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This study was carried out in Rio de Janeiro State of Brazil on three farms, using data of 1875 parturitions. The objective was to evaluate genetic and environmental effects, which influenced the reproduction and milk production of Saanen, Toggenburg and Parda Alpine, between 2004 and 2006. The data were analyzed using SAS (Statistical Analysis system, GLM procedures) and heritability was estimated using MTDFREML with an Individual Animal Model. The analyzed traits were gestation length (GL), age at first kidding (AFK), kidding interval (KI), total milk production (TMP) and lactation length (LL). The statistical model included fixed effects: farm, breed, month of kidding, parturition type, sex of kid; and the covariate, goats weight at matting time. The Parda Alpine breed had the lowest AFK. The Saanen breed had the highest TMP, while the Toggenburg breed had the highest KI. The heritability was low magnitude and dependent of breed. The KI was affected by farm, breed, month of kidding and sex of the kid. The breed and parturition type affected the AFK. The TMK was influenced by breed. The results of this study evidenced that there is a possibility to improve the goat performance in Rio de Janeiro State. The improvement on general management can be a faster option for the reduction of AFK and KI and increase the production levels in the study herd.

Key Words: age at first kidding, gestation length, kidding interval

T248 Environmental effects and variance components of birth weight in dairy goats in Rio de Janeiro state, Brazil. L. F. D. Medeiros[1], D. H. Vieira[2], C. A. Oliveira[1], J. P. F. Silveira[3], V. L. Tierzo[3], M. V. Fonseca[1], T. F. Silveira[5], P. R. C. Cordeiro[6], and R. Belintani*[4], [1]*Rural Federal University of Rio de Janeiro, Seropedica, RJ, Brazil*, [2]*Center of Creation of Animals of Laboratory, Marília, SP, Brazil*, [3]*São Paulo State University, Botucatu, SP, Brazil*, [4]*University of Agrarian Sciences - University of Marília, Marília, SP, Brazil*, [5]*Agricultural Municipal School Adolfo Alves Rezende, Campina Verde, MG, Brazil*, [6]*Celles Lamb Foods, Nova Friburgo, RJ, Brazil*.

This study was aimed at the avaluating the environmental effects on birth weight (BW) of 1175 Saanen, Parda Apine and Toggenburg, males and females, born in 2004 to 2006. The mean was 3.60kg. There were not found significant differences among contemporary groups of birth, breeds or genetic compositions. Sex, twinning and their interaction were significant ($P<0.01$). Linear and quadratic affects of age of doe at kidding were also significant ($P<0.01$). Estimates were obtained using the Restricted Maximum Likelihood Method, with the MTDFREMIL program, assuming an animal a model. The estimatives of direct additive genetic, maternal, residual variance component and heritability for BW obtained were 0.175, 0.158, 0.288 and 0.25, respectively. Kidding BW studied showed moderate magnitude of heritability. Thus, it can be genetically improved.

Key Words: birth weight, dairy breeds, animal model

Ruminant Nutrition: Additives

T249 Effects of capsicum extract on intake and performance of feedlot calves. A. L. Cardillo[1], A. D. Garciarena[1], C. Faverin[1], G. A. Gagliostro[1], J. M. Hernandez Vieyra[4], and D. Colombatto*[2,3], [1]*INTA, Balcarce, Buenos Aires, Argentina*, [2]*Universidad de Buenos Aires, Buenos Aires, Argentina*, [3]*CONICET, Buenos Aires, Argentina*, [4]*Pancosma, Geneva, Switzerland*.

Capsicum extract (CAP) has the potential to influence intake and performance of calves fed on high concentrate diets. Thirty two Aberdeen angus calves (160 kg initial weight) were separated in four groups and randomly allocated to 16 pens of 2 animals each. Treatments were no additive (CON), 133 mg/d of CAP (CAP133), 399 mg/d of CAP (CAP399), and 665 mg/d of CAP (CAP665), added into a mineral mixture. Diets were fed once a day and consisted (DM basis) of 33.6% whole corn grain, 33.6% coarsely ground corn grain, 26.2% pelleted sunflower meal, 5.1% corn silage and 2% mineral mixture. Animals had ad libitum access to water. After 15 days of adaptation to the diets, the experimental period lasted for 98 days. Dry matter intake (DMI), average daily gain (ADG), feed conversion ratio (FCR), rib eye area (REA) and subcutaneous fat deposition (SFD)were determined throughout the study. The REA and SFD deposition rates were determined by ultrasound. Data were analyzed using PROC MIXED, and repeated measures were used for DMI and FCR. Contrasts were also performed, and differences declared at $P < 0.05$. Addition of CAP did not alter ($P = 0.52$) daily DMI (14.8, 15.3, 16.2, and 14.4 kg/pen for CON, CAP133, CAP399, and CAP665, respectively), ADG (1.50, 1.44, 1.47, and 1.49 kg/d, respectively, $P =0.60$), final live weight (295.9, 289.2, 293.5, and 293.9 kg, respectively, $P = 0.44$), and FCR (5.23, 4.94, 5.08, and 4.84, respectively, $P = 0.69$). Likewise, addition of CAP did not alter final SFD (10.68, 9.75, 10.03, and 10.73 mm for CON, CAP133, CAP399, and CAP665, respectively, $P = 0.52$), rate of SFD (2.87, 2.45, 2.53, and 2.98 mm/month, respectively, $P = 0.21$), REA (53.97, 49.76, 47.65, and 49.29 cm^2, respectively, $P = 0.16$) and rate of REA growth (8.05, 6.71, 6.32, and 6.91 cm^2/month, respectively, $P = 0.31$). These observations suggest that capsicum extract, applied at commercial doses, does not affect intake or performance of calves fed on high concentrate diets. It is yet to be determined whether addition of CAP affects initial rate of DMI or the ingestive behavior of the animals, measured through video images (data not shown).

Key Words: capsicum, feedlot, calves

T250 Effect of a mixture of eugenol and cinnamaldehyde on milk production and composition of goats during the first five months of lactation. D. Bravo*[1], N. Manteaux[2], P. H. Doane[3], Y. Senlis[2], and M. Cecava[3], [1]*Pancosma, Geneva, Switzerland*, [2]*Sanders Nutrition Animale, Bruz, France*, [3]*ADM Research, Decatur, IL*.

Prior meta-analysis of results with a mixture of eugenol and cinnamaldehyde (Xtract 6965, XT) has documented improvements in milk yield and DMI for mid-lactation dairy cows. The intent of this trial was to evaluate XT during earlier lactation, for a more extended period. Milk production and composition of dairy goats was monitored during the first 5 months of lactation. Seventy six pregnant Alpine goats receiving a common diet were selected for the experiment. Fifteen days after kidding, goats were separated in 2 groups balanced by parity and kidding date, multiparous goats were balanced for prior lactation performance. Group 1 received the control diet (CTR, no additive)

and group 2 received the same diet with 100 mg.animal^{-1}.d^{-1} of XT. Individual milk yield and composition (fat, protein, urea, somatic cell count) were recorded twice a month during 4 months (week 3 to 18 of lactation). GLM procedure of SAS with repeated measures was used to analyze the results. XT did not alter average milk yield (3.36 kg/d CTR and 3.43 kg/d XT, P = 0.49) or milk protein content (30.4 g/kg CTR and 30.9 g/kg XT, P = 0.33). The effect of time was significant, where XT improved average milk fat content (40.9 g/kg XT vs 39.4 g/kg CTR, P = 0.05), with particular improvements for 12th (+1.8 g/kg, P = 0.08), 14th (+3.5 g/kg, P < 0.001) and 16th weeks of lactation (+2.2 g/kg, P = 0.031). There was also a time interaction for milk protein content with improvements between the week 8 and 12. XT tended to decrease milk urea (559 mg/L XT vs 577 mg/L CTR, P = 0.067), with the difference becoming significant after the 12th week. Finally a lower average somatic cell count (909 x 10^3 cells/mL XT vs 1725 x 10^3 cells/mL CTR, P = 0.02) was associated with XT, again particularly later in the experiment. These results agree with the earlier studies with dairy cattle, and support the continued development and use of eugenol and cinnamaldehyde for lactating animals.

Key Words: essential oil, goat, milk production

T251 Synergy of cinnamaldehyde, eugenol and garlic for reduction of methane production in vitro. S. Cavini[1], D. Bravo*[2], S. Calsamiglia[1], M. Rodriguez[1], and A. Ferret[1], [1]*Universitat Autonoma de Barcelona*, *Bellaterra, Spain*, [2]*Pancosma*, *Geneva, Switzerland*.

The effect of combination of eugenol (E), cinnamaldehyde (C) and a garlic botanical standardized for propyl propyl thiosulfonate (G) on in vitro microbial fermentation was determined using a simplex centroid experimental design of degree 3 with 3 components. Treatments were mixtures between the 3 extracts totalling 250 mg/L and composed of (doses in mg/L) 1) 125G + 125C + 0E; 2) 0G + 250C + 0E; 3) 250G + 0C + 0E; 4) 41.7G + 41.7C + 166.7E; 5) 41.7G + 166.7C + 41.7E; 6) 0G + 0C + 250E; 7) 0G + 125C + 125E; 8) 166.7G + 41.7C + 41.7E; 9) 125G + 0C + 125E; and 10) 83.3G + 83.3C + 83.3E. Two controls were also used: negative control (CTR) and 500 mg/L of monensin (MON). Each treatment was tested in duplicate and in two periods. Fifty millilitres of a 1:1 ruminal fluid-to-buffer solution were introduced into polypropylene tubes supplied with 0.5 g of DM of a 60:40 forage:concentrate diet and incubated for 24h at 39C. Samples were collected for VFA and methane concentrations (CH4). Results were analysed with SAS using a special cubic model. Total VFA were unaffected by the 3 extract combinations. The molar proportion of acetate was decreased by C*G (P = 0.015) and by C*G*E (P = 0.023) whereas the molar proportion of butyrate was increased by C*G (P = 0.004) and by E*C*G (P = 0.024). The molar proportion of valerate was decreased by E*C (P = 0.042), by E*G (P = 0.116) and increased by C*G (P = 0.081) and E*C*G (P = 0.021). Concentration of CH4 for treatments 10, 5 and 4 were lower than CTR (17.96, 18.46, 18.49 and 22.2, respectively; P < 0.001) and higher than MON (5.81, P < 0.001). Concentratino of CH4 was affected by the combination E*C (P = 0.033) and decreased by E*C*G (P = 0.012). The regression predicting CH4 concentration with the 3 compounds is: CH4 = 0.078 E + 0.077 C + 0.096 G + (0.000356 E*C) - (0.000012 E*C*G) (P = 0.012, RSD = 1.61, R2 = 0.79). Results demonstrate that there is a synergy between the 3 extracts for the reduction of methane in vitro.

Key Words: essential oils, rumen fermentation, methane

T252 Effect of feeding eugenol on ruminal fermentation and carbohydrate digestion in the digestive tract of beef cattle fed finishing ration. W. Z. Yang*[1], C. Benchaar[2], B. N. Ametaj[3], M. L. He[1], and K. A. Beauchemin[1], [1]*Agriculture and Agri-Food Canada*, *Lethbridge, AB, Canada*, [2]*Agriculture and Agri-Food Canada*, *Sherbrooke, QC, Canada*, [3]*University of Alberta*, *Edmonton, AB, Canada*.

Eugenol (4-allyl-2-methoxyphenol; $C_{10}H_{12}O_2$) is a phenolic compound with wide-spectrum antimicrobial activity against gram-positive and gram-negative bacteria, and it is one of the main active components in clove bud and cinnamon oils. A study was conducted to evaluate the effects of supplementing eugenol on feed intake, rumen fermentation and feed digestibility in beef cattle fed finishing ration. Four spayed beef heifers with ruminal and duodenal cannulas were assigned in a 4 × 4 Latin suqare design with treatments: control (no eugenol), low, medium and high eugenol supplementation of 400, 800 and 1600 mg/head/day, respectively. The diets consisted of 15% barley silage, 80% barley grain, and 5% supplement (DM basis). Feed intake (averaged 9.6 kg/d) was not affected by eugenol supplementation. However, ruminal digestibility tended to linearly (P < 0.10) reduce from 40 to 31% for ADF, and 83 to 78% for starch with increasing eugenol supplementation, although ruminal digestibility of OM was not affected. Supplementation of eugenol had no effect on nutrient digestion in the intestine, whereas dietary inclusion tended to linearly reduce digestibility of NDF from 56 to 49% (P < 0.10), and that of ADF from 51 to 43% (P < 0.08) in the total digestive tract. Rumen pH (range of 6.12 to 6.23) was not affected by eugenol. However, VFA concentration numerically reduced (P < 0.15) from 122 to 115 m*M* and the proportion of acetate numerically reduced (P < 0.13) from 65 to 62%. In contrast, proportion of propionate tended to linearly increase (P < 0.09) from 17 to 21% with increasing eugenol supplementation. The results indicate that supplementation of a feedlot finishing diet with eugenol was detrimental to ruminal microbial activity, thus reducing digestion in the rumen.

Key Words: eugenol, digestibility, beef cattle

T253 Effects of eugenol supplementation on ruminal fermentation, protozoa counts, and in situ ruminal degradation of soybean meal, grass/legume hay, and corn grain in dairy cows fed high- or low-concentrate diets. C. Benchaar*[1], W. Z. Yang[2], H. V. Petit[1], and P. Y. Chouinard[3], [1]*Agriculture and Agri-Food Canada, Dairy and Swine R&D Centre*, *Sherbrooke, QC, Canada*, [2]*Agriculture and Agri-Food Canada*, *Lethbridge, AB, Canada*, [3]*Université Laval, Département des Sciences Animales*, *Québec, QC, Canada.*

Four ruminally primiparous lactating cows (BW=568 kg; DIM=67) were used in a 4×4 Latin square design (28-d periods) with a 2×2 factorial arrangements of treatments to determine the effects of eugenol (EUG) supplementation (0 vs. 50 mg/kg of DMI) and concentrate level (high: H vs. low: L; 65% vs. 35%, DM basis) on ruminal fermentation, protozoa counts, and in situ ruminal degradation (16 h incubation) of soybean meal, grass/legume hay, and corn grain. Orthogonal contrasts (MIXED procedure; SAS) were used to test the main effects of EUG supplementation, concentrate level, and their interaction. Significance was declared at $P \leq 0.05$. Average ruminal pH was lower for H than for L (6.04 vs. 6.23) while NH_3-N concentration was similar for H and L diets (6.00 m*M*). Total VFA concentration tended (P=0.09) to increase in cows fed H diets as compared to those fed L diets (134.7 vs. 127.0 m*M*). Molar proportion of acetate was lower (59.7 vs. 63.7%) and that of propionate was higher (23.3 vs. 19.5%) for H than for L. Proportions of butyrate (13.2%) and BCVFA (2.06%) remained unaffected by concentrate level. Total protozoa numbers were higher for H than for L diet (4.1 vs. 2.6

× 10^5/mL). Supplementation with EUG had no effect on ruminal pH, concentrations of total VFA and NH_3-N, and protozoa numbers. The effect of EUG on VFA profile was only limited to BCVFA proportion, which was higher in cows fed EUG as compared to those fed diets without EUG (2.19 vs. 1.93%). Ruminal degradation of hay DM was lower (45.1 vs. 53.7%) and that of soybean meal DM tended to be lower (71.1 vs. 76.7%; *P*=0.08) for H than for L. Ruminal degradation of corn DM was unaffected (68.9%) by the concentrate level. Supplementation with EUG had no effect on ruminal degradation of any of the feed ingredients tested. Results from this study show that at the concentration evaluated (50 mg/kg of dietary DM), eugenol supplementation had minor effects on fermentation, protozoa numbers, and feed degradation in the rumen of cows fed high- or low- concentrate diets.

Key Words: essential oil, concentrate level, rumen

T254 Effects of eugenol supplementation on feed intake, nutrient digestibility, nitrogen retention, milk production, and milk composition of dairy cows fed high- or low-concentrate diets. C. Benchaar*[1], W. Z. Yang[2], H. V. Petit[1], and P. Y. Chouinard[3], [1]*Agriculture and Agri-Food Canada, Dairy and Swine R&D Centre, Sherbrooke, QC, Canada*, [2]*Agriculture and Agri-Food Canada, Lethbridge, AB, Canada*, [3]*Université Laval, Départements des Sciences Animales, Québec, QC, Canada*.

Four ruminally primiparous lactating cows (BW = 568 kg; DIM = 67) were used in a 4 × 4 Latin square design (28-d periods) with a 2 × 2 factorial arrangements of treatments to determine the effects of eugenol (EUG) supplementation (0 vs. 50 mg/kg of DMI) and concentrate level (high: H vs. low: L; 65% vs. 35%, DM basis) on nutrient digestibility, N retention, milk production, and milk composition. Orthogonal contrasts (MIXED procedure; SAS Inst., Inc., Cary, NC) were used to test the main effects of EUG supplementation, concentrate level (CON) and their interaction (CON × EUG). Significance was declared at $P \leq 0.05$. No interaction of CON × EUG was observed for any of the variables measured. Intake of DM was higher for H than for L (20.0 vs. 16.9 kg/d). Apparent total tract digestibilities of DM (66.8 vs. 69.4%), OM (68.2 vs. 70.8%), N (66.0 vs. 68.8%), and ADF (57.3 vs. 60.6%) were lower for H than for L. Retention of N was not affected by concentrate level (59 g/d; 11% of N intake). Milk production (32.2 vs. 30.8 kg/d) and milk protein content (3.31 vs. 3.02%) were higher whereas milk fat content was lower (3.64 vs. 3.92%) and milk lactose concentration tended to be lower (4.67 vs. 4.61; $P = 0.08$) for cows fed H than for those fed L. Milk urea N was unaffected by concentrate level (9.52 mg/dL). Yield of 4% FCM was similar for H and L diets (30.1 kg/d). Yield of milk fat was not affected by concentrate level (1.17 kg/d) whereas milk yields of protein (1.05 vs. 0.93 kg/d) and lactose (1.51 vs. 1.37 kg/d) were higher for cows fed H than for those fed L. Feed efficiency (kg 4% FCM/kg DMI) was lower for cows fed H than for those fed L (1.51 vs. 1.79). Neither DMI nor nutrient apparent total tract digestibility, N retention or milk performance was affected by EUG supplementation. Results of this study show that adding EUG at the concentration of 50 mg/kg of dietary DM to a high- or low-concentrate diet had no effects on nutrient digestibility, N retention, milk production and milk composition of dairy cows.

Key Words: essential oil, concentrate level, dairy cow

T255 Assessment of the potential of cinnamaldehyde, condensed tannins, and saponins to modify milk fatty acid composition of dairy cows. C. Benchaar*[1] and P. Y. Chouinard[2], [1]*Agriculture and Agri-Food Canada, Dairy and Swine Research and Development Centre, Sherbrooke, QC, Canada*, [2]*Université Laval, Département des Sciences Animales, Québec, QC, Canada*.

Recently, plant secondary metabolites such as essential oils have been suggested as potential means to manipulate bacterial populations involved in ruminal biohydrogenation of unsaturated fatty acids and modify the fatty acid composition of ruminant-derived food products such as milk. This study was conducted to determine whether feeding cinnamaldehyde (CIN; main component of cinnamon bark essential oil; *Cinnamon cassia*), condensed tannins from quebracho trees (QCT; *Schinopsis balansae*) or saponins from *Yucca schidigera* extract (YSE) alters milk fatty acid profile of dairy cows. For this purpose, four lactating cows (BW = 730 kg; DMI = 87) were used in a 4 × 4 Latin square design (28-d periods) and fed a total mixed ration containing no additive (control), or supplemented with CIN (1 g/d), QCT (150 g/d; 70% of tannins), or YSE (60 g/d; 10% of steroidal saponins). The fatty acid profile was determined on milk pooled samples collected from four consecutive milkings (d 22 to 23). Data were analyzed as a 4 × 4 Latin square design (MIXED procedure; SAS Inst., Inc., Cary, NC). Differences between treatments and the control were determined using the Dunnett's comparison test. Significance was declared at $P \leq 0.05$ and tendency at $0.05 < P \leq 0.10$. Results revealed no effects of feeding CIN or QCT on milk fatty acid profile. Supplementation with YSE resulted in some modifications of milk fatty acid profile as suggested by the reduced proportions of C6:0 (2.71 vs. 2.95%; $P = 0.10$), C8:0 (1.66 vs. 1.89%; $P = 0.08$), and *trans*-11 C18:1 (0.92 vs. 1.01%; $P = 0.05$). Results show that at the feeding rates used in this study, the potential of cinnamaldehyde, condensed tannins, and saponins to alter ruminal biohydrogenation process and modify the fatty acid profile of milk fat is low.

Key Words: plant extract, milk fatty acid profile, dairy cow

T256 Screening the activity of medicinal plants or spices on in vitro ruminal methane production. H. Jahani-Azizabadi[1], M. Danesh Mesgaran*[1], A. R. Vakili[1], A. R. Heravi Moussavi[1], and M. Hashemi[2], [1]*Ferdowsi University of Mashhad, Mashhad,Khorasan Razavi, Iran*, [2]*Research and Petroleum Engineering Center of Kermanshah, Kermanshah, Iran*.

The objective of the present study was to evaluate the in vitro effect of medicinal plants or spices powder on ruminal methane and total gas production. In vitro incubation was carried out based gas production method. Approximately 300 mg of dried alfalfa hay (as control) (NDF= 537 and CP= 150 g/kg DM) or plus 12 mg of garlic, cinnamon, cumin, nutmeg or rosemary powder as treatments were placed in a 100 ml glass syringes (n= 3) containing 40 ml of buffered rumen fluid (ratio of buffer to rumen fluid was 2:1), and incubated for 24 h at 38.5°C. Rumen fluid was obtained from three adult ruminally fistulated sheep (49.5 ± 2.5 kg body weight), before the morning feeding, and immediately strained through four layers of cheesecloth. After 24 h of incubation, gas which was accumulated in the headspace of each syringe was measured, and a sample of the gas was collected into a 10 ml vacuum tube. Methane content of the produced gas was determined using gas chromatography procedure (GC, Sri 8610, and Column: 6% cyanopropylphenyl, 94% dimethylpolysiloxane). Volumes of gas and methane (ml) were converted to mmol assuming one mol is equivalent to 22.4l L of gas (Table1). Data were applied to the completely randomized design model of SAS

(V. 9/1) and Duncan test was used to compare the means (P< 0.05). The results of the present study indicated that all medicinal herbs or spices, expect Nutmeg, reduced significantly (P< 0.05) in vitro methane and total gas production from alfalfa hay compared with the control. These finding confirmed the ability of Rosemary to decrease methane production, which may help to improve the efficiency of energy used in the rumen.

Table 1. Effect of medicinal herbs or spices on in vitro methane and total gas production (mmol/g DM incubated for 24 h)

Items	alfalfa	alfalfa + Garlic	alfalfa + Cinnamon	alfalfa + Cumin	alfalfa + Nutmeg	alfalfa + Rosemary	S.E
Total gas	11.97 a	11.13 b	12.72 c	10.81b	12.00 a	10.17	0.22
Methane	3.59 a	3.34 b	3.82 c	3.24 b	3.63 a	3.05	0.07

a, b, c: Means with difference letter in each row were significant (P< 0.05).

Key Words: methane, gas production, medicinal herbs

T257 Effects of cinnamaldehyde on in vitro methane production and ruminal fermentation of medium and high-concentrate diets. C. Kamel[1], H. M. R. Greathead[1], M. L. Tejido[2], M. J. Ranilla*[2], M. E. Martínez[2], C. Saro[2], and M. D. Carro[2], [1]*Faculty of Biological Sciences, University of Leeds*, *Leeds, United Kingdom*, [2]*Departamento de Producción Animal, Universidad de León*, *León, Spain*.

The effects of five doses (0 (control), 20, 60, 180 and 540 mg/L incubation medium) of cinnamaldehyde (CIN) on in vitro fermentation of a medium concentrate (MC; 50:50 alfalfa hay:concentrate) or a high concentrate (HC; 15:85 barley straw:concentrate) diet were evaluated in batch cultures of mixed rumen micro-organisms from the rumen of sheep fed the same diets. Previous in vitro studies have shown that CIN supplementation leads to reduced rumen ammonia levels but since this effect depends on microbial populations, it may be expected to relate to the incubated diet and the diet fed to donor sheep. After 16 h of incubation, the main fermentation variables were determined. Differences among treatments were declared at P < 0.05. CIN at 20 mg/L did not modify rumen fermentation, and at 60 mg/L only decreased ammonia-N concentrations for MC diet. For both diets, the 540 mg/L dose inhibited rumen fermentation, as indicated by the decrease in the production of volatile fatty acid (VFA), gas and methane, with the effects being more pronounced for HC diet than for MC. In addition, CIN at 540 mg/L increased total lactate concentrations by 22 and 11 times compared to control for MC and HC diets, respectively. The 180 mg/L dose increased acetate proportions and acetate:propionate ratio without reducing VFA production, decreased ammonia-N concentrations, and tended (P = 0.06) to reduce methane production for the MC diet, whereas only a reduction in acetate proportion and a tendency (P = 0.10) to lower ammonia-N concentrations were observed for the HC diet. These results would indicate that CIN dietary supplementation does show effects on lowering ammonia-N but that responses may differ depending on the administered dose and the diet composition and microbial populations in the inoculum, which could help to explain the controversial results obtained in different studies.

Key Words: cinnamaldehyde, microbial fermentation, methane

T258 Evaluation of plant extracts in natural-fed finishing cattle. N. A. Pyatt*[1], D. Bravo[2], and P. H. Doane[1], [1]*ADM Research*, *Decatur, IL*, [2]*Pancosma Research*, *Geneva, Switzerland*.

Performance data from British-cross steers (n = 35) were used to evaluate the effects of a blend of plant extracts (XT) in natural-fed feedlot diets without ionophores. Steers were adapted to a high-energy diet prior to allotment to the finishing trial. The basal diet consisted of 62% cracked corn, 25% wet distillers grains with solubles, 10% hay, and 3% supplement (DM basis). Cattle were blocked by weight to one of two treatments (2 pens per treatment; 8 or 9 head per pen); 1) negative control (CON) or 2) CON + XT (266 mg•steer^{-1}•d^{-1} eugenol + cinnamaldehyde and 133 mg•steer^{-1}•d^{-1} capsicum, XT 6965 and XT 6933, respectively; Pancosma). Steers were fed ad libitum using the GrowSafe automated feeding system (one unit per pen). Steers (initial BW 398.2 kg) were fed (on average) 103 d and harvested in two groups based on weight and condition. The model included treatment and animal nested within pen as fixed variables. There were no differences (P > 0.05) in animal performance or carcass merit parameters. Cattle fed XT tended to have greater cumulative ADG (P = 0.20; 1.74 vs. 1.88 kg/d, respectively) and feed efficiency (P = 0.16; 16.24 vs. 17.47 kg x 100/kg, respectively). Similarly, cattle fed XT tended to have greater HCW (P = 0.20; 364.2 vs. 379.8 kg, respectively), LMA (P = 0.09; 86.3 vs. 91.3 cm^2, respectively), and less KPH fat (P = 0.12; 2.0 vs. 1.8%, respectively). Cattle fed XT tended to have a greater proportion of YG 2 carcasses, while CON cattle had more (P = 0.13) YG 3 carcasses. Resulting carcass value was $27.10/hd greater for steer fed XT ($1010.13 vs. $1027.23/hd, respectively). Rumen fluid was collected by rumenocentesis from five animals per treatment on d 100. Total VFA (mM), acetate, and butyrate concentrations were lower for cattle fed XT. However, steers consuming XT had numerically greater propionate (%) and lower acetate:propionate ratio. These data suggest XT improved feedlot ADG (8.1%), feed efficiency (7.5%), HCW (4.3%), and carcass leanness. Including a blend of eugenol, cinnamaldehyde, and capsicum in natural-fed beef finishing diets without ionophores may increase finishing performance and profit potential.

Key Words: beef cattle, plant extracts, performance

T259 Effect of yellow mustard glucosinolates on ruminal fermentation *in vitro*. R. A. Hristova*[1], A. N. Hristov[2], S. Zaman[1], and V. Borek[2], [1]*Pennsylvania State University*, *University Park*, [2]*University of Idaho*, *Moscow*.

The objective of this study was to evaluate the effect of glucosinolates from mustard meal on ruminal fermentation, total gas and methane production, and protozoal counts *in vitro*. Ruminal inoculum was incubated with 1% (w/v) ground alfalfa hay and 0, 0.1, 0.2, and 0.4% (w/v) of cold-pressed yellow mustard (*Brassica juncea*, variety Pacific Gold) meal (NM). The meal contained 236 µmol/g total glucosinolates (97% of which was 2-propenyl glucosinolate). A portion of the meal was incubated with deionized water at room temperature for 48 h to inactivate the glucosinolates (IM). Monensin-Na was used as a positive control at 5 ppm final medium concentration. Incubations were continued for 24 h and repeated 3 times (n = 3). Gas pressure within the incubation vessels was recorded at 6, 12, 18, and 24 h. Gas samples for methane and carbon dioxide analyses were collected at 6 and 12 h. Compared with the blank (0% mustard meal), monensin slightly decreased (by 4%; *P* = 0.01) 24-h cumulative gas production. Increasing the inclusion of mustard meal linearly increased (*P* < 0.001) gas production, but there was no difference (*P* = 0.58) between NM and IM. Cumulative gas production per gram of substrate linearly decreased (*P* < 0.001) with

increasing the amount of mustard meal. Treatment had no effect (P = 0.24 to 0.85) on methane and carbon dioxide production. Monensin did not affect (P = 0.22 to 0.65) total or individual VFA concentrations, except propionate tended to be higher (P = 0.09) compared with the blank. Glucosinolates had no effect (P = 0.14 to 0.20) on VFA. Monensin decreased (P = 0.002 to 0.01) total protozoal counts, but NM or IM had no effect (P = 0.77 to 0.94). Inclusion of mustard meal increased linearly (P < 0.001) ammonia concentration in the incubation medium. Monensin and glucosinolates did not affect (P = 0.39 and 0.35) ammonia concentration. In the conditions of this experiment, *B. juncea* glucosinolates had no effect on ruminal fermentation, protozoal counts, and methane production.

Key Words: mustard meal, glucosinolate, rumen fermentation

T260 Effects of *Saccharomyces cerevisiae* on ruminal pH and fermentation of Holstein dairy cows. Y.-H. Chung*[1], L. Holtshausen[1], N. Walker[2], and K. A. Beauchemin[1], [1]*Agriculture and Agri-Food Canada, Lethbridge, AB, Canada*, [2]*Lallemand Animal Nutrition, Montréal, QC, Canada*.

Ten ruminally cannulated, nonlactating, and nonpregnant Holstein dairy cows were used to measure the effects of active dried yeast (*Saccharomyces cerevisiae*) on ruminal pH and fermentation. Cows were blocked by ruminal pH and DMI and randomly assigned to the control or yeast treatment. The yeast was Levucell SC (Lallemand Animal Nutrition, Montréal, QC) provided at 1×10^{10} cfu/head/d and dosed via the rumen cannula daily at the time of feeding (1× feeding/d). Cows were fed a barley-based total mixed ration (50:50 forage to concentrate ratio) formulated to meet the nutrient requirements of a dairy cow producing 30 kg/d of milk. The experiment consisted of a 28-d yeast feeding period and ruminal pH was measured continuously every 60 s using an indwelling system during the last 7 d of the experimental period. Rumen contents were sampled on 2 d (d 22 and 26) at 0, 3, and 6 h after feeding. Dry matter intake and BW were not affected (P > 0.10) by yeast feeding and averaged 14.1 kg/d and 820 kg, respectively. Supplementing the diet with yeast did not affect (P > 0.10) the minimum pH (5.67 vs. 5.63), mean pH (6.35 vs. 6.27), maximum pH (6.88 vs. 6.86), and the time that the ruminal pH was below 5.8 (0.95 vs. 2.81 h/d) or 5.5 (0.12 vs. 0.64 h/d) compared with the control. Rumen VFA profiles and lactic acid concentrations were similar between the control and yeast treatment. It is concluded that supplementing diet with yeast had no effect on ruminal pH or ruminal fermentation in nonlactating Holstein dairy cows.

Key Words: yeast culture, ruminal pH , fermentation

T261 Multiple study analysis of the effect of live yeast (*Saccharomyces cerevisiae* CNCM I-1077) on milk and milk component production and feed efficiency. M. B. de Ondarza*[1], C. J. Sniffen[2], L. Dussert[3], E. Chevaux[3], J. Sullivan[3], and N. Walker[3], [1]*Paradox Nutrition, LLC, West Chazy, NY*, [2]*Fencrest, LLC, Holderness, NH*, [3]*Lallemand Animal Nutrition, Milwaukee, WI.*

A dataset with diet information and production responses was compiled from fourteen research trials conducted internationally (160 observations representing 1615 cows) that tested the effect of dietary inclusion of live yeast (Levucell SC®). Diet and feed analysis data for each study was entered into CPM Dairy 3.0.8 to estimate dietary nutrient parameters. Mean milk yield was 31.56 kg (SD=6.45) with 3.75% milk fat (SD=0.34) and 3.02% true protein (SD=0.15). Mean DMI was 19.22 kg (SD=3.67). Mean diet CP was 17.32%DM (SD=1.93) with 32.65% RUP (%CP) (SD=2.43). Mean diet NDF was 34.91% DM (SD=5.04) and mean diet starch was 22.82% DM (SD=8.39). Mixed model analysis was conducted using JMP statistical software (SAS, Cary, NC) with CPM nutrients as main effects with no interactions. Number of cows per treatment was included as a weighting factor and experiment was included as a random effect. Live yeast significantly improved 3.5% FCM production (35.54 vs. 34.58 kg/d for live yeast and control) (P<0.0001) with the effect being greater for cows <100 DIM (36.06 vs. 34.93 kg) (P<0.01) but still highly significant for cows >100 DIM (33.81 vs. 32.83 kg) (P<0.005). Feed Efficiency (kg 3.5% FCM/ kg DMI) was improved with live yeast (1.75 vs. 1.70 for live yeast and control) (P<0.001). Yeast effects on feed efficiency were greater for cows producing >38 kg milk/d (1.85 vs. 1.78 for live yeast and control) (P<0.05). There was no overall effect of live yeast on DMI (P>0.10). Although milk fat and protein content were slightly lower with the inclusion of live yeast, both milk fat yield (1.28 vs. 1.25 kg/d; P<0.01) and milk true protein yield (1.02 vs. 1.00 kg/d; P<0.0001) increased with live yeast. The improvement in 3.5% FCM yield and feed efficiency, with the inclusion of live yeast, could be a consequence of improved rumen function. Further investigations should provide opportunities to design optimized diets.

Key Words: live yeast, 3.5% FCM, feed efficiency

T262 Potential of yeast-supplemented barley based dairy cow diets. L. Holtshausen* and K. A. Beauchemin, *Agriculture and Agri-Food Canada, Lethbridge, AB, Canada*.

Active dry yeast products, based on *Saccharomyces cerevisiae*, are widely used in corn based diets in North America to improve milk yield. However, diets fed to dairy cows in western Canada are primarily barley based and the objective of this study was therefore to determine the potential benefits of supplementing barley based diets with yeast. Forty lactating Holstein dairy cows were randomly assigned to one of two treatments: 1) control diet (no yeast) and 2) yeast supplemented diet. All cows were fed the control diet for 3 weeks followed by a 6-week period on their assigned diet. The control diet TMR consisted of 23% barley silage, 23% alfalfa silage, 6% alfalfa hay and 48% of a ground barley based concentrate (DM basis). For the treatment diet Levucell® SC-1077 (Lallemand Animal Nutrition, Milwaukee, WI) was added to the concentrate to provide 0.5 g Levucell®/head/day (10 billion CFUs/head/day). There was no difference in final body weight (623 vs. 621 kg, P = 0.82), average daily gain (0.533 vs. 0.368 kg/d, P = 0.30), net energy output (8.76 vs. 8.75 MJ/d, P = 0.98) and efficiency of net energy output (0.38 vs. 0.38 MJ/kg DMI, P = 0.20) for cows on the control diet compared to those on the yeast-supplemented diet. There was no difference (23.1 vs. 22.9 kg/d, P = 0.58) in DMI for cows on the control diet, but 3.5% fat corrected milk yield (FCM) was numerically 1 kg/d higher (35.6 vs. 36.7 kg/d, P = 0.31) for yeast-supplemented cows. This resulted in a numerically higher (5.8% increase) efficiency of milk production (1.55 vs. 1.64 kg FCM/kg DMI, P = 0.26) for yeast-supplemented cows. Although milk yield was only numerically higher with yeast supplementation to a barley-based diet, the improvement in milk production efficiency could lower the cost of feeding.

Key Words: yeast, barley based diets, dairy cows

T263 The effect of enzymatically hydrolyzed yeast on feeding behavior and immune function in early lactation dairy cows. K. Proudfoot*[1], J. Nocek[2], and M. von Keyserlingk[1], [1]*University of*

British Columbia, Vancouver, BC, Canada, [2]*Spruce Haven Research Center, Auburn, NY*, [3]*University of British Columbia, Vancouver, BC, Canada*.

An experiment was conducted to determine the effects of enzymatically hydrolyzed yeast (EHY) on eating behavior, milk production and immune function in early lactation cows. Twenty-two multiparous Holstein cows were monitored for 12 wk after calving. Experimental pens were equipped with electronic feed and water bins that controlled which cows had access and monitored cow attendance, and intake. Stocking density was 2 cows/feeding bin and 1 cow/lying stall. Group composition in all pens was dynamic; as one cow left a pen, another cow took her place. Cows were balanced for parity and previous 305 milk production. At calving cows were assigned to a TMR with or without (control) supplemental EHY(Celmanax, 1oz/d, Varied Industries Corporation, IA, USA). Treatments were alternated in space across, and cows were assigned to treatment. Blood was collected at -1,0,1,2,3,4 and 8 wk post calving for hematology and metabolic profiling. Treatment effects were tested using a mixed model with cow as a random effect. EHY had no effect (P>0.05) on DMI, feeding time and feeding rate. There was no effect (P>0.05) of EHY on milk yield or composition, although the average yield for cows consuming EHY was numerically higher (by 1.8 kg/d) than non-supplemented cows. Over the study, EHY cows exhibited 1 new case of clinical mastitis compared to 4 for control cows. Sub clinical cases (SCC > 200,000) were 1 and 3 for EHY and control cows, respectively. EHY had no effect on total WBC throughout the experiment (P>0.05). However, a trt*wk interaction for the proportion of lymphocytes and granulocytes (P = 0.008 and P = 0.01) was detected where control cows had a lower percentage of granulocytes at wk 1 and wk 4 after calving and a lower granulocyte count at wk 4 after calving (P=0.01). EHY supplementation showed a strong numerical increase in milk yield and reduced cases of mastitis compared to control: its effect on immune function appears to show some promise.

Key Words: hydrolyzed yeast, milk production, mastitis

T265 Repeated ruminal acidotic challenges in sheep : Effects on pH and microbial ecosystem and influence of active dry yeasts. M. Silberberg*[1], F. Chaucheyras-Durand[2,1], L. Commun[1], M. M. Richard-Mialon[1], C. Martin[1], and D. P. Morgavi[1], [1]*INRA, Saint Gens Champanelle, France*, [2]*Lallemand Animal Nutrition, Toulouse, France*.

In ruminants, the use of readily fermentable carbohydrates is known to increase the risk of rumen acidosis. Animals may encounter several acidotic episodes, lasting for long periods of time. The decrease in rumen pH has been reported to be linked to changes in the fermentative profile and shifts in the balance of microbial communities. The aim of this work was to follow the evolution of pH and microbial ecosystem during repeated acidotic challenges, and also to investigate the effects of Active Dry Yeasts (ADY). Rumen-cannulated sheep (n=12) were divided into one control group and one receiving the ADY CNCM I-1077. They were fed during 3 weeks with a basal diet (hay:wheat, 80:20), then they received an acidotic diet (hay:wheat, 40:60) during 5 days. This sequence was repeated 3 times. Throughout the experiment, rumen pH was continuously monitored using indwelling probes. Rumen samples were collected for determination of bacterial and protozoal counts, quantification by qPCR of specific bacterial populations, and VFA concentrations. The 1st acidotic challenge induced sharp decline in pH. Subsequent acidotic bouts led to a significant increase in time spent under pH 5.6 in the control group, whereas pH was stabilized in the ADY group from the 2nd episode. The 1st acidotic bout deeply modified the microbial balance (increase in lactate-producing bacteria, decrease in cellulolytic bacteria and protozoa numbers) and probably selected the more acidotic-resistant microbes. Moreover, ADY induced a sharp decline in streptococci and lactobacilli, and in Streptococcus bovis during the last acidotic episode. VFA profile shifted from propionate, during the 1st challenge, to butyrate during the 2nd and the 3rd challenges. As intended, ADY appears a useful tool to limit the onset of acidosis, but also to help recovery from repeated acidotic bouts. The dietary history of the animal appears important to partly explain differences observed between animals, with the same potential in feeding practices including high levels of readily fermentable carbohydrates.

Key Words: ruminal acidosis, microbiota, active dry yeast

T266 Effects of live yeast on growth performances and meat quality of beef cattle fed fast or slow fermentable diets. A. Agazzi[1], G. Invernizzi[1], M. Ferroni[1], V. Vandoni[1], C. A. Sgoifo Rossi[1], G. Savoini*[1], V. Dell'Orto[1], and E. Chevaux[2], [1]*University of Milan, Milan, Italy*, [2]*Lallemand, Blagnac, France*.

The aim of the trial was to evaluate the effects of the administration of *Saccharomyces cerevisiae* (CNCM I–1077) on growth performance and meat quality in beef cattle fed slow (SF) or fast (FF) fermentable diets. Eighty three male Charolaise cattle were divided in four homogenous groups: SF–C=n 24, FF–C=n 17, SF–T=n 21 and FF–T=n 21, and fed slow (SF; RUP 30.60%, NDF 31.20%, NFC 44.60, starch 34.20 on DM) or fast (FF; RUP 26.90%, NDF 30.60%, NFC 44.70, starch 32.40 on DM) fermentable diets with (T) or not (C) *S. cerevisiae* (8×10^9 cfu/d). ADG (evaluated at day 70 and 98 of the trial), and *longissimus dorsi* colour characteristics, chemical composition, pH at 24h post mortem, tenderness and fatty acid composition were compared using the GLM of S.A.S. with contrasts. SEUROP classes frequencies in the groups were analyzed by a PROC FREQ of S.A.S. with a chi-square test. Improved ADG was highlighted in SF–T and FF–T vs. FF–C (1.61 kg/d, 1.57 kg/d and 1.49 kg/d respectively; $P\leq0.05$). An increased lightness (L*) was recorded in SF–T vs. other groups (41.3 vs. 39.3 SF–C, 38.9 FF–C and 37.4 FF–T; $P\leq0.01$) and a decreased yellowness (b*) was observed in FF–C (8.3 vs. 10.0 SF–C, 10.3 SF–T and 9.8 FF–T; $P\leq0.01$). No differences were found in meat chemical composition, carcass characteristics, meat pH, cooking losses, or fatty acid composition of the meat except for a lower EPA content in FF–T. Tenderness was increased independently from slow or fast fermentable diets when live yeast was fed to cattle (SF–T 3.7 kgF, FF–T 3.6 kgF, SF–C 4.1 kgF, FF–C 4.1 kgF; $P\leq0.05$). The inclusion of live yeast in both slow and fast fermentable cattle diets affected positively performance and meat tenderness, while the use of slow fermentable rations in association with *S. cerevisiae* (CNCM I–1077) determined increased lightness and yellowness of the meat.

Key Words: beef cattle, live yeast, fermentable diet

T267 Effect of live yeast *Saccharomyces cerevisiae* (strain Sc 47) on ruminal nitrogen degradation in relation with varying levels of protein solubility. C. Julien[1], J. P. Marden[1,2], E. Auclair[2], R. Moncoulon[1], and C. Bayourthe*[1], [1]*Université de Toulouse, INRA, Castanet-Tolosan, France*, [2]*Lesaffre Feed Additives, Marquette-Lez-Lille, France*.

The aim of the study was to evaluate the effects of live yeast on crude protein (CP) degradability of protein sources in dairy cows. Ruminal CP degradability of raw (R) and formaldehyde-treated (F) soybean meal (SBM), and raw (R) and extruded (E) lupin seeds (LS) were studied by means of *in sacco* technique. Two lactating and ruminally cannulated

Holstein cows were assigned in a 2 × 2 Latin square design. They were fed a TMR (23 kg/d DMI) as control diet or TMR supplemented with 20 g (8×10^9 CFU/g) /d of live yeast, during a 28-d experimental period (21 d of diet adaptation, 7 d of measurements). Ruminal degradation rate of CP was estimated as percent nitrogen degradability (DgN) from polyester bags incubated in rumen for 2, 4, 8, 16, 24 and 48 h. Data were fitted to the nonlinear regression equation: $DgN(t) = a + b(1 - e^{-ct})$ where DgN is percentage disappearance of N at time *t*, *a* the soluble fraction and *b* the less rapidly degradable fraction which disappears at the constant fractional rate *c* per time *t*. Live yeast significantly reduced DgN from 61.3 and 41.9% to 51.2 and 35.1% for RSBM and FSBM respectively, and from 92 and 60.9% to 91.4 and 48.3% for RLS and ELS respectively. For any protein source, live yeast did not significantly influence *a* and *b* fractions while it reduced similarly the breakdown rate (*c*) of the fraction *b*. It diminished the DgN values by 9.4 and 4.8 points for protected and raw protein sources respectively. The effect of live yeast could be quantified by the ΔDgN (DgN measured with control diet – DgN measured with live yeast supplemented diet). The ΔDgN values were correlated at $P = 0.066$ with DgN measured with the control diet ($r = -0.602$). It can be put forward that the lower the DgN, the more pronounced is the yeast effect.

Key Words: degradability, crude protein, live yeast

T268 Effect of live yeast dietary supplementation on growing calves performance and health. V. Bontempo*[1], A. Agazzi[1], E. Chevaux[2], V. Dell'Orto[1], and G. Savoini[1], [1]*Dept Veterinary Science and Technologies for Food Safety, University of Milan*, *Italy*, [2]*Lallemand SAS*, *France*.

A trial was carried out to evaluate the effects of live yeast (*S. cerevisiae* CNCM I-1077 - Levucell SC20, Lallemand SAS) dietary supplementation on performance and health status of calves. Generally researches on yeast indicate positive effects of increasing rumen pH and VFA concentration, and reducing lactic acid production on rumen development. Ninety six male Italian Friesian calves (14 to 21 d age, 59.4 + 1.76 kg BW), were assigned by weight to one of two dietary treatments (Ctr and T). Animals were housed in pens of 16 animals each (3 replicates per group). Treatments differed only in the live yeast supplementation of milk replacer and starter. After a 5 d-rehydration period, calves were fed 4 l/d of milk replacer at 12.5% DM from 0 to 60 d; calf starter and ryegrass hay were provided ad libitum from the beginning to the end of the study. Live yeast was included in milk replacer from 0-21 d (0.03% in milk powder, 4x109 CFU/kg) and starter (0.02%, 4x109 CFU/kg from 0 to 60 d; 0.01%, 2x109 CFU/kg from 61-90 d) of treated calves. Starter consumption per pen was recorded daily. Calves were weighted at 0, 30, 60, 90 d of study. Blood samples were withdrawn at the beginning and at the end of the study. Body weight of calves fed S. cerevisiae was greater both at 60 d (115 vs 124 + 2.49 kg) ($P < 0.01$) and 90 d (134 vs 145 + 2.48 kg) ($P < 0.01$). Calves fed live yeast showed a greater daily gain from 0 to 30 d (0.85 vs 1.00 + 0.019 kg/d) ($P < 0.01$), from 30 to 60 d (0.93 vs 1.08 + kg/d) ($P < 0.01$), and during overall trial (0.91 vs 1.04 + 0.035 kg/d) ($P < 0.01$). Calves in both treatments presented similar total DMI and gain to feed ratios. No differences were detected between the two groups for total protein, creatinine, glucose, CPK, total bilirubin, γ-GT, AST, and urea plasma content. The inclusion of live yeast both in milk replacer and starter feed improved growth performance of calves and may be of great importance during transition from liquid to solid feed.

Key Words: calves, *S. cerevisiae*, growth performance

T269 Reduced carriage of *Escherichia coli* O157:H7 in cattle fed yeast culture supplement. L. Liou[1], H. Sheng[1], W. Ferens[1], C. Schneider[2], A. N. Hristov*[3], I. Yoon[4], and C. J. Hovde[1], [1]*Department of Microbiology, Molecular Biology and Biochemistry, University of Idaho*, *Moscow*, [2]*Department of Animal and Veterinary Science, University of Idaho*, *Moscow*, [3]*Department of Dairy and Animal Science, Pennsylvania State University*, *University Park*, [4]*Diamond V Mills, Inc.*, *Cedar Rapids, IA*.

Effect of yeast culture on cattle carriage of *Escherichia coli* O157:H7 (O157) was assessed using eight, one-year-old Charolais heifers equipped with ruminal cannulae in a 74 d trial. Animals were confirmed negative for O157 prior to initiation of the trial and until bacterial challenge and fed alfalfa hay and grain twice daily with *ad libitum* access to drinking water. Animals were randomly assigned to either Control (200 g/d ground barley without yeast culture) or YC (56 g/d Diamond V XP™ Yeast Culture mixed with 144 g ground barley) treatments. Animals were challenged with 10^{10} CFU O157 (ATCC 43895) through the rumen cannula on d 30 of the trial. Rumen samples were collected at 2, 6, and 12 h post-challenge with O157. Recto-anal junction mucosal swab (RAMS) samples and ruminal digesta were collected on d 1, 4, and then twice a week post-challenge and cultured for O157. On the day of inoculation, O157 in the rumen of the YC heifers was lower ($P = 0.043$) than in Control heifers (averages 5.40×10^2 vs. 2.43×10^3 CFU/ml, respectively). On d 4 post-challenge, rumen samples from all heifers that received YC were O157 culture-negative, while 2 of 4 Control heifers still harbored the bacteria. On d 4 post challenge, O157 from RAMS culture was lower ($P = 0.021$) in YC than Control heifers (averages 9.23×10^4 vs. 5.93×10^5 CFU/swab, respectively). By d 11 post-challenge, 2 of 4 YC heifers were culture negative for O157 while all Control heifers remained culture-positive through d 24 post-challenge. Thus, the cattle fed Diamond V XP™ Yeast Culture carried fewer O157 for a shorter duration than the Control heifers. The mechanism of action of YC was not investigated.

Key Words: yeast culture, *Escherichia coli* O157:H7, recto-anal junction mucosal

T270 A meta-analysis of the effect of monensin or live yeast or a combination thereof on performance of beef cattle. L. J. Erasmus*[1], R. F. Coertze[1], M. N. Leviton[1], and E. Chevaux[2], [1]*Dept. Animal and Wildlife Sciences, University of Pretoria*, *Pretoria, South Africa*, [2]*Lallemand SAS*, *Blagnac Cedex, France*.

A meta-analysis of the effect of monensin, live yeast (Saccharomyces cerevisiae CNCM I-1077, Levucell, SC) or a combination of the two feed additives on production in beef cattle was conducted using 15 trials that contained eligible data. The database included data from 1875 animals for the average daily gain (ADG) analysis and 222 replicates for the feed conversion ratio (FCR) analysis. The GLM procedure of SAS was used. All main effects (study, yeast, monensin and the interaction between yeast and monensin) were included in the initial models. The effect of different parameters (DMI, dietary CP%, dietary NDF %) as covariates and first order interactions were fitted according to a step down procedure and included if significant ($P < 0.05$). Least square means and SE were calculated and the significance of difference between means was determined by Fichers test. Average daily gain of cattle that received no supplement was lower (1.45 kg /d) than those supplemented with live yeast only (1.54 kg /d) and ADG of cattle receiving monensin only (1.54 kg/d) was lower compared to cattle supplemented with both additives (1.57 kg /d) ($P < 0.05$). The FCR of cattle supplemented with live yeast only (6.40kg DM/kg weight gain) was better than

unsupplemented cattle (6.61kg DM/kg weight gain) ($P < 0.05$) but did not differ from cattle supplemented with monensin only (6.32kg DM/kg weight gain) or a combination of additives (6.13kg DM/kg weight gain) ($P > 0.05$). Results suggest similar effects of either live yeast or monensin on performance of feedlot cattle. Further research is needed on potential complimentary effects between ionophores and live yeast when supplemented to beef cattle.

Key Words: beef cattle, live yeast, monensin

T271 Feed additives (monensin or yeast cultures) for finishing Nelore cattle. C. T. Gomes, F. A. P. Santos, J. T. das N. Neto, L. F. Greco, J. R. R. Dórea, L. R. D. A. Neto, M. C. Moscardini, G. B. Mourão, A. M. Pedroso*, A. D. Pacheco Jr., and M. A. C. Danes, *University of Sao Paulo, Piracicaba, São Paulo, Brazil*.

The objective of this trial was to study the feeding of monensin or yeast cultures for finishing cattle. Eighty non-implanted Nelore steers with an average initial shrunk BW (SBW) of 391 kg were used in a 60-d feeding trial after a period for adaptation to high concentrate diets. Animals were blocked by SBW and randomly allotted to 16 pens. Experimental diets were isonitrogenous and contained 15% sugar cane silage and 85% concentrate (DM basis), containing dried citrus pulp, finely ground sorghum, urea, and minerals and vitamins. Treatments were: 1) Control, 2) Saccharomyces cerevisiae (YEA-SAAC®1026 - 10g/animal/day), 3) Saccharomyces cerevisiae (BIOSAF SC 47 heatstable® - 10g/animal/day), 4) monensin (RUMENSIN®- 30ppm of diet DM). Data were analyzed based on a randomized complete experimental design, with pens as the experimental units, using the PROC GLM of Statistical Analysis Systems (SAS Inst. Inc., Cary, NC). Least square means were compared using the PDIFF procedure. Dry matter intake was lower ($P<0.05$) for animals fed monensin compared to other treatments. Neither ADG nor G:F ratio were improved by feed additives.

Table 1.Intake and performance of finishing Nelore bulls fed different feed additives

Variables	T1	T2	T3	T4	SEM	P value
ADG (kg/d)	1.126a	1.004ab	0.984b	1.020ab	0.917	0.0488
DM Intake (kg/d)	9.45a	9.46a	9.38a	8.77b	0.318	0.0393
G:F ratio	0.119	0.106	0.105	0.116	0.101	0.2416

Key Words: monensin, probiotics, cattle

T272 Digestibility and ruminal parameters in beef steers fed different additives. J. P. I. S. Monneratt, P. V. R. Paulino*, S. C. Valadares Filho, M. S. Duarte, N. K. P. Souza, L. D. Silva, and P. D. B. Benedeti, *Universidade Federal de Viçosa, Viçosa, MG, Brazil*.

The present experiment aimed to evaluate the effects of yeast culture supplementation in comparison to monensin and a control treatment on feed intake and nutrient digestibility, ruminal volatile fatty acids (VFA), pH and ammonia ($N\text{-}NH_3$) concentration in beef steers fed high-concentrate diets (80% of DM) with two levels of starch. Eight crossbred steers (489 kg average BW) fitted with rumen cannulae were used. The animals were allotted into two groups of four steers each; each group received one of the two diets (23 and 38% starch). The experiment was evaluated following a two-by-two Latin square design. Within each square, four treatments were implemented: control (no additive), monensin (250 mg/kg of DM), yeast low dose (*Saccharomyces cerevisae*) – 1.0 g/100 kg BW/day and yeast high dose – 2.5 g/100 kg BW/day. The diets with different levels of starch were applied independently in each Latin square. Intakes of non-fiber carbohydrates, starch and dry matter, expressed as % of BW and metabolic body size, were lower ($P < 0.10$) for the low dose of yeast when compared to the other treatments. Ruminal pH was not influenced ($P > 0.10$) by the inclusion of the additives in the diets, with a mean value of 6.48. Ruminal VFA concentrations were higher ($P < 0.10$) in the animals receiving the lowest starch level, monensin and yeast, at the dose of 1 g/100 kg of BW. Lower lactate concentrations ($P < 0.10$) were observed in the treatments which had monensin added to the diet and for the diet with the highest starch level. The ruminal concentrations of propionate and $N\text{-}NH_3$ were not influenced ($P > 0.10$) by any of the additives used in this study, with mean values of 5.61 and 16.50 mg/dL, respectively. However, propionate concentration tended to be higher ($P < 0.10$) in animals fed the low starch level than those fed the high starch diet. Lower ruminal $N\text{-}NH_3$ concentrations and higher NDF digestibility coefficients were observed in the treatment with the lowest starch level. All the additives used in this study improved ($P < 0.10$) the digestibility of ether extract.

Key Words: ruminal pH, ruminal ammonia, volatile fatty acids

T273 Feedlot performance of Nellore and Brangus cattle fed monensin or polyclonal antibody preparation against lactate-producing rumen bacteria. D. D. Millen*[1,2], R. D. L. Pacheco[1], M. D. B Arrigoni[1], C. L. Martins[1], T. M. Mariani[1], J. P. S. T. Bastos[1], L. M. N. Sarti[1], R. S. Barducci[1], and S. R. Baldin[1], [1]*FMVZ/Unesp, Botucatu, São Paulo, Brazil*, [2]*Apoio FAPESP, São Paulo, Brazil*.

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 feedlot performance of Brangus (BR) and Nellore (NE) cattle. The experiment was designed as a 2 × 2 factorial arrangement using repeated measures over time, replicated 6 times (4 bullocks/pen), in which 48 9-mo-old bullocks (284.4 ± 23.4 kg) of each of two breeds evaluated were fed diets containing either monensin (MO) at 300 mg•animal^{-1}•d^{-1} or PAP at 3g•animal^{-1}•d^{-1} for 116-d. Measures over time were taken according to the level of concentrate (LOC) fed during the study: 70, 80 and 85%. These diets were named growing 1 (G1), growing 2 (G2) and final (FN), respectively. BR had greater ($P < 0.01$) ADG (1.42 vs. 1.14 kg), HCW (251.09 vs. 206.08 kg), DMI (8.31 vs. 6.38 kg) and DMI as percentage of BW (DMIBW, 2.11 vs 1.97%) than NE cattle. But in terms of G:F, it was observed ($P > 0.10$) similar efficiencies (BR = 0.171; NE = 0.178). Similar dressing percentages (DP) were found ($P > 0.10$) among breeds as well (BR = 52.8, NE = 52.9%). Interactions between breeds and LOC were found ($P < 0.05$) for DMIBW and G:F. BR and NE showed similar DMIBW when fed G1, however BR had greater DMIBW when fed G2 and FN. On the other hand, G:F was similar when breeds were fed G1 and G2, but NE showed better G:F when fed FN. No significant ($P > 0.10$) FA main effects were observed for any of the feedlot performance parameters (ADG, HCW, DP, DMI and G:F) with the exception ($P < 0.05$) of DMIBW (PAP = 2.08; MO = 2.00%). Interaction between FA and LOC were found ($P < 0.05$) for ADG and G:F. Cattle fed PAP and MO had similar ADG and G:F when fed G1 and G2, however, feeding MO led to greater ADG (1.36 vs. 1.23 kg) and better G:F (0.175 vs. 0.159) when fed FN. No interaction between breeds and FA was found ($P > 0.10$). BR performed better than NE in the study. Cattle fed MO performed better than those fed PAP when fed FN, however over the study, no differences between FA tested were detected on feedlot performance, with the exception of DMIBW.

Key Words: feedlot, PAP, monensin

T274 The interaction of flaxseed hulls and monensin on feed intake, apparent digestibility, and milk composition of late-lactating dairy cows. C. Côrtes*[1], D. C. da Silva[1,2], R. Kazama[1,2], N. Gagnon[1], C. Benchaar[1], G. T. dos Santos[1,3], L. M. Zeoula[1,3], and H. V. Petit[1], [1]*Agriculture and Agri-Food Canada, Quebec, Canada*, [2]*Universidade Estadual de Maringa, Parana, Brazil*, [3]*CNPq, Brazil*.

The objective of the experiment was to determine the effect of feeding a combination of flaxseed hulls and monensin on DMI, apparent digestibility, and milk composition of dairy cows. Four primiparous Holstein cows (BW = 665 kg; DIM = 190 d) fitted with ruminal cannulae were used in a 4 x 4 Latin square. Each experimental period consisted of 21 d of adaptation and 7 d of data collection. Cows were milked and fed twice a day. Treatments were: control with no flaxseed hulls and monensin (CO), 20% (DM basis) flaxseed hulls (FH), control with monensin (16 ppm; MO); and 20% (DM basis) flaxseed hulls and 16 ppm of monensin (HM). Results were analyzed using the MIXED procedure of SAS (2000) within a 2 x 2 factorial arrangement of treatments. Significance was declared at $P < 0.05$. There was no interaction between flaxseed hulls and monensin. DMI was higher for CO and MO than for FH and HM and monensin had no effect. Flaxseed hulls had no effect on DM digestibility however monensin tended to increase it. Apparent digestibility of CP was higher for cows supplemented with monensin compared to those not receiving monensin. Digestibility of ADF was higher for CO and MO than for FH and HM while the inverse was observed for digestibilities of CP and EE. Milk production was decreased by flaxseed hulls supplementation. Concentrations of milk fat, CP, and lactose were similar among treatments.

Table 1. Dry matter intake, apparent digestibility, and milk composition

						P-value		
	CO	FH	MO	HM	SE	Flaxseed hulls	Monensin	Interaction
DMI, kg/d	20.1	19.0	20.0	18.6	0.4	0.04	0.56	0.72
Digestibility								
% DM	65.0	65.1	66.4	65.8	0.4	0.64	0.08	0.45
% CP	65.7	70.0	66.6	71.9	0.4	0.002	0.05	0.35
% ADF	55.3	44.0	57.6	47.2	1.5	0.01	0.17	0.78
% NDF	46.2	43.9	49.7	45.9	2.1	0.24	0.27	0.75
% EE	77.1	91.4	75.7	91.7	1.0	0.001	0.63	0.45
Milk								
kg/day	27.5	26.0	26.8	23.3	0.7	0.03	0.09	0.21
% CP	3.7	3.5	3.6	3.6	0.05	0.11	0.18	0.10
% fat	3.0	3.6	3.3	3.3	0.06	0.15	0.94	0.17
% lactose	4.7	4.8	4.8	4.9	0.38	0.14	0.17	0.57

Key Words: dairy cows, flaxseed hulls, monensin

T275 Feeding behavior of Nellore and Brangus cattle fed monensin or polyclonal antibody preparation against lactate-producing rumen bacteria. T. M. Mariani[1,2], D. D. Millen*[1], R. D. L. Pacheco[1], M. D. B. Arrigoni[1], C. L. Martins[1], J. P. S. T. Bastos[1], R. S. Barducci[1], L. M. N. Sarti[1], S. R. Baldin[1], D. Tomazella[1], E. S. Ogawa[1], F. S. Parra[1], and J. R. Ronchesel[1], [1]*FMVZ/Unesp, Botucatu, São Paulo, Brazil*, [2]*Apoio FAPESP, São Paulo, Brazil*.

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 feeding behavior of Brangus (BR) and Nellore (NE) cattle. The experiment was designed as a 2 × 2 factorial arrangement using repeated measures over time, replicated 4 times (4 bullocks/pen), in which 32 9-mo-old bullocks (279.4 ± 21.5 kg) of each of two breeds evaluated were fed diets containing either monensin (MO) at 300 mg•animal^{-1}•d^{-1} or PAP at 3g•animal^{-1}•d^{-1} for 116-d. Measures over time were taken according to the level of concentrate (LOC) fed during the study: 55, 70, 80 and 85%. These diets were named adaptation (ADP), growing 1 (G1), growing 2 (G2) and final (FN), respectively. Visual appraisal was made 15-d after introduction of a new diet, and then every five minutes during 24-h, feeding behavior data was collected as follows: time spent eating (EAT), ruminating (RUM), resting (RES) expressed in minutes and number of meals per day (MEA). The meal length (MLE) in minutes was calculated as follows: EAT/MEA. Feeding MO led to longer ($P < 0.05$) RUM than PAP (421.58 vs. 397.05 min), however no differences ($P > 0.10$) among feed additives (FA) were observed for EAT and RES. Interaction between FA and LOC was found ($P < 0.05$) for RUM and RES. Feeding PAP and MO led to similar RUM and RES when fed ADP and G1, however, cattle fed PAP had shorter RUM and longer RES than MO when fed G2 (RUM: PAP = 291.9, MO = 340.5 min) and FN (RUM: PAP = 292.6, MO = 337.1 min). MEA was greater for cattle fed MO when compared to those fed PAP (17.0 vs. 15.9; $P < 0.05$), whereas feeding PAP led to longer MLE (15.3 vs. 13.8 min; $P < 0.05$). No significant ($P > 0.10$) breed main effects were observed for any of the feeding behavior parameters (EAT, RUM, RES and MEA) with the exception ($P < 0.05$) of MLE (BR = 15.1; NE = 14.0 min). No interaction was observed ($P > 0.10$) between breeds and FA. Feeding MO reduced the MLE and led to greater MEA and RUM compared to PAP. BR and NE presented similar MEA, however BR had longer MLE.

Key Words: behavior, PAP, monensin

T276 Feedlot performance of Brangus cattle fed monensin or polyclonal antibody preparation against lactate-producing rumen bacteria. R. S. Barducci[1,2], L. M. N. Sarti[1], M. D. B. Arrigoni[1], R. D. L. Pacheco*[1], D. D. Millen[1], C. L. Martins[1], S. R. Baldin[1], F. S. Parra[1], J. R. Ronchesel[1], D. Tomazella[1], T. Leiva[1], H. D. Rosa[1], T. M. Mariani[1], J. P. S. T. Bastos[1], T. C. Putarov[1], [1]*FMVZ/Unesp, Botucatu, São Paulo, Brazil*, [2]*Apoio FAPESP, São Paulo, Brazil*.

This study, conducted at the São Paulo State University feedlot, Botucatu Campus, Brazil, was designed to test the effects of polyclonal antibody preparation (PAP) against lactate-producing rumen bacteria or monensin (MO) on feedlot performance of Brangus cattle fed high concentrate diets. Seventy-two 9-mo-old bullocks (285.9 ± 38.7 kg) were assigned to 24 pens (3 bullocks/pen) and used in a completely randomized design with 2 × 2 factorial arrangement of treatments, replicated 6 times. Factors were inclusion or not of PAP or MO, at a dose of 4.5g•animal^{-1}•d^{-1} or 300 mg•animal^{-1}•d^{-1}, respectively. Animals were adapted for 21-d to the high concentrate diet fed. Diet contained 47.5% high moisture corn, 20% citrus pulp, 12.8% soybean meal, 13.7% sugarcane bagasse, 4.6% *Cynodon* hay and 1.5% supplement. Bullocks were weighed every 28-d to calculate ADG and G:F, and DMI was recorded every day and expressed in kilos (DMIKG) and as percentage of BW (DMIBW). No significant ($P > 0.10$) PAP main effect or interactions between PAP and MO were observed for any of the feedlot performance parameters (final BW, ADG, HCW, G:F, DMIKG, DMIBW and dressing percentage). However, feeding MO led to greater final weight (with MO = 474.86, without MO = 459.61 kg; $P < 0.05$), ADG (with MO = 1.68, without MO = 1.57 kg; $P < 0.05$), HCW (with MO = 248.46, without MO = 240.20 kg; $P < 0.08$) and G:F (with MO = 0.180, without MO = 0.173;

P < 0.10). Feeding MO did not affect (P > 0.10) dressing percentage (with MO = 52.27, without MO = 52.23%), DMIKG (with MO = 9.33, without MO = 9.01 kg) and DMIBW (with MO = 2.42, without MO = 2.39%). Cattle fed MO performed better than those animals not fed MO. On the other hand, feeding PAP did not improve feedlot performance of Brangus cattle in this study.

Key Words: PAP, performance, monensin

T277 Rumen papillae measurements of feedlot cattle fed monensin or polyclonal antibody preparation against lactate-producing rumen bacteria. L. M. N. Sarti[1,3], R. S. Barducci[1], D. D. Millen*[1], R. D. L. Pacheco[1], M. D. B. Arrigoni[1], C. L. Martins[1], S. F. Costa[2], L. Q. Melo[2], F. S. Parra[1], J. R. Ronchesel[1], D. Tomazella[1], H. D. Rosa[1], T. Leiva[1], S. R. Baldin[1], N. R. B Cônsolo[4], [1]*FMVZ/Unesp*, *Botucatu, São Paulo, Brazil*, [2]*UFLA*, *Lavras, Minas Gerais, Brazil*, [3]*Apoio FAPESP*, *São Paulo, Brazil*, [4]*UD/Unesp*, *Dracena, São Paulo, Brazil*.

This study, conducted at the São Paulo State University feedlot, Botucatu Campus, Brazil, was designed to test the effects of polyclonal antibody preparation (PAP) against lactate-producing rumen bacteria or monensin (MO) on rumen wall absorptive surface area of feedlot cattle fed high concentrate diets. Seventy-two 9-mo-old bullocks (285.9 ± 38.7 kg) were assigned to 24 pens (3 bullocks/pen) and used in a completely randomized design with 2 × 2 factorial arrangement of treatments, replicated 6 times. Factors were inclusion or not of PAP or MO, at a dose of 4.5g•animal^{-1}•d^{-1} or 300 mg•animal^{-1}•d^{-1}, respectively. Diets contained 47.5% high moisture corn, 20% citrus pulp, 12.8% soybean meal, 13.7% sugarcane bagasse, 4.6% *Cynodon* hay and 1.5% supplement. After slaughter the entire rumens were washed and a fragment of 1 cm^2 of one of three animals from each pen was harvested from cranial sac. Manually, the number of papillae per square centimeters of rumen wall (NOP) was determined. Consequently, 12 papillae were randomly collected from each fragment, scanned on Petri plates, and the mean papillae area (MPA) was determined using the Image Tool software for image analysis (UTHSCSA, 2002). Absorptive surface area per square centimeters of rumen wall (ABS) was calculated as follows: 1 + (NOP×MPA) – (NOP×0.002), where number 1 represents the 1 cm^2 fragment collected, and 0.002 is the estimated basal area of papillae. Participation of rumen papillae in the absorptive surface area (PAB) was calculated as follows: (NOP×MPA/ABS)×100. No significant (P > 0.10) PAP main effect or interactions between PAP and MO were observed for any of the rumen papillae measurements. Nevertheless, feeding MO led to greater ABS (with MO = 24.92, without MO = 19.45 cm^2; P < 0.05) and PAB (with MO = 96.07, without MO = 94.30%; P < 0.10), without altering NOP and MPA (P > 0.10). Greater ABS and PAB for cattle fed MO could indicate greater VFA absorption and lesser extent of rumen lesions.

Key Words: monensin, PAP, papillae

T278 Influence of virginiamycin supplementation on ruminal fermentation and microbial populations of steers. T. J. Guo[1,2], J. Q. Wang*[1], D. P. Bu[1], J. P. Wang[1], K. L. Liu[1], D. Li[1], S. Y. Luan[1], and X. K. Huo[1], [1]*Institute of Animal Science, State Key Laboratory of Animal Nutrition, Chinese Academy of Agricultural Science*, *Beijing, China*, [2]*Xinjiang Agricultural University*, *Urumqi, China*.

Influence of virginiamycin (VM) supplementation on ruminal fermentation parameters and microbial populations was studied in steers. Four ruminally cannulated steers (BW 559.4±30.1 kg) were used in a crossover design experiment. Each period was of 28 d. The basal diet had a forage-to-concentrate ratio of 35:65 (DM basis). The experimental treatments were (1) control; (2) control diet plus VM 30 mg/kg concentrate. Ruminal fluid was collected at 0730 h prefeeding, at 1130 h and 1730 h post-feeding on 27 and 28 d of each period. Part of the pooled samples of rumen fluid were transferred to anaerobic culture by roll-tube technique and extract 11 procaryotic taxa DNA for Real-time PCR analysis. Remaining pooled rumen fluid samples were analyzed for pH, VFA, ammonia-N, and L-lactic acid. Data were analyzed by the MIXED procedure of SAS 9.0. Compared with the control, steers receiving VM had higher ruminal pH (6.70 vs 6.63; P<0.05) and lower ammonia nitrogen (4.94 vs 6.19 mg/dL; P<0.01), and had lower mean counts of amylolytic bacteria and proteolytic bacteria (P<0.01) by roll-tube technique. The L-lactic acid concentrations in rumen fluid of control and VM receiving steers were not different (1.39 vs 1.26 mmol/L). Compared to control, the steers receiving VM had no influence on the following bacterial species (log10 copies per μL): *Selenomonas ruminantium* (5.55 vs 4.46), *Anaerovibrio lipolytica* (8.12 vs 7.93), *Ruminococcus albus* (6.95 vs 7.39), *Streptococcus bovis* (6.67 vs 7.74), *Lactobacillus spp.* (4.57 vs 5.22), *Butyrivibrio fibrisolvens* (4.44 vs 4.74), Genus-level Ruminococcus (8.36 vs 8.45), *Ruminococcus flavefaciens* (3.77 vs 4.00), Genus Prevotella (9.99 vs 10.04), *Megasphaera elsdenii* (2.26 vs 2.27), and *Prevotella ruminicola* (4.79 vs 4.32). Feeding VM to steers raised ruminal pH, reduced ammonia-N with no influence on major microbial species in the rumen fluid.

Key Words: virginiamycin, beef steer, microbial populations

T279 Effects of increasing levels of monensin on dairy cows in early lactation. G. F. Schroeder*[1], B. D. Strang[1], M. A. Shah[1], M. A. Messman[1], and H. B. Green[2], [1]*Cargill Animal Nutrition, Innovation Campus*, *Elk River, MN*, [2]*Elanco Animal Health*, *Greenfield, IN*.

A previous analysis of 966 cows from nine trials suggested that the rate of increase in DMI during the first 8 weeks of lactation increased as monensin dose increased. This may indicate that monensin may have a different effect on DMI depending on stage of lactation and energy status of the cows. To evaluate this hypothesis, 44 Holstein cows (including both primiparous and multiparous cows) were blocked according to BW and milk yield from the previous lactation and randomly assigned to 1 of 4 treatments: 0 (Control), 300 (M300), 450 (M450), or 600 (M600) mg/d of monensin during the first 9 weeks of lactation. Cows were housed in a tie-stall barn and individually fed the same diet (17% CP, 34% NDF, 38% NFC, 3.7% Fat, and 1.7 Mcal/kg NEL), with monensin treatments top-dressed twice daily. Milk production and DMI was measured daily and milk composition and urine ketone body were determined twice weekly. Data were averaged by week and model included repeated measures. Treatment by week interaction was not significant for any of the variables analyzed (P > 0.05). A quadratic increase in milk yield and a linear increase in DMI was observed with increasing monensin levels. Concentration of ketone body (Acetoacetic acid) in urine tended to be lower at higher levels of monensin feeding. Efficiency of 3.5% fat-corrected milk (FCM) yield (2.0 kg FCM/kg DMI) was not affected by treatments (P > 0.05). Milk fat concentration linearly decreased with increase levels of monensin. Although milk true protein concentration was not affected, milk protein yield was quadratically increased as dose of monensin increased. Overall, the results of this study support the hypothesis that monensin seems to increase intake right after calving, reduce ketone body formation and increase milk yield in early lactating cows.

Table 1.

	Treatments						P<		
	Control	M300	M450	M600	SEM	Monensin	Linear	Quad	Cubic
Milk, kg/d	41.5	43.5	49.3	43.2	1.94	0.12	0.22	0.05	0.09
DMI, kg/d	19.0	20.4	21.9	21.0	0.79	0.03	0.04	0.16	0.52
3.5% FCM, kg/d	42.9	42.4	49.3	41.4	2.00	0.62	0.80	0.08	0.02
Fat, %	3.78	3.45	3.52	3.36	0.14	0.05	0.06	0.57	0.33
Fat, kg/d	1.53	1.45	1.72	1.40	0.08	0.84	0.72	0.12	0.01
Protein, %	2.78	2.84	2.82	2.78	0.05	0.33	0.93	0.30	0.75
Protein, kg/d	1.14	1.21	1.38	1.18	0.05	0.06	0.26	0.01	0.06
Ketone bodies, mg/dL	7.11	1.88	3.07	4.21	1.97	0.09	0.36	0.08	0.43

Key Words: early lactation, intake, monensin

T280 Field study to investigate the risk factors for milk fat depression (MFD) in dairy herds feeding Rumensin®. D. V. Nydam*[1], T. R. Overton[1], D. E. Bauman[1], T. C. Jenkins[2], and G. D. Mechor[3], [1]*Cornell University*, *Ithaca, NY*, [2]*Clemson University*, *Clemson, SC*, [3]*Elanco Animal Health*, *Greenfield, IN*.

Commercial dairy herds (n=79) in the Northeastern and Upper Midwestern U.S. were enrolled in a cross-sectional observational study to investigate herd-level factors related to bulk tank milk fat percentage in herds feeding Rumensin®. Data collection consisted of a herd survey, samples of high group TMR for wet chemistry nutrient analyses (Cumberland Valley Analytical Services, Maugansville, MD) and fatty acid (FA) profiling (Clemson) and samples of bulk tank milk for FA profiling (Cornell). Unconditional univariable associations of continuous predictor variables and herd milk fat percentage were evaluated using simple regression, categorical analyses using the 3rd quartile as a cut-point were conducted and compared using t-tests, and multivariate analyses with backward stepwise elimination of variables was conducted using PROC GLM. The median milk fat percentage was 3.45% (range 2.70 to 4.30) and Rumensin® dose was 250 mg/d (range 150 to 410 mg/d). Milk fat content of *trans*-10, C18:1 was correlated negatively (R^2= 0.53) in a curvilinear manner with milk fat percentage. Variables related to TMR composition (Rumensin® dose, CP, ADF, NDF, starch, sugar, ether extract, total FA) did not have univariate relationships with herd milk fat percentage (P > 0.50). Increased proportions of TMR particles on the middle screen of the Penn State separator were positively associated to herd milk fat (R^2=0.09; P < 0.01) and increasing proportions of TMR particles in the bottom pan were negatively associated to herd milk fat percentage(R^2=0.11; P < 0.01). Increased dietary intake of monounsaturated FA (C16:1 and C18:1) was negatively related (P < 0.07) to herd milk fat. Overall, results suggest that altered ruminal biohydrogenation of dietary FA occurs in commercial dairy herds with lower herd level milk fat percentage. Furthermore, the lack of univariate relationships of most TMR variables with herd milk fat supports multiple factors contributing to MFD.

Key Words: milk fat, Rumensin®

T281 Effect of monensin and propylene glycol on volatile fatty acid and rumen parameters in early lactation Holstein cows. H. Bahrami-Yekdangi, K. RezaYazdi, and M. Dehghan-Banadaky*, *Universsity of Tehran*, *Karaj, Tehran, I.R., Iran*.

We evaluated the effects of monensin and propylene glycol on volatile fatty acid, rumen NH3-N concentration and Rumen pH of 16 lactating Holstein cows (60±30 DIM, Milk production 33±3 Kg/day) between September and November 2007. Cows were used in a completely random design with 4 rations and 4 replicates (cows). Basal ration were formulated according to CNCPS with (60% concentrate and 40% forages). Cows in group I were fed basal ration without additive (control), cows in group 2 were fed basal ration with 335 mg/head/day monensin, cows in group 3 were fed basal ration with 400 ml/head/day propylene glycol and cows in group 4 were fed basal ration with 335 mg/head/day Monensin and 400 ml/head/day propylene glycol. Data were analyzed on mixed models for repeated measurement. Results showed that ration propylene glycol an monensin (group 4) significantly decreased acetate and butyrate concentration of cows (p<0.05) but propionate N-NH3 concentration and pH were not different between groups.

Table 1. Effects of monensin and/or propylen glycol on rumen parameters

SEM 4 3 2 1* variable	1	2	3	4	SEM
Total VFA	121.2	119.5	113.8	105.8	9.12
acetate (mmol/lit)	78.6[a]	75.2[ab]	64.3[b]	59.9[b]	9.90
propionate (mmol/lit)	23.8	27.5	27.4	28.7	4.87
acetate/propionate	3.3[a]	2.7[b]	2.6[b]	2.1[b]	0.23
butyric (mmol/lit)	14.1[a]	12.6[ab]	9.9[ab]	7.4[b]	2.77

Ration 1 without additive (control), ration 2 with 335 mg/head/day, ration 3 with 400 ml/head/day propylene glycol, and ration 4 TMR with 335 mg/head/day monensin and/or 400 ml/head/day propylene glycol.

Key Words: propylene glycol, monensin, rumen parameters

T282 The interaction of flaxseed hulls and monensin on milk fatty acid composition of late-lactating dairy cows. C. Côrtes*[1], D. C. da Silva[1,2], R. Kazama[1,2], N. Gagnon[1], C. Benchaar[1], G. T. dos Santos[2,3], L. M. Zeoula[2,3], and H. V. Petit[1], [1]*Agriculture and Agri-Food Canada*, *Sherbrooke, Quebec, Canada*, [2]*Universidade Estadual de Maringa*, *Parana, Brazil*, [3]*CNPq*, *Brazil*.

The objective of the study was to determine the effect of feeding a combination of flaxseed hulls and monensin on milk fatty acid (FA) profile of dairy cows. Four primiparous Holstein cows (BW = 665 kg; DIM = 190 d) fitted with ruminal cannulae were used in a 4 x 4 Latin square. Each period consisted of 21 d of adaptation and 7 d of data collection. Cows were milked and fed twice a day. Diets were: control with no flaxseed hulls and monensin (CO), 20% (DM basis) flaxseed hulls (FH), monensin (16 ppm; MO), and 20% (DM basis) flaxseed hulls and monensin (HM). Results were analyzed using the MIXED procedure of SAS (2000). Significance was declared at $P < 0.05$. There was no interaction between flaxseed hulls and monensin for milk FA profile. Concentrations (% of total FA) of saturated (SFA), short-chain (SCFA), and medium-chain (MCFA) FA were significantly lower and those of monounsaturated (MUFA), polyunsaturated (PUFA), and long-chain (LCFA) FA were higher for cows supplemented than unsupplemented with flaxseed hulls. Concentrations of n-3 FA (*cis*9,12,15-18:3, *cis*5,8,11,14,17-20:5 and 22:5) and n-6 FA (*cis*9,12-18:2, *cis*6,9,12-18:3, *cis*11,14-20:2, *cis*8,11,14-20:3 and *cis*5,8,11,14-20:4) were significantly higher and lower, respectively, with flaxseed hulls supplementation. Feeding flaxseed hulls decreased the n-6 to n-3 FA ratio in milk fat and changed favourably milk FA profile for better human health.

Table 1. Fatty acids concentrations (% of total FA)

							P-value	
	CO	FH	MO	HM	SE	Flaxseed hulls	Monensin	Interaction
MUFA	22.44	37.02	24.36	39.69	1.80	0.004	0.29	0.85
PUFA	3.92	6.73	4.42	6.92	0.46	0.01	0.51	0.76
SFA	73.63	56.25	71.23	53.40	2.20	0.004	0.32	0.92
SCFA	17.83	11.69	16.34	8.99	0.92	0.01	0.11	0.56
MCFA	48.92	29.73	47.57	31.49	1.17	0.001	0.87	0.28
LCFA	33.24	58.59	36.13	59.52	1.92	0.001	0.40	0.65
n-3	0.80	2.02	1.00	1.96	0.14	0.004	0.88	0.23
n-6	2.58	2.41	2.66	2.33	0.05	0.01	0.98	0.20
n-6: n-3	3.14	1.10	2.73	1.17	0.22	0.004	0.50	0.36

Key Words: flaxseed hulls, milk fatty acids, monensin

T283 Combined use of ionophore and virginiamycin in Nellore steers fed high concentrate diets. A. J. C. Nuñez*[1,2], M. Caetano[1], A. Berndt[3], J. J. A. A. Demarchi[3], P. R. Leme[2], and D. P. D. Lanna[1], [1]*ESALQ/USP, Piracicaba, SP, Brazil*, [2]*FZEA/USP, Pirassununga, SP, Brazil*, [3]*APTA Regional Extremo Oeste, Andradina, SP, Brazil*.

The objective of this work was to evaluate the effects of adding virginiamycin to a high concentrate diet containing an ionophore. Performance, carcass traits, liver abscess incidence and fecal starch content were evaluated in 72 Nellore steers, with initial BW of 379 ± 27 kg. Animals were blocked by initial weight, randomly allocated to individual pens and fed for 61 days (once daily at 0800 h). Diets had two concentrate levels (73%C and 91%C had 73 and 91% concentrate in the DM respectively) and two virginiamycin levels (Control and VM had 0 and 15 mg/kg DM respectively) in a 2x2 factorial arrangement. The 73%C diet had 16% CP, 30.5% NDF, 69% TDN and 29.7% starch (52% dry ground corn), and the 91%C diet had 16% CP, 16.9% NDF, 80% TDN and 45.3% starch (70% ground corn). All diets had the ionophore salinomycin at 13 mg/kg DM. Statistical analyses were conducted using the GLM procedure of SAS. There were no interactions between concentrate and virginiamycin levels for any variable. Dry matter intake (DMI) was higher (P<0.01) for the 91%C treatment (9.0 ± 0.2 vs. 7.8 ± 0.2 kg/day), as was average daily gain (ADG) (1.79 ± 0.06 vs. 1.43 ± 0.06 kg/day; P<0.01). There was a trend for increased feed efficiency (FE) in the 91%C treatment (202.7 ± 6.7 vs. 185.9 ± 6.7 g/kg; P=0.08). DMI was lower for the VM treatment (7.98 ± 0.2 vs. 8.76 ± 0.2 kg/day; P<0.01), however, ADG did not differ from Control (P=0.66). Hence, virginiamycin fed animals had increased FE (206.0 ± 6.71 vs. 182.6 ± 6.71 g/kg; P=0.02). Animals fed 91%C diet had higher dressing percentages (55.3 ± 0.3 vs. 54.4 ± 0.3%; P=0.02) and heavier kidney and pelvic fat (8.1 ± 3.1 vs. 7.2 ± 3.0 kg; P=0.04). Virginiamycin levels did not affect carcass traits and no liver abscesses were found. Fecal starch content was higher (P<0.01) for the 91%C treatment (19.3 ± 1.1 vs. 13.9 ± 1.1%), but did not change due to virginiamycin (17.3 ± 1.1 vs. 15.9 ± 1.1% for Control and VM, respectively; P=0.40). These results suggest that adding virginiamycin to a diet containing an ionophore is an efficient tool to improve efficiency in high concentrate diets for Nellore cattle.

Key Words: antibiotics, beef cattle, salinomycin

T284 Effects of an amylase inhibitor on rumen pH and feed intake of young Holstein heifers fed a 100% concentrate diet. A. Bach*[1,2], M. Devant[2], A. Serrano[2], and A. Aris[2], [1]*ICREA, Barcelona, Spain*, [2]*IRTA-Ruminant Production, Caldes de Montbui, Spain*.

Sixteen rumen-cannulated Holstein heifers (BW = 258±53.7 kg) were used in a replicated 4x4 Latin square design to evaluate the effects of 3 doses (35, 52.5, and 70 ppm) of an amylase inhibitor (acarbose) on rumen pH and feed consumption. The heifers received a non-acidotic ration ad libitum for the first 14 d of each period, feed was withdrawn for one day, and then animals received a 100% concentrate ration ad libitum for 6 d to induce rumen acidosis. During these 6 d of each 21-day period, rumen pH was determined every 15 min in all 16 animals simultaneously. Total feed intake during the 6-d acidotic challenge was recorded. Rumen samples were obtained from all heifers in periods 2 and 3 to determine VFA concentrations and amounts of cDNA from S. ruminantium, M. elsdenii, and S. bovis using real-time PCR. Rumen pH data were analyzed using a model that accounted for the fixed effects for treatment, day, and treatment by day interaction and the random effects for animal and period. All data from 4 heifers were removed from the study due to respiratory and digestive upsets. Concentrate intake was affected by treatment and period and their interaction. Inclusion of acarbose allowed heifers to increase feed intake and maintain number of hours that ruminal pH was <5.5 at the same level as for control animals. Feed intakes for 0, 35, 52.5 and 70 ppm acarbose supplementation were 3.5, 4.6, 4.6 and 5.5 kg/d with the two lower doses being different at P < 0.05 from the control and the high doses. Number of hours that ruminal pH was <5.5 were 7.6, 11.3, 5.0 and 8.5 for 0, 35, 52.5 and 70 ppm, respectively and only the 35 ppm dose differed (P<0.05) from control. Thus, acarbose supplementation greater than or equal to 52.5 ppm resulted in increased intake while maintaining ruminal pH. There were no differences among treatments in area under the curve of pH 5.5 or ruminal VFA concentrations. There were no change in counts of the studied bacteria with addition of acarbose. It is concluded that supplementation with as little as 52.5 ppm of acarbose improves feed consumption under acidogenic conditions, while avoiding a decrease in rumen pH.

Key Words: acidosis, intake, pH

T285 Effect of *Bacillus subtilis* natto on milk performance, ruminal fermentation, and microbial profile of dairy cows. L. F. Deng[1], J. Q. Wang*[1], D. P. Bu[1], K. L. Liu[1], Y. M. Jiang[1], Q. Chen[1], P. Yu[1], H. T. Zhang[1], and J. K. Drackley[2], [1]*State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, Beijing, China*, [2]*University of Illinois, Urbana*.

Two experiments were conducted to evaluate effects of *Bacillus subtilis* natto (BSN2) initially isolated from fermented soybeans on dairy cow performance, ruminal fermentation and microbial profile. In Exp 1, thirty-six dairy cows (DIM, 54 ± 23 d) were randomly assigned into 3 groups: Control (Cont), basal diet; Group 1, basal diet plus 0.5×10^{11} cfu/d of BSN2 cow^{-1} and Group 2, basal diet plus 1.0×10^{11} cfu/d cow^{-1}. During treatment (70 d), daily milk production and weekly milk composition were determined on individual cows. For cows in Group 2, uncorrected milk yield, 4% fat- corrected milk (FCM), and energy-corrected milk (ECM) were 14.7, 17.0, and 17.4% higher (P<0.05) than cows fed Control, but Log_{10} somatic cell count (SCC) was 5.5% lower (P<0.05). There was no difference (P>0.05) between Cont and Group 1 and 2 for milk fat, protein and lactose concentration. In Exp 2, four rumen-cannulated dairy cows fed Cont diet for 0-7 d and rumen samples were collected on d 5 and 6, the same cows then were fed BSN2 (1.0×10^{11} cfu/d) 8-21 d and rumen samples were collected on d 20 and

21. Compared with Cont period, during the treatment period ruminal pH decreased (6.64 vs. 6.46, $P<0.05$), and NH_3-N, total VFA and molar proportion of propionate increased 37.7, 47.4, 6.4% ($P<0.05$) respectively. Molar proportion of acetate decreased 1.9% ($P<0.05$), and the A/P ratio was lower (3.23 vs. 3.02, $P<0.05$). No difference ($P>0.05$) for 24-h DM digestibility were detected between treatments. Total ruminal bacteria, proteolytic and amylolytic bacteria and protozoa in rumen increased ($P<0.05$) in treatment groups. These results demonstrate that BSN2 improved milk production and milk components yield, decreased SCC, and promoted the growth of some ruminal microorganisms. Thus, BSN2 has potential to be used as a probiotic for dairy cows.

Key Words: *Bacillus subtilis* natto, milk performance, ruminal fermentation

T286 Probiotic effect of *Bacillus subtilis* (natto) on rumen bacterial diversity of weaning Holstein calves. P. Yu[1], J. Wang*[1], D. Bu[1], K. Liu[1], D. Li[1], and C. McSweeney[2], [1]*State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, Beijing,China*, [2]*CSIRO Livestock Industries, Queensland, Australia*.

The purpose of the present study was to investigate the probiotic effect of *Bacillus subtilis* (natto) on the rumen bacterial diversity of weaning calves. Eight calves were randomly assigned into two groups, a control group fed a starter diet, and a treatment group supplemented with *Bacillus subtilis* (natto), which was mixed with the diet at a concentration of 5×10^6 CFU per gram of the average daily feed intake. Calves were slaughtered eight weeks after weaning. Rumen contents were taken from the perforated rumen immediately. DNA was extracted using the Beater-Bead method and used for 16S rDNA library construction. Results showed that feeding *Bacillus subtilis* (natto) decreased the concentration of volatile fatty acids in the rumen of the treatment group compared with the control group (67.9 vs.73.5 mmol/L). The vast majority of the two 16S rDNA clone libraries were represented by sequences related to the *Bacteroidetes* and *Firmicutes*. Members of *Bacteroidetes* accounted for about 39% and 25% of the total clones in control and treatment group, respectively, while *Firmicutes* increased from 46% in control to 57% in the treatment group. Clones affiliated to *Ruminococcus* and *Prevotella* accounted for 5% and 32% in control while 10% and 17% in the treatment animals respectively. These differences were confirmed by real-time PCR quantification using genus-specific primers. The numbers of *R. albus* ($\log_{10}$ 7.7 per mL) and *R. flavefaciens* ($\log_{10}$ 8.1 per mL) were higher in the rumens of the treatment group than in that of control group ($\log_{10}$ 7.3 per mL and $\log_{10}$ 7.7 per mL, respectively). These results indicated that supplementation of *Bacillus subtilis* (natto) on weaning calves could promote the establishment of the rumen microbial community, especially the growth of fibrolytic bacteria in the rumen of weaning calves.

Key Words: *Bacillus subtilis* (natto), weaning calves, rumen bacteria diversity

T287 Effect of an exogenous phytase on *in vitro* dry matter degradation, phosphorus balance and growth performance of finishing lambs. G. Buendía-Rodríguez[1], S. S. González-Muñoz*[1], G. D. Mendoza-Martínez[2], J. M. Pinos-Rodríguez[3], E. Aranda-Ibañez[1], L. A. Miranda-Romero[4], and L. M. Melgoza-Contreras[2], [1]*Colegio de Postgraduados, Montecillo, Edo. de México, México*, [2]*UAM Xochimilco, México D.F., México*, [3]*UASLP, San Luis Potosí, SLP, México*, [4]*Universidad Autónoma Chapingo, Chapingo, Edo. de México, México*.

The objective of this experiment was to determine the effect of a phytase (Natuphos 5000G, BASF Mexicana) on finishing lambs. Phytase was added (0, 150, 300 and 450 mg/kg diet; treatments) to a sorghum (70%) based diet and *in vitro* DM degradation was evaluated; data was analyzed using a Gompertz model and the DM remaining at each incubation time was used to fit a nonlinear regression model with the NLIN option of SAS. Additionally, DM, NDF and P total tract digestion, growth performance, and P balance were determined in 32 finishing Suffolk x Creole lambs (21.5±2.2 kg initial BW) during a 60 d feeding period. The experimental design was completely randomized; data collected over time was analyzed as repeated measurements using the MIXED option of SAS, and means were compared with the Tukey test. Inclusion of phytase in the diet had not effect ($P\geq0.05$) on *in vitro* DM degradation. There was a linear ($P\leq0.01$) improvement in total tract digestion of DM (741, 769, 773 and 799 g/d), NDF (527, 552, 564 and 624 g/d), and P (37.3, 40.5, 42.3 and 49.5 g/d) as phytase level in the diet increased. Phosphorus intake and excretion (urine and feces) and plasma P were not affected ($P\geq0.05$) by the inclusion of phytase in the diet. Retention of P, calculated using P values of feed, feces and urine, was linearly ($P\leq0.01$) increased (0.62, 0.72, 0.78 and 1.17 g/d) as phytase level was added in the diet. Feed intake, final BW, ADG and carcass dressing percentage of finishing lambs were not changed ($P\geq0.05$) by phytase. It is concluded that an exogenous phytase improved digestion of DM, NDF and P, as well as retained P, but it did not affect growth performance of finishing lambs.

Key Words: phytase, lambs, P balance

T288 Effect of fibrolytic enzymes on ruminal fermentation and digestibility in steers fed a diet with sodium bicarbonate. O. D. Montañez-Valdez*[1], J. M. Tapia Gonzalez[1], G. Rocha-Chavez[1], E. O. Flores-García[2], and J. H. Avellaneda-Cevallos[3], [1]*Centro Universitario del Sur de la Universidad de Guadalajara, Ciudad Guzmán, Jalisco, México*, [2]*Centro Universitario de la Costa Sur de la Universidad de Guadalajara, Autlán de Navarro, Jalisco, México*, [3]*Universidad Técnica Estatal de Quevedo, Quevedo, Ecuador*.

The objective of this study was to evaluate the effect of exogenous fibrolytic enzymes (ENZ; 0.3% of total diet) on ruminal fermentation and disappearance in steers fed a diet with or without sodium bicarbonate (SB, 3% of total diet). Six steers (450 ± 15 kg body weight) were randomly assigned to a replicated 3 × 3 Latin square with 2 different squares for balancing carryover effects. Both squares had 3 steers and squares were conducted simultaneously. The ruminal cannulas measured 7.5 cm center diameter (Bar Diamond, Parma, ID). Steers were housed in individual dry lot pens and offered the experimental diets twice a day at 0700, 1800 h for 90% of intake to allow no refusal. Steers were offered 1 of 3 diets (treatment), which were chemically very similar with 70% concentrate and 30% forage as follow: control; fibrolytic enzymes (ENZ; 0.3% of total diet); and ENZ + sodium bicarbonate (SB; 3% of total diet). The fibrolytic enzyme preparation containing xylanase and cellulase activities (Fibrozyme, Alltech Inc., Nicholasville, KY, USA). Sodium bicarbonate was a feed grade ruminal buffer (BS; Arm & Hammer, Church and Dwight Co., Inc.). Three days before the beginning of the feeding period the enzyme mixture was first mixed with alfalfa hay and then with the rest of the feed ingredients. Each experimental period consisted of 11 d of adaptation to diets and 4 d of experimental measurements. The buffer capacity was 67.8 for control, 67.9 for ENZ, and 128 for ENZ+BS. Ruminal pH values and ammonia N concentration were increased ($P \leq 0.05$) with ENZ+BS (6.8; 95.75 mg/l), but not with ENZ (6.6; 75.25 mg/l) as compared to control diet (6.2; 55.75 mg/l).

Ruminal disappearance of DM and NDF were not affected (P≥ 0.05) by ENZ and ENZ+BS. We fail to show significant effect of EZN+SB on ruminal disappearance. The hypothesis that EZN+SB would have significant effect on ruminal disappearance was not confirmed. Perhaps, the ruminal pH found was not low enough for the ENZ+SB to alleviate the drop in digestibility that occurs in presence of low ruminal pH.

Key Words: fibrolytic enzymes, sodium bicarbonate, digestibility

T289 Effects of feeding a mixed enzyme on performance in Varamini male lambs. H. Baghershah*, K. Rezayazdi, and M. Dehghan-banadaky, *Department of Animal Science, Faculty of Agriculture, University of Tehran, Karaj, Iran*.

Twenty-four varamini male lambs (with 22±1.5 kg initial body weight) were used to evaluate the effects of feeding a mixed enzyme on performance in sheep. The mixed enzyme contained: phytase, alpha-amylase, beta-glucanase, cellulase, hemicellulase, pectinase, amylogycosidase, xylanase, protease and pentosanase. The animals were fed basal diet with three level of mixed enzyme (0, 0.05 and 0.1% in kg ration) according to a completely randomized design (CRD) with 3 rations and 8 lambs (replicate) for 84 days. The basal diet had 50:50 forage to concentrate ratio and were formulated according to CNCPS for sheep. Dry matter intake was recorded per day and lambs were weighted bi weekly. Nutrients digestibility were measured with internal marker (acid insoluble ash). The results were showed that average daily gain of lambs 144, 157 and 152 gram per day, dry matter intake 1.132, 1.147 and 1.137 kilogram per day and feed conversion ratio 7.94, 7.38 and 7.57 that were not significantly different among rations. Digestibility of crude protein, ether extract, dry matter, organic matter, neutral detergent fiber and acid detergent fiber did not different between rations. Therefore the use of 0.05 and 0.1% of this mixed enzyme were not suitable for performance of varamini male lambs.

Table 1. Effect of feeding a mixed enzyme on performance and nutrients digestibility in sheep with its SE

	Diet *		
Trial	0	0.5	1
Dry matter intake (g/day)	1132±50a	1147±12a	1137±25a
Average daily gain (g/day)	144±19a	157±21a	152±21a
Final weight (kg)	34.68±1.39a	34.90±1.86a	34.87±1.47a
Feed conversion ratio	7.94±1.02a	7.38±0.96a	7.57±0.96a
Digestibility (%)			
Dry matter	85.03±2.73a	83.63±7.01a	80.10±8.56a
Organic matter	77.36±4.10a	75.80±3.86a	75.45±2.19a
Crude protein	76.77±3.97a	74.64±5.46a	74.65±1.95a
Ether extract	84.10±6.7a	75.13±10.13a	77.18±7.67a
Neutral detergent fiber	69.05±5.37a	69.09±6.17a	67.06±3.42a
Acid detergent fiber	64.41±6.33a	63.17±5.21a	62.24±3.88a

* Level of complex enzyme (g/kg asfed) **Values with the same superscripts within rows are not significantly different (P>0.05).

Key Words: mixed enzyme, performance, nutrient digestibility

T290 Feruloyl and acetyl esterase production of an anaerobic rumen fungus *Neocallimastix* sp YQ2 and its potential in the hydrolysis of fibrous feedstuffs. Q. Yue[1], H. J. Yang*[1], Y. C. Cao[1], Y. H. Jiang[1], and J. Q. Wang[2], [1]*Department of Animal Nutrition and Feed Science, College of Animal Science and Technology, China Agricultural University,, Beijing, P.R. China*, [2]*State key Laboratory of Animal Nutrition, Institute of Animal Science, China Academy of Agricultural Sciences, Beijing, P.R., China*.

A 2×3×4 factorial experiment of ten-day pure culture was applied in *Neocallimastix sp* YQ2 with two levels of glucose (G+: glucose added at a level of 1.0 g/L and G-: without glucose), three insoluble carbon sources (C1: corn stalk; C2: Chinese wildrye grass hay; and C3: alfalfa hay) and four levels of nitrogen source (N1: 1.4 g/L yeast extract, 1.7 g/L tryptone; N2: 2.8 g/L yeast extract and 0.5 g/L $(NH_4)_2SO_4$; N3: 1.6 g/L tryptone and 0.5 g/L $(NH_4)_2SO_4$; N4: 1.0 g/L yeast extract, 1.0 g/L tryptone and 0.5 g/L $(NH_4)_2SO_4$. The optimal combinations of carbon and nitrogen sources for Neocallimastix sp YQ2 to produce ferulic acid esterase (FAE), acetyl esterase (AE), xylanase (XYL), carboxymethyl cellulosase (CMC) and avicelase (AVI) were G+C1N4, G-C2N3, G-C3N3, G+C1N2, and G+C2N4, respectively. The FAE, AE, CMC and AVI activities reached their peak at day 1, 2, 8 and 10 of the incubation. Growth performance indicated by the yield of volatile fatty acids (VFAs) showed that C1 was beneficial to the growth of Neocallimastix sp YQ2 grown on whatever nitrogen source either glucose added or not in pure culture. The fungus produced more total volatile fatty acids (VFAs) and less propionic acid (HPr) when C1 was used as growth substrate as well as more acetic acid (HAc) when C2 was used than the situation when C3 was used (P<0.05). As for the enzymological characteristics of FAE and AE, Km and Vmax of FAE against methyl ferulate (MFA) were 90 uM and 1.15 mU, and the Km and Vmax of AE were 2.97 mM and 2.94 U with substrate of p-nitrophenyl acetate. The crude enzyme preparation of the fungi grown on substrate of G+C1N4 combination showed significantly higher potential in the release of ferulic acid (FA) and p-coumaric acid (CA) in corn stalk up to 129.8 g/kg the alkali-extractable FA and 87.9 g/kg the alkali-extractable CA, respectively. The strong capability to hydrolyse plant materials presented by the fungus can be used to deeply understand the degradation of fibre-rich feedstuffs in rumen and also open up prospects for the development of feed enzyme products for ruminants.

Key Words: rumen, anaerobic fungus, plant cell wall degradation

T291 Use of *Megasphaera elsdenii* NCIMB41125 as a probiotic for early-lactation dairy cows: Effects on rumen pH and fermentation patterns. P. C. Aikman*[1], P. H. Henning[2], C. H. Horn[2], and D. J. Humphries[1], [1]*University of Reading, UK*, [2]*KK Animal Nutrition, South Africa*.

Multiparous rumen-fistulated Holstein cows were fed, from d 1 to 28 post-calving, an ad libitum TMR containing (g/kg DM) grass silage (196), corn silage (196), wheat (277), soybean meal (100), and other feeds (231) with CP, NDF, starch and water soluble carbohydrate concentrations of 176, 260, 299 and 39 g/kg DM respectively and ME of 12.2 MJ/kg DM. Treatments consisting of a minimum of 10^{10} cfu *Megasphaera elsdenii* NCIMB 41125 in 250 ml solution (MEGA) or 250 ml of autoclaved *M. elsdenii* (CONT) were administered via the rumen cannula on d 3 and 12 of lactation (n=7 per treatment). Mid-rumen pH was measured every 15 minutes and eating and ruminating behavior was recorded for 24 h on d 2, 4, 6, 8, 11, 13, 15, 17, 22 and 28. Rumen fluid for VFA and lactic acid (LA) analysis was collected at 11 timepoints on each of d 2, 4, 6, 13 and 15. Data were analysed as repeated measures using the Glimmix (LA data) or Mixed (all other data) procedures of SAS with previous 305 d milk yield and d 2 measurements as covariates where appropriate. Milk yield was higher (CONT 43.0 vs MEGA 45.4

±0.75 kg/d, P=0.051) and fat concentration was lower (CONT 45.6 vs MEGA 40.4 ±1.05 g/kg, P=0.005) in cows that received MEGA. Time spent eating (263 ±15 min/d) and ruminating (571 ±13 min/d), DM intake (18.4 ±0.74 kg/d), proportion of each 24 h period with rumen pH below 5.6 (3.69 ±0.94 h) and LA concentrations (2.00 mM) were similar (P>0.327) across treatments. Ruminal total VFA concentration (104 ±3 mM) was similar (P=0.404) across treatments, but a shift from acetate (CONT 551 vs MEGA 524 ±14 mmol/mol VFA, P=0.161) to propionate production (CONT 249 vs MEGA 275 ±11 mmol/mol VFA, P=0.099) meant that the acetate:propionate ratio (CONT 2.33 vs MEGA 1.94 ±0.15) was reduced (P=0.072) in cows that received MEGA. This study provides evidence that supplementation of early lactation dairy cows with MEGA alters rumen fermentation patterns in favour of propionate, with potential benefits for animal health and productivity.

Key Words: *Megasphaera elsdenii*, VFA, dairy cow

T292 Prebiotic performance in the prevention of acidosis of different substances using the 'gas-*in-vitro*' methodology in ruminal acidosis-like condition. A. R. Aldrovandi[1], A. Britos[1], S. Paz[1], A. Molina[1], C. Cajarville*[1], and P. Zunino[2], [1]*Universidad de la República, Montevideo, Uruguay*, [2]*Instituto de Investigaciones Biológicas Clemente Estable, Montevideo, Uruguay*.

The aim of this study was to test the prebiotic performance in the prevention of acidosis of different substances through the 'gas-*in-vitro*' methodology. Substrates were chosen to mimick subacute ruminal acidosis (SARA) with 50% forage and 50% barley grain ground. Four prebiotic substances were added at 3 doses (3, 9, and 15% of total substrate) and were: *Saccharomyces cerevisiae* (strain ATCC-18824) inactivated (SC), sorbitol (SO), inulin (IN) and malic acid (MA). Fementation flasks of 125 mL of capacity, hermetically closed with rubber stoppers and aluminium cases were used by triplicate. Each one contained 500 mg of substrate + prebiotic, 40 mL of artificial saliva and 10 mL of fresh ruminal liquor. There were 2 more treatments, one without substrate (blank) and other withouth any prebiotic (control). Gas production was measured at 2, 4, 6, 8, 10, 12, 18, 24, 48, 72, and 96 h after the beginning of fermentation. Data were fitted, by a non linear regression to a bicompartimental model where Vol (mL/g DM incubated) means total volume and it is the response variable, Vfr and Vfl (mL/g DM incubated) are fast and slow pool volume respectively, Kdr and Kdl (h-1) are specific rates of Vfr and Vfl. Parameters were compared by 2 way ANOVA. One way of variation was the prebiotic used and the other way was the level of prebiotic. No differences were observed between levels. Comparation between prebiotics showed that Kdr (minimum, MA=0.088; maximum, IN=0.152; control=0.096) and Kdl (minimum, MA=0.018; maximum, SC=0.033; control=0.020) had differences at $p < 0.01$, while Vfr $p = 0.015$ (minimum, IN=23.38; maximum, SC=33.67; control=35.90) and Vfl $p = 0.059$ (minimum, MA=22.06; maximum, IN=33.59; control=21.35). Some of the selected substances had a prebiotic effect on the modulation of the ruminal microbiota and then they acted as prebiotics, decreasing the Vfr and the rate of gas production.

Key Words: SARA, ruminal flora modulation, statical fermentation systems

T293 Effect of a prebiotic (AgriMOS) and a probiotic (Levucell SB) on performance, health and fecal microflora of veal calves. K. Chong*[1], L. Phillip[1], R. Cue[1], and N. Walker[2], [1]*McGill University, Montreal, QC, Canada*, [2]*Lallemand, Animal Nutrition, Montreal, QC, Canada*.

Probiotics and prebiotics have been used in many areas of animal husbandry for their beneficial effects on health and growth performance; however, the effect of these products in veal calf production has received little attention. The aim of the study was to determine the role of these products in improving health and performance of veal calves, and to assess their effect on the fecal microflora. Sixty-eight Holstein calves (approx. 7 d old) were randomly assigned, in a 2 month study, to 3 treatments: probiotic (0.5g/d of Levucell SB); live yeast (*S. cerevisiae*, spp. *boulardii* (SB); prebiotic (3g/d of AgriMOS, a specific combination of manno-oligosaccharides and glucose extracted from the yeast cell walls of *S. cerevisiae*); control (no additive). The products were added to the milk replacer (MR) which was consumed until d53; calf starter (CS) was offered ad lilbitum until the end of the study. Body weight, feed consumption, fecal pH and fecal score were recorded. Performance data (n=48; SB n=11, AgriMOS n=12, control n=25) were analyzed using mixed model SAS. The only significant effect on performance was on MR intake. Calves fed SB consumed more than those on AgriMOS ($p<0.05$). To assess the effect on the gut flora, fecal samples were collected on d0, 7, 13, 28, 41 and 57, and selective growth medium was used to enumerate *E. coli*, *Lactic acid bacteria*, *Campylobacter*, *Clostridia* and *Salmonella* in these samples. Animals fed the additives showed a reduction in *E. coli* over time, whereas *E. coli* counts in the control group remained static. *Clostridia* numbers were also reduced in the SB group. DNA was extracted from fecal samples and PCR-TTGE was used to generate a DNA fingerprint of the fecal bacterial community which was analyzed using GelComparII. Similarity indices were calculated using Pearson coefficient and dendograms were constructed by UPMGA. Different banding patterns were observed on different days and treatments, indicating differences in the composition of the gut flora. Although fecal pathogens were reduced indicating a health benefit, this did not translate into any significant improvement on performance.

T294 Effect of rumen-protected lysine (AminoShure™-L) on milk production and composition in dairy cows fed diets containing distillers dried grains. S. Emanuele*[1], P. Doane[2], D. Putnam[1], and M. Cecava[2], [1]*Balchem, New Hampton, NY*, [2]*ADM, Decatur, IL*.

Objective for the trial was to test the effect of supplementing rumen-protected lysine on milk yield and composition when cows were fed a low lysine diet. A 3x3 Latin Square design was replicated twice with cows producing greater than 41 kg of milk. Periods were 3 weeks with the last week for sample collection. Diets contained 16.5% crude protein, 10% RDP, 34% NDF and NEL concentration of 1.8 Mcal/kg. Treatments were control (no supplemental lysine), LYS-1 (30 g/d AminoShure™-L), and LYS-2 (60 g/d AminoShure™-L). The control diet contained 6.0% lysine as a percent of metabolizable protein (MP). The LYS-1 and LYS-2 diets contained 6.3% and 6.6% lysine as a percent of MP. All diets contained 2.2% methionine as a percent of MP. Based on actual dry matter intake, the control, LYS-1 and LYS-2 diets were predicted to supply 163, 180 and 192 g of metabolizable lysine, respectively. All statistical comparisons were performed at $p< 0.05$. Supplementing rumen-protected lysine increased DMI by 1.3 kg/d and milk yield by 2.6 kg (Table 1.). Milk fat and protein yields were also increased by supplementing rumen-protected lysine. Milk casein yield was increased ($p=0.06$) by 4.2% as the supply of metabolizable lysine was increased in the diet. Results indicate that supplementation of rumen-protected lysine to diets with low levels of lysine will increase the yield of milk and milk components.

Table 1. Effect of rumen-protected lysine on milk yield and milk components

Variable	Control	LYS-1	LYS-2	SE
DMI, kg/d	23.5[a]	24.8[b]	25.0[b]	0.30
Milk yIeld, kg/d	38.6[a]	41.2[b]	40.9[b]	0.50
Milk fat yield, g/d	1112[a]	1272[b]	1273[b]	37.0
Milk protein yield, g/d	1194[a]	1238[b]	1249[b]	17.0
Milk casein yield, g/d	973	997	1014	14.0
MUN, mg/dl	14.7	14.8	14.8	0.40

[ab] means within a row without a common superscript differ p<0.05

Key Words: rumen-protected lysine, milk protein, milk casein

T295 In vivo determination of lysine bioavailability of rumen protected lysine in lactating dairy cows. M. D. Hanigan*[1], C. Vanderhoof[1], S. Garbade[1], O. Becvar[1], C. A. Umberger[1], and M. J. de Veth[2], [1]*Virginia Polytechnic Institute and State University, Blacksburg*, [2]*Balchem Corporation*, *New Hampton, NY*.

Lysine and methionine have been identified as the two amino acids most limiting milk production in lactating dairy cows. Presently there are no rumen protected lysine (RPL) products commercially available that have reported in vivo lysine bioavailability. The objective of this study was to determine the plasma lysine response to two RPL products and compare with a plasma lysine response curve developed from known amounts of abomasally infused lysine. This approach was recently validated as a reliable approach for determining lysine bioavailability. The two RPL products (RPL-1 and RPL-2) were protected by proprietary lipid encapsulation (Balchem Corporation) and contained 47 and 46% lysine-HCl. In vitro rumen testing of both products indicated a rumen bypass of 75 and 87%, respectively (estimated passage rate of 11%/h). The study was designed as two consecutive 4 X 4 Latin square experiments and used 4 ruminally fistulated Holstein cows. In the first Latin Square, 0, 25, 50 and 75 g/d of raw lysine-HCl were abomasally infused for 3 d periods and plasma samples were used to generate a blood lysine response curve. In the second Latin Square, RPL-1 and RPL-2 were fed each at two doses (50 and 100 g lysine-HCl) for 7 d periods. Throughout the study cows were fed a TMR diet that contained 19% CP to ensure all amino acids, including lysine, were not limiting. Blood was sampled every 2 h over the last 24 h of each period and amino acids were determined by isotope dilution using a GC-MS. Abomasal infusion of graded levels of lysine resulted in a linear increase in plasma lysine concentration ($P < 0.001$; $R^2 = 0.72$) with an intercept of 68 μM (SE = 4.2) and slope of 0.52 μM per gram of infused lysine-HCl (SE = 0.09). Based on this response curve and the plasma lysine concentration when feeding RPL the bioavailability of RPL-1 and RPL-2 (averaged across both RPL doses) was estimated to be 46 and 56%, respectively, but did not differ significantly from each other ($P = 0.62$). The results from this study indicate that this lipid encapsulation provides a means to effectively supply bioavailable lysine to the lactating dairy cow.

Key Words: lysine, ruminal protection, lactation

T296 Supplementation of RuMin 8™ and urea on microbial crude protein, ammonia and volatile fatty acid concentrations *in vitro*. D. P. Bu[1], X. Y. Li[1], J. Q. Wang*[1], H. Y. Wei[1], L. Y. Zhou[1], and R. R. Rastani[2], [1]*State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences*, *Beijing, China*, [2]*MSC*, *Carpentersville, IL*.

The objective of this study was to examine the effect of ruminal supplementation of RuMin 8™ (a lactose based sugar product, MSC) and urea on microbial crude protein (MCP), ammonia (NH_3 H) and volatile fatty acid (VFA) concentrations. An in vitro batch culture system was used with a 3×3 factorial design: with RuMin 8 (0%-R0, 1.5%-R1.5, 3%-R3 on a DM basis) and Urea (0%-U0, 0.5%-U0.5, 1%-U1 on a DM basis) and 500 mg Chinese wildrye as the substrate. The experiment was repeated twice, and three flasks without substrate (only rumen fluid) were used to adjust for error between the two periods. Mixed ruminal fluid from three lactating Holstein cows fed with 20 kg DM/day (forage to concentrate = 60:40) was withdrawn via the cannula 3 h after feeding and was mixed with buffer in a ratio of 1:4. After mixing, 60 ml of buffered rumen fluid were dispensed into 120-ml flasks containing 500 mg of the substrate, according to treatment assignment. The flasks were sealed (CO_2 atmosphere) and placed in an incubator at 39°C, without shaking. The pH value, VFA, NH_3 H and MCP were measured from fermentation fluid after 6, 12, 30, 48 and 96 h incubation at 39°C. The data were analyzed using the PROC MIXED with incubation time as the repeated measure. There were no significant effects with varying levels of urea and no RuMin 8*urea interactions. Supplementation of increasing levels of RuMin 8 resulted in increased MCP, acetate, propionate, and butyrate concentrations ($P < 0.001$). Thus, RuMin 8 supplementation may improve utilization of Chinese wildrye in ruminant diets.

Table 1- Effect of RuMin 8 on fermentation parameters

	RuMin 8		
Item	0	1.5	3
MCP, gN/dL	3.55[a]	4.11[b]	4.88[c]
NH^3 N, mg/dL	15.38	14.37	13.40
Acetate, mmol/L	31.43[a]	38.91[b]	50.84[c]
Propionate, mmol/L	8.27[a]	12.19[b]	17.92[c]
Butyrate, mmol/L	5.43[a]	7.05[b]	8.96[c]

[a,b,c]Means in a row with different superscripts differ ($P < 0.001$).

Key Words: lactose, urea, rumen fermentation

T297 Effect of Optigen® on milk yield, composition, and component yields in commercial Wisconsin dairy herds. J. F. Inostroza*[1], R. D. Shaver[1], V. E. Cabrera[1], and J. M. Tricarico[2], [1]*Department of Dairy Science, University of Wisconsin*, *Madison*, [2]*Alltech Inc.*, *Brookings, SD*.

The objective of this field trial was to determine the effect of Optigen® (blended, controlled-release urea), as a source of dietary nitrogen, on milk yield, composition and component yields in commercial Wisconsin dairy herds. The number of lactating cows within herd averaged 148 cows ranging from 58 to 550 cows across the 16 trial herds. Within herd, cows were fed a single-diet TMR. Control TMR (CON) for each herd was formulated by the herd nutritionist according to production level. The treatment TMR (OPT) for each herd contained 114 g/cow/d Optigen® replacing an equivalent amount of supplemental CP, primarily from soybean meal, to provide iso-nitrogenous control and treatment TMR. Diet formulation space created by the use of Optigen® was filled with DM from either corn grain or corn silage at the discretion of the herd nutritionist in the treatment TMR. Across the 16 trial herds, TMR contained 56±3% forage comprised of 43±9% corn silage and were formulated for 17.1±0.4% CP and 30.5±1.7% NDF (DM basis). Herds were randomly assigned to either OPT-CON or CON-OPT treatment

sequence in a cross-over design with two 30-d feeding periods. Records of weight and composition (fat, protein and MUN) of bulk tank milk shipments were obtained for each herd over the 60-d trial. The numbers of cows with milk in the bulk tank for each shipment were recorded for each herd over the 60-d trial. Average per cow daily milk yield and component yields for each treatment period for each herd were then calculated. Data were analyzed using the mixed model procedure of SAS with period, sequence and treatment as fixed effects and herd as a random effect. Least squares mean results are presented in the table. Milk yield was 0.5 kg/d/cow greater (P < 0.01) for OPT than for CON.

Table 1. Least squares means for lactation performance.

Item	CON	OPT	SEM	(P <)
Milk Yield, kg/d	35.4	35.9	0.2	0.01
Fat, %	3.72	3.69	0.02	0.07
Fat Yield, g/d	1317	1322	8	NS
Protein, %	2.98	2.97	0.01	NS
Protein, g/d	1055	1065	6	0.13
MUN, mg/dl	12.4	13.2	0.3	0.01

NS=Not significant.

Key Words: milk yield, dairy cows, controlled-release urea

T298 Supplementation of grazing dairy cows with isopropyl ester of 2-hydroxy-4-methylthiobutanoic acid (HMBi). L. F. Greco*[1,2], J. T. Neves Neto[1], A. Moreira[1], M. A. Penatti[1], C. M. M. Bittar[1], G. B. Mourao[1], and F. A. P. Santos[1], [1]*University of Sao Paulo, Piracicaba, Sao Paulo, Brazil*, [2]*University of Florida, Gainesville*.

Objectives were to evaluate the supplementation with HMBi in the concentrate fed to cows grazing elephant grass. Sixteen Holstein (Ho) and 12 crossbred Ho/Jersey (Cr) cows (150d in milk) were randomly assigned to receive a concentrate supplemented or not with HMBi in a crossover design with 2 periods of 28d each. HMBi was supplemented to achieve a lys:met ratio of 3:1 of the metabolizable protein. Elephant grass was managed under rotational grazing with varying rest periods to achieve a canopy height of 1m when cows had access to the pasture. The grazing area, was divided into 28 pastures of 0.2 ha each. Pastures were fertilized with 80kg of N/ha following each grazing period, which lasted 1 to 2d, the residual grass was at a height of 40cm. The forage selected by cows had 22% CP, 66% NDF, and 71.5% in vitro digestibility of the DM. Concentrate was offered individually at 1kg for each 3kg of milk, which was established at the beginning of the study. The concentrate was the same in both treatments, except the HMBi, which was added at 2g/kg of concentrate DM. The concentrate contained 30% ground corn, 20% soybean meal, 46% citrus pulp, and 4% mineral/vitamin supplement, and had 18% CP, 17% NDF, and 2.4% ether extract. Yields of milk and milk components were measure in the last 14d of each 28-d period. Data are presented in the following sequence, control and HMBi. Supplementing grazing cows with 2g of HMBi for every 3kg of milk produced did not influence (P>0.10) yields (kg/d) of milk (16.2 vs. 16.5) and 3.5% fat-corrected milk (16.3 vs. 16.6), or the concentrations (%) of fat (3.57 vs. 3.57), protein (3.12 vs. 3.13), lactose (4.30 vs. 4.32), and milk urea N (11.3 vs. 11.5 mg/dL). Ho and Cr had similar yields of milk and 3.5% fat-corrected milk, and fat concentration in milk, but milk protein was greater (P=0.02) for Cr than Ho (3.23 vs. 3.02). Mid-lactation dairy cows grazing tropical grass with a high CP content and producing 16 kg/d do not benefit from an improved amino acid balance by supplementing HMBi.

Key Words: amino acid, grazing, methionine

T299 Effects of feeding 2-hydroxyl-4-methylthio butanoic acid (HMTBa) and HMTBa chelated trace minerals on dairy cattle production. M. Gallardo[2], G. Conti[3], G. Castillo[1], and S. Toffano*[1], [1]*Novus International Inc., Capital Federal, Buenos Aires, Argentina*, [2]*EEA- Inta Rafaela, Rafaela, Santa Fe, Argentina*, [3]*Universidad del Litoral, Esperanza, Santa Fe, Argentina*.

Primiparous and multiparous mid to late lactation cows were selected to evaluate the effect of feeding a mixture (MINTREX® MIN; Novus International, St. Charles, MO, USA) that contained the calcium salt of 2–hydroxy–4-methylthio butanoic acid (HMTBa) as a source of methionine and Zn–, Cu–, and Mn– $(HMTBa)_2$ as a source of chelated trace minerals plus methionine on dairy cattle production. During the autumn of 2008 in Nuevo Torino (Castellanos County), Sante Fe province in Argentina, 100 cows (50 control; 50 treatment) were selected from a herd of 160 lactating dairy cattle. Cows were acclimated to the experimental period for 24 d and measurements were taken over a 19 d treatment period. Diets were formulated with 30% of dietary dry matter as alfalfa pasture and 70% as a TMR containing corn silage, alfalfa hay, high moisture corn, a soybean meal pellet (expeller), sunflower meal, and an inorganic trace mineral (ITM) and vitamin premix. Minerals were formulated to meet NRC (2001) requirements for Zn (47 ppm), Cu (11 ppm), and Mn (40 ppm) from feedstuffs and inorganic mineral supplements. For the treated group, diets were top-dressed with the MINTREX® MIN providing 320 mg of Zn, 300 mg of Cu, 260 mg of Mn and 1310 mg HMTBa per head per day plus 8400 mg HMTBa as the calcium salt of HMTBa. Group fed cows receiving the mixture averaged 7.4% more milk and 8.2% more milk fat yield .On average milk protein yield, lactose, and total solids were similar in both treatments. Supplementing dairy cows on alfalfa pasture with a combination of HMTBa and Zn–, Cu–, and Mn– $(HMTBa)_2$ chelates (MINTREX®) improved milk performance.

Key Words: organic trace mineral, methionine, HMTBa

T300 The impact of a blend of synthetic antioxidants (AGRADO® Plus) on milk fatty acids in dairy cows fed a high rumen unsaturated fatty acid load (RUFAL) diet. C. L. Preseault*[1,3], J. Kraft[1], G. R. Bowman[2], H. M. Dann[3], and A. L. Lock[1], [1]*University of Vermont, Burlington*, [2]*Novus International Inc., St. Charles, MO*, [3]*William H. Miner Agricultural Research Institute, Chazy, NY*.

A risk factor for the production of specific biohydrogenation intermediates (BHI) known to cause milk fat depression (MFD), is an increase in rumen unsaturated fatty acid load (RUFAL). Previous work has indicated that antioxidants have potential to maintain 'normal' biohydrogenation pathways thus, reducing the production of BHI that cause MFD. This study evaluated the impact of a blend of synthetic antioxidants, AGRADO® Plus (Novus International, Inc.), on milk fatty acid (FA) profile in cows fed a high RUFAL diet. Sixteen lactating Holstein cows (163±47 DIM), in a crossover design with two 21-d periods, were individually fed a high RUFAL diet designed to induce MFD, primarily through feeding distillers grains (15% DM). Cows were fed the diet without supplementation (Control; CON) or supplemented with 0.02% (DM basis) of AGRADO® Plus (AP). Milk samples were collected at the start of the study (baseline) and the end of each period (d 20-21) and analyzed for milk fat and FA. The high RUFAL diet induced MFD in both treatments, although milk fat content and yield were further reduced by 3 (P<0.01) and 4% (P<0.05), respectively, in CON vs. AP. Compared to baseline, decreases in milk fat were primarily a result of lower yields (g/d) of saturated FA (SFA) with a smaller decrease in *cis* monounsaturated FA (MUFA). There were, however, no differences in

FA yields between CON and AP at the end of treatment periods (P>0.05). Compared to baseline the high RUFAL diets had a twofold increase in total *trans* 18:1 FA and *trans*-10 and *trans*-11 18:1. A similar increase in *cis*-9, *trans*-11 18:2 in both CON and AP was also observed. Examination of treatment sequence revealed possible carry over effects across periods. At the end of periods 1 and 2 the content of *trans*-10 18:1 in milk fat (g/100 g FA) was 1.06±0.31 and 0.81±0.37 for the CON-AP sequence and 1.44±0.31 and 1.73±0.37 for the AP-CON sequence. Data indicate possible carry over effects of AP requiring further research to examine any long term effects on rumen BHI production and their consequences on milk fat synthesis.

Table 1. Effect of CON and AP treatments on milk fatty acid yields

FA Yield (g/d)	Baseline ± SEM	CON	AP	SEM
SFA	996 ± 34	852	864	31
C16:0	462 ± 18	370	387	17
MUFA *cis*	379 ± 26	357	351	14
C18:1 *trans*	58 ± 2	94.2	89.8	5.0
C18:1 10*t*	7 ± 0.4	19.0	15.2	3.7
C18:1 11*t*	18 ± 1	34.7	35.0	2.4
PUFA	40 ± 2	45.5	44.0	1.6

Key Words: milk fat, dietary antioxidants, fatty acids

T301 The effect of malic acid supplementation on diet digestibility and methane production by beef cattle fed a forage diet. S. M. Cobb, J. J. Michal, and K. A. Johnson*, *Washington State University*, *Pullman*.

The effect of malic acid (MA) supplementation to a forage diet on ruminal fermentation and methane (CH_4) production by beef cattle was examined using four ruminally fistulated animals in a 4x4 Latin square design. Animals were fed at maintenance a 75% bluegrass straw (BGS) and 25% alfalfa hay diet and MA treatment levels were 0, 200, 400, and 600 g/d. Malic acid was supplemented via rumen fistula in two equal portions immediately after animals were fed at 0700 and 1900 h. Ruminal fluid samples were collected at 0, 4, 8, 12, 16, and 20 h after feeding and immediately analyzed for pH and frozen for later volatile fatty acid analysis. Bluegrass straw and alfalfa hay dry matter (DM), neutral detergent fiber (NDF), acid detergent fiber (ADF), and organic matter (OM) in situ digestibilities were determined at 0, 8, 16, 24, and 48 h after feeding. Daily methane emissions were measured for 3 d. The mean ruminal fluid pH level was 6.4 ± 0.04, changed over time (P≤0.0001), and was unaffected by MA treatment. Bluegrass straw in situ NDF, ADF, and ash disappearance was unaffected by MA treatment, although extent of DM and OM disappearance decreased (P≤0.0001) with the highest level of MA supplementation. Alfalfa hay DM, NDF, ADF, OM, and ash disappearance was also unaffected by MA treatments. CH_4emissions averaged 299.1 ± 0.11 g/d and were not affected by treatment. In addition, CH_4 loss as a percent of gross energy intake averaged 7.6% across all treatments and was not affected by treatment. These data indicate that supplementation of forage diets with malic acid does not appear to reduce methane emissions unlike the impact observed with higher concentrate diets, and may negatively affect the digestibility of poor quality forages.

Key Words: beef cattle, malic acid, methane

T302 Effects of DeOdorase® on fermentation and digestion in rumen-simulating fermenters. G. A. Harrison*, M. D. Meyer, and K. A. Dawson, *Alltech Biotechnology*, *Nicholasville, KY*.

With increasing interest in feeding strategies to reduce methane production, additives with ability to alter ruminal populations are being investigated for their potential to lower methane production in the rumen. Effects of three levels of DeOdorase® (*Yucca schidigera* extract) were investigated in single-flow rumen-simulating fermenter cultures. Cultures were fed diets formulated in CPM (version 3.08) with 0, 3, or 8 g DeOdorase (equivalent at 22.7 kg DM intake). Twelve cultures were used in a completely randomized design with 3 dietary treatments and 4 replicates. Cultures were fed 12.5 g as fed of experimental diets twice daily for 2 days. On day 2, culture pH was measured and samples collected for ammonia determination at 0, 1, 2, 4, 6, and 8 h postfeeding. An effluent sample from each fermenter was used for DM and NDF disappearance and volatile fatty acid (VFA) analyses. Methane concentration was estimated from VFA concentrations based on a theoretical fermentation balance (Wolin. 1960. J. Dairy Sci. 43:1452). Data were analyzed for effects of treatment using the GLM procedure of SAS. DeOdorase did not affect culture pH (P>0.10). Culture ammonia was lower in cultures fed either DeOdorase level than those fed control diets (P<0.05). Molar proportions of volatile fatty acids were not affected by dietary treatment (P>0.10). Total VFA concentration was lower in cultures fed either DeOdorase level (P<0.05). Methane production (mmoles/d) was lower in cultures fed DeOdorase (P<0.05). Digestion of DM and NDF were not affected by treatment (P>0.10). Compared to controls, mean ammonia concentration was 22% lower in cultures fed the DeOdorase 3 g treatment and 35% lower in cultures fed the higher DeOdorase level (8 g). DeOdorase was also effective in lowering methane concentration and production (-5.2% and -8.1%, respectively for 3 g treatment compared to control). DeOdorase has the potential to shift ruminal fermentation in a manner that results in lower ammonia concentrations and lower methane production.

Key Words: DeOdorase®, ammonia, methane

T303 Effect of saponin extract supplementation on ruminal fermentation in continuous culture. J.-S. Eun*, C. M. Dschaak, F. H. Bhushan, Y.-M. Kim, and A. J. Young, *Utah State University*, *Logan*.

This study examined whether supplementing saponin extract (SAE) was beneficial on in vitro ruminal fermentation when added to a lactating dairy TMR diet. We were particularly interested in the effects of SAE on ruminal pH, N utilization, methane production, and VFA profiles. A dual-flow continuous culture system was used in a randomized complete block design. Three fermentor vessels with working volume of 700 mL were fed 20 g of dry feed per day (divided equally between a.m. and p.m. feedings). Experimental diet consisted of 33% alfalfa hay, 7% corn silage, 40% rolled barley grain, and 20% concentrate mix. Source of SAE was *Yucca schidigera* (DK sarsaponin 30, containing 10% of steroidal saponins) by Desert King International (San Diego, CA). Dietary treatments were as follows: 1) TMR without SAE, 2) TMR with low SAE (1% SAE), and 3) TMR with high SAE (2% SAE). Following an adaptation period of 5 d, culture samples were taken on d 6, 7, and 8 of each period for analysis. A second run of the fermentors followed the same treatment sequence to provide replication. Data were analyzed using the MIXED procedure of SAS. Culture pH did not differ between treatments (average pH 6.14). In addition, methane production (average 7.28 mmol/d) and ammonia-N concentration (average 8.3 mg/dL) were not affected by the treatments. Total VFA production tended to decrease (P = 0.15) with supplementing SAE regardless of its level,

whereas molar proportions of acetate, propionate, and butyrate and acetate to propionate ratio were not influenced by supplementing SAE. The use of SAE caused an inhibition of the microbial activity, based on the decreased VFA, but it did not shift microbial fermentation patterns reflected on no effects on methane production and individual VFA proportions. At the doses tested in this study, SAE supplementation had minor impact on in vitro fermentation of the barley-based dairy TMR diet without any beneficial effect.

Key Words: saponin extract, ruminal fermentation, continuous culture

T304 The effect of combinations of Acid Buf and sodium bicarbonate on milk production, milk composition and ruminal pH profiles. C. W. Cruywagen*[1], S. J. Taylor[2], and T. Calitz[1], [1]*Dept. Animal Sciences, Stellenbosch University*, *Stellenbosch, South Africa*, [2]*Celtic Sea Minerals*, *Carrigaline, Co. Cork, Ireland*.

Eight lactating Holstein cows, fitted with rumen cannulae, were used in a Latin square experiment to compare different buffer combinations. A high concentrate TMR was used to construct four dietary treatments in which Acid Buf (AB), the skeletal remains of the seaweed Lithothamnium calcareum, was used alone or in combination with sodium bicarbonate (BC). The diets contained 3.5 g/kg of AB (Treatment 1) or 1.75 g/kg of AB and 1.75 g/kg of BC (Treatment 2) or 3.5 g/kg of AB 3.5 g/kg of BC (Treatment 3) or 3.5 g/kg of AB and 5.2 g/kg of BC (Treatment 4). The total experimental period was 100 days in which every cow received each diet for a period of 18 days prior to a data collection period of 7 days. Rumen pH was monitored continuously over 2 days and samples of rumen fluid were collected for VFA and rumen ammonia analyses. During each data collection period, milk production was recorded twice daily for 7 d, whereas milk was sampled twice daily for five consecutive days for component analysis. Treatment had no significant effect on milk production, milk composition or feed intake. Ruminal pH profiles of all the treatments indicated that the diets were well buffered. Average pH over 24 hours was 6.1, 6.1, 6.2, and 6.3, for Treatments 1, 2, 3 & 4, respectively. The pH did not go below 5.8 for any of the treatments and increasing levels of sodium bicarbonate increased the diurnal profile such that at the highest level (Treatment 4), the pH profile ranged from 6.1 to 6.5. Although not significant, Treatment 1 (Acid Buf alone) numerically resulted in the highest milk output without compromising milk quality. It is proposed that high rumen pH may impact negatively on milk output by increasing acetate:propionate ratio to the detriment of rumen efficiency. The use of buffers which react to increasing acid load in the rumen may therefore provide an efficient, safe solution to rumen acidosis. The current study confirmed previous results indicating that a daily intake of 80 g of Acid Buf by cows receiving high concentrate diets would support high milk production without compromising milk solids content.

Key Words: buffers, milk production, rumen metabolism

T305 Effect of ractopamine on whole body and splanchnic energy balance in holstein steers. A. F. Koontz*, S. W. El-Kadi, D. L. Harmon, and K. R. McLeod, *Department of Animal and Food Sciences, University of Kentucky*, *Lexington*.

This study was designed to examine the influence of ractopamine (RAC) on whole-body and splanchnic energy balance. Six growing Holstein steers (BW= 402kg ±39.5) surgically fitted with an arterial and portal, hepatic, and mesenteric venous indwelling catheters were used in a repeated measures study. Treatments were a basal diet of alfalfa cubes fed at 1.5x ME requirements (d 1-21; CON) and basal plus RAC (430mg/hd•d^{-1}; d 22-42). On d 14 of each period splanchnic and portal-drained viscera (PDV) energy balance was determined as the product of arteriovenous O2 difference and blood flow. Blood flow was determined using down-stream dilution of *p*-aminohippuric acid. Whole-body energy balance was determined on d 15-21 of each period, which included 7 d total excreta collection and 3 d of respiratory gas exchange measurements. Bodyweight and DM intake were greater ($P < 0.05$) for steers receiving RAC compared with those receiving CON, however, no difference was observed in either BW or DMI when expressed on a $BW^{.75}$ basis. Similarly, as a function of $BW^{.75}$, whole-body heat production (691 kJ/kg $BW^{.75}$•d^{-1}; $P = 0.96$) and retained N (0.85 g/kg $BW^{.75}$•d^{-1}; $P = 0.34$) and energy (298 kJ/kg $BW^{.75}$•d^{-1}; P = 0.71) were unaffected by RAC. In contrast, RAC tended to decrease ($P = 0.09$) energy use by splanchnic tissues (191 vs. 156 kJ/kg $BW^{.75}$•d^{-1}), largely due to a reduction ($P = 0.12$) in energy use by the PDV (100 vs. 86 kJ/kg $BW^{.75}$•d^{-1}). These data indicate that although whole-body energy use is not affected by RAC, energy use by splanchnic tissues is decreased, thereby increasing energy use by peripheral tissues.

Key Words: bovine, ractopamine, energy

T306 Zilpaterol hydrochloride impact on core body temperature, performance, and carcass characteristics of finishing steers. J. L. Wahrmund*[1], B. P. Holland[1], C. R. Krehbiel[1], M. N. Streeter[2], D. A. Yates[2], J. P. Hutcheson[2], W. T. Nichols[2], C. L. Goad[3], and C. J. Richards[1], [1]*Department of Animal Science, Oklahoma State University*, *Stillwater*, [2]*Intervet/Schering-Plough*, *DeSoto, KS*, [3]*Department of Statistics, Oklahoma State University*, *Stillwater*.

Beta agonists have been shown to increase heart and respiration rates in finishing beef cattle. The objective of this study was to determine the effect of zilpaterol hydrochloride (ZH) on core body temperature of finishing beef steers. Forty one d prior to slaughter (d 0) 68 crossbred steers (initial BW = 530 ± 8.7 kg) were randomly assigned to 12 pens and administered a remote temperature monitoring ruminal bolus, which transmitted rumen temperature data at a rate of once every 11 ± 8 min. Pens were then randomly assigned to one of two treatments: 0 (control) or 8.3 mg/kg (100% DM basis) ZH fed for 20 d. ZH was fed beginning on d 16 and control diets resumed for all steers on d 36. Temperature monitoring began on d 7. Temperatures were compared across treatments and during 3 time periods of 9 d prior to ZH feeding, 20 d during ZH feeding, and a 5-d withdrawal period. Feeding ZH increased ADG by 21.5% ($P = 0.01$). However, final live BW (mean = 588 ± 11.1 kg) did not differ ($P = 0.18$) between treatments. Inclusion of ZH resulted in 15 kg greater ($P = 0.01$) HCW, 3.5 percentage units greater ($P = 0.01$) dress, and 6.7 cm^2 greater ($P = 0.002$) LM area. Additionally, ZH inclusion decreased internal fat by 17.5% ($P = 0.03$) and yield grade by 9.95% ($P = 0.02$). There were no treatment × time period interactions ($P = 0.52$) for rumen temperature. Average and maximum daily rumen temperatures did not differ ($P > 0.46$; 39.81 and 40.27°C, respectively) between treatments. Average and maximum daily rumen temperatures were not different ($P > 0.17$; 39.76 and 40.27°C, respectively) during the first two periods. Average daily rumen temperatures were 0.11°C greater ($P = 0.005$) in period 3 compared to period 1, and tended ($P = 0.08$) to be 0.06°C greater in period 3 compared to period 2. During period 3, maximum daily rumen temperatures were 0.08°C greater ($P = 0.04$) compared to period 2, and 0.13°C greater ($P = 0.005$) compared to period 1. These data indicate that when fed for 20 d, ZH improves

performance and carcass traits, and has no impact on daily average and maximum core body temperature of finishing beef steers.

Key Words: Beta agonist, bovine, body temperature

T307 The effect of substituting fish oil in cow diets with DHA-micro algae on milk composition and fatty acids profile. R. B. Potu*[1], A. A. AbuGhazaleh[1], and S. Ibrahim[2], [1]*Southern Illinois University, Carbondale*, [2]*North Carolina A&T University, Greensboro*.

Fish oil (FO) in the cow diet has been shown to function as a modifier for ruminal biohydrogenation to maximize the production of vaccenic acid (VA; trans-11 C18:1), the precursor of conjugated linoleic acid (cis-9, trans-11 CLA). It also has been shown that the FO stimulatory effect on VA production is attributed to docosahexaenoic acid (DHA)'s ability to inhibit the reduction of VA to C18:0 in the rumen. In this experiment, the effect of substituting FO with DHA-micro algae on milk fatty acid composition was examined. Twenty-four Holstein cows in mid lactation (165 ± 22 DIM) allowed to graze on an alfalfa-based pasture were divided into four treatment groups (6 cows/treatment) and supplemented with 7 kg/d grain mix supplements containing 350 g soybean oil and either 150 g FO (FO), 100 g FO plus 50 g algae (2/3FO), 50 g FO plus 100 g algae (1/3FO), or 150 g algae (ALG). Cows were fed treatment diets for 3 wks and milk samples were collected from each cow during the last 3 days of the study. Grain supplement intake, milk production (17.96, 17.56, 17.55, and 19.26 kg/d for treatments 1 to 4, respectively), milk fat percentages (3.17, 3.49, 3.74, 3.43 for treatments 1 to 4, respectively) and yield, and milk protein percentages (3.35, 3.50, 3.71, and 3.42 for treatments 1 to 4, respectively) and yields were not affected ($P > 0.05$) by the treatment diets. Concentrations (g/100g fatty acids) of milk cis-9, trans-11 CLA (3.51, 3.69, 4.47, and 4.21 for treatments 1 to 4, respectively) and VA (11.80, 12.83, 13.87, and 13.53) were not affected ($P > 0.05$) by treatment diets. The results suggest that DHA-micro algae can substitute for FO in a cow's diet without any adverse effects on milk production, milk composition or milk cis-9, trans-11 CLA content.

Key Words: fish oil, algae, CLA

Ruminant Nutrition: Efficiency

T308 Residual feed intake and feeding behavior of Nellore bulls selected for post-weaning weight. T. L. S. Corvino*[1], R. H. Branco[2], A. Polizel Neto[1], S. F. M. Bonilha[2], L. A. Figueiredo[2], and A. G. Razook[2], [1]*Programa de Pós-gradução emZootecnia - UNESP, Botucatu, São Paulo, Brazil*, [2]*CAPTA Pecuária de Corte - Instituto de Zootecnia, Sertãozinho, São Paulo, Brazil*.

Residual feed intake (RFI) is the difference between DMI observed and predicted based on metabolic BW and ADG. Feeding behavior influences RFI, however the relationships between these traits are not well known. The objective of this research was to evaluate the differences in feeding behavior of low and high RFI Nellore bulls selected for post-weaning weight. The experiment was conducted at CAPTA Pecuária de Corte - Instituto de Zootecnia, Sertãozinho - São Paulo/Brazil. Sixty one Nellore bulls had RFI evaluated (112 d in individual pens) and were classified in: low RFI (<0.5 SD; more efficient; n=21), medium RFI (<0.5SD<; n=22), and high RFI (>0.5 SD; less efficient; n=18). Feeding behavior was evaluated at 10 min intervals, during 24 h, in two random d, to determine feeding and chewing categories. Measured traits were feeding duration (FD), chewing time (CT) and bunk attendance (BA). FD/DMI had significant difference for RFI levels, being more efficient bulls (low RFI) those with lesser intake and greater time spent on feeding than less efficient ones (high RFI). Low RFI bulls used food with higher efficiency, eating slowly and retaining more nutrients than high RFI bulls.

Table1. Feeding behavior of low and high RFI Nellore bulls

	RFI			
	Low	Medium	High	P
n	21	22	18	
RFI	-0.346[c]	-0.009[b]	0.415[a]	<0.001
DMI, kg/d	5.72[b]	5.94[b]	6.63[a]	0.007
FD, min/d	217[a]	225[a]	214[a]	0.609
FD/DMI, min/kg DM	39.1[a]	38.7[a]	32.6[b]	0.009
BA, event/d	9.3[a]	9.9[a]	9.8[a]	0.155
DMI/event, kg DM/event	0.62[a]	0.62[a]	0.68[a]	0.266
FD/event, min/event	23.5[a]	23.2[a]	22.4[a]	0.174
CT, min/d	477[a]	477[a]	504[a]	0.080
CT/DMI, min/kg DM	86[a]	82[a]	77[a]	0.150

Within a row, means without a common superscript letter differ ($P < 0.05$) by Student Newman-Keuls test.

Key Words: efficiency, nutrition, selection

T309 Effects of residual feed intake on carcass characteristics of Nellore bulls. S. F. M. Bonilha*[1], R. H. Branco[1], G. F. Alleoni[2], A. M. Castilhos[3], L. A. Figueirdo[1], and A. G. Razook[1], [1]*Instituto de Zootecnia, Agência Paulista de Tecnologia dos Agronegócios, Sertãozinho, SP, Brazil*, [2]*Instituto de Zootecnia, Agência Paulista de Tecnologia dos Agronegócios, Nova Odessa, SP, Brazil*, [3]*Faculdade de Medicina Veterinária e Zootecnia, Universidade Estadual Paulista, Botucatu, SP, Brazil*.

Residual feed intake (RFI) is an efficiency measurement calculated as the difference between actual feed intake and predicted DMI based on metabolic BW and ADG. Some studies, using *Bos taurus* breeds, have found differences on carcass characteristics, mainly those related to fat content, on animals selected for low RFI, but there is no information about relationships between RFI and carcass traits on Nellore breed. Therefore, the objective of this work was to evaluate carcass characteristics of Nellore bulls classified in low and high RFI levels. Thirty three young Nellore bulls, with minimum RFI -0.640 and maximum RFI