is March. To maximize MY under Iranian climatic and management conditions, calving should be synchronized to occur in February to have the second month of lactation at April.

Key Words: Ambient temperature, Day length, Milk production

Ruminant Nutrition: Grazing - rumen metabolism - protein

228 Effect of corn silage and grazing strategy on milk production and composition of grazing dairy cows. P. Chilibroste*, F. Elizondo, and D. A. Mattiauda, *Facultad de Agronomia. Est. Exp. M. A. Cassinoni.*

An experiment was completed to evaluate effects of corn silage allocation and within day grazing strategy on milk production (MP), milk composition, and body condition score (BCS) of early lactation grazing dairy cows (35±15 d in milk). A daily strip of pasture (1536±289 kg DM/ha), with an allowance of 15 kg DM/cow, was available to each treatment group between 9:00 and 15:00 h. Additionally, cows received 2.7 kg of concentrate at each milking (4:30 h and 15:30 h). Corn silage (16 kg/d/cow; fresh basis) was offered at 17:00 h (T1), at 8:00 h (T2) or in two equal meals at 17:00 and 8:00 h (T3). Thirty six cows were grouped by parity, MP and live weight, and randomly assigned to treatments. MP was recorded daily and milk composition was determined on four consecutive milkings each week (W). BCS was recorded at the beginning, middle and end of the study. Data was analyzed with repeated measures using the Proc Mixed procedure of SAS 8.1. Treatment, W and T*W effects were tested using a covariance structure. MP (25.4±0.94, 24.9±0.91 and 25.8±0.89 L/d for T1, T2 and T3, respectively), did not differ among treatments, but increased with time (P<0.01). There was no T*W interaction. Milk protein percent did not differ among treatments (2.98±0.05, 2.94±0.05 and 2.92±0.04 for T1, T2 and T3, respectively), although a T*W interaction (P<0.01) occurred. T2 cows lost BC at a higher rate than T1 (-0.389 vs. -0.167 units/wk) in the first half of the study but recovered BCS faster in the second half (0.057 vs 0.135 units/W, for T2 and T1 respectively). Corn silage allocation and grazing session strategy during the day did not effect MP and composition, although it modified BCS changes which could affect reproductive performance and energy partition during the lactation.

Key Words: Grazing, Feeding strategy

229 Effect of corn silage and grazing strategy on rumen fermentation patterns of dairy cows. P. Chilibroste*[1], C. Baccetta[1], S. Etchegaray[1], I. Ferreira[1], C. Lockhart[1], L. Posse[1], F. Elizondo[1], and D. A. Mattiauda[1], *Facultad de Agronomia. Est. Exp. M. A. Cassinoni.*

An experiment was completed to evaluate effects of within day corn silage feeding times and grazing strategy on rumen pH and ammonia concentrations of early lactation grazing dairy cows (3515 d). A daily strip of pasture (1536289 kg DM/ha; with an allowance of 15 kg DM/cow was provided to each treatment group between 9:00 and 15:00 h. Cows also received 2.7 kg of concentrate at each milking (4:30 and 15:30 h). Corn silage (16 kg/d/cow, fresh basis) was offered at 17:00 h (T1), at 8:00 h (T2) or equally distributed at 17:00 h and 8:00 h (T3). The 36 cows were grouped by parity, milk production and live weight, and randomly assigned to treatments. Two rumen fistulated dairy cows, within each treatment, were used for rumen fluid collection. Data was analyzed as repeated measures using the Proc Mixed procedure of SAS 8.1. Treatment, week, hour of the day and the interactions were tested using a covariance structure. Rumen samples were collected at the start, middle and end of the experiment at 0, 1.5, 3.5, 5, 8.5, 10, 14 and 22 h from the beginning of the grazing session. pH was determined immediately and ammonia N was determined in samples preserved with sulfuric acid and frozen at -15C. pH declined (P<.05) as the grazing session progressed, and T1 cows had the lowest (P<.05) value 8 h from t=0. Ammonia concentrations increased (P<.05) as the grazing session progessed with T1 cows having higher concentrations than T2 and T3 cows in earlier samplings. After termination of the grazing session (i.e, at t=6) ammonia N concentrations declined linearly in cows on all treatments. Differences among treatments are in the Table. Within day corn silage feeding times and grazing strategy both effected some aspect of rumen pH amd ammonia N values, which could supress pasture dry matter intake and rumen fiber digestion.

pH	Difference	Probability
T1 - T2	-0.282	≤0.01
T1 - T3	-0.382	≤0.05
T2 - T3	-0.100	NS
Ammonia N		
T1 - T2	63.78	≤0.1
T1 - T3	74.97	≤0.05
T2 - T3	11.19	NS

NS = non significant; Ammonia concentration = parts per million

Key Words: Grazing strategy, Grazing, Corn silage

230 Computer modeling of a dairy systems trial comparing Holstein-Friesians fed either pasture or TMR. P. C. Beukes, B. S. Thorrold, E. S. Kolver, M. E. Wastney, K. P. Bright, J.A.S. Lancaster, C.A.J. Palmer, and C. C. Palliser*, *Dexcel Ltd., Hamilton, New Zealand.*

A computer model of a whole farm system (known as the Whole Farm Model or WFM) was used to simulate a trial where Holstein-Friesian dairy cows were fed either grass or a Total Mixed Ration (TMR). The genetics were either New Zealand (NZ) or Overseas (OS) and the groups had comparable Breeding Worths. The aim was to determine the accuracy of the WFM in predicting cow production on a high protein versus high energy feed, i.e., pasture (the main feed used in New Zealand) or TMR. The TMR did not include grass and represented the diet upon which the OS genetics had been selected to produce overseas. The WFM is a dynamic model which consists of a framework to which are attached mechanistic submodels for cow metabolism (the Molly model) and pasture growth. Characteristics (initial and dry-off liveweight and milk potential) of a representative cow from each year of the trial were entered into the WFM together with the observed climate data and management so that the cows were fed ad lib pasture or TMR as in the trial. Predicted values for milk yield (kg/cow/year), milksolids production (kg/cow/year), milk fat %, milk protein %, liveweight change during lactation (kg) and dry-off liveweight (kg) were compared for the grass versus the TMR diet. The differences were significant (P < 0.001) for milk protein % (mean for grass = 3.66 %, standard error (SE) 0.02; mean for TMR = 3.39 %, SE 0.01), liveweight change during lactation (mean for grass = -12 kg, SE 28; mean for TMR = 139 kg, SE 12), and dry-off liveweight (mean for grass = 491 kg, SE 11; mean for TMR = 668 kg, SE 21). These model results agree with those from the trial. Although the trends were expected, given the higher energy content of TMR and the higher protein content of pasture, the values indicate the potential production of both NZ and OS genetics when fed well. It was concluded that the WFM model correctly predicts milk production, milk composition and body weight change in cows fed diets of different composition.

Key Words: Dairy cow, Model, Diet

231 Effect of grazing systems on chewing activity, ruminal pH fluctuations and pH of milk, blood and urine of dairy cows. C. Graf[1], M. Kreuzer[2], and F. Dohme*[1], [1]*Swiss Federal Research Station for Animal Production, Posieux, Switzerland,* [2]*Swiss Federal Institute of Technology, Zurich, Switzerland.*

Grass in its young vegetative stage is rich in rapidly-fermentable carbohydrates and poor in physical structure and therefore could cause low ruminal pH and reduced chewing activity in dairy cows on pasture. The effects of full-time grazing (G) versus part-time grazing with nightly supply of 5.5 kg DM either as hay (H) or corn silage (C) on chewing activity and pH in various body fluids and excretion products were studied in six rumen-fistulated Brown Swiss cows. A replicated 3 x 3 Latin square design was applied. Each experimental period lasted 28 d with sampling taking place from d 21 to 28. Grass intake was quantified by the double

alkane technique using controlled-release capsules. The pH of morning samples of milk, venous blood and urine was measured 2, 4 and 7 times per cow and period, respectively. Rumen pH was recorded continuously over 24 h except during milking with a pH electrode placed in the rumen through the fistula. These data were summarized separately for daytime and night for each cow as mean, maximum and minimum pH and time period when pH was below 5.8. The chewing activity, separated into eating and ruminating, was recorded continuously for 22 h using a behavior recorder. Grazing systems had no effect on the time spent ruminating and rumination time per kg DM intake. Cows in treatment G spent more time for eating per kg DMI (+15 min) compared to C and more time for eating per day (+121 min) compared to H and C ($P < 0.05$ for each). In rumen fluid, the maximum and minimum pH, the average night pH and the time period with pH < 5.8 did not differ among treatments. By contrast, throughout the day cows in treatment H had a lower mean ruminal pH (-0.24) compared to G, and the time period when pH was below 5.8 was longer with H (+66 min) compared to C ($P < 0.05$ for each). Milk and blood pH were not affected by treatments while urine pH tended to be lower (-0.07) in group G ($P = 0.06$). In conclusion, full-time grazing had no adverse effect on ruminal pH and rumination time whereas part-time grazing with nightly supply of hay caused less favourable ruminal pH conditions during the day.

Key Words: Grazing, Ruminal pH, Chewing activity

232 Effect of abomasal pectin infusion on digestion and nitrogen balance in dairy cows.

T. F. Dunlap* and L. E. Armentano, *University of Wisconsin-Madison*.

We hypothesized that increasing postruminal fermentation would stimulate bacterial growth in the large intestine and shift some nitrogen (N) excretion from the urine to the feces. This should reduce N volatilization from manure and improve air quality. Four multiparous lactating cows were assigned to a Latin square with 14-day periods. All cows were fed a basal diet (27.4% NDF and 10.1% neutral detergent soluble fiber (NDSF)) to meet energy and nutrient requirements . Cows received 20 L/d saline infused into the abomasum via a rumen fistula. Treatments were: 0PEC=saline only (control); 0.5PEC=saline plus 0.5 kg/d pectin; 1PEC=saline plus 1.0 kg/d pectin; MOL=saline only with 1 kg/d dried molasses added to the basal diet. One cow was removed from the trial due to failure of the infusion device. Linear and quadratic effects of increasing pectin infusion were tested. Effect of site of fermentation was also tested (1PEC vs MOL). Average milk production was 36.3 kg/d and did not differ among treatments. NDSF provided by 0.5PEC was 0.39 kg/d and 0.78 kg/d for 1PEC. Based on fecal NDSF excretion, all of the infused pectin was apparently degraded for 0.5PEC and about 55% was degraded for 1PEC. Total tract apparent NDF digestibility was numerically reduced with pectin infusion and there was little difference in digestibility of neutral detergent solubles (NDS). As hypothesized, pectin infusion resulted in a numerical reduction in milk urea nitrogen, a reduction in fraction of N excreted in urine ($P<0.08$) and a numerical increase in fecal purines. It appears that increased postruminal fermentation from pectin occurred at the expense of postruminal fermentation of NDF, resulting in only a slight increase in total postruminal fermentation and a minor shift in N.

			Treatment				Contrast	
	0PEC	0.5PEC	1PEC	MOL	SEM	Lin	Quad	Site
DMI+pectin, kg/d	25.9	25.7	25.1	25.9	1.6	0.18	0.69	0.20
MUN, mg/dl	13.2	11.1	11.9	13.4	1.1	0.33	0.24	0.29
NDF digestibility, %	34.9	29.8	23.0	32.4	6.0	0.24	0.91	0.34
NDS digestibility, %	67.7	67.0	64.1	67.5	2.6	0.23	0.62	0.25
Fecal NDSF, kg/d	1.49	1.42	1.74	1.24	0.10	0.18	0.21	0.04
UrineN/ (urineN+fecalN)	0.49	0.46	0.43	0.48	0.03	0.08	0.74	0.10
Fecal purines, g/d	15.4	17.2	18.2	16.2	1.64	0.23	0.83	0.35

Key Words: Pectin, Postruminal fermentation, Nitrogen excretion

233 Effect of dietary cation-anion difference on the milk production of early lactation dairy cows.

J. R. Roche*, S. Petch, and J. K. Kay, *Dexcel (formerly Dairying Research Corporation), Hamilton, New Zealand*.

In pasture-based systems, the dietary cation-anion difference (DCAD) offered can vary from 0 to +100 meq/100g DM, but the effect of such a range on milk production is not known. Thirty-two multiparous Holstein-Friesian cows offered generous quantities of pasture (51±6 kg/cow.d^{-1}) were randomly allocated to one of four DCAD treatments. Treatment groups were grazed together and cows were supplemented twice daily with a mixture of $NaHCO_3$, $MgCl_2$ and $CaCl_2$. Final DCAD treatments were +48, +72, +99 and +116 meq/100g DM. Blood and urine pH increased ($P < 0.001$) linearly with increasing DCAD, as did blood base excess and blood HCO_3^- concentration. The ratio of calcium to creatinine in urine (CUCa) increased ($P < 0.001$) linearly with decreasing DCAD, suggesting an increased intestinal absorption of Ca in cows at lower DCADs. The DCAD range tested did not affect the yield of milk or the yield or concentration of protein or lactose. Milk fat yield and concentration increased ($P < 0.05$) linearly with increasing DCAD, but pasture intake, BW change and BCS change were not significantly affected. It is apparent from this study that pasture diets with a large range in DCAD do not greatly affect milk production.

DCAD, meq/100g DM	+48	+72	+99	+116	SED	DCAD	Linear
						P	*P*
Blood pH	7.43	7.45	7.48	7.49	0.007	<0.001	<0.001
Blood HCO_3^-, meq/L	31.3	32.5	34.7	38.0	1.15	<0.001	<0.001
Base excess, meq/L	6.99	8.31	10.59	13.66	0.789	<0.001	<0.001
Urine pH	7.93	8.25	8.3	8.36	0.251	<0.001	<0.001
CUCa	2.6	1.4	0.9	0.6	0.40	<0.001	<0.001
Milk yield, kg/c.d^{-1}	24.8	26.1	26.6	26.3	1.26	0.50	0.19
Fat yield, kg/c.d^{-1}	1.00	1.03	1.09	1.10	0.056	0.23	0.04
Protein yield, kg/c.d^{-1}	0.87	0.89	0.89	0.89	0.044	0.95	0.63
Lactose yield, kg/c.d^{-1}	1.25	1.27	1.28	1.29	0.070	0.94	0.52
Fat, %	3.96	4.06	4.22	4.17	0.123	0.19	0.04
Protein, %	3.43	3.44	3.40	3.39	0.048	0.69	0.29
Lactose, %	4.90	4.89	4.92	4.92	0.037	0.78	0.52
DMI, kg/c.d^{-1}	15.9	16.7	18.0	17.4	1.43	0.50	0.21
BW change, kg	10.9	7.4	8.9	18.0	7.88	0.55	0.37
BCS change	-0.11	-0.19	0.00	-0.06	0.094	0.26	0.29

CUCa - ratio of Ca to creatinine in urine

Key Words: DCAD, Lactating cow, Pasture

234 Influence of a polyclonal antibody preparation against rumen proteolytic bacteria on rumen fermentation and yield of milk and milk components.

C. R. Dahlen*[1], A. DiCostanzo[2], B. M. Mitteness[3], P. Nash[3], J. E. Larson[2], N. DiLorenzo[2], and G. D. Marx[1], [1]*Northwest Research and Outreach Center, University of Minnesota,* [2]*Department of Animal Science, University of Minnesota,* [3]*CAMAS, Inc.*

Twenty-eight multiparous dairy cows were used to study the effects of a polyclonal antibody preparation (PA) against rumen proteolytic bacteria (C. stricklandi, C. aminophilum, and P. anaerobius) on rumen fermentation and yield of milk and milk components. Cows were paired by days in milk (DIM; > 50 d) and allocated to one of two treatments (fed as a top-dressing daily): 1) a dose of PA carried in 120 g of soy-hull pellets (n = 14), or 2) 120 g of soy hull pellets (n = 14). Treatments were delivered during two 14-d feeding periods in a switch-back design; each period was preceded by a 14-d measurement period (baseline; no carrier or PA fed). Diets were formulated to contain 1.70 Mcal NE_l/kg DM, 17.5% CP, 0.65% Ca and 0.35 % P. Diets were delivered once daily and fed ad libitum. Dry matter intake (DMI) and milk yield were measured daily throughout each period. Daily milk samples were composited from d 8 to d 14 and analyzed for solids, fat, protein, somatic cell count (SCC), and milk urea nitrogen (MUN). Rumen fluid was collected on d 14 of each period. Data were analyzed as a paired switchback design with cow as the experimental unit. Data for DMI and milk yield and components were separated into early lactation (EL; < 140 DIM) and late lactation (LL; ≥ 140 DIM) groups. When appropriate, milk yield and/or DMI measured during the baseline period were used as covariates in this analysis. Milk yield and 4% fat corrected milk (FCM) tended ($P < 0.15$) to be greater when EL cows were fed PA. Neither milk fat nor protein concentration was affected ($P > 0.05$) by feeding PA to EL cows. Concentration of milk solids was reduced ($P < 0.05$) when PA was fed to EL cows. Neither SCC nor MUN were affected ($P > 0.05$) by feeding PA to EL cows. Feeding PA to LL cows had no effect (P >

0.05) on milk yield, FCM, fat, protein, or SCC. However, concentration of milk solids and MUN were reduced (P < 0.05). Feeding PA had no effect (P > 0.05) on pH, or VFA and ammonia concentrations. Results of this short term feeding of a polyclonal antibody preparation against rumen protoelytic bacteria indicate that this preparation may enhance milk yield in early lactation cows without affecting rumen fermentation.

Key Words: Rumen fermentation, Milk production, Passive immunization

235 Urea synthesis by ruminal epithelial and duodenal mucosal cells isolated from growing sheep.

M. Oba*[1], R. L. Baldwin, IV[2], S. L. Owens[1], and B. J. Bequette[1], [1]*Department of Animal and Avian Sciences, University of Maryland, College Park, MD,* [2]*Bovine Functional Genomics Laboratory, ANRI, USDA-ARS, Beltsville, MD.*

To determine the capability of ruminant gut tissues to synthesize urea, ruminal epithelial (REC) and duodenal mucosal cells (DMC) were isolated from growing Polypay ram lambs (n=4) fed a mixed forage-concentrate diet. Isolated cells were incubated for 90 min with either acetate (5mM) or propionate (5mM) plus four combinations of substrate to support urea synthesis (arginine, Arg; aspartate + citrulline, AspC; aspartate + ornithine + ammonia, AspON; aspartate + ornithine + ammonia + N-carbamoylglutamate, AspONG; 5 mM each) in a 2 x 4 factorial arrangement of treatments. Background urea present in 0 time (Control) and total urea release was determined by stable-isotope dilution with gas chromatography-mass spectrometry. For both cell types, effects of VFA and interactions between VFA and substrate combinations were not observed. For REC, total urea release was 56.6, 6.7, 3.7, 5.8, and 2.2 nmol per 10^6 cells respectively for Arg, AspC, AspON, AspONG, and Control. Arg addition resulted in 10-fold greater ($P < 0.001$) urea release than other treatments that did not differ from control. For DMC, total urea release was 4.2, 2.4, 1.5, 4.0, and 2.1 nmol per 10^6 cells respectively for Arg, AspC, AspON, AspONG, and Control. Arg and AspONG treatments resulted in greater ($P < 0.001$) urea release than other treatments and control, indicating that ammonia N can be utilized for urea synthesis by DMC if carbamoyl phosphate synthetase is activated. These results demonstrate that ruminant gut tissues are capable of synthesizing urea, particularly by REC when degrading Arg. Further research is needed to determine the extent to which arginine degradation by the REC contributes to N recycling in vivo in order to assess the impact on arginine requirement in ruminants.

Key Words: Ruminal epithelial cells, Duodenal mucosal cells, Urea synthesis

236 Assessment of metabolizable protein recommendations for milking Jersey cows by NRC (2001).

L. E. Sander* and N. R. St-Pierre, *The Ohio State University.*

Metabolizable protein (MP) recommendations by NRC (2001) were derived almost exclusively from Holstein data. The objective of this study was to assess whether the calculated recommendations are accurate for Jersey cows considering the greater protein concentration of Jersey milk. Ten multiparous and ten primiparous Jersey cows were used in a three period, five treatment crossover experimental design. Experimental periods were 4 wk in length, with d 1 to 7 used for standardization, d 8 to 14 as time for adjustment, and d 15 to 28 for data collection. Levels of supplied MP were changed solely by varying the level of RUP (RDP was constant at 10.4% of DM). The treatment diets were 80, 90, 100, 110, and 120% of the RUP recommendations according to NRC (2001) for each individual cow based on DMI, milk production and composition during wk 1 of each period when a control (RUP=100%) diet was fed. All diets contained 30% corn silage, 20% hay, 26.5% ground shelled corn, and 10% whole linted cottonseed on a DM basis. A high post-ruminal digestibility bloodmeal and nonenzymatically browned soybean meal supplemented with rumen protected methionine were the sources used to modify RUP of diets by substitution with soybean hulls and urea. The level of RUP had a significant (P<0.01) positive linear effect on milk production (27.2, 26.8, 27.8, 27.8, and 29.3 kg/d), milk true protein concentration (3.69, 3.75, 3.76, 3.81, and 3.80 %), milk true protein production (1.000, 1.001, 1.046, 1.056, and 1.109 kg/d) and milk urea N (11.2, 12.0, 15.5, 13.3, and 18.7 mg/dL) for 80 to 120 % of NRC RUP respectively. Quadratic, cubic and quartic effects of RUP were not significant (P>0.10) for all variables except for a significant quadratic effect of RUP on MUN. Milk fat concentration (5.09 %), fat production (1.402 kg/d), log SCC (5.41), body weight (417.5 kg), body condition score (2.85), and DMI (17.9 kg/d) were not affected (P>0.10) by RUP levels. These results suggest that NRC (2001) either overestimate MP supply from microbial or feed origin, or underestimate MP requirements of Jersey cows.

Key Words: Metabolizable protein, Rumen undegradable protein, Jersey cows

237 Effect of dietary crude protein level and degradability on ruminal fermentation and nitrogen utilization in lactating dairy cows.

R. P. Etter*, A. N. Hristov, J. K. Ropp, and K. L. Grandeen, *Department of Animal and Veterinary Science, University of Idaho, Moscow, ID.*

The objective of this study was to evaluate the effect of dietary CP level and degradability on N utilization in lactating dairy cows. Four ruminally and duodenally cannulated Holstein cows were allocated to two dietary treatments in a crossover design. The diets were based on alfalfa hay, triticale silage, cottonseed, corn grain, soybean meal, and molasses and were formulated to provide similar metabolizable protein but different levels of ruminally degradable protein; CP content of the diets was 18.5 (HP) and 17.2% (LP). Ruminal ammonia was labeled with ^{15}N and excretion of tracer in milk protein was determined for a period of 120 h. Ammonia concentration in the rumen tended to be higher ($P < 0.1$) on HP than LP. Microbial N flow to the duodenum, ruminal digestibility of dietary nutrients, DMI, milk yield, fat content, and protein content and yield were not different ($P > 0.05$) between the diets. Total tract apparent digestibility of N was higher ($P < 0.05$) on the HP diet than on the LP diet (73.0 *vs* 69.0 %, respectively). Urinary N excretion tended to be higher ($P < 0.1$) on HP than on LP (0.348 *vs* 0.274 kg/d, respectively). The cumulative excretion of ammonia ^{15}N into milk protein, as proportion of ^{15}N dosed intraruminally, was not different between the two diets (11.8 *vs* 14.3%, respectively). The area under the milk protein ^{15}N excretion curve was greater ($P < 0.05$) for LP compared to HP (1.049 *vs* 0.957 at % exc. × h, respectively). The proportions of bacterial protein originating from ammonia N and milk protein originating from bacterial N were not different ($P > 0.05$) between the two diets. Milk urea N concentration was higher ($P < 0.05$) for HP than for LP (15.8 *vs* 13.1 mg/dl, respectively). In conclusion, excess RDP in the diet resulted in higher ruminal ammonia and milk urea N concentrations but had no significant effect on the efficiency of utilization of ruminal ammonia for milk protein, urinary N losses, or milk yield and fat and protein content.

Key Words: Dietary protein, Rumen ammonia, Milk protein

238 Use of milk urea nitrogen to evaluate dietary protein on commercial dairy farms.

A. B. Peterson* and R. A. Kohn, *University of Maryland, College Park, Maryland.*

The first objective was to evaluate the potential for using milk urea N **(MUN)** to identify overfeeding or underfeeding of protein on commercial dairy farms. The second objective was to use MUN and ration analysis to determine if dairy producers were feeding protein as recommended by the National Research Council **(NRC)**. A previously developed model was used to predict MUN concentrations using milk yield and ration CP% and NE_L. A target MUN was calculated using NRC's dietary recommendations. If cows were receiving more protein than recommended by NRC then their observed MUN values would be higher than expected and visa versa. Bulk tank and TMR samples, as well as milk production and cow information, were collected from twenty-one Holstein dairy farms across Maryland repeatedly in March, June, September and December (n=73). Predicted MUN explained 40% of the variation in observed MUN and 8% was explained by collection month ($P < 0.05$). This model predicted MUN to be 2.2 mg/dl greater than was observed (residual error = 2.8 mg/dl). Observed MUN was influenced by collection month, farm, average days in milk, and dietary CP% ($P < 0.05$). There is a correlation between MUN and dietary CP% where high MUN indicates high dietary CP% ($P < 0.0001$). Both TMR and MUN analyses suggested that cows were overfed protein 69% of the time. Additionally, 9.9% of the time, both analyses suggested that cows were underfed protein which resulted in an overall agreement of both methods at 78.9%. However, nearly 20% of the time, the TMR analysis (used in calculating predicted MUN value) indicated that cows were being overfed protein while observed MUN values suggested that cows were not receiving adequate protein. Using observed MUN values

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 ditrogen, Dietary protein

239 Effect of increased rumen-undegradable protein fed prepartum on milk production and milk protein yield in early lactation for high producing Holstein cows. K. M. Kouri*, S. M. Andrew, and T. A. Hoagland, *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-undegradable 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 randomly 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

240 Strategic ration balancing by supplementing lysine, methionine, and Prolak® on efficiency of milk protein production and potential environmental impact. J. H. Harrison[1], R. L. Kincaid[1], W. Schager[1], L. Johnson*[1], D. Davidson[1], L. D. Bunting[2], and W. Chalupa[3], [1]*Washington State University,* [2]*Archer Daniels Midland Co.,* [3]*University of Pennsylvania.*

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, metabolism protein balance, and predicted balance of Met and Lys. According to estimated % Lys and Met sufficiency, treatments were defined as Lys/Met = 89/91 (control), Lys/Met = 99/116, and Lys/Met = 116/109. 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 < .05) N imported by 8.6 %, increasing FCM, 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 FCM. This study illustrates the benefits of reducing dietary CP and improving efficiency of milk protein production. Detailed data are summarized below.

Item	Control 18.6% CP	16% CP Lys/Met (99/116)	16% CP Lys/Met (116/109)	SE	P<
DMI, kg	20.4	20.5	20.5	1.35	NS
CP Intake, kg	3.79	3.28	3.28	—	—
Milk, kg	35.8	35.4	37.5	2.32	NS
3.5% FCM, kg	37.2^a	33.4^b	38.6^a	2.29	.04
Milk Fat, kg	1.34^a	1.11^b	1.38^a	0.83	.02
Milk Protein, kg	1.10	1.08	1.13	.071	NS
MUN, mg/dl	18.8^a	13.0^b	14.4^b	.92	.01
Ratio of Milk True Protein to Intake Protein	.29	.33	.34	—	—

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. Sylvester*[1], N. R. St-Pierre[1], B. K. Sloan[2], J. L. Beckman[1], and S. M. Noftsger[1], [1]*The Ohio State University, Columbus, OH, USA,* [2]*Adisseo, 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-solvent extracted 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 % NDF, 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 dairy rations. A. L. Oliver*[1], R. J. Grant[1], and J. F. Pedersen[2], [1]*University of Nebraska, Lincoln, NE,* [2]*USDA/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