resulted in an under-prediction of protein feeding status compared to using TMR analyses, but most dairy producers were feeding over NRC recommendations for protein.

Key Words: Milk urea nitrogen, Dietary protein

239 Effect of increased rumen-undergradable protein fed prepartum on milk production and milk protein yield in early lactation for high producing Holstein cows. A. L. Oliver*, S. M. Andrew, and T. A. Haogland, University of Connecticut, Storrs, CT, USA.

Thirty-six, twenty-four multiparous and twelve primiparous, Holstein cows were assigned to one of three treatments to evaluate the impact of feeding higher rumen-undergradable protein (RUP) for four weeks prepartum on milk production, milk protein content and yield of milk protein during early lactation in corn silage-based rations. The prepartum basal diet consisted of 37% corn silage, 11.3% alfalfa silage, 35.8% mixed hay and 10.3% concentrate mix (DM basis) fed as a TMR. The control treatment (CT) was formulated to provide RUP at 31% of CP using soybean meal (SBM). Diet RUP was increased for the other two treatments to 36% of CP, by substituting either heat-treated soybean meal (HTSBM) or animal-marine byproduct (AMP) for SBM. Cows were blocked by parity, expected calving date, body condition score (BCS) and random assigned to one of the three treatments. Prepartum treatment rations were fed to maintain BCS for at least 28 d prepartum. Following parturition cows were fed a common lactating cow ration for 56 d postpartum. Daily dry matter intake (DMI), weekly body weight (BW), and bimonthly BCS were measured throughout the entire experiment. Upon parturition, daily milk weights were recorded and weekly milk samples were collected for determination of milk true protein, milk fat, milk urea nitrogen (MUN), somatic cell count (SCC), and total solids (TS). There were no treatment differences for DMI, BW, BCS, milk protein, SCC or TS. There was a trend for increased milk production (P=0.07) and milk protein yield (P=0.17) for multiparous cows fed HTSBM compared with multiparous cows fed CT. No treatment difference in these variables was observed for primiparous cows. MUN tended to be higher for multiparous cows fed HTSBM, compared to multiparous cows fed the CT. Increasing the RUP in the prepartum ration by feeding HTSBM tended to increase milk production and milk protein yield in the subsequent lactation for multiparous cows fed higher levels of RUP.

Key Words: Rumen undegradable protein, Prepartum, Milk protein


The primary objective of this study was to reduce dietary CP of lactating cows without reducing milk yield. A second objective was to reduce farm N import. Three diets were formulated using the CPM Dairy model to vary in content of CP, metabolisable protein balance, and predicted balance of Met and Lys. According to estimated % Lys and Met efficiency, treatments were defined as Lys/Met = 89/91 (control), Lys/Met = 99/116, and Lys/Met = 116/116. Ration CP was effectively reduced by 14% (18.6 % CP vs 16.0 % CP) with inclusion of a commercial source of free lysine (Archer Daniels Midland, Decatur, IL),Met (Alimet®, Novus International, St Louis, MO), and a commercially available RUP source (Prolak®, H J Baker, Atlanta, GA). Respective diets were fed in a 14-week continuous trial design. Cows (n = 36) were paired for parity and PTA prior to initiation of the study, then fed individually via Calan® headgates. Cows were milked 2x/day and were provided Posilac®. Diet reformulation was successful in reducing (P < 0.05) N imported by 8.6 %, increasing PCM, reducing MUN, and improving efficiency of milk protein yield. A proper balance of Lys/Met was necessary to maintain milk production when CP% was reduced in the diet. The apparent imbalance of Lys/Met in the second treatment decreased milk fat% and production of PCM. This study illustrates the benefits of reducing dietary CP and improving efficiency of milk protein production. Detailed data are summarized below.

<table>
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<tr>
<th>Item</th>
<th>Control</th>
<th>CP Lys/</th>
<th>CP Lys/</th>
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<td></td>
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<tr>
<td>CP</td>
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<td>116/109</td>
<td>SE</td>
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<td>Ratio of Milk True Protein to Intake Protein</td>
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</tbody>
</table>

Key Words: Protein, Environment, Nutrient management

241 Effect of HMB and HMBi on milk production, composition, and N efficiency of Holstein cows in early and mid-lactation. J. T. Sylvester1, N. R. St-Pierre1, B. K. Sloan2, J. L. Beckman1, and S. M. Nottsteger1, 1The Ohio State University, Columbus, OH, USA, 2Adisseo, Alpharetta, GA, USA.

Dietary supplementation of 2-hydroxy-4-(methylthio)-butanoic acid (HMB) results in inconsistent increases in milk yield, fat content and fat production. Chemical modification of HMB to an isopropyl ester (HMBi) increases its methionine (Met) bioavailability to approximately 50%. The objectives of this study were (1) to determine the lactation response (volume and components) to ruminally available Met (HMB), (2) to determine the lactation response to partially protected Met provided as HMBi, and (3) to evaluate whether HMBi supplied at 0.15% of the diet provides enough ruminally available HMB to achieve maximal production response. Sixty-one Holstein cows (24 primiparous, 37 multiparous) were assigned to one of four dietary treatments 21 to 28 days after calving. A base diet consisting of (DM basis) 32.5 % corn silage, 17.5 % alfalfa hay, 10 % whole cottonseed and 40 % of a pelleted concentrate made primarily of ground corn, soybean hulls, Megalac, dehulled-soybean meal, blood meal, urea, vitamins and minerals was fed for 16 weeks as a control diet (treatment 1), or was supplemented with 0.1% of diet DM with HMB (treatment 2), with 0.15% with HMBi (treatment 3), or with 0.045% HMB and 0.15% HMBi (treatment 4). The control diet contained an estimated 31.3 % DDF, 10.6 % RDP, 6.2 % RUP, 10.9% metabolizable protein (MP), 6.78% lysine (% of MP), and 1.79 % methionine (% of MP). Results were analysed as a randomized block design with repeated measurements using a mixed model with a first order autoregressive covariance of errors. Results showed a significant (P<0.05) increase in milk yield (2.9 kg/d), true protein composition (0.15%), true protein production (115 g/d), fat production (165 g/d), and lactose production (182 g/d) from the feeding of HMBi. Supplementation of HMB had non-significant effects on milk yield and composition with only lactose production showing a significant improvement. Dietary supplementation of HMBi reduced the amount of N excreted in the urine by increasing the amount of N secreted in milk.

Key Words: Methionine hydroxy analog, Dairy cattle, Milk yield and composition

Ruminant Nutrition: Dairy feedstuffs

242 Effect of bmr-6 and bmr-18 brown midrib genes on forage sorghum silage in lactating rations. A. L. Oliver1, R. J. Grant1, and J. F. Pedersen2, 1University of Nebraska, Lincoln, NE, 2USDA/ARS, Lincoln, NE.

Diets of normal sorghum, brown midrib bmr-6 sorghum, bmr-18 sorghum, and corn silage were fed to determine the effect of these two sorghum brown midrib genes on lactational performance, ruminal metabolism, and digestion. Sixteen multiparous Holstein dairy cows (including four ruminally fistulated) averaging 124 ± 68 DIM were assigned to one of four diets in a replicated Latin square design with 3-week periods. Diets comprised of 40 % test silage, 10 % alfalfa silage, 3.7 % whole cottonseed, and 23.6 % concentrate mix. Cows were housed in a tie-stall barn and fed in individual feed boxes. Lignin was decreased

in the bmr-6 and bmr-18 sorghum silage when compared to the normal sorghum silage. In addition, the normal sorghum silage had greater NDF and ADF than bmr-6, bmr-18, and corn silage. There was greater DMI for bmr-6 (25.2 kg/d) sorghum silage than bmr-18 (23.4 kg/d) sorghum silage while no difference was seen between sorghum silages and corn silage. Milk production (kg/d) and 4% FCM were significantly greater (P < 0.10) for those consuming the bmr-6 sorghum and corn silage than normal sorghum silage. Silage source had no effect on overall chewing time. Eating time was increased (P < 0.10) with the normal and bmr-18 sorghum silages. Rumination time was greatest with bmr-6 sorghum silage. Corn, bmr-6, and bmr-18 sorghum silage had greater DMI (P < 0.10) than LCW silage, whether substitution occurs on a DM or NDF basis.

**Key Words:** Brown middrill, Sorghum, Milk production

### Comparison of a corn silage hybrid with high cell wall content and digestibility with a lower cell wall hybrid on lactational performance of Holstein cows.

**S. K. Ivan*1, R. J. Grant1, D. Weakley2, and J. Beck3,1**

1University of Nebraska, Lincoln, NE; 2Purina Mills, St. Louis, MO; 3Syngenta Seeds, Golden Valley, MN.

We hypothesized that substituting a corn silage hybrid with high cell wall content and digestibility for a lower cell wall hybrid with lower digestibility would improve feed intake and milk production in lactating Holstein cows. In trial 1, 40 cows (12 primiparous) ranging in milk production from 24.1 to 44.0 kg/d, after a 2-wk preliminary period, were used in a crossover design with 2-wk periods. Diets consisted of either the high cell wall and digestibility corn silage (HCW) or 45% lower cell wall corn silage (LCW) plus 10% alfalfa hay and 45% concentrate. There was a 5.1 percentage-unit range in NDF content and a 5.3 percentage-unit range in 30-h in vitro NDF digestion between the two corn hybrids. The DMI (25.4 vs 24.2 kg/d) and 4% FCM yield (34.3 vs 31.7 kg/d) were higher (P<0.05) for cows fed the HCW diet compared with the LCW diet. Milk composition was unaffected by diet (P>0.20). When bmr silage was used for LCW then relationship (P>0.30) between pretrial milk yield during the preliminary period and response to HCW silage. In trial 2, 40 cows (8 primiparous) ranging in milk production from 20.6 to 49.0 kg/d, after a 2-wk preliminary period, were used in a crossover design with 2-wk periods. Diets consisted of the same LCW diet as trial 1 and a diet containing HCW at a concentration (40% of DM) that resulted in equal NDF content (29.4%) between the two diets (HCW); the DMI (26.8 kg/d) was unaffected by diet (P>0.30), although there was a trend (P<0.13) for greater DMI (% of BW) for cows fed the HCWN diet compared with LCW silage (4.24 vs 4.12). Milk fat % (3.91 vs 3.79) and 4% FCM yield (34.9 vs 33.4 kg/d) were greater for cows fed HCWN versus LCW diet (BM3-6). When BM3-6 was substituted for LCW silage on a NDF basis, there was a linear and quadratic (P<0.02) relationship between pretrial milk yield and response to HCW: cows with greater milk production during the preliminary period had a greater milk response to HCW than lower producing cows. Results of these trials support our hypothesis that HCW corn silage results in greater DMI and milk yield than LCW silage, whether substitution occurs on a DM or NDF basis.

**Key Words:** Corn silage, Fiber digestibility, Milk yield

### Effect of endosperm type of corn grain on starch degradability by ruminal microbes in vitro.

**S. M. Allen*1, R. J. Grant1, G. W. Roth2, W. P. Weiss3, and J. F. Beck3,1**

1Michigan State University; 2University of Nebraska, Lincoln; 3Pennsylvania State University, University Park; 4The Ohio State University/OARDC, Wooster; 5Syngenta Seeds, Golden Valley, MN.

Six corn hybrids were grown in plots in 3 states (MI, NE, PA) in 1999. Hybrids differed in endosperm type: floury, opaque-2, waxy, dent, and flint (2). Corn grain was harvested at 40%, 30%, and 20% moisture, rolled and ensiled in duplicate 10- x 30-cm PVC silos. Whole kernels and rolled samples were frozen until analysis. Within each location, duplicate silos from each plot and maturity were opened after 35 d and 120 d and frozen until analysis. Samples were ground with dry ice (Wiley mill, 1-mm screen) before analysis. In vitro starch degradation was determined after incubation for 7 h in buffered media with 20% rumen fluid. Viuetrosity of endosperm for hybrids ranged from 4 to 62%. Starch degradation was affected by hybrid (49.8 to 60.3%, P < 0.001) and increased with moisture content (46.0 to 65.8%, P < 0.001), ensiling (0 d vs. 35 d and 120 d, 46.3 vs. 59.3%, P = 0.001), and time of ensiling (35 d vs. 120 d, 57.4 vs. 61.2%, P < 0.001). However, several interactions were detected. Sample fragility, measured as DM of ground samples passing a 106-µm aperture screen, explained additional variation in starch degradation (P < 0.001) and was affected by hybrid (P < 0.001). Further, curative starch degradation was increased with time of ensiling (52.6 vs. 56.2%, P = 0.01) and affected by hybrid (52.3 to 58.8%, P = 0.001), but not by moisture content or time of ensiling. Starch degradation of hybrids was highly related to vitreousness both with (R² = 0.96, P < 0.001) and without (R² = 0.66, P < 0.05) particle size as a covariate. Increased starch degradation with increased time of ensiling and moisture content was associated with increased kernel fragility. Corn hybrids vary in starch degradation by ruminal microbes because of fragility and vitreousness of endosperm.

**Key Words:** Corn grain, Starch degradation, Endosperm type

### Effects of corn grain endospermy type and brown middrill corn silage on milk production and feeding behavior of lactating dairy cows.

**C. C. Taylor* and M. S. Allen, Michigan State University, East Lansing.**

Effects of endospermy type of corn grain and the brown middrill 3 mutation in corn silage on milk yield, DMI, and feeding behavior of cows were evaluated. Eight ruminally and duodenally cannulated Holstein cows (72 ± 8 DM; mean ± SD) were used in a duplicated 4 x 4 Latin square design with a 2 x 2 factorial arrangement of treatments. Grain treatments were dry corn grain from hybrids with floury or vitreous endosperm and silage treatments were corn silage from a hybrid with the bm3 mutation or an isogenic control hybrid without the bm3 mutation. Diets were formulated to 27% neutral detergent fiber and 18% crude protein. Corn grain and silage supplied ~23% and ~38% of the diet DM, respectively. An interaction of treatments was detected for 3.5% FCM (P = 0.10). Floury endospermy decreased 3.5% FCM 1.2 kg/d compared to vitreous endospermy when fed with control corn silage (39.7 vs. 40.9 kg/d; P = 0.10), but had the opposite effect, increasing 3.5% FCM when fed with the normal and bm3 control silage (42.2 vs. 40.1 kg/d). Corn grain with floury endospermy decreased DMI 1.8 kg/d compared to vitreous when fed with the control silage diets (23.6 vs. 25.4 kg/d) but increased DMI 0.5 kg/d when fed with bm3 corn silage (25.2 vs. 24.7 kg/d; interaction: P = 0.07). The interaction of grain and silage treatments for DMI can be attributed to a decrease in meal size for floury vs. vitreous corn with control corn silage (2.18 vs. 2.47 kg DM) but an increase in meal size for floury vs. vitreous corn with the bm3 corn silage (2.25 vs. 2.05 kg DM; interaction: P = 0.03). Diets containing bm3 corn silage tended to increase number of meals compared to control corn silage (11.7 vs. 10.6; P < 0.10). Intermeal interval was not affected by treatment. It is unlikely that ruminal distension limited DMI because effects of treatment on temporal patterns of meal production and absorption.

**Key Words:** Endospermy, Brown middrill, Feeding behavior

### Dairy cattle performance, health, and milk composition when fed silage and grain from Bt (Cry1F) and near-isogenic control hybrids.

**M. A. Faust*1, B. Smith2, M. Hinds3, and G. Dana2,1**

1Ohio State University, Ames; 2Pioneer Hi-Bred International, Inc., Johnston, IA.

Objectives for this study were to evaluate the health and performance of dairy cows fed non-Bt maize and a new generation variety of Bt maize containing the Cry1F gene (Hercules TM). Twenty lactating Holstein cows were assigned to treatment groups and fed diets containing whole plant maize silage and maize grain from Bt and near-isogenic control hybrids. The study used a c ative 2 x 2 factorial arrangement of treatments. Each cow represented 1 cow and was fed the Bt and non-Bt control diets (25.2 vs. 24.7 kg/d; interaction: P = 0.03). Diets containing bm3 corn silage tended to increase number of meals compared to control corn silage (11.7 vs. 10.6; P < 0.10). Intermeal interval was not affected by treatment. It is unlikely that ruminal distension limited DMI because effects of treatment on temporal patterns of meal size and ruminal pool sizes of DM and NDF (interactions P < 0.05) reflected effects of treatment on DMI. Treatment effects on meal size and DMI were likely from differences in temporal patterns of fuel production and absorption.

**Key Words:** Endospermy, Brown middrill, Feeding behavior

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groups did not differ for milk urea nitrogen and somatic cell count. For milk fat percentage, there was a significant treatment × genetic group interaction, however overall yields for milk and solids corrected milk did not differ and were 38.9 and 36.4 kg for Bt and 38.6 and 36.8 kg daily for non-Bt fed groups, respectively. Dry matter intakes were 27.1 and 27.9 kg per day and did not differ for the treatment and control diet groups (P > 0.05). Physical measures of cow health were collected weekly and included body weight, body condition score, temperature, and pulse and respiration rate; treatment group means for these parameters were not different. Blood chemistry and hematological analyses were conducted using blood samples collected from cows at two-week intervals. Overall, the Bt and non-Bt fed groups did not differ for these 21 indices of health. Further, hematological profiles for cows in the treatment groups were not different (P > 0.05). In summary, there were no differences in milk production, milk composition, or cow health as indicated by physical parameters, blood chemistry, and hematological analyses when dairy cows were fed diets containing maize grain and whole plant maize silage from Bt (Cry1F) or its near-isogenic counterpart hybrid.

Key Words: Genetically modified corn, Dairy cattle, Milk yield

247 Effects of feeding corn silage produced from corn containing MON810 and GA21 genes on feed intake, milk production and composition in lactating dairy cows. S. Callejón,1 E. Hernández,1 G. F. Hartnell,2 and R. H. Phipps1 1 Universidad Autonoma de Barcelona, Spain, 2Monsanto Company, St. Louis, MO, 3University of Reading, UK.

Eight multiparous (126 DIM) Holstein cows (mean live-weight 647 kg) were used in a single reversal study to assess effects of feeding genetically modified (GM) silage and alfalfa for milk production and milk composition in lactating dairy cows. The potential for transgenic DNA and proteins to occur in milk was also evaluated. The trial consisted of two periods of 28 d (23 d adaptation and 5 d sampling). Cows were housed in a tie-stall barn, fed a TMR ration ad libitum and milked twice daily. Diets contained (DM basis) 45% corn silage, 10% alfalfa hay and 45% concentrate (1.66 Mcal NEL/kg DM, 16.1% CP, 35% NDF and 4.1% fat). Treatments were corn silage containing Roundup Ready event GA21 and MaisGard event MON 810 (RRMG) and a non-modified control line (CTR). Milk was analyzed for fat, protein, solids-non-fat, lactose and somatic cell counts, and transgenic DNA and CRY1A(b)-protein. Chemical composition (37.6% DM, 1.51 Mcal NEI/kg, 8.6% CP, 40% NDF, 19.6 ADF, and pH 3.76) and in vitro DM digestibility (62%) of corn silages were within normal ranges and similar between treatments. Silage type did not affect DM intake (22.1 kg/cow/d). Cows fed the RRMG produced milk with slightly higher (P < 0.05) milk protein (3.09 vs. 3.00%), lactose (4.83 vs 4.72%) and solids-non-fat (8.60 vs 8.40%) compared with CTR. However, the total yield of milk (36.5 kg/d), 3.5% fat corrected milk (34.4 kg/d), fat (1151 g/d), protein (1106 g/d), lactose (1738 g/d) and solids-non-fat (3094 g/d), and somatic cell count (128000 cells/ml) were not affected by type of silage indicating no overall production difference. All milk samples were negative for the presence of transgenic DNA from either trait or fragments thereof and the CRY1A(b)-protein encoded in the RRMG (limit of detection of 0.1 ng/ml). Results from the chemical composition and production responses indicate that the use of the RRMG silage did not adversely affect animal performance.

Key Words: Genetically modified organism, Dairy cattle

248 Effects of replacing chopped alfalfa hay with alfalfa silage in total mixed rations fed to lactating dairy cows at two levels of concentrate inclusion. M. S. Einason1, 2, J. M. Calberry2, B. W. McSride2, K. M. Wittenberg2, and J. C. Piazie2 1Department of Animal Science, University of Manitoba, 2Department of Animal and Poultry Science, University of Guelph.

Twenty four lactating dairy cows received one of three total mixed rations (TMR) in a higher concentrate range (Exp. I) or a lower concentrate range (Exp. 2). Diets in the higher concentrate range (A, B and C) contained (DM basis) 38.5% barley grain based energy supplement, 30.5% corn silage, 17.0% protein supplement and 4.2% sunflower seeds. Diets in the lower concentrate range (D, E, and F) contained (DM basis) 31.7% barley grain based energy supplement, 40.5% corn silage, 13.9% protein supplement and 4.2% sunflower seeds. Diets also contained (DM basis) 4.0%, 6.0% and 9.8% alfalfa silage and 9.8%, 4.9% and 0% chopped hay for both diets A, B and C, respectively, and for diets D, E and F, respectively. Replacing chopped hay with alfalfa silage significantly decreased the proportion of dietary DM passing through the 8 mm bottom screen of the Penn State Particle Separator (PSPS) and dietary DM content, significantly increased the physical effective NDF (peNDF, NDF retained by the PSPS screen), but did not effect dietary CP, NDF and starch contents in both experiments. In the higher concentrate range, this replacement significantly increased rumen pH, and significantly decreased total VFA, but did not affect DMI, milk yield and milk composition. This replacement did not significantly affect rumen pH, VFA concentrations, DM, milk yield and milk composition in the lower concentrate range.

Key Words: Physical effective NDF, Dairy cows, Rumen


Diluting alfalfa silage with corn silage may be useful for improving N efficiency in dairy cattle. Twenty-eight lactating Holstein cows (8 ruminally fistulated) were randomly assigned to 7, 4 x 4 replicated Latin squares with 28-d periods to assess the effects of different ratios of alfalfa to corn silage on milk production, rumen metabolism, and N utilization. Diets contained (% of DM) the following proportions of alfalfa:corn silages, 50:0 (diet A), 37:13 (diet B), 23:27 (diet C), or 10:40 (diet D). All diets contained 26% NDF and contents of CP were 17.8% (diet A), 17.0% (diet B), 16.5% (diet C), and 15.7% (diet D). DM decreased linearly (P < 0.001) across diets with the lowest intake observed on diet D. Milk yield had both linear (P = 0.02) and quadratic (P = 0.04) effects and again diet D was lowest. Fat yield decreased linearly (P = 0.001) with diet A differing from diets C and D. Protein yield was similar across diets but a quadratic effect (P = 0.03) was observed. Total urinary N excretion, ruminal NH3, and total AA decreased linearly (P < 0.002, P < 0.001, and P = 0.004, respectively) and in all cases diet D was the lowest. Ruminal pH and propionate were not different. However, ruminal acetate and propionate increased linearly from diet A to D (P < 0.001). Overall, diet D was associated with the poorest production although it yielded better N utilization.

Whole plant corn (Pioneer hybrid 38K66; RM 93 d) planted on May 4, 2001 on four plots, was harvested at 35% DM content and processed using one of three methods prior to ensiling: (1) chopped at 0.95-cm theoretical length of cut (TLC) and processed with 3 mm roll clearance; and (3) chopped at 1.91% of ingested seeds (lint excluded) were excreted undigested for primiparous cows, although this was not reflected in body weight condition score tended to be larger (P<0.05) between treatments but NDF had lower (P<0.05) protein concentration compared to the other CHO. STA resulted in reduced (P<0.05) milk protein concentration.

Key Words: Sample preparation method, In situ digestion, Processed and unprocessed corn silage


The objective of this study was to investigate the effect of sugar, starch, NDF, and a carbohydrate (CHO) mix on utilization of ruminal ammonia in dairy cows. Four ruminally and duodenally cannulated Holstein cows were allocated to four dietary treatments in a 4 x 4 Latin square design trial. Cows were fed, at 12-h intervals, an all alfalfa hay diet. CHO (corn detroso, GLU; corn starch, STA; fiber, NDF; white oat fiber) and a CHO mix (25% of each): apple pectin, GLU, STA, and NDF, PEC were introduced intraruminally during feeding 20% of dietary DM. Ruminal ammonia was labeled with 15N. GLU resulted in reduced (P<0.05) DM compared to NDF (21.7 vs 22.6 kg/d, respectively). NDF had the highest (6.41, P<0.05) average ruminal pH (13 samples in 30 h) followed by STA, PEC, and GLU (6.19, 6.05, and 5.96). Ruminal ammonia concentration was higher (P<0.05) in NDF and PEC than in GLU and STA (16.4, 12.4, 8.5, and 9.6 mmol/L). Compared to the other CHO, GLU reduced (P<0.05) acetate and total VFA concentrations in the rumen. Milk yield and milk fat content were not different (P>0.05) between treatments but NDF had lower (P<0.05) milk protein concentration compared to the other CHO. STA resulted in lower (P<0.05) MUN concentration than NDF (16.9 vs 22.4 mg/dL). The area under the milk protein synthesis curve (22 samples in 120 h) tended to be larger (P=0.052) for STA than for NDF and PEC. As percent of the dose given, cumulative excretion of 15N in milk protein was greater for STA (6.64%) than for GLU (5.87%, trend at P<0.1) or NDF (5.58%, P<0.05). Estimated time to reach 50% of maximum 15N excretion tended to be shorter (P=0.101) for STA than for GLU (36 vs 48 h, respectively). Overall, excretion of 15N in milk protein was greater (P<0.05) for STA than for GLU and NDF. Compared to glucose and fiber, starch enhanced utilization of ruminal ammonia for milk protein synthesis in dairy cows.

Key Words: Dietary carbohydrates, Rumen ammonia, Milk protein
Effect of changes in peNDF and starch source on intake, milk production and milk composition of dairy cows. P. Berzaghi1,2 and D. R. Mertens2, 1 University of Padova, Italy, 2 US Dairy Forage Research Center, Madison, WI.

The study evaluated the effects of changes in ration physically effective NDF (peNDF) and starch source on dairy cow performance. The negative control (NC) diet was formulated to induce milk fat depression and contained 19% peNDF using finely chopped (TLC = 6.4 mm) corn silage as the main forage source. Three diets were formulated to increase peNDF to 22% by adding corn silage (CS) or chopped alfalfa hay (AH) or chopped grass hay (GH) to NC. Each of the four diets was formulated with dry ground corn (DGC) or finely ground high moisture corn (HMC) to obtain eight diets that varied in starch source and peNDF source and concentration. Twenty-four cows were blocked for milk production and half were assigned to either DGC or HMC diets in replicated 4x4 Latin squares with 21d periods. Intake, milk production, milk composition were recorded during the last week of each period. A mixed model was used for ANOVA. Increasing dietary peNDF raised milk fat percentage by 0.38% (P<0.01) and milk fat yield by about 60g/d (P<0.04), regardless of starch source. On average, HMC depressed (P<0.03) milk fat percentage by 0.47% compared to DGC and milk fat was lowest (2.87%) for the HMC-NC. Among peNDF sources, AH was most effective (P<0.07) in increasing 3.5%FCM production. Milk production tended (P<0.11) to be greater for NC diets and was lower (P<0.02) for CS than AH and GH diets regardless of starch source. Although daily DMI was about 1.6 kg less (P<0.03) for HMC diets compared to DGC, milk production was not different. Regardless of starch source, AH increased (P<0.05) DMI compared to NC, whereas CS did not. Additional peNDF from GH increased DMI for DGC, but not for HMC diets resulting in a significant (P<0.01) peNDF source x starch interaction. Larger particles in feed refusals suggest that GH may not have increased the particle size of consumed diets. In conclusion, changes in dietary peNDF and starch source were most effective alleviating milk fat test depression when used together.

Key Words: Calcium, Soluble phosphorus, Milk production