M305 Effect of live yeast on milk yield and related responses in a commercial dairy herd. G. E. Higginbotham*[1], A. R. Castillo[2], J. M. Heguy[3], and H. A. Rossow[4], *[1]University of California Cooperative Extension, Madera, [2]University of California Cooperative Extension, Merced, [3]University of California Cooperative Extension, Modesto, [4]University of California School of Veterinary Medicine, Tulare.*

Two pens with approximately 220 early lactating Holstein cows (averaging 70 DIM) were used to investigate the effect of supplementing their diets with a live *Saccharomyces cerevisiae* yeast (Yeast) versus no yeast supplementation (Control). Both treatment pens were fed a TMR 2x daily composed of 2.3% wheat hay, 4.0% alfalfa silage, 16.0% alfalfa hay, 26.2% corn silage, 16.0% earlage, 8.4% wet distillers grains, 4.0% whey, 4.8% rolled corn, 18.3% concentrate mix composed of 56.5% canola meal, 21.7% whole cottonseed, 2.2% EnergII, 8.7% high-fat product and 10.9% mineral mix. Total DM offered per cow was 28.5 kg/d. The yeast supplement was fed at the rate of 4.0g/cow/day in the TMR. Cows were milked 2 times daily and housed in freestalls with access to an open dry-lot. Milk yield and composition were recorded by weekly milk weights during the 8-wk trial. Only cows that were in the experimental pens during the complete duration of the trial were used for data analysis (n = 154-control; n = 149-yeast). Milk production of cows before entering treatment pens were used as a covariant. Adjusted mean milk and FCM production was significantly higher ($P < 0.01$) for Yeast versus Control cows, 45.5 vs. 43.3 kg/d (milk) and 43.8 vs. 42.7 kg/d (3.5% FCM). No differences in milk fat (mean 3.28%) or MUN (mean 11.8 mg/dL) were shown. Ruminal fluid pH, total VFA concentration and blood urea N (BUN) were measured twice at one-week intervals from 10 cows per treatment. BUN concentrations were significantly ($P < 0.001$) higher for yeast fed cows, 14.5 vs. 13.7 mg/100mL. Rumen acetic acid was significantly higher ($P < 0.01$) for control, 67.3 vs. 58.5 Mmol/l. Rumen NH3 was significantly ($P < 0.01$) higher for Control versus Yeast fed cows, 16.1 vs. 11.5 mg/100mL. Under the conditions of this field trial, live yeast increased milk production and other parameters (rumen and blood) were affected.

Key Words: milk production, rumen fermentation, yeast

M306 Effects of corn shredlage on lactation performance by dairy cows. L. F. Ferraretto* and R. D. Shaver, *University of Wisconsin-Madison, Madison.*

The objective of this trial was to determine the effects of feeding a TMR containing corn shredlage (SHRD) or processed corn silage (KP) on lactation performance by dairy cows. The KP was harvested using conventional rolls at 3 mm roll gap and the chopper set at 19 mm of theoretical length of cut (LOC). The SHRD was harvested using novel cross-grooved rolls at 2.5 mm roll gap and the chopper set at 30 mm LOC. The SHRD and KP were harvested from one field on 2 consecutive d and stored in separate silo bags for 30 d before the feeding trial. The DM of SHRD and KP during feed-out averaged 35%. One hundred and 12 cows (116 ± 36 DIM and 700 ± 20 kg of BW at trial initiation) were stratified by breed and parity and randomly assigned to 14 pens each with 8 cows. Pens were randomly assigned to the 2 treatment TMR in a completely-randomized design. A 2-wk covariate adjustment period with cows fed a 50:50 mixture of the treatment diets was followed by an 8-wk treatment period with cows fed their assigned treatment diet. The TMR contained (DM basis) KP or SHRD (50%), alfalfa silage (10%), concentrate mixture (40%). Data were analyzed using Proc Mixed in SAS with covariate, treatment, wk, and treatment x wk interaction as Fixed effects and pen within treatment as a Random effect. Cows fed SHRD tended ($P < 0.08$) to consume 0.7 kg/d more DM than KP. Milk yield (43.2 kg/d) did not differ ($P > 0.10$) between treatments. Fat- and energy-corrected milk (FCM, ECM) yields tended ($P < 0.07$ and $P < 0.10$, respectively) to be 1.0 kg/day greater for cows fed SHRD. A treatment by wk interaction ($P < 0.04$) was detected for both FCM and ECM yields; similar ($P > 0.10$) during wk 2, a tendency ($P < 0.10$) for SHRD to be greater during wk 4 and 6, and greater ($P < 0.05$) for SHRD at wk 8. Milk composition did not differ ($P > 0.10$) between treatments. The TMR particle size (15.6+2.9% vs. 3.5+1.4% of particles retained on a 19 mm screen) was greater for SHRD than KP, and feed sorting was minimal and did not differ ($P > 0.10$) between treatments. Feeding corn shredlage tended to increase dry matter intake and fat- and energy-corrected milk yields compared with processed corn silage.

Key Words: corn silage, dairy cow, shredlage

M307 Could live yeast supplement improve milk composition of mid lactating Holstein cows during heat stress? M. Dehghan-Banadaky*[1], R. Motameni[2], and M. Ebrahimi[1], *[1]University of Tehran, Karaj, Tehran, Iran, [2]Islamic Azad University, Tehran, Iran.*

Fifty-six Holstein cows with averaged 145 d postpartum, were used to investigate the effects of live yeast supplement (4 g/cow daily of Probio-Sacc with 15×10^9 cfu) on productivity during hot summer conditions (average thermo humidity index, THI = 78.07). Cows were fed in pens a control diet without or with 4 g of live yeast/cow daily for 4 weeks. The diet as a total mixed ration on dry matter (DM) basis included: corn silage (18.4%), alfalfa hay (21.6%), and a concentrate mix (60%). Live yeast added to the total mixed ration at the time of feeding. Milk production (35.56 and 35.67 kg/d, for control and live yeast treatment, respectively), 3.5% fat-corrected milk (32.20 and 32.96 kg/d), DM intake (22.84 and 22.52 kg/d) were similar for cows fed control and live yeast diets ($P > 0.05$). Greater milk fat percentage (3.02 vs. 3.18) was observed for cows fed live yeast compared with control group ($P < 0.05$). Also milk urea nitrogen (MUN) concentration in cows fed live yeast were lower compared with control group (16.67 vs. 18.75 mg/dl). Other milk components were similar in both groups. Body weights and body condition score changes were similar in both groups. The results suggested that the live yeast cannot improve productivity of heat stressed dairy cows in mid lactation but improved milk fat percentage and decreased MUN.

Key Words: heat stress, lactating cows, live yeast

M308 Investigation of live yeast supplement on blood metabolites and nutrient digestibility in mid lactating Holstein cows. M. Dehghan-Banadaky*[1], R. Motameni[2], and M. Ebrahimi[1], *[1]University of Tehran, Karaj, Tehran, Iran, [2]Islamic Azad University, Tehran, Iran.*

Present study conducted to investigate the effects of live yeast (4 g/cow daily of Probio-Sacc with 15×10^9 cfu) on dietary nutrient digestibility and blood metabolites of mid lactating Holstein cows during hot summer conditions (average thermo humidity index, THI = 78.07). Fifty-six Holstein cows with averaged 145 d in milk, were used in a complete random design with 2 treatments and 28 replicates for 35 d. Cows were fed in pens a control diet without or with 4 g of live yeast/

cow daily. The diets as TMR in dry matter (DM) basis included: corn silage (18.4%), alfalfa hay (21.6%), and a concentrate mix (60%). The live yeast supplement added to the total mixed ration at time of feeding. Blood samples were taken in 2 subsequent days in last week. Feed, ort and fecal samples were taken during 3 subsequent days in last week for nutrient digestibility assay. Acid insoluble ash used as an internal marker. Cows fed live yeast had higher blood glucose (76.60 vs. 66.50 mg/dL, $P < 0.05$) and numerically higher total protein concentration (10.69 vs. 9.73 g/d, $P = 0.07$) compared with control. Blood urea nitrogen was lower for cows fed live yeast compared with control ($P < 0.05$). Non-esterified fatty acids, β-hydroxybutyrate (BHBA), triglyceride, and total cholesterol were similar for both groups. The apparent digestibility of NDF was higher for cows fed live yeast compared with control (53.50 vs. 49.30%, $P < 0.05$) but, the apparent digestibility of DM, OM, CP, and ADF were similar for both diets. Results suggested that live yeast supplement can improve nutrient digestibility and blood metabolites of heat stressed dairy cows in mid lactation.

Key Words: blood metabolites, heat stress, live yeast

M309 Influence of *Salix babylonica* extract on daily milk production and composition as well as in vitro gas production in dairy cows. A. Z. M. Salem*[1], R. Rojo[2], M. Ronquillo[1], H. Gado[3], N. Pescador[1], and F. Peralta[2], *[1]Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma del Estado de México, Toluca, Estado de Mexico, Mexico, [2]Centro Universitario UAEM Temascaltepec, Universidad Autónoma del Estado de México, Temascaltepec, Estado de México, México, [3]Department of Animal Production, Faculty of Agriculture, Ain Shams University, Cairo, Egypt.*

A 3 × 3 Latin square design was used to evaluate the effect of 0, 150, and 300 mL of *Salix babylonica* extract on daily milk production and composition in dairy cows. Cows (3 cows for each treatment, 390 ± 10 kg) were fed on 5 kg of commercial concentrate (14% CP and 33% NDF- to meet 70% of their daily metabolizable energy) and oat hay ad libitum. Experiment was carried out in 3 experimental periods of 21 d (14 d of adaptation and 7 d for samples collection). Extract doses were mixed daily morning with a small amount of concentrate (approximately 1 kg) and fed to cows. Daily feed intake, water consumption, milk production and composition (solids not fat, fat, protein and lactose) were determined. In vitro gas production of the diet fed to cows (40: 60, concentrate: Oat hay) was recorded after 2, 4, 6, 8, 10, 12, 24, 48, 72 and 96 h of incubation with 0, 06, 1.2 and 1.8 mL extract/g DM. Rumen liquor was collected from 2 Brown Swiss cows (450 kg BW) and fitted with permanent cannulas. Milk production was increased ($P < 0.05$) with the extract addition at 150 or 300 mL/d while all the milk composition parameters were not affected by the extract addition. Milk energy output (Mcal/d) and milk density were also increased ($P < 0.05$) with extract addition at the 2 doses. Milk efficiency (kg DM/kg of milk) was improved ($P < 0.05$) with the extract doses versus control (1.59, 1.56 and 1.35, for 150, 300 and 0 mL extract/d, respectively). In vitro gas production of the diet fed to cows was increased ($P < 0.05$) dramatically with the 2 levels of extract with a short lag time and high rate of gas production per hour versus control (i.e., 0 mL). Addition of *Salix babylonica* extract improved milk production by 12%, without effect on milk composition in dairy cows probably due to its positive impact of ruminal microorganism's activities.

Key Words: cow, milk production, *Salix babylonica*

M310 A novel approach to measure the bioavailability of rumen protected l-lysine. K. B. Cunningham*[1], J. A. Davidson[1], S. E. Boucher[2], and B. L. Miller[1], *[1]LongView Animal Nutrition Center, Land O' Lakes Purina Feed, Gray Summit, MO, [2]Kemin AgriFoods North America, Des Moines, IA.*

This experiment includes 2 studies to determine bioavailability of a rumen protected L-lysine (Lys) product, USA Lysine (Kemin Industries Inc., Des Moines, IA), in cattle through the use of plasma lysine concentrations [p-Lys] affected by L-lysine (i-Lys) infused in the small intestine and fed as USA Lysine. Study 1 was a 4 × 4 Latin square design with 7 d periods. Four, duodenally cannulated steers (290 ± 18 kg) were fed a TMR twice daily (14.9% CP, 2.75 Mcal/kg ME) ad libitum with 60% of the TMR offered at 0800 h and remainder 12 h later. One of 4 Lys levels, 0, 30, 60 or 90 g, was infused daily into the duodenum of each steer for 22 h. On the 7th day, plasma was collected through jugular veinipuncture at 0, 2, 4, 6 and 8 h post-feeding. Each plasma sample was analyzed for L-lysine content. SAS linear regression analysis was applied to [p-Lys] versus g/d of i-Lys. Regression utilizing natural log-transformation of [p-Lys] as a percent of baseline values yields a predication equation of [p-Lys] = 0.01146 *(i-Lys) + 4.60958, r^2 = 0.602. This relationship between [p-Lys] and supplemented Lys infused to the small intestine is useful to predict bioavailability of USA Lysine in study 2. Study 2 was a replicated 4 × 4 Latin square design using 8 steers (276 ± 24 kg) fed the basal diet of study 1 and followed a similar feeding regimen, sampling and analyses. Dietary Lys treatments were offered as USA Lysine and supplied as 3 types of incorporations into the grain mix: hand mixed (50 and 100 g; H50 and H100), mechanical mixed (100 g; M100) and pellet (100 g; P100). Results of H50 did not increase [p-Lys] over the basal diet. Plasma Lys concentrations of H100, M100 and P100 were different from the basal diet ($P < 0.0001$). Mechanical mixing and pelleting of USA Lysine in the top-dress did not affect [p-Lys] compared with hand mixed. Regardless of dietary incorporation method, the regression equation applied to the [p-Lys] of steers fed 100 g of USA Lysine, predicts at least 50% bioavailability of Lys from USA Lysine.

Key Words: bioavailability, cattle, lysine

M311 Determining the bioavailability of lysine in AjiPro-L using the plasma free amino acid dose response method. N. L. Whitehouse*[1], E. S. Fletcher[1], A. F. Brito[1], C. G. Schwab[2], and I. Shinzato[3], *[1]University of New Hampshire, Durham, [2]Schwab Consulting LLC, Boscobe, [3]Ajinomoto Heartland Inc., Chicago, IL.*

Six multiparous ruminally cannulated Holstein cows averaging 108 d in milk were used in a 6 × 6 Latin square study with 7-d periods. Samples were collected during the last 3 d. The 6 treatments were: 1) control (0 g/d L-Lys), 2) 30 g/d of abomasally infused Lys, 3) 60 g/d of abomasally infused Lys, 4) 30 g/d of feed supplemented Lys, 5) 45 g/d of feed supplemented Lys, and 6) 60 g/d of feed supplemented Lys. An L-Lys HCl product containing 80% Lys and assumed to be 100% bioavailable was used for the infusions. The AjiPro-L (Ajinomoto Co. Inc., Tokyo), which contains 40% Lys (as fed basis) was mixed with 454 g of concentrate and offered to the cows 1 h before each of the 3 daily feedings. The basal diet was formulated to meet the Lys requirements and contained 36% corn silage, 14% grass silage, 3% alfalfa hay and 47% concentrate. Four blood samples were collected from the tail vein at 2-h intervals starting at 0700 h; samples were centrifuged, deproteinized, and composited by cow/day with plasma stored at −80°C for AA analysis. Data were analyzed using the MIXED and PROC REG procedures of SAS. Milk yield and composition, and DMI were not different among treatments. Lysine was the only plasma AA that increased linearly (*P*

≤ 0.05) in response to infused or feed supplemented Lys. The slopes for the infused and feed supplemented Lys were 0.0224 ($r^2 = 0.98$) and 0.0078 ($r^2 = 0.94$), respectively, when the concentration unity μg/mL was used for expressing the concentration of plasma Lys relative to that of total AA. When the concentration unity μM was chosen to express plasma Lys as a proportion of total AA, the slopes were slightly lower for the infused (0.0183; $r^2 = 0.97$) and feed supplemented (0.0068; $r^2 = 0.93$) treatments. The calculated bioavailabilities for AjiPro-L using the 2 different sets of slopes (0.0224 and 0.0078 μg/mL vs. 0.0183 and 0.0068 μM) were relatively similar averaging 35% (0.0078/0.0224 × 100) and 37% (0.0068/0.0183 × 100), thus indicating marginal impact of concentration unity (μg/mL vs. μM) on the outcome of Lys bioavailability values using the in vivo plasma response method.

Key Words: amino acids, lysine, bioavailability

M312 Microencapsulated sodium selenite supplementation in dairy cows: Effects on selenium status. E. Grilli*[1], P. Fantinati[2], M. Morlacchini[3], and A. Piva[1], *[1]DISMVET, Facoltà di Medicina Veterinaria, Ozzano Emilia, Italy, [2]Vetagro SpA, Reggio Emilia, Italy, [3]Centro Ricerche per la Zootecnia e l' Ambiente, San Bonico, Italy.*

The objective of the study was to assess the selenium status of dairy cows fed with 3 different sources of selenium; that is, free or microencapsulated sodium selenite and yeast selenium. Thirty dairy cows were divided in 5 groups and fed the same total mixed ration with 5 different supplementations of selenium: the control group (CTR) received sodium selenite at 0.3 mg/kg DM; M1 and M2 group received lipid microencapsulated sodium selenite at 0.3 mg/kg, and 0.5 mg/kg DM, respectively; Y1 and Y2 group received selenized yeast providing selenium at 0.3 mg/kg and 0.5 mg/kg, respectively. Cows were fed the supplements for 56 d during which milk, blood, and fecal samples were collected weekly to perform selenium content analysis and glutathione peroxidase 1 (GPx-1) activity. Data measured over time were subjected to ANOVA using the repeated measures in the mixed procedure of SAS in a complete randomized design. The statistical model included the fixed effect of treatment, time of measurement and (treatment x time) interaction. The random variable was the cow within treatment. Pre-experimental variables were subjected to analysis of covariance for adjustments. Cows fed with 0.3 mg/kg of microencapsulated selenium had 6.6% and 5.7% higher total plasma selenium concentration than CTR and Y1 group, respectively. Also, milk selenium concentration was higher in M1 group compared with CTR and Y1 group (+38.2% and 13.1%, respectively; source effect). The increment was more pronounced at the highest inclusion rate (0.5 mg/kg, M2 group). Despite the higher selenium content in body fluids observed in animals fed the microencapsulated form, GPx-1 activity was not significantly affected by treatments. The results showed that lipid microencapsulation is a suitable technique to protect nutrients from ruminal reduction of bioavailability and that microencapsulated sodium selenite is absorbed and incorporated in tissues (plasma and milk) in a more efficient way than in the free form. Microencapsulated sodium selenite resulted also comparable to Se-yeast in terms of availability and incorporation in milk when fed at 0.3 mg/kg DM, whereas the inclusion in the diet at 0.5 mg/kg DM resulted more advantageous for the microencapsulated form.

Key Words: dairy cow, microencapsulation, selenium

M313 Effects of dietary amylase and sucrose on productivity of cows fed low-starch diets. C. F. Vargas*[1], M. Engstrom[2], and B. J. Bradford[1], *[1]Kansas State University, Manhattan, [2]DSM Nutritional Products, Parsippany, NJ.*

Recent studies have observed positive effects of both sucrose and exogenous amylase on fiber digestion and productivity of dairy cattle. Our objective was to evaluate direct effects and interactions of amylase and sucrose on DMI, milk production, and milk components. Forty-eight multiparous Holstein cows between 70 and 130 DIM were randomly assigned to each of 4 pens (12 cows/pen). Pens were randomly assigned to treatment sequence in a 4 × 4 Latin square design balanced for carryover effects. The treatments were a control diet (36% NDF, 21% starch), the control diet with amylase (0.5 g/kg DM; Rumistar, DSM), a diet with sucrose replacing corn grain at 2% of DM, and the sucrose diet with amylase (0.5 g/kg DM). All data were analyzed with mixed models including the fixed effect of treatment and the random effects of period and pen. Milk data included the random effects of cow nested within pen and pen × period to provide the error term for the pen-level analysis. DMI was not affected by treatments. Milk yield and milk composition were not altered by the inclusion of sucrose or amylase; however, a tendency for an amylase by sucrose interaction was observed for milk protein content ($P = 0.06$), reflecting slightly lower milk protein concentrations for amylase and sucrose treatments (3.00 and 2.99 ± 0.03%) compared with control and amylase + sucrose treatments (3.02 and 3.03 ± 0.03%). Solids-corrected and fat-corrected milk yield variables were not significantly altered by treatment, although the direct effect of amylase approached significance for both variables (both $P = 0.13$), suggesting possible small increases with amylase supplementation (~0.5 kg/d). Feed efficiency (ECM/DMI) numerically increased with either amylase (1.57 ± 0.12) or sucrose (1.60 ± 0.12) treatment, but the combination of the 2 (interaction $P = 0.19$) resulted in feed efficiency similar to the control treatment (both 1.50 ± 0.12). The inclusion of amylase or sucrose did not significantly affect DMI, productivity, or feed efficiency in mid-lactation cows fed low-starch, high-fiber diets.

Key Words: sugar, enzyme, lactation

M314 The effect of essential oil/botanical product on performance and health of calves. B. L. Miller, T. J. Earleywine,* and T. E. Johnson, *Land O' Lakes Inc., Webster City, IA.*

One hundred seven (107) 3- to 10-d-old Holstein bull calves with an average initial weight of 47.3 kg (SD = 3.44 kg) were shipped from Wisconsin to the Land O' Lakes Research Facility. Calves were randomly assigned according to BW and blood gamma globulin to either a control or experimental milk replacer (MR) diet offered in a 15% solids solution. Both diets utilized a 22% all milk protein/20% fat non-medicated MR powder. The experimental diet was the same as the control with an essential oil/botanical product (Digestarom, Micro-Plus Konzentrate; Stadtoldendorf, Germany) included at 0.05% active ingredient. Calves were fed to provide 681 g DM feeding rate daily in 2 feedings at 0700 and 1615 h. Calves were offered 340.5 g in one feeding at 0700 h during the last week. Calf starter (18% crude protein, as fed basis) was fed ad libitum throughout this 42 d trial. Data were analyzed by Mixed procedures of SAS. Calves offered no essential oil/botanical product were inferior ($P = 0.10$) in total weight gain, MR intake ($P = 0.07$), feed efficiency ($P < 0.05$), scour scores ($P < 0.01$) and scour days ($P < 0.01$) when compared with calves receiving essential oil/botanical product. Essential oil/botanical product improved calf performance and health.

Table 1. Performance of calves offered MR without (Diet 1) or with (Diet 2) essential oils/botanical product

Item	Diet 1	Diet 2	*P*-value	SE
BW gain, kg	20.6	22.8	0.10	0.914
MR (DM), kg	24.1	25.0	0.07	0.342
Starter (DM), kg	20.2	20.9	0.66	1.070
Feed/Gain	2.28	2.10	0.04	0.060
Scour score,[1] 2 wk avg	1.35	1.22	0.01	0.030
Scour days, 2 wk	4.53	3.03	0.01	0.388

[1]Scour score = 1 to 4 scale; 1 = normal to 4 = watery with dehydration.

Key Words: calves, milk replacer, essential oils/botanical

M315 Effects of two sources of rumen-protected fat associated or not with conjugated linoleic acid (CLA) on milk fatty acid profile in dairy ewes. E. Ticiani[1], J. De Souza[2], F. Batistel[2], M. Baldin[3], R. Dresch[3], M. A. S. Gama[4], F. C. F. Lopes[4], and D. E. Oliveira*[1,3], *[1]Universidade do Estado de Santa Catarina, CEO, Chapecó, Santa Catarina, Brazil, [2]Universidade de São Paulo, ESALQ, Piracicaba, São Paulo, Brazil, [3]Universidade do Esatado de Santa Catarina, CAV, Lages, Santa Catarina, Brazil, [4]Embrapa Gado de Leite, Juiz de Fora, Minas Gerais, Brazil.*

The aim of this study was to evaluate the associative effects of 2 sources of calcium salts of fatty acids (Agelac 84 or Megalac E) and an unprotected CLA (UnCLA) supplement (Luta-CLA60) on milk fatty acid profile in dairy ewes. Thirty-nine Lacaune and 36 East Friesian ewes in mid lactation (70 ± 7 DIM) received for 53 d one of the following dietary treatments in a 2 × 2 factorial design:1) 27g of Agelac 84; 2) 30g of Megalac E; 3) 27g of Agelac 84 + 20g of UnCLA; and 4) 30g of Megalac E + 20g of UnCLA. The UnCLA supplement contained 29.9% of trans-10, cis-12 and 29.8% of cis-9, trans-11. Ewes grazed Panicum maximum Jacq. cv. Aruana grass and were fed an isoproteic concentrate (1 kg DM/d) in which the fat supplements were added. Milk samples were collected on the 14th day of the experimental period and analyzed for fatty acid profile by gas chromatography. Data were analyzed using the PROC MIXED of SAS. There was no interaction between treatments and breed. The concentration of fatty acids < 16C in milk fat was reduced by CLA and Megalac E (Table 1). Milk fat trans-10, cis-12 CLA was increased by 861% in ewes fed CLA (0.026 vs 0.224 g/100g of FA, $P < 0.001$) with no fat and fat x CLA effects. Milk fat cis-9, trans-11 was increased 18% (0.99 vs 0.84 g/100g of FA) and 0.7% (0.84 vs 0.83 g/100g of FA) by CLA and Megalac E ($P < 0.01$), respectively and there was an interaction between CLA x fat (Megalac E +UnCLA = 1.09 vs Agelac 84 +UnCLA = 0.89 g/100g of FA, $P < 0.02$). All desaturase indexes were reduced by CLA, and Megalac E reduced C16:1/C16:0 and CLA/trans-11 C18:1 ratios. The milk fatty acid profile of ewes was altered by dietary supplementation with UnCLA and different sources of rumen-protected fat.

Table 1. Milk fatty acid profile of dairy ewes fed two sources of rumen-protected fat (Agelac 84 or Megalac E) associated or not with UnCLA

	Treatment				*P*-value		
Item	Agelac 84	Megalac E	Agelac 84 + UnCLA	Megalac E + UnCLA	UnCLA	Fat	CLAxFat
Ratio							
<C16	30.9	30.0	25.7	24.4	0.01	0.03	0.91
C16+C16:1	26.2	25.2	25.8	23.4	0.02	0.01	0.05
>C16	43.1	45.5	48.7	51.6	0.01	0.01	0.82
Desaturase Index							
14:1/14:0+14:1	0.013	0.011	0.009	0.008	0.01	0.05	0.75
16:1/16:0+16:1	0.036	0.029	0.027	0.022	0.01	0.02	0.56
18:1/18:0+18:1	0.604	0.585	0.542	0.534	0.01	0.11	0.44
CLA/t1118:1+CLA	0.322	0.301	0.276	0.265	0.01	0.01	0.41

Key Words: dairy ewes, fatty acid profile, desaturase index

M316 Feeding protected lysine to lactating dairy cows improved milk protein yield. J. A. Davidson*[1], S. E. Boucher[2], and B. L. Miller[1], *[1]LongView Animal Nutrition Center, Land O'Lakes Purina Feed, Gray Summit, MO, [2]Kemin AgriFoods North America, Des Moines, IA.*

The objective was to determine if increasing metabolizable Lys with either blood meal (BM) or a rumen protected lysine source, USALysine (Kemin Industries, Des Moines, IA), improved milk yield and milk protein yield of dairy cows. Twenty-four cows averaging 90 DIM (blocked by parity, milk yield, and DIM) were assigned to one of 3 treatments varying in metabolizable Lys supply (g/d): Control (Ctrl, 180 g/d), BM (200 g/d), or USALysine (204 g/d). All diets were formulated with Dynamic Nutrition System model of Land O' Lakes Purina Feed with a minimum of 0.14 kg/h/d of BM and 22 g/h/d of Smartamine M (Adisseo, Antony, France) to provide 60 g/d of metabolizable Met. To increase Lys, the BM treatment included an additional 0.27 kg/h/d of BM. Smartamine M was added to diets to maintain a 3:1 ratio of Lys:Met. Cows were individually fed with Calan door system for 28 d. Data from d 5 to 28 were analyzed with repeated measures procedure of SAS. No differences were detected for main effect of day or interactions with day, thus data were pooled across day. Dry matter intake was 22.1 for cows fed additional BM and 23.1 and 23.8 kg/d for Ctrl and USALysine, SE 0.58, $P = 0.13$). Adjusting for actual DMI, cows consumed 165, 177, and 184 g/d of metabolizable Lys and 56, 52 and 54 g/d of metabolizable Met for Ctrl, BM and USALysine, respectively. Cows fed USALysine had greater milk protein concentration (2.92%) and yield (1.30 kg/d) than Ctrl (2.77% and 1.22 kg/d) and BM (2.75% and 1.19 kg/d) fed cows (SE 0.04 and 0.03, respectively, $P < 0.05$). Energy-corrected milk yield tended to be greater for USALysine cows (42.1 kg/d, SE 0.88, $P = 0.07$) compared with the other groups (40.6 and 39.3 kg/d for Ctrl and BM). However, daily milk yield was not statistically different (41.9, 42.0, and 44.1 kg/d for Ctrl, BM, and USALysine, respectively, SE 1.51). Increasing metabolizable Lys with BM numerically decreased DMI, thus no improvements in milk or milk protein yield were observed. Utilizing USALysine to deliver additional metabolizable Lys increased milk protein concentration and yield. USALysine is a protected source of Lys that can be used to improve lactation performance when Lys supply is limiting.

Key Words: dairy cows, milk protein, protected lysine

M317 The effect of treating corn stover silage with cellulase and *Lactobacillus* on nutritive value of silage in dairy cows. H. Ma, J. Q. Wang,* D. P. Bu, P. Sun, and L. Y. Zhou, *State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences,, Beijing, China.*

Corn stover silage is a major forage source for dairy cows during the winter season in the northern China due to its low cost and high content of carbohydrates. But its crude protein concentration and digestibility are low. The aim of this study was to determine if the nutritive content and digestibility in the total gastrointestinal tract of corn stover silage could be improved by addition of cellulase and *Lactobacillus* preparations at ensiling. Corn stover after harvest was ensiled with untreated or treated with commercial cellulase (1.0 g/kg of fresh forage) and *Lactobacillus* (1 × 100,000 cfu/g of fresh forage) in laboratory silos. Three ruminally cannulated Holstein dairy cows were used in a 3 × 3 Latin square design of three 21-d periods. The data were analyzed using the GLM procedure of SAS 9.1. Duncan's multiple range tests were used to detect statistical significance between treatment groups. Treatment with cellulase and *Lactobacillus* increased CP concentrations of corn stover silages ($P < 0.05$), and decreased neutral detergent fiber (NDF) and acid detergent fiber (ADF) concentrations of silages ($P < 0.05$) compared with the untreated group. In addition, silages treated with cellulase had lower concentrations of NDF and ADF compared with silages treated with *Lactobacillus* ($P < 0.05$). In situ ruminal DM, CP, NDF and ADF degradability of silages were improved by treated with cellulase and *Lactobacillus* ($P < 0.05$). Similarly, digestibility of DM, CP, NDF and ADF in the total tract were also improved by treated with cellulase and *Lactobacillus* ($P < 0.05$). Moreover, ruminal degradability and digestibility in the total tract of DM and NDF were higher in silages treated with cellulase than in untreated and treated with *Lactobacillus* group ($P < 0.05$). The results indicate that when applied at ensiling, cellulase and *Lactobacillus* can improve the degradability and digestibility of corn stover silages in dairy cows. In the experimental conditions of the current trial, nutritive value of corn stover silage treated with cellulase was superior to treatment with *Lactobacillus*.

Key Words: corn stover silage, dairy cow, nutritive value

M318 Degradation of L-arginine and N-carbomyl glutamate and their effect on rumen fermentation in vitro. B. Chacher,* D. M. Wang, H. Y. Liu, and J. X. Liu, *Institute of Dairy Science, MoE Key laboratory of Molecular Animal Nutrition, College of Animal Sciences, Zhejiang University, Hangzhou, China.*

Arginine is a versatile amino acid and plays an important role in urea cycle and protein synthesis, but the high cost limits its use in dairy production. *N*-carbomyl glutamate (NCG) is a metabolically stable analog of *N*-acetyl glutamate, which is an essential allosteric activator of carbamoyl phosphate synthase-I, and may be substituted for endogenous synthesis of arginine. The objective of this experiment was to determine the degradation rates of L-arginine (L-arg) and NCG and to examine their effects on rumen fermentation. The in vitro gas test based on syringes was employed and rumen liquor were collected from 3 rumen-fistulated dairy cows that were fed 55% roughage and 45% concentrate mixture, plus premix (minerals and vitamin). Syringes were filled with 30 mL of medium (10 mL rumen liquor and 20 mL buffer solution) and then aerobically incubated in 3 replicates with 1 mmol/L of L-arg, NCG or control (without L-arg and NCG) at 39°C. At incubation for 0, 2, 4, 6, 12 and 24 h, gas production and pH value were recorded and rumen fluid samples were collected in separate tubes to determine the contents of L-arg and NCG. At 24 h, concentrations of ammonia N, volatile fatty acids and microbial protein were measured. Degradation rates of L-Arg were 0, 32.0, 47.1, 52.8, 99.3 and 100%, while NCG degradation in rumen fluid was 0, 7.8, 12.8, 13.3, 14.2 and 17.8% during 0, 2, 4, 6, 12 and 24 h, respectively. Gas production and ratio of acetate to propionate were higher in groups treated with L-arg and NCG than that in the control ($P < 0.01$). Ammonia N concentration was higher ($P < 0.01$) in group added with L-arg than that in NCG and control group. Microbial protein concentration diminished in groups treated with L-arg and NCG, compared with the control ($P < 0.01$). In summary, the effects of L-arg and NCG on rumen fermentation were numerically relatively similar. Rapid degradation of L-arg in rumen indicates nutritionally wasteful process, and it should be protected from rumen degradation, while NCG can be fed to ruminants with no need for coating.

Key Words: L-arginine, N-carbomyl glutamate, rumen fermentation

M319 Folic acid and vitamin B12 supplement enhances energy metabolism of dairy cows in early lactation. M. Duplessis*[1,2], C. L. Girard[2], D. E. Santschi[3], D. M. Lefebvre[3], and D. Pellerin[1], *[1]Université Laval, Département des sciences animales, Québec, Qc, Canada, [2]Agriculture and Agri-Food Canada, Sherbrooke, Qc, Canada, [3]Valacta, Ste-Anne-de-Bellevue, Qc, Canada.*

The purpose of this study was to measure the effects of folic acid and vitamin B12 supplement on milk production and components, and indicators of energy balance of dairy cows from 3 wk before expected calving date until 8 wk after parturition. Commercial dairy herds (n = 15) were involved in this project. From February to December 2010, every 2 mo and within each herd, cows (n = 805) were randomly assigned, according to parity, predicted 305d milk production, and calving interval to receive weekly intramuscular injections (5 mL) of 1) saline 0.9% NaCl (C) or 2) 10 mg of vitamin B12 + 320 mg of folic acid (V). Milk production and components were obtained from the DHI agency (Valacta, Ste-Anne-de-Bellevue, Qc, Canada). Only milk production and components data for the first 60 DIM are presented. Cows with less than 2 tests were not included in the analysis. Body weight (BW) was measured by chest girth 3 wk before calving, and 1 and 8 wk after parturition. Body condition score (BCS) was evaluated on a 1 to 5 scale by the same individual every 2 wk until 100 DIM. Data were analyzed using the MIXED and GLIMMIX procedures of SAS. The 305d milk production before the study was similar between treatments (9663 ± 114 kg; $P = 0.97$). Average milk production for C and V was 36.9 ± 0.4 kg/d ($P = 0.99$). Milk fat concentration was 4.19 and 4.03 ± 0.04% for C and V, respectively ($P = 0.007$). Milk protein concentration was 3.09 and 3.15 ± 0.02% for C and V, respectively ($P = 0.02$). The vitamin supplement increased by 8.3% the number of cows with a protein:fat ratio greater than 0.75 ($P = 0.009$). From 1 to 8 wk after parturition, V cows lost 7.4 ± 2.6 kg BW less than C cows ($P = 0.007$). There was no treatment effect ($P = 0.45$) on BCS before calving (3.45 ± 0.04) but after parturition, the vitamin supplement tended to reduce BCS loss (treatment x time, $P < 0.07$). The observed reduction in BW and BCS losses and milk fat secretion without effect on milk production suggest that supplementary folic acid and vitamin B12 lessened the negative energy balance in early lactation. This effect was possibly due to an improved efficiency of energy metabolism.

Key Words: folic acid, vitamin B12, dairy cow

M320 The potential benefits of supplementing corn-based dairy diets with Zado or yeast for milk yield and production efficiency in dairy cows. H. Gado*[1], B. E. Borhami[2], and A. Z. M. Salem[3,2], *[1]Ain Shams University, Cairo, Egypt, [2]Alexandria University, Alexandria, Egypt, [3]Universidad Autónoma del Estado de México, Estado de México, México.*

The objective of this study was to verify the potential benefits of supplementing corn-based dairy diets (T0, control diet without any supplementation) with Zado (T1, contains 2.32 U/g Xylanase, 61.5 U/g α-Amylase, 7.05 U/g cellulase and 29.2 U/g protease) or yeast (T2) for milk yield and production efficiency in dairy cows. Sixty lactating Holstein dairy cows were randomly assigned to the 3 treatments and housed in pens (20 cows for each). All cows were fed the control diet for 4 weeks, followed by 8-weeks period on their assigned diets. The control diet consisted of 25% corn silage, 25% alfalfa silage, 6% alfalfa hay, and 44% of a ground corn-based concentrate (DM basis). Zado was added to concentrates to provide 40 g/head/day for (T1). Active dry yeast was added to the concentrate to provide 0.5 g Levucell/d per animal (T2). There was no difference in final BW (600 ± 22 vs. 610 ± 25 and 608 ± 20 kg; $P = 0.85$) for T0 vs T1 and T2, respectively. Meanwhile, there were differences for net energy (NE) output (34.1 ± 0.05 vs. 37.5 ± 0.07 and 35.3 ± 0.08 Mcal/d; $P < 0.05$), or efficiency of NE output (1.61 ± 0.03 vs. 1.42 ± 0.07 and 1.63 ± 0.04 Mcal/kg DMI; $P = 0.04$) for cows on T0 vs T1 and T2, respectively. There were differences in dry matter intake (21.3 ± 0.12 vs. 24.7 ± 0.14 and 21.0 + 0.18 kg/d; $P < 0.07$), 3.5% FCM (31.2 ± 0.41 vs. 36.6 ± 0.46 and 31.4 ± 0.38 kg/d; $P < 0.08$), and efficiency of fat corrected milk (FCM) production (1.63 ± 0.12 vs. 1.44 ± 0.24 and 1.68 ± 0.18 kg FCM/kg DMI; $P < 0.06$) for cows fed on T0 vs T1 and T2. In conclusion, cows fed on diet supplemented with Zado increased milk production in comparison to control or YEAST supplemented diets.

Key Words: milk production, yeast, Zado

M321 The effect of carnitine on growth and performance of calves fed milk replacer. B. L. Miller,* T. J. Earleywine, and T. E. Johnson, *Land O' Lakes Inc., Webster City, IA.*

Fifty-eight (58) 3–10 d old Holstein bull calves with an average initial weight of 45.7 kg (SD = 2.14 kg) were shipped from Wisconsin to the Land O' Lakes Research Facility. Calves were randomly assigned according to BW and blood gamma globulin to either a control or experimental milk replacer (MR) diet offered in a 17.6% solids solution. Both diets utilized a 28% all milk protein/20% fat non-medicated MR powder. The experimental diet was the same as the control with added carnitine, (International Animal Technologies, Marion, TX). Calves were fed to provide 1135 g DM feeding rate daily in 2 feedings at 0700 and 1615 h. Calves were offered 567.5 g in one feeding at 0700 h during the last week. Calf starter (22% crude protein, as fed basis) was fed ad libitum throughout this 49 d trial. Data were analyzed by Mixed procedures of SAS. Calves offered no Carnitine were inferior ($P < 0.05$) in total weight gain, starter feed intake ($P < 0.05$) and feed efficiency ($P = 0.11$) when compared with calves receiving carnitine. Carnitine improved calf growth and performance.

Table 1. Performance of calves offered MR without (Diet 1) or with (Diet 2) carnitine

Item	Diet 1	Diet 2	*P*-value	SE
BW gain, kg	30.9	34.9	0.02	1.11
MR (DM), kg	44.7	45.4	0.43	0.61
Starter (DM), kg	10.6	13.8	0.02	0.94
Feed/Gain	1.81	1.73	0.11	0.04

Key Words: calves, carnitine, milk replacer

M322 Effects of a solid oil supplement (Oralac) on milk fatty acid composition of grazing dairy cows. G. A. Gagliostro*[1], L. E. Antonacci[1], J. Ballistreri[2], E. Bonina[2], M. R. Williner[3], and C. A. Bernal[3], *[1]Instituto Nacional de Tecnología Agropecuaria, INTA, Balcarce, Buenos Aires, Argentina, [2]Tecnuar SRL, Rosario, Santa Fé, Argentina, [3]Universidad Nacional del Litoral, Santa Fé, Santa Fé, Argentina.*

Oralac (OR) is a lipid supplement (90% DM, 68.6% fat) for ruminants containing vegetable and marine oils. The fatty acid (FA) composition of OR is palmitic (11.25%), stearic (4.65%), oleic (31.7%), linoleic (44.7%), linolenic (2.45%), EPA (0.6%) and DHA (1%). The effect of OR on milk FA composition was tested on 20 multiparous Holstein cows in mid lactation. Cows consumed pasture (70% of total DM intake) and were offered concentrates (7.2 kg DM/cow) with increased OR content: OR-0, OR-8.75, OR-11.25 and OR-15%. Intake of OR was 0.666; 0.798 and 0.826 owing to concentrate refuse in OR-11.25 (6.9%) and OR-15 (27%). Intake of C18:2 was 0.13, 0.15 and 0.16 kg/cow/day in OR-8.75, OR-11.25 and OR-15. Fat intake was 1.75% of total DMI in OR-8.75 and 2.40% in the other 2 treatments. Milk yield was lower in OR-0 (27.4 kg/cow/d) than the average yield of 30.6 kg in OR supplemented cows ($P < 0.55$). Milk fat content (g/kg) was 33.5 in OR-0 and 30.2 in OR treatments ($P < 0.44$). Milk protein averaged 35.2 g/kg in all treatments. Milk concentration (g/100g) of C12:0 decreased (−32%) after OR feeding from 3.35 in OR-0 to 2.23 and 2.34 in OR-11.25 and OR-15 ($P < 0.03$) respectively. Basal (OR-0) concentration (g/100g) of C14:0 (9.82) decreased (−13%) in OR-11.25 and OR-15 (8.51) ($P < 0.21$). Basal C16:0 concentration (23.45 g/100g) decreased (−14%, $P < 0.02$) in OR-8.75 and OR-11.25. The atherogenicity index of milk in OR-11.25 and OR-15 (1.47) tended ($P < 0.09$) to be lower (−23%) than in OR-0 (1,92). Basal concentration (g/100g) of vaccenic acid (2.75) increased ($P < 0.0002$) after OR feeding (6.75). Concentration (g/100g) of rumenic acid was 1.23 in OR-0 increasing up to 2.75 in OR treatments (+124% over basal). The highest values were observed in OR-8.75 (3.01) and in OR-11.25 (2.96). Concentration of trans-10C18:1 in OR-0 (0.77 g/100g) remained low after OR feeding (1.88 g/100g) ($P < 0.58$). Basal concentration of trans-9 C18:1 averaged 0.23 g/100 g and was not affected by OR feeding ($P < 0.17$). The n-6/n-3 ratio was 3.5 in OR-0 ranging from 3.12 to 2.78 in OR treatments ($P < 0.58$). Basal OR-0 saturated/unsaturated FA ratio (1.62) was reduced ($P < 0.04$) in OR-8.75 (1.14) and OR-11.25 (1.28). Results suggested a positive effect of OR at very low doses of total oil intake on milk yield, FA composition and functional-healthy value of milk.

Key Words: grazing dairy cows, functional milk, conjugated linoleic acid

M323 Combination of bacterial and yeast probiotics: A step forward to unravel their mode of action. J. Chiquette*[1], J. Lagrost[2], C. L. Girard[1], S. Li[3], J. C. Plaizier[3], and G. Talbot[1], *[1]Dairy and Swine Research and Development Centre, Sherbrooke, Quebec, Canada, [2]Institut Supérieur d'Agriculture Rhône-Alpes, Lyon, Rhône-Alpes, France, [3]University of Manitoba, Winnipeg, Manitoba, Canada.*

Four ruminally fistulated Holstein dairy cows averaging 616 ± 38 kg body weight and 81 ± 5 d in milk were assigned to the following experimental treatments in a 4 × 4 Latin square design: 1) *Enterococcus faecium* (2.5×10^9 cfu/g; EF); 2) EF + *Saccharomyces cerevisiae* (1×10^9 cfu/g; EFSC; Probio Precise, Chr. Hansen, Milwaukee, WI); 3) EF + *Lactococcus lactis* O 224 (2.8×10^9 cfu/g; EFO); 4) No probiotics (C). Probiotics were given at the rate of 80 mg/ kg DM intake, twice a day before each meal. They were introduced directly into the rumen through the fistula. Each experimental period consisted of 18 d of adaptation, 3 d of subacute rumen lactic acidosis (SARA) challenge and 7 d of rest during which they received the same TMR than during adaptation but without probiotic. Our previous research has shown that EFSC could stabilize rumen pH when dairy cows were submitted to a SARA challenge. The objectives of this study were to: 1) compare EFSC with the bacteria EF alone or with EF and *L. lactis* O 224 as a replacement for the yeast, on rumen pH regulation during SARA; 2) examine the effect of yeast probiotic on redox potential and 3) as vitamin B12 is produced only by bacteria, detect if ruminal concentration of this vitamin could be affected during SARA. Each treatment was compared with EFSC. Milk yield drop during SARA was lower with EFSC (- 0.8 kg/d), compared with C (-7.5 kg /d; $P = 0.03$) and similar to that of EF or EFO (-0.9 kg/d). During SARA, mean pH was greater with EFSC (5.55) than with C (5.43; $P = 0.03$) and tended to be lower than with EFO (5.66; $P = 0.07$). Time with pH <6.0 tended to be lower with EFSC (13.3 h) than with EF (15.4 h; $P = 0.08$) and greater than with EFO (11.1 h; $P = 0.07$). During adaptation, time with pH <5.5 was lower with EFSC (0.2 h) than with EF (5 h; $P = 0.02$) or EFO and C (3 h) ($P = 0.08$ and 0.09, respectively). Redox potential was greater during SARA (−150 mV) than adaptation (−180 mV; $P < 0.001$) or rest (−176 mV; $P = 0.04$). During SARA, EFSC maintained the rumen concentration of vitamin B-12 in the rumen whereas it decreased with other treatments. In conclusion, both EFSC and EFO provided pH regulation during SARA but only EFSC prevented the drop of vitamin B12. Probiotics decreased milk drop during SARA.

Key Words: *Enterococcus faecium* and *Saccharomyces cerevisiae*, *Lactococcus lactis* O224, subacute ruminal acidosis

M324 Effect of live yeast supplementation on milk yield, milk components, and rumen pH in dairy cows. M. B. de Ondarza[1], A. Hall[2], J. Sullivan[2], and E. Chevaux*[2], *[1]Paradox Nutrition LLC, West Chazy, NY, [2]Lallemand Animal Nutrition, Milwaukee, WI.*

The trial objective was to determine the effect of supplemental live yeast (LY; 0.5 $g \cdot cow^{-1} \cdot d^{-1}$; *Saccharomyces cerevisiae* CNCM I-1077) vs. sodium bicarbonate (BC; 170 $g \cdot cow^{-1} \cdot d^{-1}$) on milk yield, milk components, and rumen pH in high-producing, multiparous cows. Half of the cows (n = 57) received LY and half (n = 54) received BC. The study was 11 wk in length with 6 wk of diet adaptation and 5 wk of data collection. Treatment groups were housed in separate pens with ad libitum access to TMR. Cow groups were balanced pre-trial for parity, DIM, and pre-trial 14-d average milk yield. Daily milk yield of individual cows was recorded. Milk was sampled on wk 8, 9, and 10 and analyzed for components. The statistical model included treatment, DIM category, and lactation category as fixed effects with cow as the random effect. Pre-trial production data were included as covariates. There was a trend ($P = 0.09$) for higher milk yield with LY treatment (41.9 and 39.8 kg/d for LY and BC, respectively (SE = 0.86)). Percent milk fat, milk fat yield, 3.5% FCM, and energy-corrected milk were not affected ($P > 0.10$) by treatment. Percent milk true protein and milk urea nitrogen (mg/dl) were not affected ($P > 0.10$) by treatment but milk true protein yield tended ($P = 0.09$) to be higher for cows fed LY (1.24 vs. 1.18 kg/d for LY vs. BC, respectively (SE = 0.02)). Somatic cell count (SCC x 1000) was lower ($P < 0.05$) for cows supplemented with LY (80.09) (SE = 49) than for cows supplemented with BC (245.48) (SE = 49). Four cows per treatment were used to measure rumen pH every 5 min using rumen bolus probes. Live yeast significantly increased ($P < 0.0001$) mean daily pH (6.22 vs. 6.03 for LY vs. BC, respectively; SE = 0.01), minimum daily pH (5.54 vs. 5.34 for LY vs. BC, respectively; SE = 0.01), and maximum daily pH (6.98 vs. 6.81 for LY vs. BC, respectively; SE = 0.02). The area under the pH 5.8 curve (pH x min/d) was less ($P < 0.0001$) for cows fed LY (19.5 vs. 80.1 for LY vs. BC, respectively; SE = 4.3). Live yeast reduced the risk of rumen acidosis and tended to increase milk yield.

Key Words: live yeast, rumen pH, sodium bicarbonate

***M325 Enterococcus faecium* as a probiotic for lactating ruminants.** I. K. Hindrichsen,* M. Raun, N. L. Milora, B. Struer-Lauridsen, M. M. Jensen, and E. Upton Augustsson, *Chr. Hansen A/S, Hørsholm, Denmark.*

High-yielding dairy cows often suffer from sub-acute diseases triggered by typical dairy cow diets. These results in ill-thrift and production losses. Sub-acute hindgut acidosis was recently shown to significantly affect the health of dairy cattle. Supplementing high-yielding dairy cows with the probiotic *Enterococcus faecium* has in several studies resulted in improved production and/ or well being parameters. In the current study, the aim was to unravel some of the possible mode of action of *E. faecium* has on dairy cows, using genome sequencing and in vitro assays. First, the survival of 3 *E. faecium* strains under digestion challenges were tested, including high volatile fatty acid, pH and challenge with bile. Optical density (OD) test showed that all 3 *E. faecium* strains survived in a pH range between 2 and 7. At pH 2 the lag time increased, however after 24 h the max OD was the same as for pH 7. *E. faecium* could be shown to withstand up to 9.5% bile concentration with a reduced growth. It was further illustrated that all tested *E. faecium* showed active bile salt hydrolase activity, indicating that *E. faecium* can utilize bile as a substrate in the lower tract. The genome sequencing revealed that all tested *E. faecium* had genes associated with adhesion ability, while only one strain showed genes for producing the 2 bacteriocins enterocin A and enterocin B. The bacteriocin producing strain was superior in inhibiting *S. bovis*, as well as other pathogens such as *C. perfringens*, *S. aureus* and *L. monocytogenes* compared with the none-bacteriocin producing E. faecium. It has been shown that these 2 bacteriocins have synergistic effect in reducing pathogens. It is hypothesized that the positive effect of *E. faecium* on production parameters of dairy cows may be due to the reduction of *S. bovis* in the rumen, the possibility of surviving digestive challenges and passing down to the lower tract where it actively inhibits certain pathogens. These features can significantly affect the occurrence of subacute hindgut acidosis.

Key Words: dairy cows, *Enterococcus faecium*, pathogen

M326 Effect of oral calcium bolus supplementation on early lactation health and milk yield in commercial dairy herds. G. R. Oetzel*[1] and B. E. Miller[2], [1]*University of Wisconsin-Madison, Madison,* [2]*Boehringer Ingelheim Vetmedica Inc., St. Joseph, MO.*

The objective of this study was to evaluate the effect of supplementation with oral calcium (Ca) boluses after calving on early lactation health and milk yield. Second lactation or greater cows (n = 927) from 2 large dairies in Wisconsin were enrolled during the summer of 2010. Both herds fed supplemental anions during the pre-fresh period and treated less than 1% of fresh cows for clinical signs of hypocalcemia. Prior to calving, cows were scored for lameness and body condition, then randomly assigned to either control or oral Ca bolus supplemented groups. Control cows received no oral Ca boluses around calving. Cows in the oral Ca bolus group received 2 oral Ca boluses (Bovikalc, Boehringer Ingelheim, St. Joseph, MO) - one bolus 0 to 2 h after calving and the second 8 to 35 h after calving. The oral Ca bolus administration schedule was designed to be feasible for large commercial dairies and did not require that cows be locked up more than once daily. Early lactation health events were recorded and summed for each cow. There were only 6 cases (0.6% of calvings) of clinical milk fever during the trial, and only 14% of cows tested were hypocalcemic (ionized Ca less than 1.0 mmol/L) at 8 to 35 h after calving. Subgroups of cows with significant responses to oral Ca bolus supplementation were identified based on significant interactions between oral Ca bolus supplementation and covariates in mixed multiple regression models. Lame cows supplemented with oral Ca boluses had 0.34 fewer health events in the first 30 d in milk compared with control cows. Cows with a higher previous lactation milk yield (greater than 105% of herd rank) produced 2.9 kg more milk when supplemented with oral Ca boluses. Results of this study indicate that lame and higher producing cows respond favorably to supplementation with oral Ca boluses using a protocol that is practical to implement in large commercial dairies, and that oral Ca bolus supplementation to targeted groups of cows is beneficial even for dairies with a very low incidence of hypocalcemia.

Key Words: oral calcium boluses, milk fever, hypocalcemia

M327 Effect of dietary buffers and magnesium oxide on intake, milk yield and composition, and blood metabolites of lactating dairy cows. J. K. Bernard,* J. W. West, and N. A. Mullis, *University of Georgia, Tifton.*

Forty-eight lactating Holstein cows were used to determine the effect of feeding different buffers on nutrient intake, milk yield and composition, and select metabolic indices of health of early lactation Holstein cows. Treatments included a negative control (NEG), positive control supplemented with sodium bicarbonate (POS), acid buffer (AC, CalMin, Celtic Sea Minerals, Cork, Ireland) or acid buffer plus MgO from seawater (ACM, CalMin16, Celtic Sea Minerals). A basal diet provided similar concentrations of energy and protein and treatments added at feeding provided varying concentrations of Ca, Cl, Na, and DCAD. Beginning at approximately 21 ± 4 DIM cows were fed the NEG diet for 14 d and cows were assigned randomly to one of 4 treatments for the following 10 wk. Contrast statements compared 1) NEG with all other diets, 2) POS with AC and ACM, and 3) AC with ACM. The DMI tended to be higher ($P = 0.07$) for POS compared with AC and ACM. No differences ($P > 0.10$) were observed for milk yield, concentration or yield of milk fat, protein, lactose, or SNF. Concentrations of MUN were lower ($P = 0.01$) for NEG compared with the other treatments and ACM compared with AC ($P = 0.005$). Serum concentrations of total protein ($P = 0.04$), globulin ($P = 0.03$), glucose ($P = 0.0004$), and creatinine kinase ($P = 0.06$) were highest for NEG compared with other treatments. No ($P > 0.10$) differences were observed in serum concentrations of Ca, P, Mg, K, Na, Cl, or bicarbonate. No deleterious effects were observed for cows fed NEG, but cows were not exposed to heat stress during the trial. The POS diet had lower concentrations of dietary Cl (0.52% of DM) compared with the other treatments (0.63% of DM) which could explain the trend for higher DMI. Overall the acid buffers supported similar performance as sodium bicarbonate.

Table 1. Intake, milk yield, composition, and select blood metabolites

Item	NEG	POS	AC	ACM	SE
DMI, kg/d	22.9	24.0	23.0	21.8	0.6
Milk, kg/d	43.8	45.7	44.6	43.3	1.4
Fat, %	3.55	3.56	3.83	3.69	0.13
Protein, %	2.68	2.58	2.57	2.59	0.04
Lactose, %	4.66	4.66	4.68	4.69	0.02
SNF, %	8.24	8.18	8.21	8.21	0.05
MUN, mg/dL	10.3	11.1	12.0	10.6	0.3
Serum metabolites					
Total protein, g/dL	7.50	7.25	7.28	7.15	0.11
Globulin, g/dL	3.70	3.41	3.45	3.32	0.01
Glucose, mg/dL	61.69	56.37	55.60	53.05	1.39
Creatinine kinase, U/L	278.60	133.58	147.14	152.93	60.25

Key Words: buffers, milk yield, milk composition