH fat ($P = 0.73$), but compared with the control group, increased HCW (2.9%, $P = 0.02$), carcass dressing percentage (2.5%, $P = 0.04$) and LM area (8.2%, $P = 0.05$). Reducing zilpaterol feeding duration from 30 to 20 d did not affect ($P > 0.45$) both, growth performance or carcass characteristics. We conclude that zilpaterol administration improved growth performance, HCW, carcass dressing percentage and LM area. Responses to zilpaterol supplementation could be observed since 20 d of zilpaterol supplementation.

Key words: heifers, performance, zilpaterol

M299 Feeding tannins to reduce nitrogen losses from feedlot cattle fed high protein diets containing distillers grains 1. Animal performance and plasma urea nitrogen. K. M. Koenig*, K. A. Beauchemin, and S. M. McGinn, *Agriculture and Agri-Food Canada, Research Centre, Lethbridge, Alberta, Canada.*

Inclusion of distillers grains as an energy source in diets of feedlot cattle increases the protein concentration to levels often exceeding requirements. Excess feed N is largely excreted as urea in urine, a labile form of N with potential for loss to the environment. A completely randomized design with 148 crossbred steers (425 ± 4.3 kg, initial BW) was conducted to determine the effects of feeding condensed tannins (CT), recognized for protein binding effects, with high protein diets on performance and plasma urea N (PUN). Steers were allocated to 16 pens with 4 pens per treatment. The basal diet contained 92% barley grain concentrate and 8% barley silage (DM basis) and was fed as a total mixed ration once per day. The 4 dietary treatments included control (no corn distillers dried grains and solubles, DG0), 20% DG (DG20), 40% DG (DG40) and 40% DG with 2.5% CT (DG40CT) from *Acacia mearnsii* (black wattle tree). Cattle were weighed on 2 d at the start and end of the experiment and on 1 d every 3 wk in between. The DMI was determined from feed offered daily andorts at the end of each 3-wk period. Blood samples were collected from 5 cattle per pen when they were weighed, and PUN was determined as a relative indicator of protein status and urinary excretion of urea N. Data for DMI for each pen, BW, ADG, G:F and PUN for each animal were analyzed as a mixed linear model with diet, time (repeated measure) and diet x time as fixed effects and pen as the experimental unit. The CP content of the diets was 13.2, 15.9, 20.4 and 19.4% for DG0, DG20, DG40 and DG40CT, respectively. There was no effect ($P > 0.05$) of the treatments on DMI (12.0 ± 4.3 kg/d), final BW (621 kg ± 2.5), ADG (1.98 ± 0.07 kg/d), G:F (165 ± 5 g/kg) and carcass traits. The PUN ($P < 0.05$, SEM 6.0 mg N/L) was lowest in cattle fed DG0 (113 mg N/L), highest in cattle fed DG40 (170 mg N/L) and intermediate in cattle fed DG20 (153 mg N/L) and DG40CT (146 mg N/L). Feeding CT to beef cattle fed a high protein diet reduced PUN without altering performance, suggesting lower urinary urea N excretion.

Key words: condensed tannins, distillers grains, finishing cattle

M300 Feeding tannins to reduce nitrogen losses from feedlot cattle fed high protein diets containing distillers grains 2. Nutrient digestibility and route of nitrogen excretion. K. M. Koenig*, K. A. Beauchemin, and S. M. McGinn, *Agriculture and Agri-Food Canada, Research Centre, Lethbridge, Alberta, Canada.*

Eight ruminally cannulated beef heifers (427 ± 41 kg, initial BW) were used in a replicated 4×4 Latin square to determine the effects of feeding condensed tannins (CT) with high protein diets containing corn distillers grains on nutrient digestibility and route of N excretion. Periods were 5 wk with 2 wk for transition to the diet, 1 wk for adaptation to CT and 2 wk for measurements. The basal diet contained 92% barley grain concentrate and 8% barley silage (DM basis) and was fed as a total mixed ration once per day. Dietary treatments included control (no corn distillers dried grains and solubles, DG0), 20% DG (DG20), 40% DG (DG40) and 40% DG with 2.5% CT (DG40CT) from *Acacia mearnsii* (black wattle tree). Data were analyzed using a mixed linear model with diet as a fixed effect, and square, period within square and animal within square as random effects. The CP content of the diets was 12.9, 16.8, 20.4 and 20.5% for DG0, DG20, DG40 and DG40CT, respectively. Feed offered and refused were measured daily. Urine and feces were quantitatively collected for 5 d. There was no effect ($P >$

0.05) of CT on DMI, but the inclusion of 40% DG (without and with CT) in the diet decreased ($P < 0.05$) DMI compared with 20% DG. As a result, N intake was similar among heifers fed DG20, DG40 and DG40CT (313 g N/d), and was lower ($P < 0.05$, SEM 18 g N/d) for heifers fed DG0 (220 g N/d). Total tract digestibility of N was similar ($P > 0.05$, SEM 1.1%) among heifers fed DG0, DG20 and DG40 (78.4%), and due to the protein binding effects of CT, was reduced ($P < 0.05$) in heifers fed DG40CT (70.6%). Reduction of N digestibility reflected a shift in N excretion from urine to feces in heifers fed DG40CT compared with DG40 ($P < 0.05$). Feeding CT with 40% DG reduced the amount of N excreted in urine by 17% compared with heifers fed 40% DG and was equivalent to the amount excreted by heifers fed 20% DG. Feeding CT to cattle fed high protein diets shifted the route of N excretion from urine to feces, although there was a 3% decrease ($P < 0.05$) in total tract OM digestibility.

Key words: condensed tannins, distillers grains, nitrogen excretion

M301 Potential modulation of the inflammatory response associated with enteropathogenic *Escherichia coli* infections in young calves using Actigen. A. Aris¹, E. Rodriguez*¹, A. Tort¹, M. Terré¹, F. Fàbregas¹, K. A. Jacques³, and A. Bach^{1,2}, ¹*Ruminant Production, Institut de Recerca i Tecnologia Agroalimentàries (IRTA), Caldes de Montbui, Barcelona, Spain*, ²*Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Barcelona, Spain*, ³*Center for Animal Nutrigenomics and Applied Animal Nutrition, Alltech, Nicholasville, KY.*

Ten male Holstein calves were distributed in 2 groups to evaluate the potential of Actigen (Alltech) to modulate the inflammatory response elicited by enteropathogenic *Escherichia coli* (EPEC). The control (CTR) calves were fed a basal milk replacer, and Actigen (ACT) calves were fed the same milk replacer plus Actigen at the rate of 1g/head/day. After 42 d, calves were euthanized and segments of mid-jejunum harvested. Explants were retreated again with 0.5 mg Actigen ex vivo or incubated with a control media for 1 h at 37°C. Tissues were then either incubated in a control medium (CTR) or the same medium with 1×10^8 cfu of EPEC for 7h in a 5% CO₂ at 37°C. Supernatant and tissue samples were taken to analyze cytokines. Data were analyzed using a mixed-effects model accounting for the fixed effects of in vivo, ex vivo, infection, and all their 2-way interactions, and the random effect of animal nested within the interaction between in vivo and ex vivo. The ex vivo infection with EPEC infection triggered an inflammatory response by increasing ($P < 0.05$) the levels of pro-inflammatory cytokines IL-1 β (135.64 and 206.44 pg/ml for CTR and EPEC, respectively) and IFN- γ (30.80 and 46.51 pg/ml for CTR and EPEC, respectively) and decreasing ($P < 0.05$) the levels of anti-inflammatory cytokine TGF- γ (107.77 and 68.72 mRNA ratio to β -actin for CTR and EPEC, respectively). Both Actigen supplementation in vivo and in vivo plus ex vivo modulated EPEC inflammatory response through the downregulation of IFN- γ (12.39, 0.07, and 1.18 pg/ml for CTR, ACT in vivo, and ACT in vivo-ex vivo, respectively) and the upregulation of IL-10 (1.16 and 1.46 mRNA ratio to β -actin for CTR and ACT in vivo-ex vivo, respectively). At tissue level the production of IL-1 β was lower ($P < 0.05$) in ACT (121.51 pg/ml) than in CTR (230.44 pg/ml). These results indicate that Actigen has a positive effect on intestinal tract, regulating not only the inflammatory response triggered by an infection, but also modulating the basal inflammatory response of the tissue.

Key words: inflammation, EPEC infection, Actigen

M302 Effects of crude protein levels on the concentrate supplement on gas production from carbohydrate in vitro degradation of Elephant grass. M. A. C. Danes*, J. R. R. Dorea, and F. A. P. Santos, *University of Sao Paulo/Esalq, Piracicaba, SP, Brazil.*

The trial was conducted to evaluate the effects of concentrate crude protein (CP) levels on gas production from carbohydrate in vitro degradation of Elephant grass (*Penisetum purpureum*) intensively managed. Hand-plucked samples of intensively managed Elephant grass 'Cameron' (18.5% CP; 58.7% NDF) were dried at 55°C, ground at 1 mm and incubated alone or in a 60:40 forage:concentrate ratio with concentrates based on fine ground corn and soybean meal with 3 levels of CP (8.7 – only corn, 13.4 and 18.1% DM). Ruminal inoculum was collected from a protein supplemented grazing animal. Degradation rates (kd) were estimated by the cumulative gas production semi-automated method (Mauricio et al., 1999). Gas pressure was measured at 1, 2, 3, 4, 6, 8, 10, 12, 14, 17, 20, 24, 28, 36, 48, 72 96 and 120 h after incubation. The final gas volume and kd from fibrous (F) and non-fibrous (NF) carbohydrate and lagtime were calculated according to Pell and Schofield (1993) model. The energy concentrate (8.7% CP) affected fibrous degradation, increasing ($P < 0.05$) its kd, decreasing ($P < 0.05$) lagtime and increasing ($P < 0.05$) gas production per unit of NDF incubated (corrected fibrous carbohydrate volume, cFvol). Those results suggest that the limiting nutrient in diets based on intensively managed tropical grasses is the energy and the supply of that nutrient through an energetic concentrate can improve fiber degradation and might result in better animal performance. The addition of protein through soybean meal did not result in any further improvements and reduced cFvol, most likely due to lack of energy.

Table 1. Volume of gas (vol; mL) and kd (%/h) from non-fibrous (NF) and fibrous (F) carbohydrates, corrected Fvol (mL/g FDN) and lagtime (h) of Elephant grass (P) incubated alone or mixed with concentrates with 8.7, 13.4 or 18.1% CP

	P	P+8.7	P+13.4	P+18.1	SE
NFvol	73.8 ^c	121.9 ^b	157.7 ^a	139.3 ^{ab}	5.5
NFkd	3.55 ^b	5.20 ^a	4.34 ^{ab}	4.20 ^{ab}	0.15
Lagtime	4.97 ^a	3.38 ^b	4.80 ^a	4.53 ^{ab}	0.26
Fvol	101.7 ^a	81.9 ^b	57.0 ^c	55.5 ^c	1.9
cFvol	577.4 ^b	696.4 ^a	481.9 ^c	444.0 ^c	15.6
Fkd	0.99 ^b	1.72 ^a	1.10 ^b	1.07 ^b	0.09

^{a-c}Means within the row with different letters differ ($P < 0.05$).

Key words: ruminal degradation, supplementation, tropical pasture

M303 Effect of 2,4-thiazolidinedione in finishing beef cattle growth performance and carcass traits. M. Arévalo*, L. González-Dávalos, A. Kunio, J. D. Garza, J. L. Dávalos, O. Mora, and A. Shimada, *Universidad Nacional Autónoma de México, Querétaro, Querétaro, México.*

Thiazolidinediones (TZDs) are insulin sensitizing agents, which are used as adipogenic agents. 2, 4-TZD, is a synthetic ligand of peroxisome proliferator activated receptor- γ (PPAR γ the main adipogenic transcription factor). The objective of this study was to evaluate the effect of 2, 4-TZD on bovine carcass characteristics. Seventeen Limousin bulls (18 mo old and 350 kg BW) were assigned into 2 treatments: control and 2, 4-TZD (8mg/70 kg BW). The bulls received daily 2 kg of alfalfa hay and 6 kg of a 15% CP; 2.8 Mcal ED/kg DM supplement based on corn, sorghum, soybean meal; the amount offered was adjusted throughout the feeding trial. Orts were removed, weighed,

and recorded daily. Bulls were weighed and blood samples obtained from the coccygeal vein at 28-d intervals to determine glucose, triglycerides, and 2, 4-TZD. Animals were slaughtered when they reached 500 kg BW. DNA, RNA and protein were determined in liver, subcutaneous, kidney and omental adipose tissue and skeletal muscle to determine protein synthesis rate and cellular size. PPAR α , δ and γ mRNA expression was measured by qPCR in liver and skeletal muscle and PPAR γ mRNA expression in subcutaneous adipose. All data were statistically analyzed, growth performance and carcass data as a randomized blocks; laboratory measurements were analyzed using a model for a completely randomized design. No significant differences were found ($P > 0.1$) in productive (daily weight gain, days at feedlot) and carcass quality (carcass yield, rib eye area, fat thickness) parameters. Muscle synthesis was greater in control animal ($P < 0.05$), while size was greater in 2, 4-TZD treatment ($P < 0.05$). Respect to PPARs expression in liver PPAR α , δ and γ were lower in 2, 4-TZD treatment vs. control ($P < 0.01$), in muscle; in subcutaneous adipose tissue no differences were found for PPAR γ mRNA expression. The results suggest the potential use of 2, 4-TZD in beef cattle diets, because it not only improves adipose tissue differentiation, but also liver and muscle fatty acid oxidation (by an increase in PPAR α expression), that therefore could result in improvements in energy efficiency.

Key words: TZD, PPAR, beef cattle

M304 Evaluation of rumen protozoa counting under influence of a polyclonal antibody preparation against lactate-producing and proteolytic bacteria in cows fed different energy sources. C. Marino*², W. Otero¹, C. Barreto³, V. Pellizari³, F. Ferreira¹, M. Arrigoni², and P. Rodrigues¹, ¹University of Sao Paulo, FMVZ-USP, Pirassumunga, Sao Paulo, Brazil, ²University of Sao Paulo State, FMVZ-UNESP, Botucatu, Sao Paulo, Brazil, ³University of Sao Paulo, ICB II-USP, Sao Paulo, Sao Paulo, Brazil.

Nine ruminally cannulated cows fed different energy sources were used to evaluate an avian-derived polyclonal antibody preparation (PAP) against specific ruminal bacteria *Streptococcus bovis*, *Fusobacterium necrophorum*, *Clostridium aminophilum*, *Peptostreptococcus anaerobius* and *Clostridium sticklandii* and monensin (MON) on rumen protozoa counting. The experimental design was 3 Latin squares 3 \times 3 distinguished by the main energy source in the diet [dry-ground corn grain (CG), high moisture corn silage (HMCS) or citrus pulp (CiPu)]. Inside each Latin square, animals received one of the feed additives per period (21 d) [none (CON), MON or PAP]. Sample collection for quantitative protozoa analysis were performed at 21 d of each period at 4 h after morning meal collected by manual scanning of rumen floor. Data were analyzed by MIXED procedure, which separated the effects of interaction between feed additive and energy source, effect of feed additive, effect of energy source as well as effects of period and animal inside the square. Mean effects were separated by PDIF. Differences were declared at $P < 0.05$. Relative count of *Entodinium* was influenced by the type of energy source ($P = 0.0467$). Animals treated with CG and HMCS showed greater values of these protozoa when compared with animals receiving CiPu but do not differ between them. It was observed feed additive effect for *Isotricha* ($P = 0.0404$). The group treated with PAP showed great values for relative count compared with CON. The MON group did not differ from the others 2. Also, it was observed an energy source effect for *Isotricha* ($P = 0.0008$), where the animals fed CiPu showed greater relative count than animals fed HMCS and CG that did not differ between them. Polyclonal antibodies plus CiPu addition in the diet resulted in

an increase of relative counting of *Isotricha* protozoa that indicates a possible effect on ruminal microbial population.

Key words: feed additive, microorganism, passive immunization

M305 Inclusion of triticale dried distiller grains with or without oilseeds reduces growth performance but increase alpha-linolenic acid and lowers trans 10 C18:1 fatty acid of subcutaneous fat in finishing beef cattle. M. L. He*^{1,2}, T. A. McAllister¹, H. Sultana¹, M. Oba³, M. E. R. Dugan⁴, J. P. Kastelic¹, and J. J. McKinnon², ¹Lethbridge Research Centre, Agriculture and Agri-Food Canada, Lethbridge, AB, Canada, ²University of Saskatchewan, Saskatoon, SK, Canada, ³University of Alberta, Edmonton, AB, Canada, ⁴Lacombe Research Centre, Agriculture and Agri-Food Canada, Lacombe, AB, Canada.

Flaxseed (FS) and sunflower seed (SS) have been included in finishing diets of beef cattle to increase beef omega-3 fatty acids. Triticale dried distiller's grain with solubles (TDDGS) is a byproduct of the ethanol industry that has been substituted for barley grain in finishing diets. Steers (n = 90; 455 ± 31 kg) were housed in individual pens (n = 15 per treatment) and given ad libitum access to 1 of 6 diets: 1) control (CON) diet (DM basis) consisted of 90% barley grain - 10% barley silage, with barley concentrate substituted for; 2) 30% TDDGS; 3) 10% FS; 4) 30% TDDGS - 8.5% FS (FS+TDDGS); 5) 10% SS; and 6) 30% TDDGS - 8.5% SS (SS+TDDGS). The diets provided 1.3, 1.4, 1.3, 1.4, 1.4 and 1.5 Mcal NEg per kg, 13, 20, 14, 21, 14 and 21% CP, and 3, 4, 7, 8, 8 and 8% EE (DM basis), respectively. During a 12-wk feeding period SQ fat biopsies were collected once monthly for fatty acid analysis. Inclusion of TDDGS in the diet decreased ($P < 0.01$) ADG and feed conversion (FC), whereas inclusion of oil seeds improved ($P < 0.05$) FC. After 12 wk, the concentration of α -linolenic acid (ALA) increased ($P = 0.02$), whereas C18:1 t10 - a major *trans* fatty acid decreased ($P < 0.01$) in SQ fat in cattle fed TDDGS. Inclusion of oilseeds also increased ($P < 0.01$) ALA in SQ fat. In conclusion, inclusion of 30% TDDG in a barley grain finishing diet with or without FS or SS, lowered growth performance but increased omega-3 fatty acids and lowered *trans* fatty acids.

Key words: beef cattle, triticale dried distiller grains, fatty acid

M306 Substitution of wheat dried distiller grains with solubles for barley silage in a barley based finishing diet increases beef alpha-linolenic acid. M. L. He*^{1,3}, W. Z. Yang¹, T. A. McAllister¹, M. E. R. Dugan², K. A. Beauchemin¹, and J. J. McKinnon³, ¹Lethbridge Research Centre, Agriculture and Agri-Food Canada, Lethbridge, AB, Canada, ²Lacombe Research Centre, Agriculture and Agri-Food Canada, Lacombe, AB, Canada, ³University of Saskatchewan, Saskatoon, SK, Canada.

Wheat dried distiller grain with solubles (WDDGS) contains low levels of starch but is high in protein and fiber, and has been used as a substitute for barley grain in beef cattle finishing diets. This study investigated the effects of WDDGS on carcass quality and the meat fatty acid profile when it was substituted for barley silage in a barley based finishing diet. Steers (n = 200; 489 ± 30 kg) were fed one of 4 finishing diets consisting of barley concentrate (barley grain plus additives), barley silage and WDDGS (dry matter basis) in ratios of 85:15:0 (CON), 65:10:25 (DG25), 65:5:30 (DG30), and 65:0:35 (DG35) over a 12 wk period. Carcass quality parameters including weight, dressing percentage, back fat thickness, rib eye area, marbling score, quality grade, and meat yield, did not differ among treatments. Substitution of WDDGS

for barley silage improved *pars costalis diaphragmatis* (PCD) muscle fatty acid profiles through increasing ($P < 0.01$) concentrations of total polyunsaturated fatty acids (PUFA) including α -linolenic acid (ALA) without affecting major *trans* fatty acids. WDDGS replacement of 10 and 15% silage in addition to 20% barley grain in the diets increased ($P < 0.05$) ALA from 0.32 g in CON to 0.40 and 0.41 g per 100 g total fatty acids with 24.4 and 26.6% improvement in DG30 and DG35, respectively. The results indicate that replacement of barley silage with up to 35% WDDG increases total PUFA and omega-3 fatty acids in beef without affecting carcass quality.

Key words: beef cattle, wheat dried distiller grains, carcass quality

M307 Effect of early grain feeding on ADG and signaling proteins for protein synthesis in the muscle tissues of beef animals. W. A. D. Nayananjali*, M. Bell, J. M. Scheffler, H. Jiang, M. A. McCann, D. E. Gerrard, J. Escobar, and M. D. Hanigan, *Virginia Polytechnic Institute and State University, Blacksburg.*

Early weaning followed by a period of high grain feeding in beef cattle enhances growth rate and reduces lifetime feed intake. High grain feeding leads to absorption of more glucose precursors which can enhance muscle protein synthesis by signaling through mammalian target of rapamycin (mTOR). This response is partially mediated by insulin, but glucose can also improve ATP levels leading to inactivation of AMP-activated protein kinase and induction of mTOR signaling. The objective of this study was to investigate the effects of early weaning followed by a period of high-grain feeding on signaling protein phosphorylation in muscle. Twelve fall-born, Angus × Simmental steers were either weaned at 106 ± 4 d of age in December (EW, n = 6) and fed a high-gain diet as a group for 148 d or remained with their dams (NW, n = 6) on pasture until weaning at 251 ± 5 d of age in May. Both groups were on pasture (predominantly tall fescue) from 253 ± 5 d to 392 ± 5 d of age. Longissimus muscle tissue biopsies were collected at 253 ± 5 and 392 ± 5 d of age. Total and phosphorylated forms of Akt (Ser473), ribosomal protein S6 (rpS6, Ser235/236), eukaryotic initiation factor 4E binding protein 1 (4EBP1, Thr37/46), and eukaryotic elongation factor 2 (eEF2, Thr56) were determined by Western immunoblotting. The experimental unit was steer. Total:phosphorylated forms and ADG were statistically analyzed for effects of treatment using the MIXED procedure of SAS. ADG was regressed on period and total:phosphorylated forms. EW calves had greater ADG (1.4 ± 0.01 kg/d) during the early grain feeding period than NW calves (0.9 ± 0.01 kg/d; $P < 0.01$). However, NW calves had greater ADG during the subsequent grazing period (0.7 ± 0.04 vs. 0.3 ± 0.04 kg/d; $P < 0.01$). There were no treatment differences in signaling protein phosphorylation ratios for either sampling time. Phosphorylation ratios of Akt, 4EBP1, rpS6 and eEF2 were not correlated with ADG. In conclusion, early weaned calves gained more weight during the early grain feeding period than normal weaned calves and grazing ADG was greater for normal weaned calves.

Key words: ADG, signaling proteins, weaning

M308 Slow release urea can replace nitrogen from soybean meal in dry-rolled corn-based finishing diets for yearling steers. B. P. Holland*¹ and J. S. Jennings², ¹Department of Animal and Range Sciences, South Dakota State University, Brookings, ²Alltech Inc., Brookings, SD.

One hundred 92 British crossbred steers (initial BW = 410 ± 23.6 kg) were blocked by BW and allotted to 3 pens within block (12 or 13

steers/pen). Pens were allotted to 3 experimental diets (n = 5 pens per treatment). Diets were dry-rolled corn-based with 3 sources of supplemental CP (N basis): 100% soybean meal (SBM); 50:50 blend of soybean meal and Optigen® (SBM/OPT), a slow release urea; or 100% (OPT). All diets contained a supplement that provided 1.25% equivalent CP from non-protein N, and were formulated to target 12% CP. Steers were individually weighed on (d -1 and 0) and implanted with Revalor-S. Steers were fed at 0800 daily and weighed on a pen basis on d 29, 57, 85, and 117 and individually one day before slaughter (d 117 for blocks 3, 4, and 5 and d 145 for blocks 1 and 2). Blood samples were collected 4 h after feeding on d 1, 22, 50, and 78 (6 steers/pen) for plasma urea N (PUN) analysis. Mixed models were used to analyze data and repeated measures were used to analyze PUN data. Slaughter date x N source interactions were not observed for any variables. Final BW, ADG, DMI, and G:F were similar across N sources ($P \geq 0.31$). However, steers fed SBM/OPT tended to gain faster (1.64 vs. 1.41 kg/d; $P = 0.10$) and be more efficient (0.163 vs. 0.146; $P = 0.08$) than OPT steers from d 57 to 85. Standard carcass measurements were similar ($P \geq 0.22$) across treatments. No interaction ($P = 0.11$) between N source and sampling day were observed in PUN, but concentrations were greatest ($P < 0.001$) on d 1 (15.0 mg/100 mL), intermediate on d 50 (13.7 mg/100 mL) and 78 (13.6 mg/100 mL), and least on d 22 (11.0 mg/100 mL). When supplemental N was provided by OPT, PUN concentrations increased ($P < 0.001$). Plasma urea N concentrations were 11.9, 13.4, and 14.6 mg/100 mL when N was supplied by SBM, SBM/OPT, and OPT, respectively. Data suggest SBM nitrogen can be replaced by OPT in dry-rolled corn-based finishing diets, but increased PUN in steers fed OPT may indicate decreased N efficiency.

Key words: beef cattle, nitrogen, plasma urea N

M309 Acetate clearance rates and postabsorptive capacity to utilize acetate by beef steers. W. A. D. Nayananjalie*, T. R. Wiles, S. Arriola, M. Aguiar, J. Escobar, M. A. McCann, D. E. Gerrard, M. L. McGilliard, and M. D. Hanigan, *Virginia Polytechnic Institute and State University, Blacksburg.*

Weaning beef calves at 200 d of age may not be economically advantageous in all management systems. Early weaning followed by high-grain feeding can improve performance and increase marbling deposition. Because fat synthesis utilizes acetate as a substrate, we hypothesized that early grain feeding may enhance acetate conversion to fat. The objective of this study was to determine the effects of early grain feeding on acetate utilization in growing steers. Eight Angus x Simmental steers were weaned at 105 ± 4 d of age and fed a high-grain diet for 148 d (EW, n = 4) or remained with their dams on pasture until 249 ± 5 d of age (NW, n = 4). Both groups were on grass from 251 ± 5 to 393 ± 5 d of age. Acetate clearance was assessed at 114 ± 5 d (129 ± 12 kg, P1), 141 ± 5 d (160 ± 14 kg, P2), 227 ± 5 d (276 ± 18 kg, P3) and 348 ± 5 d (330 ± 17 kg, P4) of age. A bolus of acetate (4 mmol/kg of BW) was infused into the jugular vein. Jugular blood was collected at -15 min, at 5-min intervals over the first 30 min and 15-min intervals over the next 60 min. Plasma acetate levels were determined by isotope dilution using a GC-MS and plasma glucose levels were determined using a YSI glucose analyzer. Acetate clearance and appearance rate constants were determined by steer by fitting a one-pool model to the data using the Nelder Mead algorithm in acslX. Resulting rate constants were statistically analyzed for fixed effects of period, treatment and period by treatment and blood glucose concentrations were analyzed for fixed effects of treatment, period, time and the covariate effect of acetate concentration using the GLIMMIX procedure of SAS. Acetate clearance rate constants were less ($P = 0.06$) and appear-

ance rate greater ($P < 0.05$) in EW steers during grain feeding. Acetate appearance rate constants were greater ($P < 0.05$) in NW steers in P4. Blood glucose concentrations were greater in NW steers ($P < 0.05$) only in P1. Infusion of acetate did not significantly affect glucose concentrations. Grain feeding increases rates of acetate appearance, yet reduces acetate clearance and suggests feeding high concentrate diets alters acetate metabolism in growing steers.

Key words: acetate, glucose, weaning

M310 Blood profile of bulls fed different levels of crude glycerin. J. R. R. Carvalho, M. M. Ladeira*, M. L. Chizzotti, T. M. Gonçalves, D. M. Oliveira, P. D. Teixeira, A. Nogueira Neto, and P. T. Silva, *Federal University of Lavras, Lavras, MG, Brazil.*

This study was carried out to analyze the effect of crude glycerin on blood concentrations of the enzymes aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyl aminotransferase (GGT), creatine kinase (CK) and glucose and creatinine metabolites, after 84 d on feedlot. Forty-four Red Norte bulls received the following levels of crude glycerin (83% glycerol): 0, 6, 12 and 18% of DM. The basal diet consisted of 30% of corn silage, 12% of soybean meal, 56% of ground corn grain and 2% of mineral mixture. Glycerin was added to partially replace corn and corn gluten meal (21% of CP) was added to maintain diets isonitrogenous. Blood samples were collected on d 84 of the experimental period, after 16 h of overnight fasting. The experiment was conducted in a completely randomized design and data were analyzed using PROC GLM of SAS 9.1. The levels of glycerol did not affect the blood concentration of enzymes and metabolites (Table 1). Increased levels of blood glucose could be expected due to gluconeogenic pathway. However, the absence of this effect indicates that glycerol could be used by the liver and enteric tissues. The AST enzyme showed high concentration, which could indicate liver injury, which can be attributed to the low forage:concentrate ratio and absence of ionophores or buffers in the diet. The GGT enzyme appeared in normal concentrations. There was not effect for ALT, which is normally present in low concentrations in large animals. Creatinine remained low and within normal limits, which may indicate absence of toxic effect of methanol (0.02% in glycerin). The level of 18% of crude glycerin in diet DM did not result in health impairment and could be used in feedlot diets. Funded by Fapemig, CNPq, CAPES, and INCT-CA

Table 1. Biochemistry of the blood of bulls fed different levels of crude glycerin

Item	Crude glycerin level, DM basis				SEM	P-value
	0%	6%	12%	18%		
Glucose, mg/dL	83.2	73.1	85.1	71.9	5.40	0.21
Creatinine, mg/dL	1.53	1.41	1.47	1.48	0.09	0.83
AST, U/L	93.0	95.4	85.8	84.9	6.80	0.62
ALT, U/L	28.7	28.5	28.9	29.4	1.48	0.98
GGT, U/L	12.5	12.2	15.7	17.5	2.36	0.32
CK, U/L	284.1	461.0	274.0	244.9	73.0	0.16

Key words: enzymes, glucose, glycerol

M311 Effect of specific polyclonal antibody preparation doses on ruminal variables in cattle fed high concentrate diets. J. Bastos*², C. Marino¹, D. Millen², R. Pacheco², J. Magalhaes¹, J. Carvalho³, M. Arrigoni², and P. Rodrigues¹, ¹University of Sao Paulo,

FMVZ-USP, Pirassununga, Sao Paulo, Brazil, ²University of Sao Paulo State, FMVZ-UNESP, Botucatu, Sao Paulo, Brazil, ³Nutribeef Consultancy, Botucatu, Sao Paulo, Brazil.

The objective of the present study was to evaluate the effects of different doses of polyclonal antibody preparation (PAP) against specific ruminal bacteria *Streptococcus bovis*, *Fusobacterium necrophorum*, *Clostridium aminophilum*, *Peptostreptococcus anaerobius* and *Clostridium sticklandii* on rumen fermentation parameters (pH, total concentration of volatile fatty acids (tVFA) which included acetate, propionate and butyrate, ammonia nitrogen (NH₃-N) and lactate) in cattle fed high concentrate diets. Eight rumen cannulated cows were used in a latin square 4x4, twice replicated. The treatments were T1: 0.0 g/anim/d, (control); T2: 1.5 g/anim/d; T3: 3.0 g/anim/d; T4: 4.5 g/d with 4 experimental periods with 21 d each. Sample collection was carried out at the last day of each period with 2 h of interval between each collection. Data were analyzed by MIXED procedure, which separated the effects of treatments, period, animal nested in square and square. The effect of treatments was evaluated by polynomial regression. Differences were declared at $P < 0.05$. There was no interaction between time and treatment ($P > 0.05$) for any of the rumen variables studied. Independently from time of sampling, there was no linear or quadratic effect on rumen pH, tVFA, molar proportion of acetate, propionate and butyrate and NH₃-N. Thus, it can be concluded that different levels of PAP were not sufficient to alter rumen environment with the necessity of more studies to validate or not this observation.

Key words: feed additive, passive immunization, ruminal fermentation

M312 Corn grain processing methods and forage levels in finishing diets for Nellore bulls. R. Carareto¹, F. A. P. Santos*¹, G. Mourão¹, A. M. Pedroso², C. Sitta¹, M. P. Soares¹, M. R. Paula¹, R. S. Marques¹, and M. C. Soares¹, ¹University of Sao Paulo, Piracicaba, São Paulo, Brazil, ²Embrapa Cattle Southeast, Sao Carlos, São Paulo, Brazil.

The trial was conducted at the Animal Sciences Department of the University of São Paulo in Piracicaba, SP. One hundred and 90 2 (192) finishing Nellore bulls (403 kg) BW in 32 pens were fed for 99 d to compare diets containing fine ground (FG), dry rolled (DR), high moisture (HM) or steam flaked flint corn (SF) and 2 levels (12 or 20% on DM) of sugar cane bagasse. Data were analyzed as a randomized complete block using the Mixed procedure of SAS, with pens serving as the experimental units. There was no interaction between corn processing methods and diet forage levels ($P > 0.05$). DMI was greater ($P < 0.05$) for dry rolled corn compared with the other 3 processing methods (Table 1). ADG was greater ($P < 0.05$) for steam flaked and high moisture corn than for ground or rolled corn (Table 1). Feed efficiency (ADG/DMI) was greater ($P < 0.05$) for steam flaked corn than for fine ground or dry rolled corn, and greater ($P < 0.05$) for high moisture and ground corn than for dry rolled corn. The greatest ($P < 0.05$) diet net energy values were observed for steam flaked and high moisture corn. DMI was less and ADG, feed efficiency, dressing and diet energy values were greater for cattle fed 12% than 20% forage diets ($P < 0.05$). Forage level had no effect on diet starch digestibility ($P > 0.05$). In conclusion, steam flaked corn and high moisture corn are the greatest, ground corn is intermediate and dry rolled corn is the least in net energy for finishing Nellore bulls. Performance of finishing Nellore bulls is improved with 12% sugar cane bagasse forage diets compared with 20% forage diets.

Table 1. Influence of corn processing on growth performance of feedlot Nellore bulls and dietary net energy values

Variable	FG	DR	HMC	SF	SE	Pr>F
ADG, kg/d	1.12 ^b	1.09 ^b	1.21 ^a	1.25 ^a	0.031	0.0057
DMI, kg	9.37 ^b	10.18 ^a	9.41 ^b	9.26 ^b	0.168	0.0034
ADG/DMI	0.121 ^b	0.108 ^c	0.129 ^{ab}	0.136 ^a	0.004	<0.001
NEm (mcal/kg/DM)	1.73 ^b	1.58 ^c	1.821 ^{ab}	1.93 ^a	0.0386	<0.001
NEg (mcal/kg/DM)	1.11 ^b	0.97 ^c	1.18 ^{ab}	1.28 ^a	0.0339	<0.001

Key words: corn grain processing, fiber lever, Nellore