

## Ruminant Nutrition: Management and Misc Additives - Dairy

**W244 Lignocellulolytic activity of *Pleurotus ostreatus* solid culture on barley straw.** L. Luna-Rodriguez<sup>1</sup>, M. Meneses-Mayo<sup>1</sup>, G. Mendoza-Martinez<sup>2</sup>, C. Montalvo-Paquini<sup>3</sup>, S. S. Gonzalez-Muñoz<sup>\*1</sup>, and O. Loera-Corral<sup>4</sup>, <sup>1</sup>*Colegio de Postgraduados, Montecillo, Edo. Mexico, Mexico*, <sup>2</sup>*UAM Xochimilco, Mexico D.F.*, <sup>3</sup>*Universidad Politécnica de Puebla, Puebla, Mexico*, <sup>4</sup>*UAM Iztapalapa, Mexico D.F.*

The first objective of this study was to evaluate radial growth (Vr) of *Pleurotus ostreatus* (IE8 and CP50 strains) with N supplement (urea and ammonia sulfate) and 70 or 80% humidity, on barley straw. The experimental design was completely randomized, an analysis of variance was performed and means were compared with Tukey test ( $P < 0.05$ ). The higher Vr were: 0.568 mm/h for CP50 control (80% humidity, distilled water only); 0.573 mm/h for IE8 and 80% humidity plus a saline solution (magnesium sulfate 25.0 g/L, ferrous sulfate 2.8 g/L, manganese sulfate 1.7 g/L, sodium chloride 1.6 g/L). For both strains, Vr was improved only by 80% humidity. Therefore, strain IE8 was selected to determine fibrolytic enzymes (xylanases, cellulases and laccases) activity and *in vitro* DM digestibility (IVDMD) for 30 d. Values were expressed in international units (IU): the amount of enzyme needed to release 1  $\mu$ mol product/min under the assay conditions. Activity was referred to initial substrate dry weight (IU/g dry wt). The higher activity was at 8 d for cellulases (15.95 IU/g dry wt) and at 12 d for xylanases (80.51 IU/g dry wt) and laccases (3.46 IU/g dry wt) which coincided with the maximum content of extracellular protein (0.12 IU/g dry wt). Further characterization of enzymatic activity (39°C; pH 6 and 7) showed the following: 1) higher stability at pH 6 with residual activity of 77.5, 49.1 and 27.5% for xylanases, cellulases and laccases; 2) at pH 7 residual activity was lower and similar (xylanases 41.1%; cellulases 36.8%; laccases 24.1%). After 30 d there was a significant decrease in the content of NDF (2.42%), hemicellulose (7.03%) and lignin (3.79%), whereas CP increased 0.86% and IVDMD also increased from 36.64% to 42.36%. It may be concluded that this rather simple biotechnological procedure improved IVDMD of barley straw.

**Key Words:** Fungi, Fibrolytic Enzymes, Crop Residues

**W245 Feedlot performance, carcass characteristics and liver abscesses in heifers fed MGA, Rumensin and Tylan continuously or withdrawn the last 35 days on feed.** G. E. Sides<sup>\*1</sup>, R. S. Swingle<sup>2</sup>, R. C. Borg<sup>1</sup>, and W. M. Moseley<sup>1</sup>, <sup>1</sup>*Pfizer Animal Health, Kalamazoo, MI*, <sup>2</sup>*Cactus Feeders, Cactus, TX*.

Experimental design: 2x2 factorial, randomized block, one location. Treatment groups: Rumensin, Tylan (RT), RT plus MGA (RTM), RT withdrawn 35 d pre-harvest (RTwd), and RTM withdrawn 35 d pre-harvest (RTMwd). Experimental unit: pen of heifers. Numbers per treatment group: 10 pens; 985, 997, 974, 1026 heifers in RT, RTM, RTwd, RTMwd, respectively. Diets: 30 g\* $r^{-1}$  (air dry basis) Rumensin; 90 mg\*heifer<sup>-1</sup>\*day<sup>-1</sup> Tylan; 0.4 to 0.5 mg\*heifer<sup>-1</sup>\*day<sup>-1</sup> MGA. Implants: Revalor-IH d 0; Revalor-200 d 60. Statistics: appropriate mixed model procedures including fixed effect of treatment and random effects of block and residual. Average days fed: 150.2 to 150.8. Percent died or removed: 2.7 to 3.9. Final BW (kg): greater ( $P < 0.05$  to  $P < 0.01$ ) for RTM (524) than RT (512), RTwd (511), RTMwd (516). DMI (kg): greater ( $P < 0.01$ ) for RTM (8.1) and RTMwd (8.1) than RT (7.8), RTwd (7.9). ADG (kg): greater ( $P < 0.01$ ) for RTM (1.45) than RT (1.39), RTwd

(1.38), RTMwd (1.40). ADG:DMI ratio (0.17 to 0.18). Dressing percent: groups ranged from 64.5% to 64.9%; greater ( $P < 0.01$ ) for RTMwd than RTM and RT. RTM had greater ( $P < 0.01$ ) HCW, marbling score, rib fat, calculated yield grade, and percent quality grade prime and choice but lesser ( $P < 0.01$ ) color score, percent dark cutters, percent yield grade 1, 2, or 3, and rib eye area compared to RT, RTwd, and RTMwd. Withdrawal of RTM: significantly ( $P < 0.05$  to  $P < 0.01$ ) decreased HCW, marbling score, rib fat, calculated yield grade, and percent quality grade prime and choice; significantly ( $P < 0.01$ ) increased color score, percent dark cutters, rib eye area and percent yield grade 1, 2, or 3 compared to continuous RTM. Liver abscesses: no difference among groups. MGA fed heifers: increased in both carcass weight and carcass quality traits of economic importance. Withdrawal of RT: no adverse affect on carcass weight or quality traits. Withdrawal of RTM: adversely affected economically important feedlot performance and carcass traits.

**Key Words:** Carcass, Feedlot, MGA

**W246 Effects of feeding different dose levels of melengestrol acetate on feedlot performance, carcass characteristics and estrus activity of feedlot heifers.** G. E. Sides<sup>\*1</sup>, O. A. Turgeon<sup>2</sup>, W. C. Koers<sup>2</sup>, M. S. Davis<sup>2</sup>, K. Vander Pol<sup>2</sup>, R. C. Borg<sup>1</sup>, and D. J. Weigel<sup>1</sup>, <sup>1</sup>*Pfizer Animal Health, Kalamazoo, MI*, <sup>2</sup>*Bos Technica Research Services, Inc., Salina, KS*.

A randomized complete block design was used to compare the effects of feeding melengestrol acetate (MGA) at 0.4 mg\*heifer<sup>-1</sup>\*d<sup>-1</sup> (0.4M) and 0.5 mg\*heifer<sup>-1</sup>\*d<sup>-1</sup> (0.5M) on feedlot performance, health, and carcass characteristics of commercial beef heifers (n=1,418). Heifers were enrolled upon arrival at the feedlot (Bos Technica Research Inc., Syracuse, KS), randomly assigned to treatment, processed according to feedlot protocol and administered an abortifacient within 48 h of arrival. Enrollment date was used as the blocking factor with pen (n=10 per treatment) as the experimental unit. Heifers averaged 290.2 kg of BW at enrollment and were fed for an average of 176 d. Estrus activity was monitored twice daily and summarized as a count of heifers showing estrous within a pen over each 21 d interval throughout the feeding period. Linear mixed model procedures were used to compare treatment differences in feedlot performance parameters and all quantitative carcass measurements and included the fixed effect of treatment and the random effects of block and residual. A generalized mixed model was used to evaluate proportional measures of estrus activity (E), dark cutting carcasses (%DC), preliminary USDA Yield Grades  $\leq 3$ , and Quality Grades  $\geq$  Choice using the same model listed above. Repeated measures models for E also included fixed effects for time of measure and time by treatment and the random effect of block by treatment. Overall treatment effects were significant for E and %DC ( $P < 0.05$  and  $P < 0.10$ , respectively). Least squares means of E were 3.2% and 2.1% in 0.4M and 0.5M, respectively, and for %DC were 3.0% and 1.7% in 0.4M and 0.5M, respectively. Dry matter intake, ADG, gain\*feed<sup>-1</sup> and all other carcass measurements were not significantly different between treatments. The decrease in E and %DC may suggest an economic advantage of feeding a higher level of MGA to finishing heifers.

**Key Words:** Carcass Performance, Feedlot, MGA

**W247 Effects of tannins supplementation on animal growth and in vivo ruminal bacterial populations associated with bloat in heifers grazing wheat forage.** B. R. Min<sup>\*1,4</sup>, W. E. Pinchak<sup>1</sup>, K. Hernandez<sup>2</sup>, C. Hernandez<sup>3</sup>, M. E. Hume<sup>3</sup>, E. Valencia<sup>2</sup>, and J. D. Fulford<sup>1</sup>, <sup>1</sup>Texas AgriLife Research, Vernon, TX, <sup>2</sup>University of Puerto Rico, Puerto Rico, <sup>3</sup>USDA-ARS, Southern Plains Agricultural Research Center, Food & Safety Research Unit, College Station, TX, <sup>4</sup>Ichthus Education Center, La Trinitaria, Chiapas, Mexico.

Two experiments were conducted to 1) enumerate the effect of tannins supplementation on bio-film production, in vitro gas and foam production, ADG, and bloat frequency; and 2) quantify the influence of tannins supplementation on ruminal bacterial populations of heifers grazing wheat forage. Molecular PCR enumeration was used to quantify 5 major ruminal bacterial strains in the rumen of heifers grazing wheat forage supplemented with tannins. Twenty-six heifers (286.1 ± 25.7 kg) were randomly allocated to 1 of 3 treatments that included a control (non-tannins group) and two types of tannins (mimosa, mainly condensed tannins vs. chestnut tannins, mainly hydrolysable tannins). Plant tannins (1.5% of DMI) were supplemented once daily (approximately 0800) mixed with a textured feed (500 g/animal). Heifers were visually monitored daily for bloat score (0 = no bloat, 3 = severe bloat). In Exp. 1, supplementation of tannins reduced the rate of frothy foam and biofilm production with chestnut being more efficacious than mimosa tannins. Chestnut tannin supplementation increased ADG. Mean bloat score and bloat day were greater ( $P < 0.01$ ) for the control diet than for tannins treatment groups. In Exp. 2, phenotypic study shows that the dynamics of *Fibrobacter succinogenes*, *Streptococcus bovis*, and *Prevotella rumenicola* strains were relatively stable with time (d 0, 10, and 25) in the rumen of animals not receiving tannins supplementation. However, with supplementation of chestnut and mimosa tannins, populations of *P. rumenicola* and strains of both *F. succinogenes* and *Ruminococcus flavefaciens* were increased, respectively. Conversely, populations of both *F. succinogenes* and *S. bovis* were decreased in chestnut tannins supplementation with time, indicating that different types of tannins have different mode of action on rumen bacterial population.

**Key Words:** Ruminal Bacterial Populations, Bloat, Plant Tannins

**W248 Carcass traits of grazing young bulls.** H. J. Fernandes<sup>\*1,2</sup>, A. G. Silva<sup>2</sup>, J. Cavali<sup>2</sup>, A. A. Rocha<sup>2</sup>, M. F. Paulino<sup>2</sup>, L. M. Paiva<sup>1,2</sup>, and R. M. Paula<sup>2</sup>, <sup>1</sup>State University of Mato Grosso do Sul / FUNDECT, Brazil, <sup>2</sup>Federal University of Viçosa, Brazil.

The objective of this study was to evaluate the carcass measures of grazing young bulls in dry season, supplemented with concentrate rations with different urea levels. Twenty young bulls with initial weight of 220 kg were used, separated in four groups, housed in *Brachiaria decumbens* Stapf pastures and fed daily with one of the supplements: *ad libitum* mineral salt (control treatment); or 1.5 kg/animal of concentrated rations (32% of crude protein) formulated with corn, soybean meal and 0, 4 or 8% of urea. Two young bulls of each group were slaughtered after 90 days and the remaining after 180 days. After chilling, the carcasses were weighted. In the right half carcass, the lengths, and the loin eye areas (LEA) and the backfat thickness (BFT) in the 12<sup>th</sup> rib were measured. The effect of the supplementation with concentrate and the linear and quadratic effects of the urea level in the concentrate were evaluated by the partition of the sum of squares of treatment in orthogonal contrasts.

The significance level was 5%. The carcasses yields and lengths to the reference treatment and to the supplemented treatments (levels of 0, 4 e 8% of urea) were: 51.2, 51.8, 53.3 and 52.2 % (coefficient of variation - CV=3.9%); and 95.6, 101.3, 104.0 and 96.3 cm (CV= 6.7%). In the same way, the LEA and BFT were 38.3, 48.3, 51.4, 43.0 cm<sup>2</sup> (CV= 15.45%); and 0.70, 0.88, 0.87 and 1.15 mm (CV=46.2%). Only the LEA presented significant effect of the concentrate supplementation. The linear or quadratic effects of the urea levels in the supplement were not significant to none of the measures. Usually, grazing animals have low development in dry season because the low forage availability. This may explain these results. This study showed that the extra nutrients offered by the concentrate or the different urea levels in the supplement were not able to alter the carcass traits

**Key Words:** Carcass, Grazing, Supplementation

**W249 Influence of feed restriction and oral vitamin D and E supplementation on meat quality of Canchim heifers.** S. A. Matsuhara<sup>1,3</sup>, M. Parrili<sup>1</sup>, M. D. B. Arrigoni<sup>1</sup>, C. L. Martins<sup>1</sup>, D. D.s Millen<sup>1</sup>, R. D. L. Pacheco<sup>\*1</sup>, M. V. Fossa<sup>1</sup>, L. M. N. Sarti<sup>1</sup>, J. P. S. T. Bastos<sup>1</sup>, T. M. Mariani<sup>1</sup>, H. N. de Oliveira<sup>1</sup>, S. R. Baldin<sup>1</sup>, T. C. B. da Silva<sup>2</sup>, R. S. Barducci<sup>1</sup>, R. d. O. Roça<sup>1</sup>, <sup>1</sup>FMVZ/UNESP, Botucatu, São Paulo, Brazil, <sup>2</sup>Faculdade de Zootecnia/UNESP, Dracena, São Paulo, Brazil, <sup>3</sup>Apoio FAPESP.

This study, conducted at São Paulo State University (UNESP) feedlot, Botucatu Campus, Brazil, was designed to evaluate the influence of feed restriction (FR) and oral vitamin D and E supplementation (VIT) on meat quality of Canchim (5/8 Charolais, 3/8 Nellore) heifers. The experiment was designed as a 2x2 factorial arrangement, in which sixteen 7-mo-old heifers (227.4±23.7kg) were randomly assigned according to FR: Restricted (RT) and Non-Restricted (NR) fed one of two diets with (VDE) or without (WV) vitamins (D=7.5X10<sup>6</sup> UI/head/d and E=1838 UI/head/d during 18 and 43 days prior to slaughter, respectively). During 48d RT heifers received 70% of amount fed to NR, but after this period all animals were fed 77 days ad libitum. Rib eye samples were harvested between 12th and 13th ribs for total lipids in % (TL), color (L\*, a\*, b\*), vitamin concentration and tenderness analysis. Tenderness was evaluated by three methods: shear force (SF), miofibrillar fragmentation index (MFI) and sensory panel (using a scale from 1 (extremely tender) to 9 (extremely tough)). It was found a FR effect ( $P < 0.05$ ) for meat tenderness, evaluated by sensory panel, where RT was more tender than NR (RT=2.9, NR=4.3), but no VIT effect ( $P > 0.05$ ) was found (WV=4.0, VDE=4.2). Both FR and VIT did not affect ( $P > 0.05$ ) TL (WV=1.99, VDE=2.07; RT=1.89, NR=2.18), meat tenderness evaluated by SF (WV=3.46, VDE=3.89; RT=3.60, NR=3.75) and MFI (WV=81.98, VDE=69.32; RT=77.50, NR=73.80). It was found ( $P < 0.05$ ) VIT effect for L\*, where WV heifers presented brighter meat than those VDE (WV=42.88, VDE=40.23), but no differences were observed ( $P > 0.05$ ) for a\* (WV=18.43, VDE=18.45) and b\* (WV=10.60, VDE=10.30). There was not FR effect ( $P > 0.05$ ) on color. No FR and VIT effects were observed ( $P > 0.05$ ) on vitamin D (WV=0.07, VDE=0.07; RT=0.60, NR=0.80) and E (WV=4.27, VDE=5.91; RT=4.80, NR=5.38) concentration (%). No interactions were found ( $P > 0.05$ ) between FR and VIT in this study. Thus, FR improved tenderness by sensory panel and VIT did not enhance meat quality of Canchim heifers.

**Key Words:** Feedlot, Feed Restriction, Heifers

**W250 Influence of feed restriction on performance and carcass traits of Canchim heifers.** M. Parrili<sup>1,3</sup>, S. A. Matsuhara<sup>1</sup>, M. D. B. Arrigoni<sup>1</sup>, C. L. Martins<sup>1</sup>, D. D. Millen<sup>\*1</sup>, R. D. L. Pacheco<sup>1</sup>, H. N. de Oliveira<sup>1</sup>, M. V. Fossa<sup>1</sup>, L. M. N. Sarti<sup>1</sup>, T. M. Mariani<sup>1</sup>, J. P. S. T. Bastos<sup>1</sup>, S. R. Baldin<sup>1</sup>, R. S. Barducci<sup>1</sup>, and T. C. B. da Silva<sup>2</sup>, <sup>1</sup>FMVZ/UNESP, Botucatu, São Paulo, Brazil, <sup>2</sup>Faculdade de Zootecnia/UNESP, Dracena, São Paulo, Brazil, <sup>3</sup>Apoio FAPESP.

This study, conducted at São Paulo State University (UNESP-Botucatu) feedlot, Brazil, was designed to evaluate the influence of feed restriction (FR) on performance and carcass traits of Canchim (5/8 Charolais, 3/8 Nellore) heifers. Sixteen 7-mo-old (253.4±23.7 kg) Canchim heifers were randomly assigned according to treatments: Restricted (RT) and Non-Restricted (NR). Heifers were fed in feedlot for 125d. During the first 48d RT heifers received 70% of amount fed to NR, but after this period all animals were fed 77 days ad libitum. Initial and final rib eye areas in cm<sup>2</sup> (REA) and initial and final back fat thickness in mm (BFT) were measured by ultrasound. After slaughter, visceral fat (VF) and livers were weighed and rib eyes scored for marbling (MB) using a scale from 1 to 6. During FR, NR presented greater (P<0.05) average daily gain in kilos (ADG) than RT (NR=1.16, RT=0.74), but no differences (P>0.05) were found when heifers were re-fed *ad libitum* (NR=0.96, RT=1.12). There was not difference (P>0.05) for total ADG, considering 125d on feed (NR=1.03, RT=0.95). FR did not affect (P<0.05) REA, BFT, final live weight (FBW), hot carcass weight (HCW), dressing percentage (DP), MB and weights of VF and liver (Table 1). Treatment had a significant impact (P<0.05) for percent hindquarter (NR=50.3, RT=51.58), but it was not found effect (P>0.05) for percent forequarter (NR=37.12, RT=36.38). Feed costs were reduced by 4.31% for RT heifers. FR could be useful for Canchim heifers in feedlot for reducing feed costs and presenting heavier hindquarter without affecting performance and carcass traits.

**Table 1. Influence of FR on carcass traits of Canchim heifers**

Item	NR	RT	SEM
Initial Live Weight (kg)	250.60	256.38	18.53
Final Live Weight (kg)	381.10	377.13	30.58
Initial REA (cm <sup>2</sup> )	40.05	44.32	3.01
Final REA (cm <sup>2</sup> )	64.24	62.21	3.50
Initial BFT (mm)	0.97	1.31	0.26
Final BFT (mm)	4.03	3.89	0.64
Hot Carcass Weight (kg)	206.99	199.91	18.50
Dressing Percentage (%)	54.25	53.00	1.25
Visceral Fat (kg)	5.44	6.39	1.38
Liver (kg)	4.82	4.74	0.51
Marbling (scale from 1 to 6)	1.90	1.50	0.45

**Key Words:** Feed Restriction, Heifers, Performance

**W251 Supplementation frequency effects on performance of steers grazing tropical grass.** J. A. S. Morais<sup>1</sup>, T. T. Berchielli<sup>\*1</sup>, M. F. S. Queiroz<sup>1</sup>, R. A. Reis<sup>1</sup>, M. A. Balsalobre<sup>2</sup>, G. Fiorentini<sup>1</sup>, S. F. Souza<sup>1</sup>, and P. H. M. Dian<sup>1</sup>, <sup>1</sup>Faculdade de Ciências Agrárias e Veterinárias - Campus de Jaboticabal/UNESP, <sup>2</sup>Bellman Nutrição Animal.

The objective of this research was to determine the effect of reduction in supplementation frequency over the performance of Nellore steers grazing palisade grass (*Brachiaria brizantha* cv. Marandu) pasture.

Twenty seven castrated steers, 270 kg average initial body weight (BW) were distributed in nine palisade grass paddock of two ha each. Each paddock still received a variable number of regulators animals to maintain the forage allowance approximately 8 kg DM/100 kg of BW. The animals were supplemented with 0.5% of BW/day of a concentrate composed by 65% of corn gluten-60, 25% of dry sugarcane yeast and 15% of citric pulp. The supplement was offered in 3 different frequencies: daily, from Monday to Friday or Monday, Wednesday and Friday. There was no interaction time\*frequency supplementation effect (P > 0.05). The supplementation frequency didn't affect (P > 0.05) the animals performance, weight gain was in average 0.890 kg/day. However, the experimental periods affect animals performance (P < 0.05), in the first period (from February to March) it was observed highest daily animal BW gain compared to the other period (from March to May). Based on the experimental results it can be concluded that the supplementation frequency reduction from 7 to 3 days of the week doesn't affect the performance of steers grazing palisade grass pasture, becoming a viable alternative for reduction in the costs with labour and equipments. The experimental period has important effect on the performance of the steers grazing tropical pasture.

**Table 1. Effect of supplementation frequency on performance (kg/an/day) of Nellore steers grazing palisade grass pasture (São Paulo – Brazil).**

Supplementation frequency	Periods			Mean	SEM <sup>1</sup>
	Feb-Mar	Mar-Apr	Apr-May		
Daily	1.23	0.74	0.54	0.84	0.049
Monday to Friday	1.30	0.67	0.65	0.87	
Mon-Wed-Fri <sup>2</sup>	1.29	0.75	0.66	0.90	
Mean	1.28 a	0.72 b	0.62 b	0.89	

<sup>1</sup> Standard error mean; <sup>2</sup> Supplement offered Monday, Wednesday and Friday. Means values within rows with different letters are significantly different (P < 0.05).

**Key Words:** Nellore, Palisade Grass

**W252 Comparative effects of virginiamycin supplementation on growth-performance and dietary energetics of calf-fed Holstein steers.** E. Ponce<sup>\*1,2</sup>, J. Lenin<sup>1,2</sup>, U. Sanchez<sup>1,2</sup>, N. Torrentera<sup>1</sup>, and R. Zinn<sup>2</sup>, <sup>1</sup>UABC, Mexicali, BC, Mexico, <sup>2</sup>University of California, Davis, CA.

One hundred forty-four Holstein steer calves (119 kg) were used in a 340-d trial. Treatments were: Control (no antibiotic); 2) 16 ppm virginiamycin; 3) 22.5 ppm virginiamycin; and 4) 28 ppm monensin. Calves received a steam-flaked corn-based growing diet, formulated to meet average nutrient requirements for the first 112 d, and thereafter were fed a finishing diet formulated to meet average nutrient requirements from d 112 until slaughter. Steers were divided into two weight groupings (light and heavy), and assigned within groupings to 24 pens (6 steers/pen). Fresh feed was provided twice daily. Virginiamycin supplementation did not affect (P > 0.10) ADG, but increased (linear component, P = .02) 340-d gain efficiency. Improvement in gain efficiency was attributable to enhanced energetic efficiency (linear component, P = 0.04). Improvements in dietary NE were most pronounced during the final 116 d of the feeding period (linear component, P = 0.04) that comprised the hot summer months (June through September). Mon-

ensin supplementation did not affect ( $P > 0.10$ ) growth performance or dietary NE. There were no dietary treatment effects ( $P > 0.10$ ) on carcass characteristics. Both virginiamycin (linear component,  $P = 0.03$ ) and monensin ( $P = 0.06$ ) supplementation reduced morbidity. There were no dietary treatment effects ( $P > 0.10$ ) on mortality. Although average initial weight for the light and heavy groupings differed by only 4 kg, the heavy-weight grouping had greater carcass weight (13 kg,  $P = 0.02$ ), LM area (5.4%,  $P = 0.01$ ), ADG (4.3%,  $P = 0.03$ ), and gain efficiency (2.3%,  $P = 0.08$ ) than the light-weight grouping. Improvement in gain efficiency was due largely to increased (3.2%,  $P = 0.01$ ) dietary NE. We concluded that virginiamycin supplementation can markedly enhance feedlot growth-performance and dietary energetic efficiency of calf-fed Holstein steers. Holstein calves that are lighter than group average for initial weight may have slightly slower growth rates as well as slightly reduced dietary energetic efficiency.

**Key Words:** Virginiamycin, Cattle, Performance

**W253 The effects of dexamethasone and Revalor-S® on growth, carcass quality and visceral organ and fat mass of finishing beef steers fed cracked corn.** S. E. Kitts\*, S. W. El-Kadi, C. C. Taylor-Edwards, F. F. Korthaus, J. B. Cannon, A. F. Koontz, D. L. Harmon, E. S. Vanzant, and K. R. McLeod, *University of Kentucky, Lexington.*

Dexamethasone (DEX), a synthetic glucocorticoid, has been shown to alter site and rate of fat accretion in several mammalian species, including cattle. The current study was designed to investigate potential interactions between DEX and trenbolone acetate/estradiol (Revalor-S) administration on growth performance, carcass quality and visceral organ and fat mass of finishing beef steers fed cracked corn. Ninety-six crossbred steers ( $385 \pm 1$  kg) were assigned randomly to a  $2 \times 2$  factorial arrangement of treatments consisting of either no implant or Revalor-S (d 1 and 56) and either no injection or i.m. injection of 0.09 mg/kg BW DEX (d 1, 28, 56 and 84). Steers received a 90:10 concentrate-forage diet ad libitum during the feeding period and were slaughtered ( $n=60$ ) on d 113 for determination of carcass quality. A subset of steers (9/treatment) was slaughtered between d 106-119 for determination of visceral organ and fat wet mass and carcass quality. There were no interactions ( $P \geq 0.05$ ) between implant and DEX for any variable measured. Over the feeding period, DMI was unaffected by treatment. However, ADG and efficiency of gain were both 13% greater ( $P \leq 0.05$ ) with implant. Conversely, DEX lowered ADG by 10% ( $P = 0.007$ ). Dexamethasone decreased ( $P = 0.04$ ) and implant increased ( $P = 0.04$ ) HCW. There were no effects ( $P \geq 0.05$ ) of treatment on carcass quality. Implant resulted in greater ( $P \leq 0.01$ ) digestive tract and liver weights which translated to greater ( $P \leq 0.05$ ) small intestine (SI) and liver weights as a function of empty BW. Dexamethasone decreased ( $P \leq 0.05$ ) digestive tract and liver weights and decreased ( $P = 0.02$ ) SI weight as a function of empty BW. As expected, Revalor-S increased ADG and feed efficiency; however, DEX decreased ADG and had no effect on fat deposition. These results indicate that, in contrast to previous data, DEX does not alter site or amount of fat deposition in finishing beef cattle.

**Key Words:** Cattle, Fat, Dexamethasone

**W254 Effect of feeding cinnamaldehyde essential oils and monensin on feedlot cattle performance.** W. Z. Yang<sup>1</sup>, C. Benchaar<sup>2</sup>, M. L. He\*<sup>1</sup>, and K. A. Beauchemin<sup>1</sup>, <sup>1</sup>*Agriculture and Agri-Food Canada,*

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A study was conducted to evaluate the effects of supplementing cinnamaldehyde essential oil (CIN) on growth performance of feedlot cattle. Seventy-five yearling steers (BW=390 kg) were assigned to a randomized complete block design with five treatments: control; 400; 800; 1600 mg/head/day CIN; or 330 mg monensin (MO)/head/day. At the start of the trial, steers were blocked according to BW and assigned to fifteen blocks of five cattle. The diets consisted of 9% barley silage, 86% dry-rolled barley grain, and 5% supplement (DM basis). Steers were housed in individual pens that allowed measuring feed intake individually, and weighed on days 0, 28, 56, 84 and 112. Cattle fed with CIN consumed more feed DM than the cattle fed control (7.7 vs 6.6 kg/d;  $P < 0.01$ ) or MO diet (7.7 vs 7.1 kg/d;  $P < 0.14$ ) in the first 28 days. However, feed intake (kg/d or % of BW) of cattle fed CIN was not different from those fed MO or control from day 29 to the end of the experiment even though a quadratic dose response to CIN was detected during the first 28 d ( $P < 0.01$ ) and the overall experiment ( $P < 0.11$ ). A general decrease in feed intake was observed the first week of the trial compared to the adaptation period, with the highest decrease for control (7.4 vs 5.3 kg/d), following by MO (7.4 vs 6.0 kg/d) and minimal decrease for CIN (7.2 vs 6.7 kg/d). The reduction of feed intake was likely due to the stress of weighing and bleeding on the day before starting the trial. The mean ADG (kg/d) overall ranged from 1.64 to 1.75 and was not affected by the treatments. In contrast, feed efficiency (gain/intake) tended ( $P < 0.10$ ) to be lower for CIN (0.21) than for MO (0.22) with no difference between control and CIN. These results indicate that supplementation of a feedlot finishing diet with CIN improved feed intake of stressed beef cattle but had minimal effects on ADG or feed efficiency over the entire feedlot finishing period.

**Key Words:** Cinnamaldehyde Essential Oil, Intake and Growth, Feedlot Cattle

**W255 Effect of a rumen buffer derived from calcified seaweed on ruminal disappearance and fermentation in steers.** O. D. Montañez-Valdez\*<sup>1</sup>, J. M. Pinos-Rodriguez<sup>2</sup>, J. H. Avellaneda-Cevallos<sup>3</sup>, E. O. Garcia-Flores<sup>4</sup>, and E. C. Guerra-Medina<sup>4</sup>, <sup>1</sup>*Centro Universitario del Sur de la Universidad de Guadalajara, Ciudad Guzmán, Jalisco, México,* <sup>2</sup>*Universidad de San Luis Potosí, San Luis Potosí, México,* <sup>3</sup>*Universidad Técnica Estatal de Quevedo, Ecuador, Quevedo, Los Ríos, Ecuador,* <sup>4</sup>*Centro Universitario de la Costa Sur, Aulán de la Grana, Jalisco México.*

Effect of a rumen buffer derived from calcified seaweed on ruminal disappearance was evaluated in steers. Three ruminally cannulated steers ( $450 \pm 15$  kg body weight) with three treatments in a crossover design, were fed with a diet formulated with 30% forage (15% alfalfa hay and 15% corn silage) and 70% concentrate (47% ground sorghum, 8% soybean meal, 7% molasses cane, 6.8% corn gluten meal and 1.2% mineral premix). The treatments were: 1) control (without buffer); 2) 1% sodium bicarbonate; and 3) 0.5% rumen buffer derived from calcified seaweed. There were differences ( $P \leq 0.05$ ) among treatments on ruminal pH; the values from steers fed diet without ruminal buffer were lower (5.98) than those fed buffer derived from calcified seaweed (6.34), but pH values from both treatments were similar than those fed sodium bicarbonate (6.14). This reduction of pH values induced by no addition of ruminal buffer did not affect ( $P \geq 0.05$ ) ruminal disappearance of diet, ruminal volatile fatty acid (108.1 vs 97.8 vs 93.9), and N

ammonia (28.5 vs 33.3 vs 39.5) as compared to sodium bicarbonate or buffer derived from calcified seaweed. Buffer derived from calcified seaweed increase ruminal pH values in steer fed a diet with 30% forage and 70% concentrate, but did not changed the ruminal disappearance of diet, volatile fatty acid or N ammonia.

**Key Words:** pH, Ruminal Disappearance, Ruminal Buffer

**W256 Net energy and protein requirements for maintenance and gain of Nellore steers estimated with deuterium oxide<sup>2</sup>.** G. Aferrri\*<sup>1</sup>, P. R. Leme<sup>1</sup>, A. S. C. Pereira<sup>1</sup>, R. R. P. S. Corte<sup>1</sup>, M. Z. Moreira<sup>1</sup>, and D. P. D. Lanna<sup>1</sup>, <sup>1</sup>Universidade de São Paulo, Pirassununga, São Paulo, Brasil, <sup>2</sup>FAPESP, São Paulo, São Paulo, Brasil.

Thirty six Nellore steers with a mean weight and age of 359 kg and 20 months at the beginning of the trial were individually fed to determine the energy and protein requirements for maintenance and gain. The steers were fed the same diet (76.43% TDN and 13.62% CP) in three levels of dry matter (DM) intake, *ad libitum*, 75 g DM/kg LW<sup>0.75</sup> and 60 g DM/kg LW<sup>0.75</sup>. The body composition was estimated with the marker deuterium oxide that allowed repeated water estimate in the same animal. Deuterium in blood samples was analyzed by mass spectrography. The empty body weigh (EBW) from shrunk body weigh (SBW), was obtained from equation: EBW(kg) = -15.74911+(0.98517×SBW), (R<sup>2</sup>=0.96, S<sub>y,x</sub>=8.64). The following equations were used to estimate the empty body chemical composition: Water% = 65.9654+(0.0977×Deuterium Space)-(0.0909×SBW), (R<sup>2</sup>=0.83, S<sub>y,x</sub>=1.33), Fat% = 93.92968-(1.27598×Water%), (R<sup>2</sup>=0.97, S<sub>y,x</sub>=0.62). The relationships between protein and water and between ash and water in the empty body were 0.3009 and 0.0747, respectively. The net energy for maintenance (NEm) was calculated as the antilogarithm of the intercept of the linear regression of the logarithm of heat production on the metabolizable energy intake. The heat production of the steers was calculated by deducting energy retained from metabolizable energy intake. The net energy requirement for weight gain (NEg) was determined as the energy deposited in the gain. The net protein requirement for weight gain (NPg) was determined as the retained protein in the gain. The equations were calculated using the statistical program SAS. The NEm was 74 kcal/kg EBW<sup>0.75</sup> or 70 kcal/kg LW<sup>0.75</sup>. The NEg for steers with 450 kg weight was 4.47 Mcal. The net protein maintenance requirement was 186 g/kg LW and NPg was 133 g/kg LW gain.

**Key Words:** Nutrition, Ruminant

**W257 Venous blood gas in Holstein steers fed diets differing in concentrate to alfalfa hay ratios.** M. Danesh Mesgaran\*, A. R. Vakili, and A. Heravi Mousavi, Ferdowsi University of Mashhad, Mashhad, Khorasan Razavi, Iran.

The aim of the present experiment was to investigate the effect of diets providing different concentrate: lucerne hay ratios on venous blood gas in Holstein steers. Holstein steers (initial body weight= 261±15 kg, n=30) were adapted to experimental diets for one week. Then, for 120 days, steers were fed 10 kg of DM of diets differing in concentrate (155 g CP kg<sup>-1</sup> of DM; 30% maize, 34% barley, 8% soybean meal, 5% sugar beet pulp, 10% wheat bran, 12% cottonseed meal, 0.3% CaCO<sub>3</sub>, 0.5% mineral and vitamin premix, 0.2% salt) to alfalfa hay ratios as 60:40 (C<sub>60</sub>:A<sub>40</sub>) and 80:20 (C<sub>80</sub>:A<sub>20</sub>) in a completely randomized design.

Animals were fed the experimental diets (ad lib) as total mixed ration twice daily at 0800 and 2000 h. At days 60 and 120 of the experimental period, blood samples were taken from jugular vein 4 h after the morning feeding. Samples were analyzed for venous blood gas by Automatic blood gas system (AVL 995, Switzerland). Data were analyzed as repeat measures using the PROMIX of SAS and the means compared by the Duncan test (P< 0.05). The results of the present study indicated that blood HCO<sub>3</sub><sup>-</sup> and PaCO<sub>2</sub> were not significantly affected by time when steers were fed high concentrate diets. However, HCO<sub>3</sub><sup>-</sup> was significantly affected by time (p< 0.05). Therefore it was concluded that the increasing of concentrate from 60 to 80 % could not cause a mixed metabolic acidosis in our condition.

**Table 1. Venous blood gas in steers fed diets differing in concentrate: alfalfa hay ratios**

Item	Sampling				Treatment effect		Time effect	
	60 days		120 days		SEM <sup>1</sup>	P <sup>2</sup>	SEM	P
	Concentrate: alfalfa hay ratio							
	C <sub>60</sub> :A <sub>40</sub>	C <sub>80</sub> :A <sub>20</sub>	C <sub>60</sub> :A <sub>40</sub>	C <sub>80</sub> :A <sub>20</sub>				
pH	7.33	7.35	7.38	7.36	0.01	0.97	0.01	0.05
PO <sub>2</sub> (mmHg)	37.31	35.41	35.33	38.37	1.17	0.76	1.02	0.67
PCO <sub>2</sub> (mmHg)	56.95	57.28	55.85	65.80	2.63	0.19	2.35	0.22
HCO <sub>3</sub> <sup>-</sup> (mEq/lit)	29.61	30.80	31.50	35.24	1.23	0.19	1.1	0.03
O <sub>2</sub> Saturation (%)	62.34	60.67	60.23	64.16	1.84	0.74	1.46	0.05

1: SEM: Standard Error of Mean; 2: P: Probability

**Key Words:** Venous Blood Gas, Steer, Alfalfa Hay

**W258 In vitro gas production kinetics of regional feedstuffs used in sheep diets in Northwest Mexico.** A. S. Suarez-Reyes<sup>1</sup>, G. Nevarez-Carrasco<sup>1</sup>, M. A. Cerrillo-Soto\*<sup>1</sup>, J. F. Obregon<sup>2</sup>, and F. G. Rios<sup>2</sup>, <sup>1</sup>FMVZ-Universidad Juarez del Estado de Durango, Durango, Durango, Mexico, <sup>2</sup>FMVZ-Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, Mexico.

Sheep production in Northwest Mexico represents an important potential. Agricultural products which are mainly produced for human consumption are also utilized for animal production. Thus, a study was carried out to determine the *in vitro* gas production (GP) characteristics of regional feedstuffs commonly used in sheep nutrition practices in the dry tropics of northwest Mexico. Samples (200 mg) of broom sorghum (BS), cull apple meal (CAM), cull raw chickpeas (CRC), cull cooked chickpeas (CCC), and cull cooked beans (CCB) were placed in 100 ml calibrated glass syringes by triplicate. Buffered and mineral solutions were mixed in a 2:1 proportion with rumen fluid collected from three rumen cannulated sheep fed alfalfa hay and a commercial concentrate (75:25). Thirty ml of buffered rumen fluid was dispensed to each syringe at the time incubation started. The gas volume was recorded at 0, 3, 6, 9, 12, 24, 48, 72 and 96h. Data obtained were fitted to the equation: p=a+b(1-e<sup>-ct</sup>) using PROC NLIN. Metabolizable energy (ME) content from *in vitro* gas production was determined by: ME (Mcal kg<sup>-1</sup> DM) = (2.20 + 0.136 GP<sub>24h</sub> + 0.057 Crude Protein + 0.0029 Crude Fat<sup>2</sup>)/4.184. Data were analyzed using ANOVA for a completely randomized design. Differences (P<0.05) were registered in the gas produced from the soluble (a) fraction of feeds. CRC registered the higher value while the lower was registered in BS. The higher (P<0.05) gas produced from the slowly

fermentable fraction (b) was accounted in CCB and the lower in CAM. The constant rate of gas production (c) was higher ( $P < 0.05$ ) in CCC, CCB and CAM than in the other analyzed feeds. The higher values for the potential gas production (a+b) were registered in CCB, CRC, and CCC. The same pattern was observed for the ME content. *In vitro* gas production data supported the good potential of beans and chickpeas as feeds for sheep production in the subtropics of Northwest Mexico.

**Table 1. *In vitro* gas production characteristics of regional feedstuffs used in sheep nutrition practices in northwest Mexico**

Feed	Parameters				ME
	a	b	c	a+b	
BS	-7.26 <sup>c</sup>	70.01 <sup>c</sup>	0.046 <sup>b</sup>	62.76 <sup>b</sup>	2.03 <sup>b</sup>
CAM	-5.53 <sup>c</sup>	55.92 <sup>c</sup>	0.066 <sup>a</sup>	50.39 <sup>c</sup>	2.00 <sup>b</sup>
CRC	13.22 <sup>a</sup>	70.43 <sup>c</sup>	0.045 <sup>b</sup>	83.65 <sup>a</sup>	2.80 <sup>a</sup>
CCC	3.63 <sup>b</sup>	77.36 <sup>b</sup>	0.066 <sup>a</sup>	80.99 <sup>a</sup>	2.86 <sup>a</sup>
CCB	-7.08 <sup>c</sup>	91.01 <sup>a</sup>	0.069 <sup>a</sup>	83.93 <sup>a</sup>	2.96 <sup>a</sup>
Mean	-0.60	72.95	0.058	72.34	2.53
SEM	2.17	3.09	0.003	3.64	0.114

<sup>a,b,c</sup> Means within columns with different superscript differ ( $P < 0.05$ ).

**Key Words:** Gas Production, Feedstuffs, Sheep

**W259 Effect of two doses of zilpaterol clorhidrate on productive performance and carcass characteristics of hair sheep in the feedlot.** F. G. Rios\*, F. Leon, J. F. Obregon, J. A. Felix, D. C. Acosta, and J. J. Portillo, *FMVZ-Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, Mexico.*

To determinate the effect of two doses of beta-agonists zilpaterol clorhidrate (HCl-Z) on productive performance and carcass characteristics of hair sheep in the feedlot, 36 ram lambs ( $37.34 \pm 0.570$  kg) were used in a randomized complete block experiment where block was initial weight. The lambs were assigned to one of three diets fed ad libitum: 1) control diet with 17% CP and 3.62 Mcal of DE/kg consisting of 62% whole corn grain, 14% soybean meal, 11.9% Sudan grass hay, 5.0% molasses cane, 2.0% meat meal, 2.0% animal fat, 2.5% mineral premix and 0.6% sodium bicarbonate; 2) diet similar to control but with the addition of 12 ppm of HCl-Z; and 3) Diet similar to control but with the addition of 18 ppm of HCl-Z. Feed intake (FI), average daily gain (ADG), feed efficiency (FE), carcass traits, and primary cuts weight were recorded. The data were analyzed with ANOVA for randomized blocks design; Tukey test were utilized to examine the effect of treatment. The final weight was higher in 4.49% ( $46.54$  vs.  $44.50$  kg;  $0.623$  SEM) ( $P < 0.07$ ), and FE was improved 24.25% ( $5.760$  vs.  $4.635$ ;  $0.249$  SEM) for lambs fed diets with HCl-Z, but ADG ( $0.285$  kg/d) not was modified and feed intake was similar ( $1.386$  kg/d). Diet with beta-agonist increased ( $P < 0.05$ ) hot carcass weight was improved in 6.65% by HCl-Z ( $27.07$  vs.  $25.384$ ;  $0.329$  SEM) and the dressing carcass percent in 3.0%. Rib eye area ( $15.71$  cm<sup>2</sup>); fat thickness ( $2.67$  mm); retail product yield (47.9%), mesenteric fat weight ( $1.160$  kg), kidney fat weight ( $0.871$  kg), and empty body weight ( $44.29$  kg) not were modified by treatments. Diets with beta agonists increased ( $P < 0.01$ ) the weight of primal cuts: shoulder ( $1.92$  vs.  $1.59$  kg;  $0.057$  SEM), leg ( $3.05$  vs.  $2.73$  kg;  $0.039$  SEM), and rack ( $1.83$  vs.  $1.68$  kg;  $0.039$  SEM). Loin ( $1.82$  kg), breast ( $1.37$  kg) and flank ( $0.912$  kg), was not affected by diets. Its concluded that addition of 12 or 18 ppm de HCl-Z to diets of hair sheep increased feed efficiency, final, hot carcass, shoulder, leg and rack weight.

**Key Words:** B-Agonists, Hair Sheep, Carcass Characteristics

**W260 Effects of feeding a polyclonal antibody preparation against *Escherichia coli* O157:H7 on performance, carcass characteristics and *E. coli* O157:H7 fecal shedding of feedlot steers.** N. DiLorenzo\*, C. R. Dahlen, and A. DiCostanzo, *University of Minnesota, St. Paul.*

Oral doses of avian-derived polyclonal antibody preparations (PAP) against *Streptococcus bovis* or *Fusobacterium necrophorum* were effective at reducing ruminal counts of target bacteria, and improving feed efficiency of feedlot steers. The objective of this study was to determine the effects of feeding a PAP against *E. coli* O157:H7 (PAP-Ec) on performance, carcass characteristics and *E. coli* O157:H7 fecal shedding of feedlot steers. Eighty four Angus and Angus crossbred steers ( $258$  kg initial BW  $\pm 22$ ) were randomly allocated to one of two treatments: PAP-Ec or CTL. Steers received a basal diet (1.39 Mcal NE<sub>g</sub>/kg DM, 12.5% CP, 0.7% Ca, and 0.35% P) comprised of high-moisture corn and dry ground corn (50:50 mix, DM basis), corn silage, and a supplement containing laidlomycin propionate and were supplemented (PAP-Ec) or not (CTL) with 2.5 mL PAP-Ec/d. Individual fecal samples were collected every 28 d for *E. coli* O157:H7 analysis. Steers receiving PAP-Ec tended ( $P = 0.06$ ) to have greater feed efficiency (live basis). Carcass-adjusted feed efficiency did not differ ( $P = 0.10$ ) between treatments. Steers receiving PAP-Ec had greater ( $P < 0.05$ ) fat thickness than CTL. No differences ( $P > 0.10$ ) were observed in *E. coli* O157:H7 fecal shedding at 0, 28, 84 and 165 d on feed. After 56 d on feed, a greater ( $P < 0.05$ ) prevalence of *E. coli* O157:H7 was observed in steers fed PAP-Ec. Steers fed PAP-Ec had a lower ( $P < 0.05$ ) prevalence of *E. coli* O157:H7 after 112 d on feed and tended ( $P = 0.06$ ) to have reduced *E. coli* O157:H7 prevalence after 140 d on feed. The use of an avian-derived polyclonal antibody preparation against *E. coli* O157:H7 in feedlot diets may be a valid intervention to enhance cattle performance and reduce *E. coli* O157:H7 fecal shedding.

**Key Words:** Steers, Antibodies, *E. coli* O157:H7

**W261 Selenoprotein expression is induced during oxidative stress in beef cows.** E. Terry, K. Brennan, J. Michal\*, K. Johnson, and R. Kincaid, *Washington State University, Pullman.*

Oxidative stress is increased during fat mobilization during weight loss. Selenoproteins, including glutathione peroxidase (Gpx), thioredoxin reductase (TrxR), and selenoprotein W (Sel-W), are potent antioxidants that protect against cellular damage and may be particularly important at times when oxidative stress is acute. Therefore, a study was conducted to examine the expression of selenoprotein mRNA in skeletal muscle 18 Angus-cross cows during weight loss and weight maintenance. Cows were fed at maintenance for 60 days in early-lactation to allow weight loss. The weight maintenance period (60d) took place shortly after weaning. Cows had access to trace mineralized salt with added selenium at all times. Muscle biopsies were aseptically collected from the *Biceps femoris* at the end of each period and immersed in liquid nitrogen. Total RNA was later extracted and cDNA synthesized. Primers were designed based on available sequences for Gpx1 (Accession No. AF532927), TrxR1 (Accession No. NM174625) and Sel-W (Accession No. AF380118) and real-time quantitative PCR used to determine expression of mRNA relative to  $\beta$ -actin. During the 60-d period following parturition, cows lost an average of  $72.2 \pm 4.97$  kg, whereas, in the 60-d after weaning, cows gained  $5.18 \pm 4.97$  kg. Gpx1 mRNA expression in skeletal muscle during weight loss was not changed when compared to expression during weight maintenance. However, skeletal muscle TrxR1 mRNA

was 10 fold higher ( $P < 0.05$ ) and expression Sel-W mRNA was almost 3-fold greater ( $P < 0.05$ ) during weight loss when compared to weight maintenance. The mammalian antioxidant system has evolved to protect against reactive oxygen species and the subsequent oxidative stress that an animal experiences. Increased expression of these antioxidant genes indicate these cows responded to increased oxidative stress.

**Key Words:** Beef Cattle, Selenium, Oxidative Stress

**W262 Validation of a continuous in vitro system modeling the jejuno-ileal ecosystem of veal calves.** M. Champod<sup>2,1</sup>, S. Blanquet-Diot<sup>1</sup>, D. Bravo<sup>2</sup>, J. P. Meunier<sup>\*2</sup>, and M. Alric<sup>1</sup>, <sup>1</sup>University of Auvergne, France, <sup>2</sup>Pancosma Research, Geneva, Switzerland.

Since the European prohibition of antibiotics used as growth promoters in 2006, it is necessary to develop new feed additives able to maintain the intestinal microflora equilibrium of the veal calves. The aim of this work is to validate an in vitro system that has been set up to reproduce the intestinal ecosystem of veal calves.

This fermentor reproduces the anaerobic, pH and temperature conditions found in the jejuno-ileum of calves. It is inoculated with the jejuno-ileal contents of three 20 weeks-old Prim'Holstein veal calves slaughtered after 6h fasting. The fermentative content is continuously homogenized and renewed by addition of fresh nutritive medium (composition established from biochemical analyses of in vivo intestinal content). The main bacterial groups were followed by regular counting on selective culture media during 1 week. Fermentative samples were collected for lactate and ammonia analyses. The results were compared with in vivo data by one-way analysis of variance.

The levels of total anaerobic microflora, Enterococci, Bifidobacteria and lactate utilizing bacteria were not statistically different from in vivo ones. The concentrations of *Bacteroides* and *Escherichia coli* were significantly ( $P \leq 0.001$ ) higher in vivo than in vitro whereas *Lactobacilli* were stabilized at 8.1 log compared to 6.9 log in vivo ( $P = 0.001$ ). In vivo and in vitro lactate concentrations were not different ( $P > 0.05$ ), whereas ammonia reached concentrations significantly ( $P < 0.001$ ) higher in vitro than in vivo (3.39 vs 0.14 g/L).

These results show that most of the bacterial groups enumerated were stabilized in the in vitro system at their in vivo levels and that their metabolic activities were maintained. This model will be used to screen new feed additives by studying their action on the intestinal microflora equilibrium of the veal calves.

**Key Words:** Veal Calf, Intestinal Microflora, In Vitro System

**W263 Maternal natural source vitamin E supplementation on suckling calf performance and immune response.** M. J. Richardson<sup>\*1</sup>, S. L. Lake<sup>1</sup>, S. D. Eicher<sup>2</sup>, R. Lemenager<sup>1</sup>, M. Einstein<sup>1</sup>, and N. Pyatt<sup>3</sup>, <sup>1</sup>Purdue University, West Lafayette, IN, <sup>2</sup>USDA-ARS, West Lafayette, IN, <sup>3</sup>ADM Animal Nutrition Research, Decatur, IN.

The objective of this study was to determine the effects of maternally supplemented natural-source vitamin E (NSVE) on suckling calf performance and immune response. In a two-year study, one hundred twenty-five Angus-cross beef cows ( $n = 75$  in year one, 50 in year two; initial BW = 607 kg; initial BCS = 5.3) were randomly assigned to one of two isocaloric dietary treatments: 1) corn-based supplement (CON) or 2) corn-based supplement formulated to contain 1000 IU/d NSVE

(NAT). Maternal supplementation began 5 wk prepartum and continued through wk 8 of lactation. Blood was collected from calves at 24 h of age for analysis of IgG concentration as an indicator of passive transfer and circulating  $\alpha$ -tocopherol concentration. At 19 d of age, blood was collected from calves to determine the presence of CD14 and CD18 receptors on leukocytes. At 21 and 35 d of age, calves were injected with hen egg albumin (20 mg; OVA) and bled weekly until d 63 of age to determine total antibodies produced to OVA. No differences were seen in calf birthweight ( $P = 0.59$ ), ADG ( $P = 0.93$ ), or weaning weight ( $P = 0.39$ ). Circulating  $\alpha$ -tocopherol concentrations were increased at both 24 h ( $P < 0.001$ ) and at the day of initial OVA challenge ( $P < 0.001$ ). There was no difference in IgG concentration ( $P = 0.36$ ) at 24 h or presence of CD14 ( $P = 0.83$ ) or CD18 ( $P = 0.84$ ) receptors at d 19 of age. Calves suckling NAT cows tended ( $P = 0.19$ ) to have a greater overall titer response than calves suckling CON cows, however there was no treatment  $\times$  day interaction ( $P = 0.59$ ). In conclusion, calves suckling cows supplemented with NSVE had increased circulating concentrations of  $\alpha$ -tocopherol at 24 h which appeared to continue throughout maternal supplementation. Furthermore, calves suckling NAT dams tended to have increased overall titer response when compared with CON calves; however, calf performance was not affected.

**Key Words:** Beef Calves, Immune Response, Vitamin E

**W264 The relation between plasma vitamin C, leptin and fat accumulation during the fattening period in Japanese Black steers.** K. Hodate<sup>\*</sup>, M. Hayashi, and K. Kido, National Institute of Livestock and Grassland Science, Tsukuba, Ibaraki, Japan.

In this study, changes of plasma vitamin A and C, leptin and insulin were observed and investigated in relation to fat accumulation in fattening Japanese Black steers. Nine Japanese Black steers ( $334 \pm 18$  kg) were fattened for 56 weeks (from 14 to 28 months of age) and divided into three groups: vitamin A supplemented S group was supplemented with 296.8 ( $42.4 \times 7$ ) IU/BW kg vitamin A weekly from week 1 to week 56, vitamin A restricted R group was restricted vitamin A, keeping the plasma vitamin A level above 30 IU/dL, and the RS group was restricted vitamin A and treated as the R group from week 1 to week 44 and then supplemented with vitamin A weekly and treated as the S group from week 45 to week 56. Blood plasma samples were drawn every 4 weeks before feeding. Leptin and insulin concentrations were measured by RIA kit. Vitamin A and C concentrations were determined using HPLC and a colorimetric method, respectively. Backfat thicknesses were measured by real ultrasonography every 4 weeks. At the start of the experiment, plasma vitamin A and C concentrations were 127 IU/dL and 6.2 mg/L, respectively. At the end of the experiment, plasma vitamin A and C concentrations of the supplemented (S and RS) groups and the R group were 120 and 37 IU/dL ( $p < 0.01$ ), and 3.5 and 2.7 mg/L ( $p = 0.10$ ), respectively. Backfat thickness of the S and the R groups was 17.0 and 15.0 mm and had no correlations with plasma vitamin A concentrations. Plasma leptin and insulin concentrations increased with fattening and showed a high correlation to backfat thickness during the experimental period ( $r = 0.93$  and  $0.81$ ,  $p < 0.01$ ). Cross-correlation coefficient between backfat thickness and plasma leptin concentration was at its maximum with a 4 week delay. Backfat thickness was reflected in the circulating leptin concentration 4 weeks later. There was a reciprocal correlation between plasma leptin and vitamin C concentration ( $r = -0.93$ ,  $p < 0.01$ ). Fattening cattle for a long term with high energy feed has decreased plasma vitamin C concentrations.

**Key Words:** Vitamin C, Steer, Fat Accumulation

**W265 Performance, carcass characteristics and IGF-I plasmatic concentrations of feedlot young cattle from different genetic groups.** C. L. Martins<sup>1</sup>, M.D. B. Arrigoni<sup>1</sup>, A. C. Silveira<sup>1</sup>, H. N. de Oliveira<sup>1</sup>, R. d. C. Cervieri<sup>1</sup>, L. A. L. Chardulo<sup>1</sup>, D. D. Millen<sup>\*1</sup>, R. D. L. Pacheco<sup>1</sup>, T. M. Mariani<sup>1</sup>, J. P. S. T. Bastos<sup>1</sup>, T. C. B. da Silva<sup>2</sup>, S. R. Baldin<sup>1</sup>, L. M. N. Sarti<sup>1</sup>, and R. S. Barducci<sup>1</sup>, <sup>1</sup>FMVZ/UNESP, Botucatu, São Paulo, Brazil, <sup>2</sup>Faculdade de Zootecnia/UNESP, Dracena, São Paulo, Brazil.

This study was designed to evaluate performance, carcass characteristics, meat tenderness and IGF-I plasmatic concentration (IGFPC) of *Bos indicus*-based types (BT). The experiment was designed as a 5X2 factorial arrangement, in which 80 8-mo-old bullocks (302.4±28.5kg) and 80 8-mo-old heifers (260.8±26.4kg) of five BT: 40 CH (1/2 Charolais, 1/4 Nellore, 1/4 Simmental), 40 GE (1/2 Gelbvieh, 1/4 Nellore, 1/4 Simmental), 40 AN (1/2 Angus, 1/4 Nellore, 1/4 Simmental), 40 HE (1/2 Hereford, 1/4 Nellore, 1/4 Simmental) and 40 SI (3/4 Simmental, 1/4 Nellore) were fed in feedlot for 150 days. Rib eye area (REA) and back fat thickness (BFT) were taken after slaughter to evaluate muscle and fat deposition. Meat samples were harvested between 12th and 13th ribs for shear force (SF) and intramuscular fat (IMF) analysis. Rib eyes were scored for marbling (MB) using a scale of 1 to 6. CH, HE and SI presented greater (P<0.05) average daily gain in kilos (ADG) when compared to GE and AN (CH=1.07, HE=0.97, SI=1.13, GE=0.84, AN=0.86). Bullocks (BL) had greater (P<0.05) ADG (1.09 vs. 0.85) than heifers (HF). No differences were observed (P>0.05) for dressing percentage and hot carcass weight during the study. AN presented smaller (P<0.05) REA in cm<sup>2</sup> (56.70) than CH (64.34), SI (62.30), HE (65.85) and GE (63.99). In the other hand, AN showed in mm (P<0.05) greater BFT (AN=3.8, HE=2.9, SI=2.6, GE=2.5, CH=2.6), higher (P<0.05) MB scores (AN=4.4, HE=3.4, SI=3.1, GE=3.1, CH=3.2) and greater (P<0.05) IGFPC in ng/ml (AN=245.6, HE=177.1, SI=197.4, GE=184.8, CH=178.5) and IMF in % (AN=4.27, HE=3.20, SI=3.06, GE=2.78, CH=2.96) between BT. It was found (P<0.05) lower SF (kilograms) values for AN (AN=3.95, HE=5.12, SI=5.63, GE=5.38, CH=5.27). HF had smaller (P<0.05) REA (57.85 vs. 67.42), greater BFT (3.1 vs. 2.6) and lower IGFPC (137.8 vs. 260.1) when compared to BL. No differences were observed (P>0.05) in MB, IMF and SF for HF and BL. Even presenting lower ADG, AN showed better carcass and meat quality with higher MB scores, greater BFT and IMF and better tenderness. BL performed better than HF, but without impacting carcass and meat quality.

**Key Words:** Carcass, Cattle, Feedlot

**W266 Influence of chromium methionine addition during last days in feedlot on performance and carcass characteristics of finishing bulls.** R. Barajas<sup>\*1</sup>, B. J. Cervantes<sup>2,1</sup>, J. A. Romo<sup>1</sup>, P. J. Rojas<sup>3</sup>, and E. A. Velazquez<sup>1</sup>, <sup>1</sup>FMVZ-Universidad Autonoma de Sinaloa, Culiacán, Sinaloa, Mexico, <sup>2</sup>Ganadera Los Migueles SA de CV, Culiacán, Sinaloa, Mexico, <sup>3</sup>Tecnología de Máxima Producción, S.A. de C.V., Culiacán, Sinaloa, Mexico.

With the objective of determine the effect of addition of chromium methionine during last days in feedlot on performance and carcass characteristics of bulls, sixty bull calves (455.95 ± 2.19 kg) Brahman cross were used. Bulls from a same fattening lot, in a complete randomized block design, were assigned to received one of two diets during last 34

days in feedlot: 1) Diet with 13.17 % CP and 2.048 Mcal of NEm/kg, containing 87% de concentrate corn-soybean meal-based (Control); 2) Diet similar to control added with 0.2 ppm of chromium from chromium methionine. Chromium improved (P = .09) ending weight, and augmented (P = 0.09) ADG in 14.6%. Dry matter intake was not affected (P = 0.84). Chromium enhanced (P = 0.09) in 12% feed conversion, 8% NE retained from the diet and 11% NEm retained from diet. Chromium did not affected (P = 0.20) hot carcass weight, and tended (P = 0.11) to improved carcass dressing. Chromium not modifies (P > 0.20) back fat thickness, rib eye area, marbling score, KPH fat neither meat pH. It is concluded, that addition of chromium methionine at low dosages during last days in feedlot, could contribute to improve performance of finishing bulls.

**Key Words:** Chromium, Feedlot Cattle, Growth-Performance

**W267 Influence of chromium-methionine supplementation level during last 32 days on feedlot performance, carcass characteristics, and blood cortisol of finishing bulls.** V. Monterrosa<sup>1,2</sup>, R. Barajas<sup>\*3</sup>, J. A. Romo<sup>3</sup>, and B. J. Cervantes<sup>3,4</sup>, <sup>1</sup>Técnica Mineral Pecuaria, Guadalajara, Jalisco, Mexico, <sup>2</sup>CUCBA-Universidad de Guadalajara, Guadalajara, Jalisco, Mexico, <sup>3</sup>FMVZ-Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, Mexico, <sup>4</sup>Ganadera Los Migueles, S.A. de C.V., Culiacan, Sinaloa, Mexico.

Forty five finishing beef bulls (487.7 ± SE 2.49 kg) were involved in an experiment to determine the influence of chromium-methionine supplementation level during last 32 days on feedlot performance and carcass characteristics. Animals were blocked by weight, and in groups of five were placed in ground pens. Within each block pens were randomly assigned to one of three dietary treatments: 1) Finishing diet 13% CP; NEm 1.9 Mcal/kg without additional chromium (CTRL); 2) Diet similar to CTRL but with 0.2 mg/kg of chromium added during last 32 days in feedlot (Cr-0.2); and 3) Diet similar to CTRL but added with 0.4 mg/kg of chromium added during last 32 days in feedlot (Cr-0.4). Chromium-methionine premix (MiCroplex TM; Zinpro, Co, Eden Prairie, MN) was used as source for additional Cr. All cattle received 60 mg/head/d of zilpaterol hydrochloride from day 33 to day 3 prior to slaughter. Ending weight was not affected by treatments (P > .40). Cr-0.4 increased ADG 4.8% (P = .04) with respect to control, and a linear increase in ADG as Cr level increased was observed (P < .05) with values of 1.898, 1.920 and 1.898 by CTRL, Cr-0.2, and Cr-0.4, respectively. Dry matter intake was not influenced by treatments (P > .25). Feed/gain ratio was improved 4% by Cr-0.4 (P < .05) with respect to CTRL. Feed/gain ratio was linearly reduced supplementary Cr was increased (P < .05), with values of 6.023, 5.917, and 5.785 kg/kg for CTRL, Cr-0.2, and Cr-0.4, respectively. NEm and NEm observed/expected ratio was not altered by Cr-supplementation (P > .15). Carcass characteristics and meat-pH were not altered by treatments (P > .40). Blood cortisol at slaughter time was decreased 28% by Cr-0.2 and Cr-0.4, relative to unsupplemented-Cr cattle (4.53, 3.23, and 3.23 mg/dL by CTRL, Cr-0.2, and Cr-0.4, respectively). The results suggest that chromium methionine supplementation during last 32 days in feedlot, improves daily weight gain and feed/gain ratio of finishing bulls without affecting carcass characteristics.

**Key Words:** Beef Cattle, Chromium Methionine, Feedlot Performance

**W268 Effects of essential oils on ruminal environment and performance of feedlot calves.** J. I. Geraci<sup>1</sup>, A. D. Garcarena<sup>1</sup>, D. Colombatto<sup>2,3</sup>, D. Bravo<sup>4</sup>, and J. C. Burges<sup>1</sup>, <sup>1</sup>EEA Balcarce INTA, Argentina, <sup>2</sup>University of Buenos Aires, Argentina, <sup>3</sup>CONICET, Argentina, <sup>4</sup>Pancosma SA, Switzerland.

Essential oils (EO) have the potential to modify the ruminal environment and to replace the use of antibiotics for specific markets. Twenty four Aberdeen angus calves (135.4 kg initial weight) were blocked by weight in four groups and randomly allocated to 8 pens of 3 animals each. Treatments were EO (800 mg Xtract 7065 animal<sup>-1</sup> d<sup>-1</sup>) or monensin (430 mg Rumensin<sup>®</sup> kg DM<sup>-1</sup>) added into a mineral mixture. Diets were fed twice a day and consisted (DM basis) of 70% coarsely ground corn, 28% pelleted sunflower meal and 2% mineral mixture, plus 200 g alfalfa hay animal<sup>-1</sup> d<sup>-1</sup>. The experiment lasted for 85 days, and DM intake, average daily gain (ADG), feed conversion ratio (FCR) and rate of subcutaneous fat deposition (RFD) were determined throughout the study. In addition, two ruminally fistulated steers were also used in a cross over design in order to examine ruminal variables (pH and NH<sub>3</sub>) as affected by EO or monensin. Compared to monensin, EO did not alter DM intake (6.50 vs. 6.45 kg,  $p=0.79$ ), ADG (1.31 vs. 1.23 kg d<sup>-1</sup>,  $p=0.35$ ), FCR (4.96 vs. 4.99,  $p=0.91$ ) or RFD (1.80 vs. 1.68 mm month<sup>-1</sup>,  $p=0.65$ ) for EO and monensin, respectively. In addition, feeding behaviour was not altered by EO compared to monensin, as animals visited the feeders a similar number of times and the length of each visit was also similar (11.2 vs. 10.74; and 9.55 vs. 9.72 min for EO and monensin, respectively). Ruminal pH was lower with EO than with monensin (5.58 vs. 6.09,  $p=0.002$ ), and the same held true for NH<sub>3</sub> (10.78 vs. 20.05 mg dl<sup>-1</sup>,  $p=0.01$ ). Lower NH<sub>3</sub> concentrations with EO addition can be partially explained by the lower pH, conducive to lower protein degradation, and perhaps due to some EO action on specific, deaminative bacteria in the rumen. Overall, this study shows that EO can replace monensin in high grain diets without any alteration in the productive response of feedlot cattle.

**Key Words:** Essential Oils, Monensin, Feedlot

**W269 Body and ultrasound measurements, muscularity scores, blood physiology and behaviour in growing beef heifers differing in phenotypic residual feed energy intake.** M. McGee<sup>\*1</sup>, M. J. Drennan<sup>1</sup>, D. A. Kenny<sup>2</sup>, and B. Earley<sup>1</sup>, <sup>1</sup>Teagasc, Grange Beef Research Centre, Dunsany, Co. Meath, Ireland, <sup>2</sup>University College Dublin, Belfield, Dublin, Ireland.

The effect of residual feed energy intake (RFI), an alternative measure of feed efficiency, on growth, body and ultrasound measurements, blood physiology and behaviour was determined in growing purebred Simmental and Simmental x Friesian-Holstein heifers (n=85; mean (± SD) initial age 299 ± 47 d and weight 311 ± 48.8 kg). They were individually offered grass silage ad libitum and 2.0 kg of concentrate once daily over 84 d using a Calan gate system. Live weight (consecutive days), body (withers height, chest depth and girth, pelvis width and back length) and ultrasound fat (13th rib), and fat and muscle (3rd lumbar) depth measurements were taken at the beginning and end, and additionally, a visual muscularity score was recorded at the end, of the feeding period. Blood samples were obtained on four occasions for analysis of albumin, creatinine, beta-hydroxy butyrate, globulin, glucose, non-esterified fatty acids, total protein, triglycerides, urea, aspartateaminotransferase, alkaline phosphatase, creatine kinase, fibrinogen, haptoglobin, anti-

oxidant status and total bilirubin. Expected energy intake (EI) (UFL/d) was calculated by regressing average daily EI on average daily live weight gain (ADG) and mean live weight<sup>0.75</sup>, with a model which included genotype. Within genotype, heifers were then ranked by RFI and assigned to low (efficient), medium and high RFI groups. At the end of the study, time spent lying and standing was determined using pedometers on nine heifers with the highest and lowest RFI. Overall mean (± SD), ADG (kg/d), DMI (kg/d), EI (UFL/d) and RFI (UFL/d) were, 0.52 ± 0.20, 5.81 ± 0.73, 5.17 ± 0.58 and -0.00 ± 0.35, respectively. The RFI groups did not differ ( $P>0.05$ ) in live weight, ADG, body and ultrasound measurements, muscularity score, blood variables or lying and standing time.

**Key Words:** Beef Cattle, Residual Feed Intake, Feed Efficiency

**W270 The effect of mineral supplement delivery system on frequency, duration, and timing of use by beef cows grazing topographically rugged native range.** N. A. Sproul<sup>\*</sup>, K. C. Olson, J. S. Drouillard, J. R. Jaeger, L. A. Pacheco, J. W. Bolte, M. D. Thomas, and J. J. Higgins, Kansas State University, Manhattan.

The study was conducted on 4 pastures (average size = 101 ha) from June to September. The pastures were grazed by 188 lactating beef cows and their calves (30-70 pairs/pasture). Treatments were mineral provided in dry granular form (DRY) or mineral provided in a low-protein, cooked molasses-based block (BLOCK). Both supplements were available ad libitum. DRY was supplied to cattle via 1 covered mineral feeder. BLOCK was supplied via 4 open-topped barrels spaced within 3 m of one another. Both DRY and BLOCK were deployed in each pasture and pasture constituted the experimental unit. No additional NaCl was supplied to cattle. Forage use in the vicinity of each supplement and the frequency and duration of herd visits to each supplement were measured during 7 14-d periods. Supplements were moved to new locations at the beginning of each period. BLOCK consumption was greater ( $P<0.01$ ) than DRY in periods 1, 3, 5, and 7 but was not different ( $P>0.1$ ) from DRY during periods 2, 4, and 6. The frequency of herd visits to BLOCK and DRY sites were similar ( $P>0.1$ ) for periods 1 through 5; however, herds visited BLOCK about twice as often as DRY during periods 6 and 7 ( $P<0.01$ ). Herd visits to BLOCK sites were longer than those to DRY sites (84 vs. 51 min/herd visit;  $P<0.01$ ). The total length of nighttime visits (1800 to 0600) to BLOCK was greater than that for DRY (57 vs. 49 min/d;  $P<0.01$ ); however, the percentage of all herd visits that occurred at night was similar ( $P=0.38$ ) between treatments. Forage disappearance around supplement deployment sites was not influenced by treatment ( $P=0.81$ ). Forage disappearance over time generally decreased (main effect of period,  $P<0.01$ ). BLOCK influenced the behavior of grazing cattle more strongly than DRY. Influences extended to the amount of supplement consumed as well as to the frequency, duration, and timing of use.

**Key Words:** Beef Cattle, Grazing Behavior, Native Range

**W271 Effects of the dose of capsicum extract on intake, water consumption and rumen fermentation of beef heifers fed a high-concentrate diet.** M. Rodriguez-Prado<sup>1</sup>, S. Calsamiglia<sup>\*1</sup>, A. Ferret<sup>1</sup>, J. Zwieter<sup>1</sup>, L. Gonzalez<sup>1</sup>, and D. Bravo<sup>2</sup>, <sup>1</sup>Universitat Autònoma de Barcelona, Spain, <sup>2</sup>Pancosma, Switzerland.

Four beef Holstein heifers (BW = 438 ± 71 kg) fitted with a 1-cm i.d. plastic ruminal trocars were used in a 4 × 4 Latin square design to evaluate the effect of 3 doses of capsicum extract on intake, water consumption and ruminal fermentation in heifers fed a high-concentrate diet. Animals were fed (DM basis) 10% barley straw and 90% concentrate (32.2% barley grain, 27.9% ground corn, 7.5% wheat bran, 10.7% soybean meal, 10.7% soybean hulls, 7.2% corn gluten feed, 3.1% mineal-vitamin mix; 16.6% CP, 18.3% NDF). Treatments were: no additive (CTR), 625 mg/d of capsicum extract (CAP625), 1250 mg/d of capsicum extract (CAP1250), and 2500 mg/d of capsicum extract (CAP2500). Each experimental period consisted of 25 d (15 d for adaptation, 5 d of continuous measurement of DM intake, and 3 d for rumen sample collection). Animals had ad libitum access to water and feed offered once daily at 0800. Data was analysed using PROC MIXED for repeated measures (SAS), and differences were declared at  $P < 0.05$ . Intake of water (30.3 and 29.4 vs 27.4 L/d) was higher in CAP625 and CAP2500 compared with CTR, respectively. Intake of concentrate was also higher in CAP2500 vs CTR (8.40 vs 7.64, respectively). As a result of the higher intake, total volatile fatty acids tended ( $P < 0.07$ ) to be higher in CAP625 and CAP2500 compared with CTR (144.8 and 142.9 vs 134.1 mM, respectively). However, the concentration of acetate (59.2 mM), propionate (23.8 mM), butyrate (14.2 mM), lactate (0.28 mM) and ammonia N (14.9 mg N/dL) was not affected by treatments. In spite of the higher intake, pH was not affected by treatments. Capsicum extract can be used in beef cattle diets to stimulate DM intake and water consumption without reducing ruminal pH.

**Key Words:** Intake, Capsicum, Fermentation

**W272 Blood metabolic profile of feedlot cattle supplemented with monensin or polyclonal antibodies preparations against lactate-producing rumen bacteria during diet step-up.** D. D. Millen<sup>1,3</sup>, R. D. L. Pacheco<sup>1</sup>, M. D. B. Arrigoni<sup>1</sup>, A. DiCostanzo<sup>2</sup>, C. T. Marino<sup>1</sup>, N. DiLorenzo<sup>2</sup>, S. A. Matsuhara<sup>1</sup>, M. Parrili<sup>1</sup>, M. V. Fossa<sup>1</sup>, L. M. N. Sarti<sup>1</sup>, S. L. Beier<sup>1</sup>, H. N. de Oliveira<sup>1</sup>, C. L. Martins<sup>1</sup>, T. M. Mariani<sup>1</sup>, J. P. S. T. Bastos<sup>1</sup>, <sup>1</sup>FMVZ/UNESP, Botucatu, São Paulo, Brazil, <sup>2</sup>University of Minnesota, Saint Paul, <sup>3</sup>Apoio FAPESP.

This study, conducted at the São Paulo State University feedlot, Botucatu Campus, Brazil, was designed to test polyclonal antibody preparation (PAP) against lactate-producing rumen bacteria on blood gas concentrations during diet transitions (58% to 85% concentrate; substituting corn silage and sugarcane bagasse for corn grain) of *Bos indicus*-based biotypes. The experiment was designed as a 3 X 2 factorial, replicated thrice (4 bullocks/pen), in which 24 8-mo-old bullocks (259.6±26.4kg) of each of three *Bos indicus*-based types: 3-way cross (1/2 Brangus, 1/4 Angus, 1/4 Nellore; TC), Canchim (5/8 Charolais, 3/8 Nellore; CC), or Nellore (NE) were fed one of two diets containing either monensin (MO) at 300 mg/head/d or RMT at 10 ml/head/d. Jugular venous whole blood was collected in 1 ml syringes and analyzed within 1 h. Over the step-up periods, greater ( $P < 0.05$ ) O<sub>2</sub> pressure in mmHg (pO<sub>2</sub>) and percentage O<sub>2</sub> saturation (O<sub>2</sub>Sat) were observed in NE bullocks (33.5 and 63.8 vs. 30.2 and 57.6 and 31.1 and 58.7 for NE, CC, and TC, respectively). No differences ( $P > 0.05$ ) were found in pH, bicarbonate concentration (BC) in mmol/l, CO<sub>2</sub> pressure in mmHg (pCO<sub>2</sub>) and base excess in mmol/l (Beb) among biotypes. There were not differences ( $P > 0.05$ ) in pH, BC, Beb, pCO<sub>2</sub> and O<sub>2</sub>Sat when either PAP or MO was fed, but feeding MO led to greater ( $P < 0.05$ ) pO<sub>2</sub> (32.2) than PAP (31.2). Within MO transitions, transition to 73% concentrate led to greater ( $P < 0.05$ ) pCO<sub>2</sub> and a linear increase ( $P < 0.05$ ) of O<sub>2</sub>Sat during all diet transitions.

Lower ( $P < 0.05$ ) pH, BC and Beb were observed during transition to 73% concentrate diet. Values for blood gas were in normal ranges (not representative of metabolic acidosis). Effects of diet transition were greater than those of biotype or feed additive.

**Key Words:** Blood Gas, Monensin, Antibodies

**W273 Intake fluctuations of feedlot cattle supplemented with monensin or polyclonal antibodies preparations against lactate-producing rumen bacteria during diet step-up.** D. D. Millen<sup>1,3</sup>, R. D. L. Pacheco<sup>1</sup>, M. D. B. Arrigoni<sup>1</sup>, A. DiCostanzo<sup>2</sup>, N. DiLorenzo<sup>2</sup>, C. T. Marino<sup>1</sup>, S. A. Matsuhara<sup>1</sup>, M. Parrili<sup>1</sup>, L. M. N. Sarti<sup>1</sup>, M. V. Fossa<sup>1</sup>, H. N. de Oliveira<sup>1</sup>, S. L. Beier<sup>1</sup>, C. L. Martins<sup>1</sup>, T. M. Mariani<sup>1</sup>, J. P. S. T. Bastos<sup>1</sup>, <sup>1</sup>FMVZ/UNESP, Botucatu, São Paulo, Brazil, <sup>2</sup>University of Minnesota, Saint Paul, <sup>3</sup>Apoio FAPESP.

The adaptation response to high-concentrate diet step-up in bullocks of three distinct biotypes (Nellore, NE; Canchim cross, 5/8 Charolais, 3/8 Nellore, CC; or a 3-way cross, 1/2 Brangus, 1/4 Nellore and 1/4 Angus, TC) supplemented with a polyclonal antibody preparation (PAP) against lactate-producing bacteria (10 ml/head/d) or monensin (MON; 300 mg/head/d) was measured in a 2 × 3 factorial design. Seventy-two bullocks (24 of each biotype; 259.6±26.4 kg) were randomly allocated to each of 18 pens (one biotype within treatment) for a 135-d (TC and CC) or 175-d (NE) feeding period. On the first 4 d of each step-up period (from 58% to 85% concentrate), daily DMI (kg and as percent of BW) and daily DMI fluctuation (DMIF; kg and as percent of BW; the absolute value of the difference in DMI between consecutive days) were measured. During step-up, corn grain replaced proportions of corn silage and sugarcane bagasse. Over the step-up periods, bullocks fed PAP consumed more ( $P < 0.05$ ) DM than those fed MON (2.34% vs. 2.24%), but no differences were detected for DMI kg or DMIF. *Bos taurus*-influenced biotypes consumed more ( $P < 0.05$ ) DM than pure *Bos indicus* biotypes (9.65 and 9.15 vs. 7.14 for TC, CC, and NE, respectively), but no differences in DMI fluctuation were observed. During the transition from 58% to 73% concentrate, bullocks fed PAP consumed more DM (8.34 kg and 2.69% vs. 7.38 kg and 2.38%, respectively), but no differences were observed in subsequent diet transitions. When comparing across diet transitions, the transition from 58% to 73% concentrate resulted in greater ( $P < 0.05$ ) DMI (as percent of BW) and DMIF. A day effect was observed, where day 1 showed greater ( $P < 0.05$ ) DMIF kg (1=0.73, 2=0.52, 3=0.43, 4=0.49) and DMIF BW (1=0.20, 2=0.14, 3=0.11, 4=0.13) when compared to the days 2, 3 and 4. It was not found ( $P > 0.05$ ) interaction between days and feed additives for DMIF. Diet transition effects were greater than those elicited by use of either feed additives.

**Key Words:** Dry Matter Fluctuation, Monensin, Antibodies

**W274 Effects of supplemental cobalt on site and extent of digestion in beef heifers consuming chopped grass hay.** E. J. Scholljegerdes<sup>1</sup> and W. J. Hill<sup>2</sup>, <sup>1</sup>USDA-ARS, Northern Great Plains Research Laboratory, Mandan, ND, <sup>2</sup>Ralco Nutrition, Inc., Marshall, MN.

The objectives of this study were to determine if a mineral supplement containing a high level of organic cobalt would improve site and extent of digestion in beef cattle consuming a forage-based diet. Six ruminally cannulated Angus heifers (BW 432 ± 6.6 kg) were utilized in a triplicated

2 × 2 Latin square. Animals were fed chopped (2.54 cm) native grass hay (9.19% CP, 67.5% NDF on an OM basis) ad libitum. Cattle also received twice daily, 42.5g of a Bullseye™ All Purpose mineral-vitamin premix plus Suppli-mix® formulated to provide either 109 mg of Co/ kg or 283 mg of Co/ kg. Experimental periods lasted 21 d (17 d of adaptation with 4 d of sampling). Total DM, OM, N, and NDF intake did not differ ( $P = 0.80$  to  $0.85$ ) across treatment. Likewise, no differences ( $P = 0.54$  to  $0.99$ ) were noted for fecal DM, OM, N, and NDF flow (g/d) between cattle fed 109 mg of Co/ kg of supplement or 283 mg of Co/ kg. Therefore, Total tract DM, OM, N, and NDF digested (g/d) was not different ( $P = 0.75$  to  $0.79$ ) across treatments. Increasing supplemental cobalt from 109 mg of Co/ kg to 283 mg did not improve ( $P = 0.68$  to  $0.91$ ) total tract digestibility of any of the nutrients examined when expressed as a percent of intake. Dietary treatment did not affect ruminal pH ( $P = 0.99$ ) or ruminal  $\text{NH}_3$  ( $P = 0.18$ ). Likewise, additional cobalt had no effect ( $P = 0.40$ ) on total VFA production. However, feeding 283 mg of Co/ kg of supplement did tend ( $P = 0.08$ ) to increase ruminal molar proportions of butyrate from 9.9 to 10.2 mol/100mol but did not influence any other ruminal VFA ( $P = 0.36$  to  $0.87$ ). Due to the lack of differences in ruminal molar proportions of acetate and propionate, the acetate:propionate ratio did not differ ( $P = 0.77$ ) across treatments. Overall, increasing the concentration of cobalt from 109 mg of Co/ kg of supplement to 283 mg of Co / kg did not improve diet digestibility. Nevertheless, more work needs to be done to elucidate the potential of supplemental cobalt to improve forage digestibility.

**Key Words:** Cobalt, Digestibility, Forage

**W275 Effect of added dietary tannins on animal performance, carcass traits, and methane producing activity in finishing calves.** W. K. Krueger<sup>1,2</sup>, H. G. Bañuelos<sup>1</sup>, W. E. Pinchak<sup>3</sup>, B. R. Min<sup>3</sup>, R. C. Anderson<sup>4,2</sup>, G. E. Carstens<sup>1,2</sup>, R. R. Gomez<sup>1</sup>, and N. A. Krueger<sup>4</sup>, <sup>1</sup>Texas A&M University, College Station, <sup>2</sup>Intercollegiate Faculty of Nutrition, TAMU, College Station, TX, <sup>3</sup>Texas AgriLife Research, Vernon, TX, <sup>4</sup>USDA-ARS-Food and Feed Safety Research Unit, College Station, TX.

The objective of the study was to characterize the effect of added dietary tannins on animal performance, carcass traits, and methane producing activities in finishing cattle. Thirty-six crossbred steers (414 ± 40 kg) were stratified by initial BW (IBW) and randomly assigned to one of three treatments (n = 12): control (Cn), mimosa (M), and chestnut (Ch) tannin. Tannins were supplemented at 1.5% of the diet. Calves were fed for 42 d in a Calan gate™ system; intake and BW were measured weekly. Rumen fluid and feces were collected on d 0, 7, 21, and 42 for methane producing activity, ammonia, and pH. There was no effect ( $P > 0.05$ ) of tannins on IBW, final BW, ADG, DMI, feed to gain ratio, and DMI %BW. IBW was used as a covariate in carcass trait analysis. There was no effect ( $P > 0.05$ ) of tannin on HCW, 12<sup>th</sup> rib fat thickness, LMA, and YG; there tended ( $P < 0.10$ ) to be a tannin effect on KPH and marbling score. There was an IBW\*treatment interaction in dressing percent (DP) and internal fat (IF). Estimates of treatment differences in DP and IF were computed as the mean covariate IBW, and mean ± 1 SD. At mean IBW, M had lower ( $P < 0.05$ ) DP compared to Cn while Ch was intermediate. At heavy IBW, Ch and M had lower ( $P < 0.05$ ) DP than Cn. At light IBW, Cn had more ( $P < 0.05$ ) IF as compared to Ch and M; at heavy IBW, Ch had the most ( $P < 0.05$ ) IF, M the least ( $P < 0.05$ ) with Cn intermediate. Methane, ammonia and pH data were analyzed using repeated measures; d 0 was used as a covariate. Tannins had no

effect on rumen fluid or feces methane producing activity, rumen or fecal ammonia and rumen pH ( $P > 0.05$ ). There was a treatment\*d0 interaction on fecal pH. In low initial fecal pH calves, Ch and M increased fecal pH versus Cn calves. The expected decrease in methane producing activity did not materialize, which is in contrast to our previous findings with cattle grazing winter wheat pasture. There appears to be no detrimental or positive effects of adding tannins in finishing diets; however, site of digestion may be altered in some calves, evidenced by treatment effect on fecal pH.

**Key Words:** Tannins, Carcass Traits, Methane Producing Activity

**W276 Evaluation of feed efficiency and feeding behavior traits in Angus and Red Angus growing bulls.** Z. D. Paddock<sup>\*1</sup>, G. E. Carstens<sup>1</sup>, P. A. Lancaster<sup>1</sup>, L. R. McDonald<sup>2</sup>, and S. Williams<sup>2</sup>, <sup>1</sup>Texas A&M University, College Station, <sup>2</sup>Midland Bull Test, Columbus, MT.

Objectives of this study were to characterize feed efficiency traits and to examine phenotypic relationships with feeding behavior traits in growing bulls. Feed intake and feeding behavior traits were measured in Angus (n = 243, initial BW = 366 ± 47 kg) and Red Angus (n = 87, initial BW = 364 ± 43 kg) bulls for 70 d using a GrowSafe feeding system. Bulls were fed a corn silage based diet (ME = 2.42 Mcal/kg DM), and BW measured at 14-d intervals. Residual feed intake (RFI) was calculated as the residual from the linear regression of DMI on mid-test BW<sup>0.75</sup> and ADG within breed. Daily meal duration (min/d) and meal frequency (events/d) were averaged over the 70-d study, and eating rate (g/d) computed as DMI divided by meal duration. Red Angus bulls had higher ( $P < 0.05$ ) ADG (1.52 vs 1.45 ± 0.03), consumed more ( $P < 0.05$ ) DMI (10.64 vs 10.35 ± 0.13) and tended ( $P < 0.10$ ) to lower feed:gain ratios (7.36 vs 7.06 ± 0.14) than Angus bulls. Overall (mean ± SD) RFI of Angus and Red Angus bulls were 0.0 ± 0.62 and 0.0 ± 0.74, respectively. RFI was positively correlated ( $P < 0.05$ ) with DMI (0.54) and feed:gain ratio (0.35), but not with ADG or initial BW. Angus bulls had longer ( $P < 0.01$ ) meal durations (193.4 vs 211.3 ± 2.50 min/d) lower ( $P < 0.01$ ) meal frequencies (10.92 vs 11.75 ± 0.23 events/d) and higher ( $P < 0.01$ ) eating rates (54.20 vs 50.82 ± 0.87 g/min) than Red Angus bulls. Meal Duration was more positively correlated ( $P < 0.05$ ) with ADG (0.35) than DMI (0.23), such that meal duration was negatively correlated with feed:gain ratio (-0.22). Eating rate was not correlated with ADG, but was positively correlated ( $P < 0.05$ ) with DMI and feed:gain ratio (0.58, 0.35). RFI was positively correlated with meal duration and eating rate (0.23, 0.24), but not with meal frequency. These results suggest that feeding behavior traits may be useful indicator traits for early identification of bulls with favorable phenotypes for RFI.

**Key Words:** Feed Efficiency, Feeding Behavior, RFI

**W277 Effects of fish oil and sunflower oil supplementation on trans-10, cis-12 CLA and cis-9, trans-11 CLA contents of ruminal bacteria from beef cattle.** D. P. Bu, S. L. Liu, J. Q. Wang\*, S. Liang, L. Liu, H. Y. Wei, and L. Y. Zhou, State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, Beijing, P.R. China.

The objective of this study was to evaluate fatty acids profile of ruminal bacteria in beef cattle fed the mixture of fish oil and sunflower oil.

Four steers with ruminal cannulas were randomly assigned to control (C, without additional oil supplement) or C with 3% sunflower oil plus 1% fish oil (SF1), 2.5% sunflower oil plus 1.5% fish oil (SF2) and 2% sunflower oil plus 2% fish oil (SF3) in a 4 × 4 Latin square with 12-wk durational periods. All diets (forage to concentrate ratio was 65:35) were isonitrogenous (average of 12.6 %). Ruminal digesta was collected every 4 h over a 24 h period on d 20 and 21 of each experimental period and pooled for each animal. Pooled samples were prepared for bacteria separation and fatty acids analysis according to M. Sönnichsen. All data were analyzed using the MIXED procedure of SAS 8.2. Compared with CK, stearic acid in ruminal bacterium was obviously changed with fish oil increasing ( $P < 0.001$ ), and reduced by 41.36%, 65.69%, 73.15% in SF1, SF2 and SF3 treatments, respectively. Cis-9, trans-11 CLA in ruminal bacterium was not affected with dietary sunflower and fish oil supplementation. Compared with C, trans-11 C18:1 in ruminal bacterium increased by 2.88, 4.26 and 3.99 times in SF1, SF2 and SF3 ( $p < 0.01$ ). When fish oil was added to diets, trans-10, cis-12 CLA proportion of mixed ruminal bacterium reached to average 1.02% of total fatty acids, yet was not detected in C ( $p > 0.05$ ). In bacterium fatty acid profiles, cis-9 C18:1 and cis-11 C18:1 content did not change with dietary unsaturated fatty acids addition. These results showed that CLA content of rumen bacteria was affected by the supplementation of fish oil and sunflower oil.

**Key Words:** Ruminal Bacteria, Fish Oil, Conjugated Linoleic Acids

**W278 Different levels and combinations of fish oil and sunflower oil do not alter fiber digestion in China Nooxi steers.** S. Liang, J. Q. Wang\*, D. P. Bu, S. J. Liu, L. Liu, H. Y. Wei, L. Y. Zhou, and K.L. Liu, *State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, Beijing, China.*

Adding fish oil (FO) and sunflower oil (SFO) is one of the best established strategies to enhance conjugated linoleic acid content in ruminant products, while effect of combinations of fish oil and sunflower oil into diet on nutrient digestion was scarcely reported. Four rumen-cannulated China Nooxi steers, with initial weight of 600±20 kg, were used in a 4 × 4 Latin square study to determine the effects. Treatments were basal diet (forage to concentrate was 65:35, control), or basal diet with 3% SFO plus 1% FO (SF1), or basal diet with 2.5% SFO plus 1.5% FO (SF2), or basal diet with 2% SFO plus 2% FO (SF3). The steers were fed at maintenance level. Each experimental period lasted for 21 d. Ruminal fluid was collected every 2 h from 0730 to 1930 on d 15 of each experimental period. On d 20 and 21, duodenal digesta were collected every 4h over a 24-h period for a composited sample. All data were analyzed by MIXED procedure of SAS8.2. Statistical model included cow as random effect, and period and treatment as fixed effects. Ruminal acetic and butyric acid content decreased ( $P < 0.05$ ), while propionic acid was remarkably enhanced ( $P < 0.01$ ). DM, OM, ADF and NDF digestion across rumen was not affected statistically by treatments, averaged 43.94, 42.50, 47.72, 49.24%. Although SF3 tended to increase total tract digestion, the results from this study suggested fish oil inclusion did not decrease ( $P > 0.05$ ) fiber digestion. It even seemed that dietary fish oil addition increased nutrient digestion of steers fed high forage diet. This result should be considered with caution, for steers used in this study have a relative lower DMI. Meanwhile, high forage in diets might be the main reason that masked the effect of combined oils.

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**Key Words:** Fish Oil, Sunflower Oil, Fiber Digestion

**W279 Different combinations of fish oil and sunflower oil alter fatty acids profile in rumen fluid and duodenal fatty acid flows in China Nooxi steers.** S. Liang, J. Q. Wang\*, D. P. Bu, S. J. Liu, L. Liu, K. L. Liu, H. Y. Wei, and L. Y. Zhou, *State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, Beijing, China.*

Adding fish oil (FO) and sunflower oil (SFO) is one of the best ways to enhance milk CLA content, while effect was not clear to beef steers. This experiment was designed to evaluate influence of combination of fish oil and sunflower oil on fatty acid profile in rumen fluid and duodenal fatty acids flow. Four rumen-cannulated China Nooxi steers, with initial weight of 600±20 kg, were used in a 4 × 4 Latin square study. High forage (60%) diets were fed. Treatments were basal diet (forage to concentrate was 65:35, control), or basal diet with 3% SFO plus 1% FO (SF1), or basal diet with 2.5% SFO plus 1.5% FO (SF2), or basal diet with 2% SFO plus 2% FO (SF3). Each experimental period lasted for 21 d. Ruminal fluid was collected every 2 h from 0730 to 1930 on d 15 of each experimental period and composited. On d 20 and 21, duodenal digesta were collected every 4h over a 24-h period for a composited sample. All data were analyzed by MIXED procedure of SAS 8.2. Statistical model included cow as random effect, and period and treatment as fixed effects. Compared with control (3.36% of total fatty acid), TVA content in rumen fluid highly increased ( $P < 0.01$ ) when FO and SFO were added, but there was no significant difference ( $P > 0.05$ ) among SF1, SF2 and SF3 with an average of 6.56% of total fatty acid. RA content was also similar among three oil-added treatments. Duodenal flow of TVA markedly increased ( $P < 0.01$ ) when SFO and FO was added while there was no significant difference among SF1, SF2 and SF3 averaged 35.67 g/d vs. 9.45 g/d for control. The results from this study suggest that providing only 1% FO in diet is enough to maximize RA and TVA production in rumen and duodenum of China Nooxi steers.

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**Key Words:** Fatty Acid Profile, Fish Oil, Sunflower Oil

**W280 Changes in rumen bacterial flora in beef cattle fed fish oil.** Y. X. He, J. Q. Wang\*, D. P. Bu, P. Yu, S. J. Liu, H. Y. Wei, L. Y. Zhou, and K. L. Liu, *State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, Beijing, China.*

Dietary cis-9, trans-11-conjugated linoleic acid (CLA) is generally thought to be beneficial for human health. Unsaturated fatty acid added to ruminant diets increases the CLA concentration of milk and meat. The aim of this study was to investigate the change of rumen bacterial floras after beef cattle were supplemented with 2% fish oil. Total genomic DNA was extracted from rumen fluid obtained before and after oil supplementation. 16S rDNAs were amplified with bacteria universal primer 27F/1492R and two 16S rDNA libraries were constructed. 384 clones were picked up randomly from each library and positive clones were evaluated by restriction fragment length polymorphism (RFLP) with *Hha*I. Representative clones in each RFLP class were sequenced. A phylogenetic tree was constructed to study the structural differences of rumen bacterial floras before and after oil supplementation. Cluster analysis identified 74 and 41 unique RFLP patterns in oil supplementation library and without oil supplementation library separately. It was indicated that CFB (*Cytophaga-Flexibacter-Bacteroides*) and LGCGPB (low G+C Gram positive bacteria) were the major taxa in both libraries.

The percent of LGCGPB declined and no *Fibrobacteres* were detected after oil supplementation. The sequencing results showed that the similarity of 50%-60% sequences obtained were ~97% to the 16S rRNA gene sequences reported in GenBank. Uncultured bacteria accounted for over 90%. The diversity of rumen bacteria flora was reduced after oil supplement. The percent of CFB in post-oil supplementation library was increased but the diversity decreased. Bacteria in LGCGPB and

*Fibrobacteres* phyla decreased. These results provided evidence for investigating mechanism of increasing the CLA concentration of milk and meat, controlling the fermentation of rumen and recognizing more uncultured bacteria.

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**Key Words:** Rumen Bacteria, 16S rDNA, RFLP