0.05) compared to control BSP pieces. There were no differences ($P > 0.05$) in odor between treatments and the control BSP pieces for all storage days. Lactic acid treated BSP pieces were more likely to be lighter, greener, and more yellow throughout the storage period when compared to control BSP pieces. Lower microbial counts and indistinguishable odor differences were achieved with 2.00% LA treated BSP pieces. Using 2.00% LA in beef trimmings may provide a microbiologically cleaner product to the consumer without major adverse effects on quality.

Key Words: Lactic Acid, Beef Trimming, Residue

203 Influence of aflatoxin B1 on milk production and health in dairy sheep. G. Battacone[1], M. Palomba[2], M. Pascale[3], A. Mazzette[1], and G. Pulina*[1], [1]*Dipartimento di Scienze Zootecniche, University of Sassari, Italy via Enrico de Nicola 9, 07100 Sassari, Italy,* [2]*Dipartimento Farmaco Chimico Tossicologico, University of Sassari, Italy via Muroni, 07100 Sassari, Italy,* [3]*CNR Istituto di Scienze delle Produzioni Alimentari, Bari, Italy via le Einaudi 51, 70125 Bari, Italy.*

The transfer of aflatoxin B1 in the diet of lactating sheep into the milk were investigated, and also its effects on milk yield and animal health. Twenty lactating Sarda sheep were divided into four groups of five. Three groups were used for the experiment and the fourth was a control group. The experimental design was a 33 Latin square with one additional group. The experimental groups were given 32, 64 or 128 μg per day of pure aflatoxin B1 (AFB1) in two daily doses, given immediately before milking at 7:00 a.m. and 7:00 p.m.. The treatment continued for 7 days, followed by a 5 day clearance period. The control group was fed an aflatoxin-free diet. Individual milk production was recorded and milk sampled at each milking. Blood samples were collected after 7 days. Aflatoxin M1 (AFM1) levels in milk were determined using an immunoaffinity column - HPLC method. AFM1 appeared in the milk of all treated groups 12 h after the beginning of administration. No AFM1 was found in the milk of the control group. AFM1 concentrations above the EC tolerance level (0.05 μg/kg) were detected even in the milk of the group that received only 32 μg/d of AFB1. The mean AFM1 concentration in milk reached a steady state after 2-3 days. At this point AFM1 concentration did not differ at morning and evening milking. The AFM1 concentration was linearly related to the dose. No AFM1 was detected 3-4 days after the end of treatment with AFB1. This suggests that the Latin square is an appropriate experimental design for mycotoxicological studies. The milk production traits of the AFB1 groups were no different from those of the control group. These doses of AFB1 had no effect on hematological and biochemical blood parameters. The results indicate that the level of AFB1 used did not adversely affect animal health and milk production traits, while considerable amounts of AFM1 were excreted in the milk. (Partly supported by MIUR-MiPAF SISPROLAT project)

Key Words: Aflatoxin, Sheep, Milk

ADSA-ASAS Northeast Graduate Student Competition

204 Fractional removal of amino acids by the small intestines and whole gastrointestinal tract of sheep remains constant across levels of protein supply. S. W. El-Kadi*, N. E. Sunny, M. Oba, S. L. Owens, and B. J. Bequette, *University of Maryland, College Park.*

We hypothesized that the net removal of amino acids (AA) by the mesenteric (MDV; small intestine) and portal (PDV; whole gut) drained viscera of sheep would remain fixed in amount, even with increasing supply of protein to the gastrointestinal tract (GIT). Wethers (n=4, 33 $\pm$ 2.0 kg) were fitted with catheters for duodenal infusion of casein and for measurements of PDV and MDV appearance of AA. Animals were fed a forage-based diet low in protein (9.5 % CP) to 1.4 $\times$ maintenance and given 5-d duodenal infusions of casein (0, 35, 70 and 105 g/d) in a 4 $\times$ 4 Latin square design. On day 5 of each period, a blood flow marker was infused and blood continuously withdrawn over 1-h intervals during a 4-h period. Plasma concentrations of AA were determined by isotope dilution with mass spectrometry. Net absorption of AA across the PDV and MDV were calculated as the product of veno-arterial difference and blood flow. Regression analyses were performed to establish equations describing net appearance of AA in relation to AA infusion rate as casein. Regression curves were found to best fit a first-order model (R^2 = 0.60-0.95; at least $P < 0.05$) for all AA except Val ($R^2 = 0.50$; $P = 0.06$). The large removals of the branched chain AA (43-51%; $P < 0.05$) by the GIT probably relates to their catabolism for energy production. For Lys, however, it is unclear why the GIT net metabolizes (33%; $P < 0.05$) this potentially limiting AA to a much greater extent than for His, Phe and Met, whose fractional removals by the GIT were lower (7-19%). Our data indicate that AA removal by the GIT is not fixed in amounts, but rather that the amount removed increased with greater protein supply. The fates and factors affecting AA metabolism by the GIT have yet to be elucidated. However, if AA are metabolized by the GIT to provide energy then perhaps there may be opportunity to reduce catabolism by providing energetically equivalent non-AA substrates.

Key Words: Amino Acid, Sheep, Gastrointestinal Tract

205 Regulation of urea recycling to the gastrointestinal tract and ammonia metabolism in ruminants. N. E. Sunny*, L. H. Hanus, S. W. El-Kadi, S. L. Owens, and B. J. Bequette, *University of Maryland, College Park.*

Urea recycling is the main N salvage mechanism allowing ruminants to maintain positive N balance on poor quality diets. Our aim was to determine the extent ruminants control urea recycling to the GIT, independent of rumen microbial metabolism. Thus, four wether lambs (28.1 kg BW) were fed to 1.5 x maintenance energy a pelleted diet containing (kg^{-1}, as-fed) 1.7 Mcal ME and only 68 g CP. Animals were assigned to four levels of urea-N infusion (0, 3.8, 7.5, 11.3 g/d) arranged in a 4 x 4 Latin square design. Urea was infused into a jugular vein for 10-d periods, and urea kinetics determined by continuous infusion of [$^{15}N^{15}N$]urea over the last 80 h. During [$^{15}N^{15}N$]urea infusion, total urine was collected by suction and feces by harness. Isotope enrichment of urinary urea ($^{15}N^{15}N$, $^{14}N^{15}N$ and $^{14}N^{14}N$) and fecal total ^{15}N was determined by mass spectrometry. Urea-N entry rate (UER) increased (5.1 to 21.8 g/d; $P < 0.0001$) with level of urea infusion, whereas the proportion of UER entering the GIT decreased progressively (80 to 61%; $P < 0.01$). The amount of urea-N partitioned to the GIT (recycling; 4.1 to 13.2 g/d; $P < 0.0001$) increased with each level, as did the amount excreted in urine (1.0 to 8.6 g/d; $P < 0.0001$). However, the proportion (44 to 69%; $P < 0.001$) and amount (1.8 to 9.2 g/d; $P < 0.0001$) of the GIT entry that returned to the liver for ureagenesis was greater with urea infusion. In consequence, the amount of urea-N used for anabolism (rumen microbial protein synthesis) reached a maximum (2.3 g/d) at the second level of urea infusion. Concurrently, fecal urea-N excretion reached a maximum (1.5 g/d) at the third level of infusion. The present study suggests that the ability of ruminants to partition urea-N to the GIT is less a limitation than the rumen environment. Thus, rather than up-regulating urea entry to the GIT, there appears to be more potential to improve N efficiency of ruminants by manipulating the rumen environment (eg. fermentable energy, pH) for optimal capture of recycled N.

Key Words: Urea Recycling, Ruminant, Metabolism

206 Urea supplementation increased rumen function in lactating dairy cows fed a corn silage based diet deficient in rumen-degradable feed protein (RDP). S. E. Ferguson*, R. S. Ordway, N. L. Whitehouse, P. J. Kononoff, and C. G. Schwab, *University of New Hampshire, Durham.*

Four lactating Holstein cows fitted with ruminal and duodenal cannulae were used in a 4 x 4 Latin square to determine the efficacy of adding urea to a corn silage based diet on ruminal fermentation and microbial protein synthesis. Dietary treatments were 0, 0.3, 0.6, and 0.9% urea in diet DM; urea was top dressed and manually incorporated into the diet. The basal diet contained (DM basis) 32% corn silage, 16% grass silage, 4% alfalfa hay, 19% corn, 6% barley, 4.5% soybean hulls, 3% citrus pulp, 3% beet pulp, 7% soybean meal, 1.3% ProvAAl^{TM}, 1.7% Megalac$^{®}$, and 2.7% vitamin/mineral mix. The basal diet was formulated to meet NRC (2001) requirements for energy and all nutrients except RDP. Cows were fed 3 times daily. Experimental periods were 14 d with a 9-d adaptation. Duodenal digesta (n=16), rumen samples (n=16), and milk samples were

collected over the last 5 d. The consumed diet contained 9.2% RDP in DM and had a predicted RDP balance of -170 g/d (NRC, 2001). Feeding increasing amounts of urea increased mean rumen ammonia N concentrations (9.0, 11.9, 12.8, and 17.4 mg/dl; linear, $P < 0.001$), passage of microbial N (quadratic, $P < 0.01$), and microbial N as a percent of nonammonia N (quadratic, $P < 0.05$). Total ruminal volatile fatty acid (VFA) concentrations (μmole/ml) and butyrate as a percent of total VFA increased with increasing urea level (linear, $P < 0.05$); there was a trend for a linear increase in acetate as a percent of total VFA ($P = 0.06$). There were no treatment effects on DM intake (20.8 kg/d), milk yield (32.2 kg/d), milk protein yield (903 g/d), or on ruminal true digestibility of organic matter (59.7%), neutral detergent fiber (41.3%), or acid detergent fiber (47.6%). Urea supplementation increased milk urea N concentrations (11.0, 11.0, 12.5, and 13.2 mg/dl; linear, $P < 0.05$). The results of this study indicate positive effects of adding urea to the described lactating dairy cow diet, and that microbial protein synthesis was maximized at an average rumen ammonia N concentration of 12.8 mg/dl.

Key Words: Lactating Cows, Urea, Microbial Protein

207 Mechanisms of transport of vitamins into colostrum: A potential role of megalin and low density lipoprotein receptor.

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Previous studies have shown that IgG1 is concentrated in ruminant colostrum through active and selective transport by the neonatal Fc receptor (FcRn). It has been speculated that vitamins such as vitamin A and β-carotene are also transported into colostrum through a receptor-mediated mechanism. We hypothesized that the endocytic receptors, megalin and low density lipoprotein receptor (LDL-R), are responsible for transport of vitamin A and β-carotene, respectively. To test this hypothesis, blood samples and mammary secretions were collected from 12 pregnant, multiparous cows and mammary biopsies were obtained on days -40, -20, -7 and +7 relative to calving. Expression of megalin and LDL-R mRNA in biopsy samples were measured by real-time PCR. Expression of α-lactalbumin mRNA was measured as a functional marker of lactogenesis. Concentrations of IgG1 and β-carotene were measured in blood and secretion samples. The mixed procedure of SAS was used for statistical analysis. Expression of megalin and LDL-R mRNA was low at 40 d, peaked during colostrum formation (-7 d; $P<0.05$) and then declined markedly ($P<0.01$) during lactation. Expression of α-lactalbumin increased sharply from day -7 to day +7 relative to calving ($P<0.01$). Plasma IgG1 and β-carotene decreased from 3 weeks before parturition reaching minimal concentrations around parturition ($P<0.01$). In contrast, IgG1 and β-carotene in secretions increased to maximal concentrations around parturition and then decreased during lactation ($P<0.01$). Similar patterns have been previously reported for vitamin A. These results imply that, like IgG1, β-carotene and vitamin A are depleted from maternal plasma as they are concentrated in colostrum. Temporal changes in mammary expression of megalin and LDL-R suggest that they may mediate the transfer of these components into colostrum.

Key Words: Colostrum, Megalin, Low Density Lipoprotein Receptor

208 Quantifying the effect of dietary sodium bicarbonate on ruminal pH.

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Dairy cattle are fed sodium bicarbonate ($NaHCO_3$) to reduce fluctuation in ruminal pH. However, we do not know whether $NaHCO_3$ acts through increasing the cation- anion difference in the rumen or by increasing the liquid turnover rate or volatile fatty acid (VFA) absorption from the rumen. A meta-analysis was conducted using studies where $NaHCO_3$ was used as a dietary supplement. Treatment means (n=38) from 14 studies with ruminally fistulated cows were used to evaluate the effect of dietary $NaHCO_3$ on ruminal pH, VFA concentration and calculated strong ion difference (SID) of ruminal fluid. The model included levels of $NaHCO_3$ and the random study effect. Analysis of studies revealed that addition of $NaHCO_3$ to diet increased ruminal pH ($P=0.0065$) and SID ($P<0.001$). A decrease in ruminal [VFA] was evident in three studies but was not a general trend across studies. A single compartmental model was fit using two zero-order inputs to the ruminal sodium pool, (saliva and dietary sodium), and sodium outflow as a first order reaction with respect to rumen sodium concentration [Na]. The model can predict a final ruminal pH of 6.04 on addition of 0.03 moles/l-d of $NaHCO_3$ for a given initial pH of 5.5. Rumen fractional outflow rate was 0.19/h for sodium ion equivalent (Na^+) equivalent. The model predicted changes in ruminal SID as affected by dietary changes in $NaHCO_3$ and the changes in ruminal SID were in turn used to predict ruminal pH. There was no significant mean bias or linear bias for SID (RMSPE= 0.76) or pH (RMSPE= 0.19). Predictions from formulation data set demonstrated that the model accurately estimated rumen [SID] and pH in the data set. Across all studies, addition of $NaHCO_3$ to the diet increased ruminal pH by increasing ruminal SID, but within 3 studies it decreased rumen [VFA]. The model can be used to predict the effect of dietary $NaHCO_3$ on rumen pH from a given starting pH.

Key Words: Sodium Bicarbonate, Strong Ion Difference, Ruminal pH

209 *Trans*-10, *trans*-12 conjugated linoleic acid (CLA) reduces the Δ^9-desaturase index without affecting milk fat yield in lactating dairy cows.

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Trans-10, *cis*-12 CLA is a potent inhibitor of milk fat synthesis and the magnitude of the milk fat depression (MFD) often corresponds to the milk fat content of this CLA isomer. However, in certain situations the *trans*-10, *cis*-12 CLA content of milk fat does not correspond to the MFD observed with some diets and with CLA supplements. An increase in the milk fat content of *trans*-10, *trans*-12 CLA has been observed in some of these situations. In the present study we synthesized *trans*-10, *trans*-12 CLA (purity > 90%) and investigated its effect on milk fat. Three rumen fistulated Holstein cows (168 $\pm$ 80 DIM, mean $\pm$ SE) were randomly assigned in a 3 X 3 Latin square experiment. Treatments were abomasal infusion of 1) ethanol (control), 2) *trans*-10, *cis*-12 CLA supplement (positive control), and 3) *trans*-10, *trans*-12 CLA supplement. CLA supplements supplied 5 g/d of the CLA isomer of interest and the daily dose was provided by infusion at 6 h intervals. Treatment periods were 4 d in length with a 7 d washout interval. Milk yield ($P < 0.69$), DMI ($P < 0.50$) and milk protein yield ($P < 0.50$) were unaffected by treatment. The *trans*-10, *trans*-12 CLA isomer had no effect on milk fat yield whereas *trans*-10, *cis*-12 CLA reduced milk fat yield by 28% ($P < 0.01$). Milk fat content (percent of total fatty acids) of specific CLA isomers was elevated within respective treatment groups, 0.11% for *trans*-10, *trans*-12 CLA and 0.18% for *trans*-10, *cis*-12 ($P < 0.001$). Changes in specific fatty acids indicated that Δ^9-desaturase was reduced significantly for both CLA treatments, but to a greater extent for the *trans*-10, *trans*-12 CLA treatment. Overall, abomasal infusion of *trans*-10, *cis*-12 CLA altered desaturase ratios and reduced milk fat synthesis, whereas *trans*-10, *trans*-12 CLA altered desaturase ratios but had no affect on milk fat synthesis. This indicates that the mechanism for the reduction in milk fat synthesis by *trans*-10, *cis*-12 CLA does not directly involve the reduction of Δ^9-desaturase.

Key Words: Conjugated Linoleic Acid, Milk Fat Depression, Stearoyl-CoA Desaturase

210 Altering dry matter intake affects the nutritional efficiency of dairy heifers.

G. I. Zanton* and A. J. Heinrichs, *The Pennsylvania State University, University Park.*

The objective of this experiment was to elucidate the effects of differing intakes of dry matter on the nutritional and nitrogen efficiency in growing, postpubertal dairy heifers. A grass-based, total mixed ration (49.1% NDF, 13.0% CP) was administered to eight rumen cannulated Holstein heifers (340 +/- 5 kg) in a replicated 4x4 Latin square design at levels of intake formulated to equally span the region between maintenance and ad libitum consumption. Treatments consisted of one ration fed at 1.25, 1.50, 1.75, and 2.00 kg per 100 kg body weight with energy being the first-limiting dietary component. Rumen fluid was sampled every two hours for 24 hours and total fecal and urine collection was made over six days. Rumen pH was linearly reduced and total VFA concentration linearly increased as DMI increased ($P<0.05$), but molar proportions of acetate, propionate, and butyrate and rumen concentrations of ammonia were unaffected by treatment. Bacterial nitrogen flowing to the duodenum, estimated by quantifying the excretion of urinary purine derivatives, was linearly increased by increasing levels of

DMI (P<0.05), however the bacterial nitrogen produced per unit organic matter consumed was not altered by treatment. Organic matter digestibility was linearly increased (P<0.05) by decreasing levels of DMI, while NDF digestibility was unaltered by treatment. Nitrogen excretion in the feces and urine increased linearly (P<0.05) with increasing intake of nitrogen and dry matter. Nitrogen was apparently more digestible for those heifers receiving a lower amount of dry matter compared to those receiving a greater amount (P<0.05). While apparently absorbed nitrogen increased linearly as intake increased (P<0.05), apparently retained nitrogen increased linearly but with a decreasing rate as the intake of dry matter approached the highest level of intake (linear and quadratic, P<0.05). Nitrogen retained as either a proportion of nitrogen consumed or nitrogen absorbed was quadratically affected by treatment (P<0.05) with nitrogen efficiency peaking at intermediate levels of intake.

Key Words: Nitrogen Efficiency, Dairy Heifers, Bacterial Nitrogen

211 The effect of essential plant oils on milk production and composition from lactating dairy cows and on silage fermentation and aerobic stability of corn silage. R. J. Schmidt*[1], D. H. Kleinschmit[1], J. M. Ladd[1], J. E. Lynch[1], L. Kung, Jr.[1], P. G. Williams[2], and R. Losa[3], [1]*University of Delaware, Newark,* [2]*Akzo Nobel LLC, Davis, CA,* [3]*CRINA S.A. Switzerland.*

Alternative feed additives have been studied and the use of plant secondary compounds is a promising option. A blend of essential oil components (CRINA Ruminant, CRINA S.A., Switzerland) was fed to lactating cows to study its effect on intake and milk production. Cows were fed a TMR of 15% alfalfa silage, 10% alfalfa hay, 25% corn silage, and 50% concentrate (DM basis). For a 2-wk pretreatment period all cows were fed 50 g of a limestone/CRINA blend that was mixed into the TMR to provide a daily intake of 0.6 g of CRINA/cow/d. At the start of an 8 wk treatment period cows were blocked on lactation number, pretreatment milk production and days in milk, and randomly allocated to one of two treatments: 1) 100 g of limestone or 2) 100 g of limestone/CRINA (1.2 g CRINA/cow/d). Cows fed CRINA ate 1.9 kg more DM/d and produced 2.7 more kg of 3.5% FCM/d than did cows fed the control diet ($P < 0.05$). Milk composition was unaffected by treatment. CRINA was also added to chopped corn forage (30% DM) to evaluate its effect on silage fermentation and aerobic stability. Treatments were: 1) no additive, 2) 2.5 g of CRINA/25 kg of wet forage, 3) 5.0 g CRINA/25 kg of wet forage, or 4) a buffered propionic acid based product, 4 lb/ton of wet forage (Kemin Industries, West Des Moines, Iowa). After ensiling, addition of CRINA had no effect on silage fermentation or the aerobic stability of corn silage. As expected, addition of the buffered propionic acid based product increased the concentration of propionic acid ($P < 0.05$) and decreased the yeasts in silage (4.45 vs. 5.16 log cfu/g, $P < 0.05$) but only numerically improved aerobic stability (47.5 vs. 59.5 h) when compared to untreated silage. The findings of this study show that CRINA was unable to affect silage fermentation or aerobic stability but it increased DM intake and milk production in dairy cows.

Key Words: Essential Oils, Milk Production, Silage

212 The effects of *Lactobacillus buchneri* 40788 and damage to the corn ear on the fermentation, aerobic stability, and production of mycotoxins in corn silage. R. S. Teller*, R. J. Schmidt, and L. Kung, Jr., *University of Delaware, Newark.*

We examined the effects of damaging ears of corn and microbial inoculation on the fermentation, aerobic stability, and production of mycotoxins in whole plant corn silage. Ears of corn on several plants were slashed, exposing damaged kernels to the environment. Seven days later, whole plant corn was harvested at 35% DM and ensiled in 20-L laboratory silos (packing density of 227 kg DM/m^3 or 14 lb/ft^3) in quadruplicate as one of the following treatments: 1) no inoculation and undamaged ears of corn (CC), 2) inoculation with *L. buchneri* 40788 (400,000 cfu/g of fresh forage) and *Pediococcus pentosaceus* (100,000 cfu/g) (Lallemand Animal Nutrition, Milwaukee, WI) and undamaged ears of corn (IC), 3) no inoculation and damaged ears of corn (CD), 4) inoculation and damaged ears of corn (ID). After 126 d of ensiling, regardless of damage to the ear, inoculated silages had higher concentrations of acetic acid (1.59 vs. 0.87%, $P < 0.05$), lactic acid (4.39 vs. 3.47%, $P < 0.05$), and 1,2 propanediol (0.87 vs. 0.0%, $P < 0.05$) than did uninoculated silages. Inoculated silages had fewer yeasts (0.61 vs. 3.33 log cfu/g) and thus were more aerobically stable (74 vs. 43.3 h, $P < 0.05$) than were uninoculated silages. Although initial numbers of yeasts and molds and concentrations of deoxynivalenol (DON) and fumonisin B1 (FB1) toxins were not different in fresh corn forage, between forage with damaged and undamaged ears, silage with damaged ears had higher concentrations of DON (3872 vs. 1009 ppb, $P < 0.05$) and FB1 (9.05 vs. 4.07 ppm, $P < 0.05$). Silages made from corn with damaged ears tended to have higher concentrations of ethanol (5.40 vs. 4.31, $P < 0.06$). Addition of *L. buchneri* 40788 and *P. pentosaceus* altered silage fermentation and improved the aerobic stability of the corn silage, regardless of damage to the ear before ensiling, but it was not able to prevent an increase in the production of mycotoxins during ensiling.

Key Words: Aerobic Stability, Lactobacillus buchneri, Mycotoxins

National ADSA Production Only (Graduate) II

213 Effects of providing supplemental methionine (Met) in the form of Smartamine™ M or 2-hydroxy-4-methylthio butanoic acid isopropyl ester (HMBi) to prepartum and early lactation dairy cows on feed intake and lactational performance. R. S. Ordway*[1], N. L. Whitehouse[1], A. M. McLaughlin[1], C. G. Schwab[1], and B. K. Sloan[2], [1]*University of New Hampshire, Durham,* [2]*Adisseo USA, Inc., Alpharetta, GA.*

Sixty primiparous (n=18) and multiparous (n=42) Holstein cows were blocked according to parity and expected calving date and assigned randomly to one of three dietary treatments: 1) basal diet, 2) basal diet plus HMBi, or 3) basal diet plus Smartamine™ M. Treatments were initiated 21 d before expected calving and continued through 140 d postpartum. Methionine supplements were added to the diet of each cow in amounts needed to achieve predicted concentrations of Lys (7.19%) and Met (2.37%) in metabolizable protein of 3.0:1.0 (NRC, 2001). It was assumed that 50% of the HMB in dietary HMBi is converted to metabolizable Met and that 80% of the Met in SmartamineTM M is absorbed. Prepartum DM intake (13.5 kg/d), body weight (687 kg), and body condition score (3.81), and postpartum milk yield (42.0 kg/d), milk fat yield (1549 g/d), milk fat content (3.66%), milk true protein yield (1192 g/d), and milk urea nitrogen content (12.9 mg/dl) were not different among treatments. Postpartum DM intake and body condition score were greater and milk/DM intake and milk N/feed N ratios were less for cows fed HMBi than for cows fed the control and Smartamine™ M diets (22.9 vs. 22.0 and 21.4 kg/d; 3.37 vs. 3.26 and 3.28; 1.92 vs. 2.00 and 1.98; 0.32 vs. 0.33 and 0.34, respectively). Milk protein content was greater for Smartamine™ M (2.87%) and HMBi (2.81%) than for control (2.72%). Concentrations of Met and Met+Cys in total plasma AA were different among treatments with values for Smartamine™ M being the highest followed by HMBi and control (2.10, 1.43, and 1.15% and 3.92, 3.12, and 2.73%, respectively). The results indicate that both HMBi and Smartamine™ M are effective in providing metabolizable Met, but clarification of their relative contributions to metabolizable Met is still needed.

Key Words: Lactating Cows, Rumen Protected Methionine, Methionine Analogs

214 Comparison of Holstein, Brown Swiss and Jersey cows for age at first calving and first calving interval. T. B. Garcia-Peniche*[1], B. G. Cassell[1], I. Misztal[2], and R. E. Pearson[1], [1]*Virginia Polytechnic Institute and State University, Blacksburg,* [2]*University of Georgia, Athens.*

The objective of this study was to examine breed differences due to geographic location and birth season on age at first calving and first calving interval, and the effect of season of first calving on first calving interval in Holsteins and Jerseys and Holsteins and Brown Swiss housed on the same farm. Data were analyzed for five (R5) or seven regions (R7) within the United States. The geographic division definition influenced the effect of season of first calving on first calving interval in Holstein-Jersey farms (P=0.68 in R5 and P<0.01 in R7). Holsteins housed with Jerseys (HJ) had shorter first calving intervals and calved at younger