Exp. 1: 1/Milk = 0.0125*(1/Suppl) + 0.0826 r^2 = 1.00

Exp. 2: 1/Milk = 0.0199*(1/Suppl) + 0.1032 r^2 = 0.96

The theoretical maximum milk production (1/a) were 12.1 and 9.7 kg/animal/day, respectively, and the half maximum milk production (b/a) was verified with 5.2% of the supplementation necessary to reach 95% maximum response. Therefore, the marginal increase in milk production reduces with increasing supplementation, different of the 2001 dairy NRC that consider linear responses for both energy and protein supplies.

Key Words: Dairy cattle, Lineweaver-Burk, Supplement

M214 Physiological responses to heat stress in steers following ruminal administration of ground endophyte-infected tall fescue seed. L. E. Wax*, G. Rottinghaus, and D. E. Spiers, *University of Missouri*, *Columbia*.

Cattle from Southeast to Midwest regions of the US often experience fescue toxicosis during summer months following intake of tall fescue infected with the endophyte Neotyphodium coenophialum (E+). Recent studies in our lab have attempted to enhance this condition by feeding cattle a diet containing ground E+ seed under heat stress conditions, which resulted in a large reduction in feed intake. The objectives of the present study were to separate out the oral effect of ground E+ seed by using ruminal administration, and determine a dose-response to ergovaline (i.e., a primary toxin found in E+ seed). Steers (n=6, 350kg avg. BW) were housed in the Brody Environmental Center at the University of Missouri and used in four trials over a 5 month period to ultimately expose each animal to each of the four treatments. All animals were originally housed at 19C for seven days and received endophyte-free ground seed (E-; Miller Seed Company, MO) in the diet. This was followed by 11 days of cycling heat stress (i.e., 26 to 36C). After this time, steers either continued on the E- supplementation or switched to E+ seed (Seed Research of Oregon, OR) at 5, 10 or 20µg ergovaline/kg BW for five days. Respiration rate, skin, and rectal temperatures were taken six times daily, along with daily measurement of feed intake. Fescue seed was mixed directly into the rumen four times daily to ensure the animal received the entire dose. Results were analyzed using ANOVA. Only the highest dose resulted in a significant change in performance. Treatment at this level resulted in a 30% rapid reduction in feed intake (P=0.02) below E- level. In contrast, hyperthermia associated with the highest dose developed gradually over four days of treatment to peak at 0.85C above E- level (P=0.01). Feed intake is more responsive to fescue toxicosis than indicators of thermal stress, which develop gradually. These results also suggest that the reduction in feed intake is not a taste issue, since bypassing the mouth still results in decreased intake.

Key Words: Cattle, Heat stress, Endophyte

M215 Assessment of blended sorbitol and mannitol as a prepartum glucogenic supplement for periparturient dairy cows. J. W. McFadden*[1], S. S. Block[2], and J. K. Drackley[1], [1]*University of Illinois*, *Urbana*, [2]*ADM Alliance Nutrition, Inc.*, *Decatur, IN*.

We evaluated the effects of prepartum sugar alcohol supplementation on metabolic status and milk production in a commercial herd setting. Primiparous (n=66) and multiparous (n=101) Holstein dairy cows were utilized in a completely randomized design with two prepartum treatments: control (unsupplemented) or 100 g/d of sorbitol-mannitol blend (SMB) incorporated into the total mixed ration. Treatments were initiated 3 wk before expected calving and terminated at parturition. Cows were housed in group pens corresponding to treatment during the prepartum period then released into the herd after parturition. Milk production and composition was determined until 98 DIM. Blood metabolite response was measured at 1 d and 7 d postpartum. A single liver biopsy was obtained between 5 d and 8 d postpartum. Body condition score was documented prior to treatment and at parturition. Frequency of health disorders was recorded. Data was analyzed using the PROC MIXED procedure of SAS with repeated measures. Treatment with SMB tended to increase milk yield (P=0.10) in multiparous cows (44.3 and 46.3 kg/d for the control and SMB, respectively; SEM = 0.9). Milk yield in primiparous cows was not affected by SMB. Milk protein content was significantly lower (P=0.03) for the SMB treatment, however milk protein yield was not affected. Milk fat content and yield, SCC, and MUN concentrations were not affected by treatment. Serum glucose, β-hydroxybutyrate, and nonesterified fatty acid concentrations were not affected by prepartum supplementation of SMB. Hepatic concentrations of total lipid, triacylglycerol, and glycogen were not affected by treatment. Neither body condition score nor frequency of health disorders was affected by treatment. We conclude that prepartum supplementation of SMB may increase milk yield in multiparous Holstein dairy cows, but did not alter metabolic characteristics during the periparturient period. (Experiment supported by ADM Alliance Nutrition, Inc., Decatur, IN).

Key Words: Milk yield, Sorbitol, Transition cow

Ruminant Nutrition: Nitrogen Metabolism/Amino Acids - Dairy

M216 Effects of the isopropylester of the hydroxylated analogue of methionine (HMBi) on production performance of dairy cows in early lactation. S. Jurjanz*[1], J. C. Robert[2], and F. Laurent[1], [1]*INRA-ENSAIA, Laboratoire de Sciences Animales*, *Vandoeuvre, France*, [2]*Adisseo France SAS*, *Commentry, France*.

Thirty six Holstein cows (26 multiparous, 10 primiparous) were assigned to one of two treatments 17 to 24 days after calving. A basal diet consisting of (DM basis) 61.5 % corn silage, 6.7% wheat straw, 14.9% cracked wheat, 15.6% soybean meal, 1.3 % minerals was fed for 17 weeks as a control diet (treatment 1: T1), or was supplemented with 0.12 % of diet DM with HMBi (treatment 2: T2). The control diet contained an estimated (per kg DM) 1.61 Mcal Net Energy, 100g metabolizable protein (MP), 46g digestible undegraded protein (PDIA from PDI system), 6.91 metabolizable lysine (%MP) and 1.78 metabolizable methionine (%MP). Treatment 2 contained 2.25 metabolizable methionine (%MP), HMBi supplying 0.47 metabolizable methionine (%MP). Results were analysed through an ANOVA using the mixed procedure of SAS with the repeated time option. The covariance structure between the different weekly averages was defined as compound symmetric. No significant differences were observed between treatment groups for DMI, milk yield, milk fat (content and yield) and body weight variations. Milk protein content was higher for T2 vs T1 (%3.36 vs 3.24, $p<0.10$) and lactose content increased significantly for T2 vs T1 (% 5.13 vs 5.02, $p<0.01$). Total nitrogen content in milk did not vary significantly (g/L, 5.37 and 5.20 respectively for T2 and T1). Protein nitrogen and casein nitrogen

increased significantly for T2 vs T1: respectively (g/L) 5.10 vs 4.91 ($p<0.10$) and 4.33 vs 4.12 ($p<0.05$). Non protein nitrogen content and proportion in total nitrogen decreased significantly for T2 vs T1: respectively (mg/L) 274 vs 293 and (%) 5.12 vs 5.68. HMBi supplementation improved N use by partitioning a greater proportion of absorbed N into milk protein N. Moreover, N losses in non-valorised form as NPN were reduced. This result is in agreement with metabolizable methionine optimization of the ration through HMBi supply.

Key Words: Dairy cow, Methionine, Milk protein

M217 Evaluation of rumen-protected methionine (RP-Met) sources and period length on performance of lactating dairy cows within Latin squares. B. C. Benefield*[1], R. A. Patton[2], M. J. Stevenson[3], and T. R. Overton[1], [1]*Cornell University*, *Ithaca, NY*, [2]*Nittany Dairy Nutrition, Inc.*, *Mifflinburg, PA*, [3]*Degussa Corporation*, *Kennesaw, GA*.

A previous study showed carryover effects on production parameters in Latin square designs assessing RP-Met sources. Multiparous Holstein cows (n=16) were used in a replicated (n=4) Latin square design to determine effects of different sources of RP-Met on performance. Squares were balanced to enable determination of carryover effects. The basal TMR was predicted to supply Met at 1.75% of metabolizable protein (MP) supply (NRC, 2001). Treatments consisted of 0 g/d RP-Met (control; C), 6 g/d RP-Met as Mepron (M6), 12 g/d RP-Met as Mepron (M12), and 12 g/d RP-Met as Smartamine M (S). The daily treatment for each cow was mixed into 0.45 kg of wheat middlings and combined with the basal TMR at the mixer. Cows were fed treatments for 2-wk periods and data were collected on the last 2 d of each week. Statistical analysis (GLM of SAS) was conducted separately for data collected during wk 1 and 2 of each period. RP-Met resulted in varying positive effects on DMI and content of milk fat and true protein during wk 1; however, these differences were not significant after 2 wk of treatment. Carryover effects were not significant. Predicted Met supplies (g/d) were in excess of predicted requirements for all treatments. Increasing Met supply (% MP) through use of RP-Met resulted in small increases in milk true protein content. Results suggest that length of study period can affect productive variables of cows fed RP-Met sources.

Table 1.

	DMI, kg/d Fat, %		DMI, kg/d Fat, %		Milk, kg/d Protein, %		Milk kg/d Protein, %	
Treatment	wk 1	wk 2	wk 1	wk 2	wk 1	wk 2	wk 1	wk 2
C	28.4[a]	28.4	38.4	37.0	3.16[a]	3.26	2.90[a]	2.97
M6	28.6[a]	28.2	36.8	35.9	3.36[b]	3.24	3.02[b]	2.99
M12	28.8[a]	28.0	37.3	36.2	3.39[b]	3.31	3.02[b]	3.03
S	29.2[b]	28.7	37.5	37.0	3.37[b]	3.29	2.98[ab]	3.04
SE	0.2	0.2	0.6	0.5	0.06	0.05	0.04	0.02

Values within columns with different superscripts differ, $P < 0.05$

Key Words: Amino acids, Methionine, Milk protein

M218 The effect of various rumen protected methionine sources on milk yield, milk composition and nitrogen efficiency of cows in mid-lactation. J. A. Strzetelski[1], J. Kowalczyk[2], and W. Heimbeck*[3], [1]*National Research Institute of Animal Production*, *Balice, Poland*, [2]*The Kielanowski Institute of Animal Physiology and Nutrition*, *Jablonna, Poland*, [3]*Degussa AG*, *Hanau, Germany*.

The objective of this experiment was (1) to assess the effect of rumen protected methionine sources (RP-Met) on N efficiency, DMI and lactational performance of mid-lactation cows and (2) to compare N efficiency and milk protein % as measures of RP-Met response. The experiment used 4 Black-and-White cows in mid lactation (8-16 weeks) in a Latin square design. The basal diet (kg DM/d) consisted of corn silage (8.22), meadow hay (3.47) and concentrate (9.20) and contained 1.85% methionine as a percent of metabolizable protein (NRC, 2001). Treatments consisted of the basal diet (C) plus one of 3 supplements added daily: 10.5 g Mepron® (M), 10.5 g Smartamine™ M (S) or 21 g MetaSmart™ (H), estimated to increase Met to 2.14 as % of MP. Cows were first adapted to control diet for 3 weeks followed by four 21-day treatment periods. A 14-day preliminary period was followed by 7 days of collection. Statistical analysis was performed with Proc GLM of SAS. There were no significant differences among diets for N efficiency, N or DM intake or milk yield. Milk protein % was affected by RP-Met supplementation as was lactose % ($P<.06$). Results suggest that under conditions of this experiment, added RP-Met had little effect on animal performance. N-efficiency appears to be a less sensitive measure of Met status in milking cows than milk protein %.

Table 1.

Diets	DMI	Milk	Fat	Protein	Lactose	Casein	N Intake	Milk N	MNE*
	kg/d	kg/d	%	%	%	%	g/d	g/d	%
C	19.9	25.6	4.01	3.43[a]	4.70[ab]	2.84	500	137	27.5
H	19.9	25.6	3.93	3.42[a]	4.72[b]	2.84	499	136	27.4
M	19.8	24.7	4.36	3.60[b]	4.60[a]	2.96	496	138	27.7
S	19.6	25.3	3.98	3.46[ab]	4.71[b]	2.86	497	136	27.5
SE	0.16	0.58	0.19	0.05	0.04	0.04	2.1	3.6	0.79

*Milk Nitrogen Efficiency = Milk N/N intake*100. Different superscripts within columns differ significantly ($P<.06$)

Key Words: RP-Met, N-efficiency, Milk protein

M219 Milk composition as technique to evaluate the relative bio-availability of rumen protected methionine sources. Z. Bester, L. J. Erasmus*, and R. J. Coertze, *University of Pretoria*, *Pretoria,South Africa*.

To determine the bio-availibility of any rumen protected amino acid, the resistance to ruminal degradation and intestinal availability need to be measured.This requires multi-cannulated animals.When various prototypes are evaluated, simpler techniques are needed to screen the prototypes for relative bio-availability.The objective of this study was to evaluate the use of milk composition as a simple technique to evaluate the relative bio-availability of an experimental liquid rumen protected methionine(LRPM).Using a randomized block design, forty mid-lactation Holstein cows were used to compare a methionine (met) deficient diet (MP lys:met of 4.23:1) to the same diet supplemented with either LRPM, DL-met or Smartamine M.Supplementation with the rumen protected sources resulted in a MP lys:met ratio of 7.2:2.4, which is considered optimal.After an adaptation phase of one week (period 1), cows were fed the met deficient diet for three weeks (period

2) and thereafter fed either the met deficient diet or one of the three supplemented diets (period 3).Dry matter intake and milk production did not differ (P>0.10).Supplementation with Smartamine M increased (P<0.05) milk protein from 3.22 to 3.46% when compared to the met deficient diet; the other supplements had no effect.When the change in milk fat and protein % between the last week of period 2 and period 3 respectively are compared, the magnitude of change was higher (P<0.05) for cows receiving Smartamine M, when compared to the other treatments.Results suggest milk composition to be a simple method to evaluate the relative bio-availability of rumen protected methionine sources.

Key Words: Rumen protected methionine, Milk composition, Smartamine M

M220 Supplemental rumen-protected choline and methionine for lactating dairy cows. M. L. Eastridge*, J. Engel, and C. V. D. M. Ribeiro, *The Ohio State University*, *Columbus*.

In experiment one, 3 rumen protected choline (RPC) sources [Reashure® (REA), Balchem Encapsulates, New Hampton, NY; BPC, Robt Morgan, Inc., Paris, IL; and Pro-Choline™40 (PC), Probiotech, Inc., St-Eustache, QC, Canada] were incubated in situ using 2 rumen cannulated cows. Dacron bags containing the samples were suspended in the rumen and removed at 0, 2, 4, 6, 12, 24, and 48 h, with 2 samples per time point per cow. Rate of DM disappearance was lower for REA (0.015 /h) than for BPC (0.187 /h) and PC (0.215 /h). Rate of disappearance of choline also was lower for REA (0.003 /h) than for BPC (0.558 /h) and PC (0.254 /h). Although REA and BPC had similar DM residue after 48 h of incubation (31%), the choline remaining was only 2% for BPC but 85% for REA. In situ DM disappearance is inadequate for assessing choline protection, and REA provided greater choline protection compared to the other 2 sources. In experiment two, initially 56 lactating cows were fed one of 4 diets beginning at parturition: 1) control (duodenal flow of lysine:methionine (lys:met) 3.8, NRC 2001), 2) 0.26% RPC (REA; targeted at 60 g/d to provide 15 g/d of choline; lys:met 3.8; REA-L), 3) 0.52% RPC (REA, 120 g/d to provide 30 g/d of choline; lys:met 3.8; REA-H), or 4) 0.096% rumen protected methionine (Smartamine M™, Adisseo, Antony Cedex, France; lys:met 3.0; MET). Diets were fed as TMR for 13 weeks and consisted of 52% forage (76% corn silage and 24% alfalfa hay), 9% whole linted cottonseed, and 39% concentrates. Diets contained 16.8% CP, 39.2% NDF, and 20% forage NDF. Forty-eight of the cows (31 Holstein and 17 Jersey) completed the trial. The DMI (20.6 kg/d), milk yield (36.5 kg/d), milk fat (4.35%), and milk protein (3.14%) were not different among diets. The MUN was highest for REA-H (19.1 mg/dl) and intermediate for MET (18.1 mg/dl). Milk choline was higher for MET, but plasma choline and nonesterified fatty acids were similar among diets. Plasma glucose was higher for control and MET than for either level of REA. Milk choline was a better indicator of choline status than plasma choline, and MET resulted in higher milk choline concentration than the feeding of RPC.

Key Words: Choline, Methionine, Rumen protect

M221 Milk production and carry-over effects of methionine supplements in lactating dairy cows. H. F. Bucholtz*[1], R. A. Patton[2], J. S. Liesman[1], P. N. Naasz[3], and M. J. Stevenson[4], [1]*Michigan State University*, *East Lansing*, [2]*Nittany Dairy Nutrition, Inc.*, *Mifflinburg, PA*, [3]*Michigan State University Upper Peninsula Experiment Station*, *Chatham*, [4]*Degussa Corporation*, *Kennesaw, GA*.

Amino acid requirements of dairy cattle and efficacy of rumen protected amino acids are often assessed using Latin square experiments with 2 week periods. Carry-over effects between periods may affect estimates of both. Objectives were to measure (1) the effects on milk production and composition and (2) carry-over effects of commercially available methionine supplements (RP-Met). A basal TMR, with 1.87% Met as % of MP was fed to all cows. Dietary treatments consisted of 0 g of RP-Met (C), 12 g of Smartamine (S), 6 g of Mepron (M6) and 12 g of Mepron (M12) to the TMR. Four squares of 4 cows were utilized. Periods were 12 days for diet adaptation and 2 days for data collection. Milk aliquots were taken to determine composition, reported as the average of 2 days. Statistical analysis was by proc GLM of SAS. Addition of RP-Met had no effect on any variable measured, but methionine flow was in excess as calculated by CPM and AminoCow models. Carry-over effects were observed only for S. For a treatment following S compared to following C, milk and lactose production were 2.49 and 0.14 kg less respectively (P<0.05). We conclude that carry-over effects may occur when using experiments with 2-week periods to evaluate RP-Met sources and that these carry-over effects need to be accounted for when evaluating experiments with RP-Met sources.

Table 1.

Variable	Treatments					
	C	S	M6	M12	SE	P<
Milk kg	33.5	33.6	34.0	33.7	0.47	0.85
Fat %	4.09	4.17	4.12	4.25	0.05	0.15
Fat kg	1.36	1.40	1.41	1.43	0.03	0.38
4FCM kg	33.8	34.4	34.8	34.9	0.57	0.54
Protein %	3.25	3.31	3.25	3.29	0.02	0.14
Protein kg	1.07	1.11	1.10	1.10	0.02	0.52

Key Words: Amino acids, Methionine, Milk protein

M222 Plasma lysine irreversible loss rate to determine the effect of treatment of soybean meal on lysine availability in dairy cattle. S. I. Borucki Castro*[1,2], H. Lapierre[2], L. E. Phillip[1], P. Jardon[3], and R. Berthiaume[2], [1]*McGill University*, *Ste Anne de Bellevue QC, Canada*, [2]*Agriculture and Agri-Food Canada, Dairy and Swine R&D Centre*, *Lennoxville QC, Canada*, [3]*West Central*, *Ralston IA*.

In an attempt to develop a non-invasive, accurate technique to determine the effect of treatment of soybean meal (SBM) on lysine (Lys) availability, the increment in plasma Lys irreversible loss rate (ILR) was compared with the increment in Lys intestinal flow and apparent digestibility. Four multiparous Holstein cows (173 DIM) with ruminal and duodenal cannulas were used in a 4 x 4 Latin square with 14-d periods. They were fed either solvent extracted SBM (SE), expeller SBM (EP) or lignosulfonate treated SBM (LS) as 23% of the diet. The fourth treatment (SE20) consisted in a 20 mmol/h omasal infusion of Lys to cows fed the SE diet. On the last day of each period, a pulse dose of [2-^{15} N] Lys was given in the jugular vein and jugular

plasma samples were collected at 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 16, 19, 25 and 31 min after the injection. Chromic oxide was included as an indigestible marker to asses DM flow and 8 separated digesta samples were collected on d 13 and 14 and pooled by period. The decay curve of ^{15} N Lys enrichment was explained by a two exponential equation. The plasma Lys ILR was not different (P>0.10) between the different SBM (84, 89 and 80 ± 3.9 mmol/h for SE, EP and LS, respectively). However, the SE20 treatment increased (P<0.04) Lys ILR to 104 mmol/h, i.e. exactly 20 mmol/h above the SE treatment. No differences were observed on duodenal Lys flow (213, 203 and 213± 11.9 g/d) or apparent intestinal digestion (79, 75 and 77 ± 1.8 %) between the SBM diets. Plasma Lys ILR was an accurate technique to estimate the increment of Lys availability, as it responded quantitatively to Lys infusion. Although the treatment of SBM should have increased Lys availability (NRC 2001), differences were too small or too variable to be detected. Further studies should be performed to test the sensitivity of this method, increasing the power of detection with larger amount of animals.

Key Words: Lysine, Irreversible loss rate, Soybean meal

M223 Effect of post-ruminal supplementation of amino acids on production performance of lactating dairy cows. T. Whyte*[1], A. Hayirli[1], H. Lapierre[2], and L. Doepel[1], [1]*University of Alberta*, *Edmonton, AB, Canada*, [2]*Agriculture and Agri-Food Canada, Dairy and Swine Research and Development Centre*, *Lennoxville, QC, Canada*.

Amino acids (AA) are classified as essential (EAA) or nonessential (NEAA), based on the ability of the animal to synthesize them or not. Despite this confusing nomenclature both types of AA are needed to synthesize milk protein. The objective of this experiment was to determine if *de novo* synthesis of NEAA limits milk and milk protein yields. Eight lactating cows (61 ± 4 DIM), 4 primiparous and 4 multiparous, were used in a replicated 4x4 Latin square balanced for residual effects. Samples were collected from the last 7 days of each 14-d period. The diet provided 87% of the net energy requirement and 75% of the metabolizable protein requirement (NRC, 2001). The effects of abomasal infusions of EAA and NEAA were tested in a factorial arrangement. The four treatments were 1) Ctl (water), 2) EAA (359 g/d), 3) NEAA (356 g/d) and 4) TAA (EAA + NEAA, 715 g/d), with the casein profile. Milk, protein and lactose yields and DMI were affected (P<0.05) by parity, with all parameters being lower in the primiparous than in the multiparous cows. Since there was no parity by treatment interaction the responses were averaged over the parities. Milk fat concentration and yield were not affected by treatment. Milk production and milk protein concentration and yield were increased by EAA infusions. Milk lactose content was lowest for the EAA treatments whereas lactose yield was highest. There were no effects of NEAA on the response variables monitored, nor was there an interaction between EAA and NEAA. These results indicate that NEAA supplementation is not beneficial, at least on a 14-d period, suggesting that NEAA synthesis does not limit milk and milk protein yields.

Table 1.

	Trt					*P* (Contrasts)		
	Ctl	EAA	NEAA	TAA	SEM	EAA	NEAA	EAAxNEAA
DMI, kg/d	16.6	16.9	16.6	16.7	0.6	0.26	0.85	0.40
Milk, kg/d	34.0	37.1	34.4	37.9	1.3	<0.01	0.37	0.74
Fat, %	2.96	2.90	3.00	2.64	0.23	0.07	0.33	0.18
Fat, g/d	989	1072	1013	995	78	0.38	0.49	0.18
Protein, %	2.83	2.97	2.81	3.03	0.05	<0.01	0.55	0.16
Protein, g/d	967	1104	966	1150	32	<0.01	0.34	0.31
Lactose, %	4.65	4.55	4.69	4.60	0.06	<0.01	0.14	0.87
Lactose, g/d	1583	1691	1609	1744	51	<0.01	0.18	0.63

Key Words: Amino acid supplementation, Milk production

M224 Metabolizable essential amino acids in mature ewes fed limited amounts of beet pulp. B. W. Hess*[1], P. W. Nathanielsz[2], and S. P. Ford[1], [1]*University of Wyoming*, *Laramie*, [2]*University of Texas Health Sciences Center*, *San Antonio*.

Eleven mature Western white-face ewes fitted with ruminal, duodenal, and ileal cannulae were used to determine the effects of OM intake on supply of metabolizable essential AA and concentrations of plasma AA and urea-N. Ewes were assigned randomly to be fed beet pulp OM at various levels of NE_mm requirements (OM intake ranged from 200 to 844 g/d). Titanium dioxide was dosed intraruminally twice daily. After a 14-d adaptation to diets, intestinal digesta was collected in a manner which represented every 2 h in a theoretical 24-h timeframe. Simple linear regression was used to assess responses to amount of OM intake. Apparent ruminal OM digestibility (51.9 ± 11.3%) was not affected ($P = 0.60$) by amount of OM consumed. Except for phenylalanine ($P = 0.03$) and tryptrophan ($P = 0.02$), profile of essential AA disappearing from the small intestine did not differ ($P = 0.14$ to 0.97) among various amounts of OM intake. Intestinal disappearance of arginine ($P = 0.36$), histidine ($P = 0.88$), lysine ($P = 0.74$), and tryptophan ($P = 0.77$) was not a simple function of OM intake, whereas OM intake could be used to predict ($P < 0.001$) intestinal disappearance of methionine, threonine, valine, isoleucine, leucine, and phenylalanine. Intestinal disappearance of total essential AA could be predicted ($P < 0.001$) using OM intake as the dependent variable, where metabolizable essential AA, g/d = 0.0365 g/d OM intake + 1.941 g/d ($r^2 = 0.87$). Plasma AA concentrations did not differ ($P = 0.09$ to 0.99) across level of OM intake, but increased ($P < 0.006$) plasma urea-N as amount of OM intake decreased indicated that tissue AA were used to maintain plasma AA concentrations. A simple linear regression equation can be used to predict metabolizable essential AA supply in mature ewes fed limited amounts of OM.

Key Words: Amino acids, Intake, Sheep

M225 Metabolizable essential amino acids in mature ewes fed limited amounts of beet pulp and supplementary ruminally undegradable protein. B. W. Hess*[1], P. W. Nathanielsz[2], and S. P. Ford[1], [1]*University of Wyoming*, *Laramie*, [2]*University of Texas Health Sciences Center*, *San Antonio, TX*.

Seven mature Western white-face ewes fitted with ruminal, duodenal, and ileal cannulae were used in a randomized incomplete block designed experiment to determine if supplemental ruminally undegradable intake protein could be used to maintain supply of metabolizable essential AA when mature sheep consume limited amounts of OM.

Ewes were stratified by BW and assigned randomly to be fed beet pulp OM at either 50 or 100% of NE_m requirements. Ewes assigned to 50% of NE_m requirements were fed a protein supplement (6.8% porcine blood meal, 24.5% hydrolyzed feather meal, and 68.7% menhaden fish meal; DM basis) designed to provide quantities of metabolizable essential AA equal to that of ewes fed 100% of NE_m requirements. Amount of supplement was formulated using tabular estimates of metabolizable AA or adjusted for more extensive ruminal degradation in ruminants consuming limited amounts of OM. Titanium dioxide was dosed intraruminally twice daily. After a 14-d adaptation to diets, intestinal digesta was collected in a manner which represented every 2 h in a theoretical 24-h timeframe. Although flow of isoleucine (P = 0.09) and methionine (P = 0.10) to the duodenum tended be less in ewes fed beet pulp at 50% of NE_m and supplementary protein, duodenal flow of total essential AA did not differ (P = 0.23) among dietary treatments. Likewise, intestinal disappearance of individual (P = 0.19 to 0.89) and total (P = 0.74) essential AA did not differ among dietary treatments. Although ewes fed beet pulp at 100% of NE_m requirements tended to have greater (P = 0.06) amounts of CP reaching the duodenum, supply of metabolizable amino acids (P = 0.40) and protein (P = 0.26) did not differ among dietary treatments. Therefore, provision of supplementary ruminally undegradable protein can be used to maintain supply of metabolizable AA in mature ewes fed limited amounts of OM.

Key Words: Amino acids, Intake, Sheep

M226 An *in-silico* comparison of nitrogen fraction parameter estimates derived from data in the 1996 Beef NRC and 2001 Dairy NRC feed libraries. M. Barry*, *AgModels, LLC*, *Tully, NY*.

Nitrogen fractionation and kinetic behavior of 25 feedstuffs common to the 1996 Beef and 2001 Dairy NRC feed libraries were compared. There was a close agreement between feed libraries for gross nitrogen (crude protein) content (r = 0.997; concordance coefficient = 0.997). However, a lower agreement was found for calculated rumen-degradable protein (RDP) and rumen-undegradable protein (RUP) values using respective library parameters at a standardized passage rate of 0.040 h^{-1} (r = 0.767; concordance coefficient = 0.708). Both systems use a first-order competition between passage and degradation to estimate extent of ruminal digestion, but they differ in the number of nitrogenous fractions included. The 3-pool (A, B and C) model used by the Dairy NRC is simpler to parameterize, but changes in chemical composition are not reflected in pool sizes. In contrast, the 5-pool model (A, B1, B2, B3 and C) used by the Beef NRC attempts to relate each fraction to specific analytical entities, but it is more difficult to estimate kinetic parameters using this model. A simulation representing the simultaneous competition between ruminal passage and degradation of nitrogenous fractions was constructed for each model across a range of physiologically likely passage rates. A least squares approach using the standard solver function of Microsoft Excel 2003 was then applied to fit parameters for the 3-pool model to match the response curves of the 5-pool model across the various passage rates for that feed. For all feeds, a solution was obtained and parameter values thus estimated for the 3-pool model that yield the same RDP/RUP values as the original 5-pool model (r > 0.999; concordance coefficient > 0.999). A 5-pool model provided no better sensitivity with respect to variable passage rates than did a fitted 3-pool model when estimating RDP/RUP. However, the 5-pool model does allow for field adjustments due to variation in chemical composition. This approach permits more direct animal model comparisons to be made by providing a method to reduce inherent bias present between the two feed libraries.

Key Words: Protein, Kinetics, Parameterization

M227 Milk odd and branched chain fatty acids in relation to rumen protein digestion. T. Van Nespen[1], W. van Straalen[2], and V. Fievez*[1], [1]*Laboratory for Animal Nutrition and Animal Product Quality, Ghent University*, *Melle, Belgium*, [2]*Schothorst Feed Research*, *Lelystad, The Netherlands*.

In this study we investigated changes in rumen fermentation characteristics and milk odd and branched chain fatty acids (OBCFA, expressed relative to their sum) and their mutual correlation by feeding early lactation cows varying proportions of quickly fermentable carbohydrates with or without buffer supplementation. The experiment was according to 4 x 4 Latin square design with four rumen fistulated cows, but results reported here were limited to three diets, consisting of 12 kg DM grass:maize silage (50:50 on DM basis) and 5.5 kg DM of concentrates. The concentrate of the control diet (C) contained 100 g starch/kg DM, the glucogenic diet (G) 333 g starch/kg DM and the glucogenic diet with buffer (B) 333 g starch/kg DM and a daily dose of 250 g of NaHCO3. Rumen (2, 4, 6, 8, 10 and 12h after morning feeding) and pooled morning and evening milk samples were taken after two weeks of adaptation on three sampling days of the experimental week. Rumen concentrations of total and dominant volatile fatty acids or rumen pH showed no significant differences according to the diets fed. Feeding glucogenic diets significantly reduced rumen NH3 concentrations [83.1 (C) vs. 59.9 (G) and 64.9 (B); mg NH3-N/l]. The diet with buffer showed higher rumen concentrations (mmol/l) of valeric [2.16 (B) vs. 1.79 (C) and 1.81 (G)] and isovaleric acid [1.51 (B) vs. 1.14 (C)]. Milk fat of cows fed the glucogenic diets (either G or B) showed higher values of iso C17:0 and lower values of iso C14:0, anteiso C15:0 and anteiso C17:0. The glucogenic diet with buffer induced significantly higher amounts of iso C13:0 and anteiso C13:0 in the milk. Iso C14:0 was negatively and anteiso C17:0 positively correlated with the rumen NH3-N concentration (rPearson: -0.475 and 0.433, respectively, n = 36; P<0.05). These findings might be related to a more asynchronous protein feeding by diet C, confirming earlier hypotheses, which suggests that milk OBCFA can indicate irregularities in the rumen digestion.

Key Words: Dairy nutrition, Odd and branched chain fatty acids, Synchronization

M228 Effects of reducing rumimally degradable protein in the diets of lactating dairy cows. J. Cyriac*, A. G. Rius, M. L. McGilliard, and M. D. Hanigan, *Virginia Polytechnic Institute and State University*, *Blacksburg*.

This study was conducted to determine the effect of reducing ruminally degradable protein (RDP) with constant ruminally undegradable protein in mid-lactation dairy cow diets on feed intake, milk production, milk composition, feed efficiency and body condition score. Forty mid-lactation Holstein (36) and Jersey by Holstein cross-bred (4) cows were randomly assigned to one of four dietary treatments. Diets were fed as total mixed rations. A common diet of 18.4% crude protein (CP) was fed from day 1 to 28. From day 29 through 47, cows were fed diets with formulated CP contents of 18, 16.8, 15.7, or 14.5% with formulated RDP contents of 11.3, 10.4, 8.5 and 7.6% of dry matter, respectively. Cows were transitioned to lower CP diets over a period of 3 d. Feed intake, milk yield and body weight were measured daily. Milk composition was measured for 3 d in each of weeks 3 and 7. Body condition was scored by two individuals at the end of the 3rd and 7th weeks. Blood was collected from the coccygeal vessel on two days in weeks 3 and 7 for metabolite analyses. Individual forage samples, grain mixtures and total mixed rations were sampled weekly. The Proc Mixed procedure of SAS was used to analyze the data using a repeated

measures model. Second period milk yields were observed to be 41.2, 42.1, 40.3, and 36.6 kg/d as dietary CP decreased from 18 to 14.5% with the lowest CP diet trending towards significance. No treatment effects were observed for body weight or milk fat, protein, or lactose content. Milk urea nitrogen decreased linearly as the CP content of the diets declined averaging 20.2, 17.6, 14.3, and 12.4 mg/dl, respectively, for diets of 18 to 14.5% CP. These results suggest that mid-lactation dairy cows can be fed diets with RDP contents as low as 8.5% of dry matter, which is less than that recommended by NRC (2001). This indicates that current NRC RDP requirements may be overstated.

Key Words: Dairy cow, Ruminally degradable protein, Milk production

M229 Evaluation of Biuret as a slowly degradable non-protein nitrogen source for lactating dairy cows. K. J. Daniels, P. H. Doane*, N. A. Pyatt, and M. J. Cecava, *ADM Animal Nutrition Research, Decatur, IN*.

Our objective was to examine if Biuret (ADM Alliance Nutrition, Inc., Quincy, IL) is a suitable replacement for ruminally degradable true protein in dairy lactation diets. Lactating Holstein cows (n=237) were divided into three groups balanced based upon parity, stage of lactation (DIM), and mean milk production measured one week before the co-variant adjustment period. The standard lactation ration served as the control ration (CT). A 2-week co-variant adjustment period in which CT was fed was followed by a 28-day test period during which cows received diets containing 0, 45 (LO), or 77 (HI) g/cow/day of Biuret. Biuret replaced an equivalent amount of soybean meal-nitrogen in the diet. Urea and total crude protein of diets were similar among diets. Estimated bypass protein content of diets decreased and non-fiber carbohydrate increased with addition of Biuret. Data was analyzed using the Proc Mixed procedure of SAS for a repeated measures, completely randomized design. Milk yield and components were co-variant adjusted using data collected in the pre-test period. Substitution of Biuret for ruminally degradable true protein did not affect milk yield (P>0.10). Dry matter intake linearly decreased (P<0.05) with Biuret feeding. Efficiency of milk yield (milk/feed DMI) improved when Biuret was fed. The HI treatment decreased (P<0.05) daily milk fat yield (1371, 1374, 1305 g for CT, LO and HI, respectively) and decreased (P<0.05) milk lactose percentage (4.86%, 4.85%, 4.82% for CT, LO and HI, respectively). Data were parsed into high and low production groups based on pre-study median performance to examine treatment effects of Biuret on milk yield and composition. Milk composition of lower-producing cows was affected by Biuret whereas milk yield was more responsive to Biuret in higher-producing cows. For all cows, MUN levels increased with Biuret feeding. Milk urea nitrogen may be an appropriate tracking variable to evaluate efficiency of nitrogen use when slowly degradable NPN sources, such as Biuret, are fed to lactating dairy cows. In lactating cow diets balanced for RDP and RUP, Biuret was an effective substitute for ruminally degradable true protein.

Key Words: Biuret, NPN, RDP

M230 Effect of RDP source on ruminal digestion in lactating dairy cows. S. M. Reynal*, G. A. Broderick, and J. Leibovich, *US Dairy Forage Research Center, Madison, WI*.

Eight lactating dairy cows fitted with ruminal cannulas and averaging 116 DIM were assigned to two 4 x 4 Latin squares to determine the effect of feeding diets differing in the proportions of RDP coming from urea and non-urea sources on apparent ruminal digestion of nutrients. Diets contained (DM basis) 15% alfalfa silage, 40% corn silage, 29 to 27% high-moisture corn, and 16 to 18% concentrate mix. The RDP from soybean meal (SSBM) was replaced with RDP from urea by changing the proportions of concentrates (DM basis) in diets A to D in equal increments as follows: ground shelled corn, from 0 to 6.3%; SSBM, from 14 to 0%; lignosulfonate-treated SBM, from 0 to 8.0%, and urea, from 0 to 1.2%. Diets contained on a DM basis 16.1% CP, 10.5% RDP, 5.6%RUP, 26% NDF, and 1.58 Mcal of NEl/kg. Data were analyzed using the Proc Mixed procedure of SAS. Omasal flows of N decreased linearly while rumen ammonia concentrations increased linearly with increasing addition of urea to the diets, suggesting a lesser utilization of dietary urea-N by microbes. Replacing RDP from SSBM with RDP from urea depressed OM intake and N flows from the rumen in lactating dairy cows.

Table 1.

Diets	A	B	C	D	SE	Linear	Quadratic
Urea, % of DM	0	0.4	0.8	1.2			
OM							
Intake, kg/d	21.0	19.7	20.4	19.2	0.6	0.02	0.84
Digestibility, %	40.4	41.5	40.4	41.1	2.2	0.90	0.90
NDF							
Intake, kg/d	5.54	5.52	5.95	5.46	0.22	0.80	0.12
Digestibility, %	32.5	40.6	36.0	35.4	2.8	0.72	0.09
ADF							
Intake, kg/d	3.18	3.12	3.36	2.97	0.14	0.40	0.09
Digestibility, %	36.5	43.7	40.9	39.6	2.9	0.57	0.10
Total N							
Intake, g/d	569	545	561	534	18	0.09	0.90
Flow, g/d	603	559	573	508	27	<0.01	0.52
Rumen NH_3-N, mg/dl	8.2	9.3	10.3	10.8	0.86	<0.01	0.52

Key Words: Rumen-degraded protein, Urea, Digestibility

M231 Effects of replacement of animal protein with soy protein in lactating Holstein cows. A. Garcia*[1], P. W. Jardon[2], and R. A. Patton[3], [1]*Instituto Tecnologico y de Estudios Superiores de Monterrey, Queretaro, Mexico*, [2]*West Central, Ralston, IA*, [3]*Nittany Dairy Nutrition, Inc., Mifflinburg, PA*.

Animal proteins are regarded as superior amino acid sources for dairy cattle. However, soy protein has an amino acid composition more like rumen bacteria and thus may be equal or superior to animal protein. To test this, we fed diets supplemented with either fishmeal plus commercial animal protein blends (AP) or soy protein as SoyPLUS® (SP). Diets were formulated to be 16.8% CP with high RUP (~39% of CP) to force greater dependence on amino acids from RUP. Diets were equal in amount of metabolizable protein by NRC model. Eighty cows (39 multiparous and 41 primiparous) were divided by production, days in milk and parity into two groups in a switch over design of two 3-week periods. Lactational performance was assessed on the last two days of each period. Statistical inference was by Proc Mixed of SAS and the model included terms for diet, parity, stage of lactation and period. There were no statistical differences due to dietary treatment. First lactation cows produced more milk than older cows but neither period nor stage had a significant effect on performance. In early lactation, when protein was at a premium, MUN was significantly higher (P<.01) compared to mid or late lactation (20.8, 15.6 and 12.3 mg-dl-1, respectively.) We conclude that soy protein may be substituted for animal protein without loss of production and that this substitution should be made solely on the basis of ingredient cost.

Table 1.

Variable	AP	SP	SE	P<
Milk kg	38.8	39.0	1.00	0.73
Fat %	3.38	3.26	0.09	0.18
Fat kg	1.29	1.27	0.04	0.43
Protein %	3.12	3.06	0.04	0.27
Protein kg	1.21	1.19	0.03	0.48
Lactose %	4.81	4.75	0.05	0.37
Lactose kg	1.87	1.86	0.05	0.71
MUN mg/dl	16.1	16.4	0.71	0.41

Key Words: RUP, Amino acids

M232 Effect of dietary protein levels on milk production and nitrogen efficiency in dairy cattle. M. Baik*[1], J. R. Aschenbach[2], M. J. VandeHaar[3], and J. S. Liesman[3], [1]*Chonnam National University, Gwangju, South Korea*, [2]*Institute of Veterinary Physiology Leipzig University, Leipzig, Germany*, [3]*Michigan State University, East Lansing*.

Efficiency of nitrogen use in lactating dairy cows is 25 to 30%, and much of the waste nitrogen is converted to ammonia, an emerging environmental hazard. Twelve lactating multiparous cows between 100 and 200 days postpartum were randomly assigned to a treatment sequence in four - 3x3 Latin Squares balanced for carryover effects and with 10 d periods. Treatments were 3 rations with crude protein (CP) levels at 19%, 15% and 11%. Rations were fed ad libitum and contained corn and alfalfa silage, with CP being adjusted by varying soybean meal and corn grain. Milk production, milk components, and DMI were recorded the last 3 days of a period. Approximately 200 mg of liver and mammary tissues were biopsied on the last day of each period; gene expression is being examined in these tissues. Statistical analysis was by proc GLM of SAS. Results for treatments are below. There were no significant carryover effects. Feeding 11% CP for 10 d reduced milk yield 15%, and, as expected, dramatically increased the gross efficiency of feed N use. This may not have been a sustainable metabolic adaptation but should result in some measurable changes in the expression of genes involved in metabolism and metabolic regulation.

Table 1.

Items	11% CP	15% CP	19% CP	SE	P Linear	P Quadratic
Milk (kg/d)	34.1	40.1	40.6	0.8	0.0001	0.016
Fat (kg/d)	1.29	1.46	1.53	0.04	0.0002	0.28
Protein (kg/d)	0.99	1.20	1.24	0.02	0.0001	0.0026
Fat%	3.83	3.66	3.80	0.06	0.75	0.087
Protein%	2.93	3.02	3.07	0.03	0.011	0.73
DMI (kg/d)	48.6	52.4	51.2	0.9	0.068	0.052
Milk N/Feed N (%)	40.4	33.1	27.4	0.7	0.0001	0.35
MUN (mg/dL)	6.3	10.7	18.4	0.4	0.0001	0.012

Key Words: Protein levels, Nitrogen efficiency, Dairy cattle

M233 Optimal nutrient intake and digestion for ruminal microbial protein and milk yields in lactating dairy cows. S. M. Reynal* and G. A. Broderick, *US Dairy Forage Research Center*, *Madison, WI*.

Individual-cow data from six in-vivo experiments (248 observations) conducted in our laboratory were used to study the response of microbial nonammonia nitrogen flow (MNAN) from the rumen and milk yield (MY) of lactating dairy cows to several dietary and digestion factors. Diets were based on high-moisture corn, corn silage, and legume silage (mainly alfalfa) and ranged from 13.5 to 20.3% CP (mean = 17.4%), from 43 to 55% NFC (mean = 49%), and from 22 to 30% NDF (mean = 25%). Urea, heated and unheated soybean meal, corn gluten meal, blood meal, canola meal, and cottonseed meal were used as protein supplements. Cows averaged 113 days in milk, consumed between 14 and 34 kg of DMI/d (mean = 23 kg/d), and produced between 14 and 55 kg milk/d (mean = 36 kg/d). Digestion variables were measured in vivo using the omasal sampling technique and total purines (1 study) and ^{15}N (5 studies) as microbial markers. Data were analyzed using ProcMixed in SAS following the meta-analysis approach of St. Pierre et al. (J. Dairy Sci. 84:741) with study considered as random in the models. Response variables evaluated were OM truly digested in the rumen (OMTDR), rumen-degraded (RDP) and rumen-undegraded (RUP) protein, DM intake (DMI), N intake, dietary CP content, and ruminal fiber digestibility. MNAN was evaluated as a response variable for MY. The equation for MNAN was:

MNAN, g/d = 36 (SE=82; P=0.68) + 32 RDP (% of DM; SE=12; P<0.01) - 0.8 RDP^2 (% of DM; SE=0.43; P=0.06) + 0.57 $OMTDR^2$ (kg/d; SE=0.06; P<0.01)

The equation for MY was:

MY, kg/d = -8.3 (SE=7.8; P=0.34) + 1.18 RUP (% of DM; SE=0.26; P<0.01) + 0.29 DMI (kg/d; SE=0.13; P<0.05) + 0.115 MNAN (g/d; SE=0.030; P<0.01) - 0.0001 $MNAN^2$ (g/d; SE=0.00004; P<0.01)

Quadratic maxima for MY was at 573 g of MNAN. Milk yield responses to RUP supplementation (slope = 1.18) were substantially smaller than those predicted by the NRC (2001; slope = 1.85). For this data set, maximum MNAN was achieved at a dietary RDP level (20% of DM) that may result in inefficient N utilization and high N losses to the environment.

Key Words: Meta-analysis, Microbial protein, Milk yield

M234 Effect of dietary energy and protein level on dry matter intake, body weight changes and milk yield of Holstein cows in transition period. R. Lopez*[1], D. Gomez-Perez[1], J. G. Garcia-Muniz[1], G. D. Mendoza[2], and A. Lara[3], [1]*Universidad Autonoma Chapingo, Chapingo, Estado de Mexico, Mexico*, [2]*Colegio de Postgraduados, Montecillo. Texcoco. Edo. de Mexico, Mexico*, [3]*Cooperativa Agropecuaria y Forestal Chapingo S. C. de R. L., Chapingo, Edo. de México, Mexico*.

The objective was to study the effect of increasing dietary NEL (Mcal/d) and CP (%) levels on BW (kg), DMI (kg), and ADG (kg/d) in the dry-off period, and its influence on BW, DMI, NEL intake, milk yield (MY, kg), MY efficiency and reproductive traits during 105 DIM. Thirty Holstein cows (BW = 703.4 \plusmn; 16.4 kg; eight weeks before expected calving) were stratified by BW and randomly assigned to one of three treatments. During the dry-off period, cows were individually fed with one of three diets containing 1.46 and 16.9, 1.58 and 18.7, or 1.83 and 19.3 Mcal/kg and % CP, respectively, for the low, medium and high diets. After calving, cows were fed 1.46 and 16.9, 1.77 and 1.92, or 2.10 and 19.5 Mcal/kg and % CP, respectively, for the low, medium and high diets. Results were analyzed using mixed procedures for repeated measures. The model included treatment, week and the interaction of treatment x week. Reproductive traits were analyzed using mixed procedures in a CRD with treatment as a main effect. No differences on BW were observed during the dry period, except cows fed high and low diets showed higher ADG than those fed

medium diets. Cows had similar (P > 0.05) DMI from week -7 through week -4 before calving; conversely, DMI from week -3 through calving was higher for cows on the high diet. Pospartum cows fed high and medium diets were heavier than those fed low diets, whereas no treatment effect (P > 0.05) was observed for ADG. Cows on the high level diet had higher DMI than the medium and low diet cows. A interaction treatment x week (P < 0.05) indicates differences in MY among treatments; on average, MY of cows fed the high diet was 7.0 and 15.3 kg higher than those fed on the medium or low diets, respectively. In contrast, calves BW at birth, days to first estrous, days open and service per conception were similar among treatments groups. In conclusion, increasing dietary levels of ENL and CP during the dry period increased DMI, BW, and ADG. Likewise, in pospartum period, increasing the levels of ENL and CP were associated with increased DMI, BW changes, and MY.

Key Words: Energy, Protein, Transition cow

Ruminant Nutrition: Non-fibrous Carbohydrate and By-Product Feedstuffs

M235 Altering structural to non-structural carbohydrate ratio in the diet of transition dairy cows grazing pasture did not affect subsequent health or production. J. R. Roche*, *Dexcel*, *Hamilton, New Zealand*.

Due to increasing glucose requirements precalving, it was hypothesized that altering the dietary structural to non-structural carbohydrate content to increase gluconeogenesis would reduce precalving mobilization of body tissue and improve subsequent milk production. Sixty-eight multiparous dairy cows were randomly allocated to one of two diets for 36 ± 8.7 d precalving. All cows were fed pasture and pasture-silage precalving, with one group also receiving 3kg DM/d of a barley-maize concentrate (30% DMI). Precalving diets were iso-energetic (114 MJ ME/cow/d). At calving, cows in both precalving feeding treatments were allocated in a completely randomized design to two dietary treatments for 35 d in a 2x2 factorial arrangement. Postcalving, all cows received pasture and pasture silage with one group also receiving 5.0 kg DM/d of a barley-maize concentrate (35% DMI). Postcalving diets were also iso-energetic (179 MJ ME/cow/d). Daily FCM (26.0 kg/cow/d) was not affected by either pre- or postcalving concentrate supplementation, although protein to fat ratio was higher in cows supplemented postcalving. Similarly, concentrate supplementation pre- or postcalving did not affect either BW or BCS change before or after calving. Cows receiving concentrates precalving had slightly higher (P<0.001) plasma NEFA concentrations, but otherwise were not different to those receiving an equivalent energy intake from pasture and pasture silage. Postcalving concentrate supplementation increased (P<0.01)plasma glucose and NEFA, decreased (P<0.001) plasma BHBA. Results suggest little effect on milk production by replacing energy from structural carbohydrates in high quality pasture with energy from non-structural carbohydrate during the transition period.

Table 1.

Variable	Precalving Past	Precalving Conc	Postcalving Past	Postcalving Conc	SED	P- value Pre	P- value Post
FCM, kg/d	26.2	25.8	26.3	25.6	0.75	0.68	0.39
Fat,%	4.67	4.72	4.99	4.40	0.091	0.57	<0.001
Protein, %	3.48	3.53	3.48	3.53	0.048	0.31	0.30
BCS change precalving	0.02	0.06			0.043	0.39	
BCS change postcalving	-0.11	-0.11	-0.09	-0.13	0.029	0.99	0.20

Key Words: Structural to nonstructural carbohydrate ratio, Pasture, Transition dairy cow

M236 The feeding value of corn distillers solubles for lactating dairy cows. A. K. Sasikala-Appukuttan*[1], D. J. Schingoethe[1], A. R. Hippen[1], K. F. Kalscheur[1], K. Karges[2], and M. L. Gibson[2], [1]*South Dakota State University*, *Brookings*, [2]*Dakota Gold Research Association*, *Sioux Falls, SD*.

Fifteen Holstein cows (10 multiparous and 5 primiparous) in midlactation (79.3 ± 9.2, DIM) were used in a replicated 5 x 5 Latin square design with 4-wk periods to evaluate and compare the use of condensed corn distillers solubles (CCDS) and dried distillers grains with solubles (DDGS) in the total mixed ration. The forage portion of the diets was kept constant at 27.5% corn silage and 27.5% alfalfa hay (DM basis). Diets were: 1) 0% distillers grains products (control), 2) 18.5% DDGS, 3) 10% CCDS, and 4) 20% CCDS, and 5) 18.5% DDGS with 10% CCDS. Diets 2 and 3 contained 2% added fat while diet 4 and 5 contained 4% added fat from the distillers byproducts. The diets were balanced to provide 17% CP. Mixed model procedure of SAS was performed and the statistical model was y = treatment + parity + period with cow (parity) being random. Milk yield tended (P < 0.10) to be greater for diets 2 to 5 than for diet 1. Fat and protein concentration and yields were similar (P > 0.10) for all diets. Dry matter intake, energy-corrected milk and feed efficiency, defined as ECM/DMI, were similar (P > 0.10) across diets. Milk urea nitrogen was greatest (P < 0.01) for cows fed diet 1. Ruminal acetate decreased (P < 0.01) and propionate increased (P < 0.01) when fed CCDS and DDGS. The results showed that CCDS is as effective as DDGS in replacing soybean meal and corn grain in the total mixed ration.

Table 1.

Item	Diet 1	2	3	4	5	SEM
DMI, kg/d	21.4	22.0	20.9	21.3	21.9	1.53
Milk, kg/d	33.8	36.2	35.5	36.0	36.0	1.86
ECM, kg/d	31.0	32.4	32.3	32.8	32.7	1.67
Fat, %	2.96	2.84	2.93	2.93	2.86	0.09
Fat, kg/d	1.00	1.01	1.03	1.05	1.04	0.06
TP, %	2.92	2.88	2.87	2.88	2.90	0.05
TP, kg/d	0.99	1.03	1.01	1.03	1.04	0.05
FE	1.55	1.60	1.62	1.59	1.55	0.12
MUN, mg/dL	15.0	10.9	11.1	11.0	11.4	1.31
Ruminal VFA						
-Acetic, %	65.6	64.6	62.6	61.1	61.4	0.97
-Propionate, %	19.9	22.0	22.1	22.3	22.6	0.95

Key Words: Condensed corn distillers solubles, Dried distillers grains with solubles, Dairy cattle