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_3H) 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_3H 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