rumen microbes and for manipulation of diets to reduce the production of odorous compounds. SPME-based approach could serve as a novel technique for the development of an alternative method for characterization of ruminal fermentation end products, and effects of important variables on their kinetics. Characterization of rumen gases that were not detectable or previously not of interest may open new approaches and applications related to animal (and perhaps in the future human) metabolism.

Key Words: Detection, Ruminal gases, Gas chromatography - mass spectrometry

734 Inhibition of methanogenesis in Methanobrevibacter (Mbr.) smithii cultures and ruminal cultures by p-aminobenzoate (pABA) analogs. B. A. DeMontigny*, R. Dumitru, S. Schroeder, H. Palencia, S. W. Ragsdale, J. M. Takacs, and J. L. Miner, [1]*University of Nebraska-Lincoln.*

Ruminal methane production causes a loss of 2 to12% of feed gross energy during digestion. Methane is a greenhouse gas and livestock account for 17% of total methane emissions. Inhibition of ruminal methanogenesis could both increase feed efficiency and mitigate global warming. Methanogenic archaea use a unique pathway to synthesize methane. The enzyme, 4-(β-D-ribofuranosyl) aminobenzene 5'-phosphate synthetase is a promising target for inhibition. A natural substrate of this enzyme is pABA. We hypothesize that analogs of pABA could inhibit methane production in mixed rumen cultures and pure cultures of Mbr. smithii. Methanogenesis assays were conducted in 30-hour, 4-ml anaerobic incubations of bovine rumen fluid in buffer containing trypticase, cellobiose and trace nutrients, with 5.4 ml of headspace pressurized (190 kPa) with H_2/CO_2 (80:20). Headspace methane was quantified by gas chromatography (GC) using a silica gel column, thermal conductivity detection (TCD), and adjustment for headspace pressure, and VFA analyses were completed by GC. Three pABA analogs were included in the cultures from 0 mM to 10 mM. Five mM 4-ethylamino-benzoate (EB), 9 mM 4-isopropylamino-benzoate (IB), and 6mM 4-(2-hydroxy-ethylamino)-benzoate (HEB) each completely inhibited methane production. Eight mM IB enhanced ($P < 0.02$) total VFA production but EB and HEB did not. To determine if these pABA analogs inhibit growth of methanogenic archae as well as inhibit methane synthesis, we grew pure cultures of Mbr. smithii, media included EB, IB, or HEB at 0, 1 and 10mM. Absorbance was measured two times daily for one week via spectrophotometry. After 117 hours, headspace samples were analyzed for methane content. At 10mM, all three compounds completely ($P < 0.01$) inhibited methane production and cell growth. One mM EB and IB each delayed ($P < 0.01$) the growth curve of Mbr. smithii >20hours. We conclude that these pABA analogs inhibit methane production as well as the growth of methanogenic archaea.

Key Words: Mbr. smithii, rumen, methane

735 Modeling starch digestion in the rumen: a comparative approach. A. Offner*[1], A. Bach[2], and D. Sauvant[1], [1]*INA P-G INRA, Paris, France,* [2]*Agribrands, Barcelona, Spain.*

Digestibility of starch in the rumen (**dR**, %) is highly variable. This study was conducted to evaluate and compare three different rumen models (Lescoat and Sauvant **LE**, 1995; Molly **MO**, 1999; CNCPS **CO**, 2001) on their ability to predict the partitioning of starch digestion. To perform this study, an independent dataset with complete data on animal characteristics, rations and starch digestibility was built: 31 references (110 treatments) on dairy cows were pooled. Starch content in the experimental diets ranged from 12.1 to 54.7 % of DM (average starch = 30.1 ± 8.6) and the observed dR ranged from 27.2 to 96.7 % (dR = 65.2 ± 16.2). One single library with complete feed model inputs was created for the 43 feedstuffs used in the references. Thus, the comparative simulations were based on identical inputs. The results were evaluated and compared among models and with observed values. Three parameters were used to estimate the accuracy of dR predictions: the coefficient of determination (R^2), the residual standard deviation (rsd, %) and the slope (b). The values were respectively of 0.26, 13.9 % and 0.98 for CO and 0.22, 14.3 % and 0.59 for LE. The regression with MO was not significant. MO tended to underestimate dR (dR_{MO}, % = 62.3 ± 9.7) whereas starch digestibility was rather overpredicted in CO and LE. Statistical analyses were also conducted within references, the parameter values were then of 0.78, 8.8 % and 1.02 for MO, 0.89, 6.1 % and 1.24 for CO and 0.90, 6.0 % and 0.71 for LE. Generally, variations in starch digestibility were poorly predicted by MO but were predicted satisfactorily in LE and CO. LE, which is based on *in situ* values, appeared to be the most accurate model, especially when the experiments with large normalized residuals were removed. This result supports our current work dealing with the development of another model of ruminal starch digestion based on *in situ* data and adjusted with *in vivo* observations.

Key Words: Rumen, Modeling, Starch digestion

Ruminant Nutrition
Transition Cow

736 Metabolic nutrients for transition dairy cows. D. P. Casper*[1], G. Wernet[2], and G. B. Ayangbile, [1]*Agri-King, Inc., Fulton, IL,* [2]*Purdue University, West Lafayette, IN.*

Deficiencies in critical nutrients required for metabolic pathways can lead to metabolic complications during the transition period. The high nutrient requirements for the initiation of lactation, in combination with a reduction in dry matter intake prior to calving, could lead to several possible nutrients becoming deficient. These nutrients were formulated into a pack (PK) consisting of niacin, methionine, rumen protected choline, and several B-vitamins along with yucca. This PK was evaluated during the transition period (3 wk prior and 4 wk after calving) using 26 dry pregnant Holstein cows randomly assigned to one of two treatments. All cows were fed a TMR, prior to calving, consisting of (DM basis) 22.9% corn silage, 9.8% haylage, 18.1% alfalfa hay, 14.9% high moisture corn and 34.3% protein supplement, minerals, and vitamins. After calving, a TMR was fed consisting of 9.8% corn silage, 16.6% haylage, 8.8% alfalfa hay, 29.8% high moisture corn and 35.0% protein supplement, minerals, and vitamins. The treatments were the control (C) TMR and TMR containing the PK at .11 kg/hd/d. During the Pre-Calving period, BW (681.2 and 718.1 kg), BW gain (10.0 and 12.7 kg), dry matter intake (10.1 and 10.5 kg/d), and concentrations of blood glucose (47.7 and 44.3 mg/dl) and non-esterified fatty acids (.53 and .69 meq/l) were similar (P>.10) for cows fed C and PK, respectively. During the Post-Calving period, BW (575.1 and 592.1 kg), BW loss (-42.9 and -27.4 kg), and dry matter intake (14.6 and 13.3 kg/d) were similar (P>.10) for cows fed both C and PK. Yields of milk (29.2 and 27.4 kg/d), 4% FCM (32.2 and 29.0 kg/d) and solids-corrected milk (27.3 and 24.3 kg/d) were similar (P>.10) for cows fed both C and PK. Percentages of fat (4.71 and 4.62%), protein (2.91 and 2.74%), lactose (4.61 and 4.54%), and total solids (13.13 and 12.80%) were similar (P>.10) for cows fed C and PK. Concentrations of blood glucose (36.7 and 30.2 mg/dl) and non-esterified fatty acids (.51 and .75 meq/l) were similar (P>.11) for cows fed C and PK. Under the conditions of this study it was demonstrated additional nutrients supplied by the PK were not required for optimal performance during the transition period.

Key Words: Choline, Nutrients, Transition cows

737 Effect of timing of sample collection and sample handling on urine pH of close-up dry Holstein dairy cows. P. W. Jardon*, *West Central Soy.*

The objective of this study was to determine the effect of sample handling on urine pH of close-up dairy cows. Samples were collected from cows (n=31) in the close-up pen on a Wisconsin dairy at 0, 4, 8, and 16 hrs post-feeding for 2 days. Cows were fed a diet balanced for dietary cation-anion difference (DCAD = (Na + K - Cl - S) = -80 meq/kg). All cows had been on the close-up ration for at least 7 days. The TMR was fed once a day. The first few ml of urine were collected separately from the main stream. The pH was measured within one h of collection. The main stream samples from the 0 hr collection on the first day were then split and stored either at 20°C or at 5°C.

In all samples, the pH of the first few ml of urine were either equal to or higher than the main stream of urine. Mean values were 6.89 and 6.42, respectively ($p < .01$). The pH of samples stored at 5°C rose 0.10 units (range=0 to 0.22) after 24 hrs ($p < 0.01$) and 0.30 units (range of 0.04 to 0.58) after 48 hrs ($p< .01$). The pH of samples stored at 20°C dropped 0.02 units (range=#0.66 to +0.28) after 24 hrs ($p > .05$) and 0.14 units (range of #1.03 to 0.47) after 48 hrs ($p < .05$). Although the mean change was smaller for the samples stored at 20°C, the direction and size of the changes were less consistent.

The mean, SD, min., and max., of pH of urine samples collected 0, 4, 8, and 16 hrs post feeding were 6.34, 0.66, 5.16, 7.79 for 0 hours; 6.02, 0.70, 5.10, 7.42 for 4 hrs; 5.94, 0.61, 5.09, 7.14 for 8 hrs; 5.86, 0.65, 5.11, 7.97 ($p<0.05$ for 0 hr compared to all others and $p>0.05$ for all other comparisons).

These results indicate that the first few ml of urine should not be used to assess urine pH because it is more alkaline than later samples. Samples storage either at 0°C or at 20°C will not bias the results. Overnight storage of samples does not appear to bias results, but samples should not be stored for 48 hours. Although urine pH was highest at feeding compared to later times in the day this difference was relatively small and unlikely to bias interpretation. Collecting urine samples at feeding appears to be acceptable.

Key Words: Urine pH, Dietary cation-anion difference

738 Effects of dry cow grouping strategy and body condition score at dry off on performance of dairy cows during early lactation.

L. L. Contreras*, C. M. Ryan, and T. R. Overton, *Cornell University, Ithaca, NY.*

One-group dry cow nutritional strategies would simplify management of dry cows on many commercial farms. Multiparous Holstein cows (n=377) on two commercial dairy farms were used to determine the effects of feeding a standard two-group dry cow system [three weeks (21 6 d) on the close-up (1.55 Mcal/kg NE_L , 16.1% CP, 34% non-fiber carbohydrate) diet (treatment S)] versus feeding the close-up diet for the entire dry period (62 17 d; treatment L) on subsequent milk production and composition, BCS, prepartum plasma NEFA, and postpartum plasma BHBA. Performance data were collected during the first five monthly test days of lactation. Milk yield (42.4 vs. 42.0 kg/d) for treatment S and L was not affected by treatment; however, cows fed treatment S tended ($P < 0.15$) to have higher milk fat percentage (3.66 vs. 3.56%) and had significantly ($P < 0.05$) higher milk true protein percentage (2.83 vs. 2.77%), resulting in trends ($P < .15$) for increased yields of milk fat (1.55 vs. 1.48 kg/d), 3.5% FCM (43.5 vs. 41.8 kg/d), and true protein (1.20 vs. 1.15 kg/d). Cows fed treatment L gained more BCS during the dry period (treatment by time; $P < 0.01$). Interestingly, cows with initial BCS of 3.0 or less (thin) tended ($P < 0.12$) to produce more milk (43.0 vs. 41.3 kg/d) during early lactation than cows with initial BCS of 3.25 or greater (fat). A trend ($P < 0.11$) for an interaction of treatment and initial BCS existed for milk yield such that thin cows fed S produced the most milk (44.1 kg/d) and fat cows fed S produced the least amount of milk (40.6 kg/d); cows fed L regardless of BCS produced an intermediate amount of milk (42.0 kg/d). Prepartum plasma NEFA concentrations and postpartum plasma BHBA concentrations were not affected by treatment. These data indicate that two-group nutritional strategies for dry cows are preferred, and that BCS at dry off should be considered when determining grouping and nutritional strategies for dry cows.

Key Words: Periparturient Cow, Body Condition Score

739 Peripartal changes in fatty acid profiles of blood, adipose tissue, and liver of dairy cows can be modulated by diet.

G. N. Douglas[1], J. Rehage[2], A. D. Beaulieu[1], A. O. Bahaa[1], and J. K. Drackley*[1], [1]*University of Illinois, Urbana, IL,* [2]*Clinic for Cattle, Hannover, Germany.*

The fatty acid (FA) composition of bovine tissues might impact metabolic regulation and adaptation during the peripartal period. Patterns of change during the peripartal period and the extent to which these might be altered by diet are unknown. Holstein cows (n=25) were fed a control diet (1.59 Mcal NE_L/kg) at ad libitum (CA) or restricted (CR) intake, or fat-supplemented (S or U; 1.73 Mcal/kg) diets for ad libitum intake during the last 40 d prepartum to provide 120% (CA, S, and U) or 80% (CR) of NE_L requirements. Fat was supplemented either as a dietary saturated FA mixture (S) or by abomasal infusion of unsaturated FA (soy oil; U). A single lactation diet was fed postpartum. Groups CR and U had lower prepartum intakes of DM and NE_L. Cows fed S, U, and CR had higher NEFA in plasma prepartum ($P<0.05$), but peripartal and postpartal NEFA and hepatic total lipid and glycogen contents were similar among treatments ($P>0.15$). Cows fed U had greater 18:2 but decreased 20:4 and 22:0 in total plasma lipids ($P<0.05$). In adipose tissue biopsied at d 1 postpartum, CR decreased 14:0 and increased 18:1 vs CA; U increased 18:2 and 18:3 but decreased 18:1, 20:0, and 20:3 vs S ($P<0.05$). Liver was biopsied at -45 d (covariate), 1, 21, and 65 d postpartum. In hepatic phospholipids (PL), 16:0 and *trans*-18:1 were increased, and 18:0, 20:3, and 20:5 were decreased at d 1 ($P<0.05$). Treatment × day interactions ($P<0.05$) showed that 18:2 was increased and 18:1, 20:3, 20:4, and 22:6 were decreased in PL at d 1 from cows fed U. The FA profile of PL was similar among diets by d 21 postpartum. In hepatic triglyceride (TG), 16:0, 18:1, and 22:0 were higher at d 1 and then decreased by d 21; 18:0, 20:3, 20:4, 20:5, 24:0, and 26:0 were lower at d 1 and then increased by d 21. Both 18:2 and 18:3 were higher at d 1 for U than for S ($P<0.05$). Changes in blood and tissue FA profile occur during the peripartal period; the potential exists to modify FA profile via dietary manipulation, which in turn could alter metabolic responses.

Key Words: Transition Period, Liver Metabolism, Fatty Acid Profile

740 Rumen fermentation and fiber degradability in pre-fresh transition dairy cows as affected by different levels of dietary crude protein.

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Twelve multiparous rumen-cannulated Holstein cows (758 kg BW) were used to evaluate the impact of dietary crude protein (CP) concentration on rumen fermentation and fiber degradability during the pre-fresh transition period. The diet consisted of 64% corn silage, 17% alfalfa silage, 5% straw and 14% concentrate mix (DM basis). Treatments were 10, 12 and 15% dietary CP (DM basis), and were achieved by replacing part of the straw with urea. Cows were randomly assigned to a CP treatment sequence, with diets going from low to high (10 to 12, 10 to 15, or 12 to 15), or high to low (15 to 10, 15 to 12, or 12 to 10) CP percentage. Diets were fed as a TMR for ad libitum intake. Cows started the experiment at 32 d prior to the expected calving date (ECD) and diets were switched at 18 d prior to ECD, with 10 d of adaptation to the experimental diets and 4 d of data collection. Dacron bags containing the forage portion of the TMR were incubated in the rumen for 0, 2, 4, 8, 12, 24, 48, and 72 h, and rumen samples were collected every 2 h from 0 to 12 h after feeding. Dry matter intake tended to decrease as the CP percentage in the diet was increased. Rumen ammonia concentration increased linearly with increased levels of dietary CP. No treatment effect was observed for ruminal pH and acetate to propionate ratio. Increasing dietary CP concentration had no effect on NDF fractional rate of degradation, NDF degradability, or the potentially degradable fraction. The results of this study suggest that feeding above 10% CP does not enhance NDF degradation in the rumen and may result in a decrease in DMI during the pre-fresh transition period.

	Treatment[1]				Linear effect
	10	12	15	SE	*P*=
DMI, kg/d	14.3	13.0	11.3	1.2	.105
NH_3-N, mg/dl	3.6	10.1	13.3	1.2	<.0001
pH	6.6	6.5	6.5	.1	.799
A:P[2]	3.3	4.3	3.7	.3	.358
Kd[3], % per h	3.3	3.4	2.9	.7	.816
Degradability, %	36.7	33.9	35.6	2.6	.854
Fraction B[4], %	61.3	50.1	59.5	5.6	.922

[1]Dietary treatments were 10, 12, and 15% CP (DM basis). [2]A:P=Acetate to propionate ratio. [3]Kd=Fractional rate of degradation. [4]Fraction B=Potentially degradable fraction.

Key Words: Transition period, Crude protein, Fiber degradability

741 Effects of prefresh diet and post parturition drenching on early lactation performance of multiparous holstein cows. B. M. Visser*, J. G. Linn, S. M. Godden, and M. L. Raeth-Knight, *University of Minnesota, St. Paul, MN*.

Forty-eight multiparous Holstein cows were assigned to one of four treatments starting 21d before parturition: control diet with water drench (CW), control diet with treatment drench (CT), supreme diet with water drench (SW), supreme diet with treatment drench (ST). Diet C was 73% forage and 27% corn, soybean meal, minerals and vitamins. Diet S was 59% forage and 41% corn and soybean meal with anionic salts, sugar, soluble fiber, yeast, and enhanced minerals and vitamins. Cows were drenched for three consecutive days postpartum with 37.84 liters/day of water or a treatment drench (T) that contained alfalfa meal, calcium propionate, electrolytes, yeast, probiotics, niacin and propylene glycol mixed into 37.84 liters of water. All cows received the same lactation diet through six weeks of lactation. Over the six week postpartum period, there was no effect of diet, drench or interaction between diet and drench on milk production (37.8 kg/d, 37.2 kg/d, 41.9 kg/d and 38.8 kg/d for CW, CT, SW and ST, respectively). However, there was a trend for a diet by week effect with cows fed the supreme diet producing more milk ($P<0.10$) in week 3 (4.20 kg/d), week 4 (4.19 kg/d), week 5 (4.98 kg/d), and week 6 (4.41 kg/d) than control diet fed cows. Milk protein yield was greater ($P<0.05$) for the supreme diet, (average 1.28 kg/d vs 1.15 kg/d) with the greatest differences occurring in week 3 to 5. No difference ($P<0.05$) was seen between diet, drench, or interaction between diet and drench for milk fat yield, lactose yield, body weight change, body condition change, and udder edema measurements. Milk fever incidences were 18.2%, 9.1%, 0%, and 12.5% for CW, CT, SW, and ST, respectively. Retained placentas were 36.4%, 36.4%, 9.1% and 0% for CW, CT, SW, and ST, respectively. Cows with no metabolic disorders at parturition (n=25) were evaluated against those with any metabolic disorders (n=16). Cows without any metabolic disorders averaged 3.57 kg/d more milk over the six week lactation period, with the greatest significant increase in week 1 to 3 ($P<0.05$).

Key Words: Transition cow, Metabolic disorder, Drench

742 Metabolic adaptations in dairy cows to changes in diet and lactational status. A.F. Park*, J.E. Shirley, E.C. Titgemeyer, R.C. Cochran, J.M. DeFrain, and E.E. Ferdinand, [1]*Kansas State University, Manhattan Kansas*.

Four-ruminally fistulated, multiparous, pregnant Holstein cows were utilized in a randomized design to measure plasma metabolites as the cow transitioned from a non-lactational to lactational state. Plasma measurements were obtained on d 79 prior to calving and weekly thereafter until parturition and on d 1, 3, 5, 7, 15, 20, 25, 30, 60, and 90 postpartum. Calculated NEL (Mcal/kg) and measured crude protein (%) of the diets were 1.73, 18.7; 1.46, 11.5; 1.56, 15.6; 1.70, 18.4 for late lactation (-79, -72, -65 d), far-off dry (-58, -51, -44, -37, -30d), close-up dry (-23, -16, -9, -2d), and early lactation diets. Albumin was above 3 mg/dl during the last 3 wk of lactation (-79, -72, -65d) and the first 3 wk of the far-off period (-58, -51, -44d), decreased to less than 2 mg/dl until parturition, increased linearly ($P < 0.05$) to 4 mg/dl on d 25 postpartum and 4.5 mg/dl on d 60 postpartum, then declined to 3.0 mg/dl on d 90 postpartum. Plasma NEFA were relatively constant prepartum (200 uM), experienced a sharp increase at parturition, peaked on d 15 (440 uM), and returned to prepartum levels by d 30 postpartum. Insulin and glucagon decreased just prior to calving, but glucagon increased sharply during the first wk postpartum while insulin continued to decline. The insulin to glucagon molar ratio was relatively constant prepartum, declined sharply at parturition reaching nadir at d 5 after calving. Glucose and triacylglycerol were elevated prepartum and decreased significantly at parturition. Plasma urea varied with level of dietary protein and DM intake. Plasma total alpha amino nitrogen increased from 2 mM prepartum to 2.9 mM on d 25 postpartum. These data support the concept that plasma metabolites respond to diet and lactational status.

Key Words: Periparturient, Dairy cow, Plasma metabolite

743 Characterization of ruminal fermentation in transition dairy cows. A.F. Park*, J.E. Shirley, E.C. Titgemeyer, R.C. Cochran, J.M. DeFrain, E.E. Ferdinand, and T.G. Nagaraja, [1]*Kansas State University, Manhattan Kansas*.

Four-ruminally fistulated, multiparous, pregnant Holstein cows were utilized in a randomized design to delineate ruminal fermentation adaptations as the cow transitions from a non-lactational to lactational state. Ruminal measurements were obtained 72 (late lactation), 51 (far-off dry), 23, and 9 d (close-up dry) prepartum and 6, 20, 34, 48, 62, 76, and 90 d postpartum. Calculated NEL (Mcal/kg), measured crude protein (%), and digestibilities (based on steers fed the same diets at 2 % of BW) of the diets were 1.73, 18.7, 74.1; 1.46, 11.5, 66.2; 1.56, 15.6, 71.0; 1.70, 18.4, 70.7 for late lactation, far-off dry, close-up dry, and early lactation. Ruminal samples were collected 0, 3, 6, 9, and 12 h after feeding. Ruminal pH increased (6.1 to 6.6) when cows were switched from the late lactation to the far-off, remained elevated during the close-up period, and then decreased (6.6 to 6.1) when cows were fed the early lactation diet. Total VFA concentration remained relatively stable (100 mM) when cows were fed the late lactation, far-off, and close-up diets then increased to a peak of 150 mM by d 48 of lactation. Ruminal ammonia decreased (9.0 versus 3.0 mM) when cows were switched to the far-off diet, then increased slightly (3.0 to 5.0 mM) when cows consumed the close-up diet, and increased (5.0 to 12.0 + mM) further when cows were fed the lactation diet. Ruminal peptides decreased (0.6 to 0 mM) when cows were switched to the far-off diet, remained relatively stable (0.25 mM) during the dry period, then increased to over 2 mM by d 48 postpartum. The trend for ruminal free amino acids was similar to that of ruminal peptides. These data indicate that significant fermentation adaptations occur as the cow transitions from non-lactational to lactational status: likely due to changes in diet composition and DMI.

Key Words: Transition, Dairy cow, Fermentation

744 Effect of sampling time and different commercial anionic products on urinary pH from pre-partum cows. L.M Rode*[1], K.A. Beauchemin[2], and G.R. Bowman[2], [1]*Rosebud Technology Development Ltd.*, [2]*Agriculture and Agri-Food Canada*.

Twelve dry, pregnant Holstein cows were used to investigate the impact of commercial anionic products on diurnal changes in urinary pH. Cows were limit-fed (12.0 kg DMI/d) a TMR comprised of barley silage, grass hay and barley-based concentrate (55:22:23 DM basis). Cows were randomly assigned to one of four treatments and received 1.0 kg (as fed) of a treatment supplement. Treatments and corresponding supplements were: Control, canola meal; BC-M, Bio-Chlor MM^{TM}; BC-F, Bio-Chlor FR^{TM}; and SC, Soychlor 16-7^{TM}. Cows were fed once daily and treatment supplements were hand-mixed within the TMR prior to feeding for five consecutive days. Cows were monitored from #2 to 16 h post-feeding for four days starting 22 h after the first feeding of the treatment supplements. During the observation time, urine spot samples were collected and pH measured. For each day, pH observations were grouped into three Time Groups (TG1, -2 to +4 h; TG2, +4 to +10 h; and TG3, +10 to +16 h relative to feeding). A repeated measures model was used with time within day as the repeated measure. For Day 1, there were differences due to treatment ($P<0.01$) and Time Group ($P<0.09$) where urine pH was 7.81, 7.33, 6.00 and 6.02 for Control, SC, BC-M and BC-F respectively and 6.90, 6.83 and 6.64 for TG1, TG2 and TG3 respectively. Urine pH for cows fed BC-M and BC-F were similar but different ($P<0.013$) from Control and SC. TG3 was different ($P<0.05$) from TG1 and TG2. By Day 4, urine pH was 7.90, 6.37, 5.72 and 5.52 for Control, SC, BC-M and BC-F respectively and 6.36, 6.40 and 6.39 for TG1, TG2 and TG3 respectively. Urine pH for cows fed BC-M, BC-F and SC were similar but different ($P<0.001$) from Control. There were no differences among Time Groups. All commercial products acidified urinary pH. However it took longer for SC to achieve acidification. Once acidified, there was little change in urinary pH and nadir was not restricted to a narrow window around four hours post-feeding.

Key Words: transition, pH, DCAD

745 Periparturient responses of multiparous Holstein cows to varying prepartum dietary phosphorus. A. B. Peterson* and D. K. Beede, *The Michigan State University, East Lansing, Michigan/U.S.A.*

Objective was to compare periparturient responses of 42 pregnant, nonlactating multiparous Holstein cows fed 0.21, 0.31, or 0.44% dietary P (dry basis) for 28 d prepartum. Cows were assigned to prepartum P treatments in a randomized block (parity and expected calving date) design. Dietary P requirement for a cow (average prepartum BW = 764 kg in this experiment) equaled 31 g/d (NRC, 2001). Prepartum basal diet (0.21%P) contained 17.5% alfalfa silage, 27.0% corn silage, 27.0% beet pulp, 9.1% corn starch, 9.0% ground corn, 2.1% HCl-treated protein supplement, 1.8% rice hulls, 1.1% blood meal, 0.9% biuret, 0.8% urea, and 3.7% mineral-vitamin premix, dry basis. Graded inclusions of monoammonium phosphate increased P to achieve 0.31 and 0.44%P treatments. All diets were similar in energy, RDP, RUP, and other nutrients. Daily prepartum DMI was unaffected by P treatment (overall mean = 15.5±0.7 kg/cow or 2.05±0.09% of BW). Daily prepartum P intakes differed (34, 48, and 67±2.0 g/cow for 0.21, 0.31, and 0.44%P; $P < 0.01$). Prepartum blood serum P was lower (5.06 mg/dl), but still within the normal range for 0.21%P compared with 6.41 and 6.60 mg/dl for 0.31 and 0.44%P (SEM = 0.24; $P < 0.01$). Prepartum serum Ca was unaffected by treatment ($P > 0.1$). Periparturient (±7d of calving) serum Ca was lower with 0.44%P compared with 0.21 and 0.31%P ($P < 0.05$). Pre- and postpartum serum osteocalcin and deoxypyridinoline were unaffected by prepartum P, suggesting no effects on bone accretion or resorption. After parturition, cows were fed the same lactation diet (0.40%P). Daily DMI (19.5±0.92 kg/cow) and energy-corrected milk yield (52.9±1.49 kg/cow) through 28 DIM were unaffected by prepartum P. No clinical cases of hypophosphatemia and one case of hypocalcemia (cow on 0.31%P prepartum) were observed. We conclude that 34 g of P/cow per d prepartum is sufficient for multiparous Holstein cows without negative periparturient effects.

Key Words: Phosphorus, Dairy Cattle

746 Breed differences in ruminal fibre digestibility in cows receiving high concentrate diets. C.W. Cruywagen*[1], N. Bangani[1], and C.J. Muller[2], [1]*University of Stellenbosch,* [2]*Western Cape Department of Agriculture.*

Eight non-lactating ruminally cannulated cows (four Holsteins and four Jerseys) were used to determine rumen digestibility values of oat silage (OS), oat hay (OH) and alfalfa hay (AH). To simulate lactation conditions, all cows received a TMR containing 65% concentrates at a rate of 25 kg/day for Holsteins and 17 kg/day for Jerseys. Cows were adapted to the diets for 14 days before the *in sacco* incubations. Samples of OS (wet, cut to 10mm lengths), OS and AH (both ground through a 2mm sieve) were incubated in the rumen in 230 x 100mm dacron bags (53um pores) for 0, 2, 4, 8, 16, 24, 48 and 72 hours. Rumen liquor samples were collected at 10:00, 13:00 and 18:00 on the last day of the trial. For both breeds, rumen pH decreased between 2 and 5 hours after feeding, but Jerseys had a higher ($P<0.05$) mean daily pH (6.45) than Holsteins (6.10). Also, pH never dropped below 6.1 in Jerseys, while values were 5.90 and 5.93 for Holsteins at 3 and 5h post-feeding, respectively. Differences in pH were probably responsible for differences observed between breeds regarding ruminal DM and NDF degradabilities. Effective DM degradability values (at k=.05) for Jerseys and Holsteins, respectively, were 30.4 and 26.0% (OS), 46.6 and 38.0% (OH) and 60.9 and 57.7% (AH). Effective NDF degradability values for Jerseys and Holsteins, respectively, were 23.0 and 17.3% (OS), 22.0 and 18.5% (OH) and 29.9 and 26.0% (AH). Regarding crude protein, Jerseys showed a lower ($P<0.05$) effective degradability than Holsteins (40.4 and 36.0%, respectively), but for the other forages, the two breeds did not differ. It was concluded that Jerseys appear to be more efficient to digest forages than Holsteins when receiving a high concentrate diet, but that the difference is probably related to pH patterns that could again be affected by feeding behaviour and management.

Key Words: Rumen degradability, Fiber digestibility, NDF

747 Preliminary report on gas pressure sensors in the reticulorumen of sheep. W.M. Shaik Mossadeq* and W.L. Grovum, *University of Guelph, Guelph, Ontario, Canada.*

Most of the carbon dioxide and methane gases produced during microbial fermentation of food in the ruminant forestomach are eliminated by eructation. This involves special contractions of the dorsal and ventral sacs of the rumen, relaxation of the upper esophageal sphincter and, inhalation and expiration of the gases with normal breathing. Previous studies have shown that insufflations of the rumen with carbon dioxide, oxygen, nitrogen and air all evoked eructation via a vago-vagal reflex, whereas distension of the rumen with large bladders containing air or fluid did not. Thus, we hypothesized that as yet unidentified sensors in the reticulorumen detected the pressures of these gases and elicited eructation. The properties of these sensors/neuronal receptors were investigated in 14 anesthetized sheep by recording afferent activities from single-fibres in the left cervical vagus in response to first, 0, 5, 10, 15, 20, and 25 mm Hg air pressure in the emptied and washed reticulorumen and secondly, tactile stimulation and manual stretch of its wall. The impulses from single gas sensors were isolated from a mixed record of impulses from several fibres in a vagal strand connected to the reticulorumen using the Multi-Spike Detection software (MSD®) from Alpha Omega Engineering. Four sensors from four different sheep increased their firing rates between 6.3±2.5 (threshold) and 19.6±3.7 mm Hg air pressure but then, they decreased sharply at higher pressures. Two receptors were localized to the dorsomedial wall of the cranial sac because manual stretch of its wall in these sites inhibited the background activities of these two receptors. Furthermore, these two receptors did not respond to either graded manual stretch or to light tactile stimulation of the forestomach wall as is characteristic of in-series tension receptors and epithelial receptors respectively. The gas pressure sensors responded uniquely to gas pressure and hence, were considered a new receptor type in the reticulorumen.

Key Words: Eructation, Receptors, Sheep

748 Availability of phosphorus in dairy feeds. M.J. Aguerre*[2], S. Marcot[1], H. Henselmeyer[1], and L.D. Satter[1,2], [1]*U.S. Dairy Forage Research Center USDA/ARS,* [2]*Dairy Science Department, University of Wisconsin, Madison.*

Three trials were conducted. In trial 1 and 2, 10 and 9 cows in mid to late lactation were fed for 3 wks a low P basal diet (BD) containing 0.17-0.19% P (dry basis). During the last 3-d of the third wk 12 fecal samples (dispersed through the 24-hr day) were collected. Ytterbium was used as an external marker for estimating DM digestibility. Following this three wk period, all cows were assigned to a trt diet where the test feed (soybean meal and corn gluten feed for trials 1 and 2) was inserted to provide a source of P. The test feed replaced P-free starch in the BD and increased P content of the test diets to approximately 0.3%. Fecal samples were again obtained during the last 3 days of the two-wk test period. This cycle was repeated in trial 1 and 2, this time with cottonseed and corn distillers grain. Dry matter digestibility estimates from the two BD periods were averaged for calculating P availability of the two test feeds for trial 1. Marker problems prevented DM digestibility estimates in trial 2, so values of 67 and 65% were assumed for BD and test diets. The incremental increase in fecal P excretion due to feeding of the test feed was considered as unavailable P. Trial 3, utilizing 10 cows, was conducted in the same way, except there was only one BD period sandwiched between two test feed periods (porcine meat and bone meal and dicalcium P). The availability of P in test feeds ranged between 64 to 85%. These values are slightly higher than availability values used by NRC (2001), suggesting that the NRC estimates of P requirement provide a moderate margin of safety.

	DMI kg/d	DM Digest-ibility	P intake g/d	P excreted g/d	SD	P avail-ability (%)	SD
Trial 1 (n=10)							
BD	19.2	64	33.0	19.8	2.4		
BD+soybean meal	20.7	63	51.3	26.0	3.4	74	24.0
BD	20.0	64	34.5	23.8	4.3		
BD+ cottonseed	20.2	66	48.1	24.4	3.7	81	20.1
Trial 2 (n=9)							
BD	18.5	67	33.3	20.9	3.9		
BD+corn gluten feed	20.7	65	66.1	29.7	8.2	73	16.2
BD	17.0	67	30.6	19.0	3.0		
BD+corn distiller grain	17.0	65	49.2	22.4	3.9	83	17.1
Trial 3 (n=10)							
BD+meat and bone meal	21.2	70	61.4	31.0	6.9	64	22.9
BD	20.2	74	40.5	23.0	4.0		
BD+dicalcium phosphate	21.7	68	65.1	26.9	7.2	85	16.0

Key Words: Phosphorus availability, Milk production

749 Phosphorus balance in Holstein cows fed normal or low-phosphorus diets for 2 lactations. R. Kohn*, T. Oleas, K. French, C. Sutcliffe, L. Scott, and T. Moreland, *University of Maryland, College Park.*.

The objective of this study was to determine phosphorus (P) balance and apparent P digestibility for Holstein cows in different stages of lactation when fed normal or low dietary P. Twelve multiparous cows (mean body weight = 698 kg) were fed diets based on corn silage, timothy hay and corn cobs (dry period) or corn silage and beat pulp (lactation period). Six cows (normal treatment) were fed diets supplemented with P using calcium phosphate in place of calcium carbonate. Two cows from each treatment did not complete the second lactation. Diets averaged 0.23 or 0.27% P for dry period, and 0.30 or 0.35% P during lactation. P balance was determined by total collection of feces, urine and milk for 5-d periods during dry, early, peak, mid and late stages of two lactations. Differences were tested with the model: Y = mean + lactation + diet + stage of lactation + interactions + cow(diet) as a random effect. P balance (g P intake # g P excretion) was #1.5 (SE=2.6) and #9.7 (SE=2.7) for low and normal P diets respectively in the first lactation, but was 12.4 (SE=2.9) and 26.4 (SE=2.8) g/d for low and normal P diets in the second lactation. In the first lactation, P balance was most negative in early (-17.2 g/d) and peak (-12.5 g/d) lactation, and greatest in the dry period (8.2 g/d). Apparent P digestibility (g/100g) was 0.41 (SE=0.03) and 0.21 (SE=0.03) for low and normal P diets respectively in the first lactation, but both increased to 0.54 (SE=0.03) in the second lactation. Milk production and intake were unaffected by diet. Long-term feeding of low-P diets can increase apparent P digestibility and P retention in different stages of lactation.

	Dry-Low	Dry-Normal	Lac-Low	Lac-Normal	Effects
Intake	30.0	40.3	62.2	76.0	L,S,D,S*L
Fecal	20.5	32.5	35.2	58.9	L,S,D,L*D
Urine	0.2	0.4	0.3	0.6	L
Milk	0	0	31.1	30.5	S,L*D
Balance	9.3	7.4	-4.4	-14.0	L,S,D,L*S,L*D,L*S*D
Digestibility	0.34	0.21	0.43	0.22	L,D,L*D,S*L

Least square means for P balance (g/d) and apparent P digestibility (g/100g) for normal and low P diets for non-lactating (Dry) and lactating (Lac) cows. Effects (P<.05) are lactation (L), stage (S), diet (D).

Key Words: phosphorus feeding, dairy cattle

Beef Species
Status and Application of Genetic Technologies in the Beef Industry

750 Consumer attitudes toward biotechnology: Impact on animal related applications. Christine Bruhn*, *University of California, Davis*.

Concern about biotechnology continues to be low on consumer#s list of concerns. When asked to volunteer food-related concerns, only 2% express concerns about the safety of foods modified by biotechnology, and a minority selected biotechnology when asked to add one additional item to a food label. Most people are not aware that products modified by biotechnology are in the supermarket. People support applications that benefit the environment, with modifications that provide direct consumer benefits, such as increased nutritional value or better taste endorsed by slightly fewer people. Following the recall of products containing StarLink corn, a higher percentage of consumers believed foods containing modified products should be labeled. Most consumer research has focuses on plant applications of biotechnology; modification of animals is likely to be more emotionally charges. Since the majority of US consumers agree that #animals have rights, just like people,# it would be likely that applications of biotechnology that benefit the animal, such as increased disease resistance, would have greatest support. Environmentally friendly application would also be viewed positively. Changes that primarily benefit people would likely receive public support from a smaller percentage of consumers, at least as recorded on consumer surveys. Frequent and effective communication that addresses public concern is a prerequisite for increasing public acceptance.

Key Words: biotechnology, consumer attitudes, consumer acceptance

751 Genomic and computing strategies in optimizing the genetic component of specification beef. J.W. Wilton*, *University of Guelph, Guelph, Ontario, Canada*.

Genomics and computing are closely inter-related in beef cattle improvement. Both require the prior definition of breeding objectives, both can be used together to carry out genetic evaluations of economically important traits and both can be used in the development of selection tools for sires and dams. Effective use of both requires accurate specification of the desired product, optimum production program, and cross-breeding structure. Optimizing the genetic component of production requires information on traits of economic importance, identification and relationships of animals, information on candidate and marker genes, and information on economics. Genomic information can be used for strategies involving identified gene deletions, identified gene introgressions, marker assisted introgression, and marker assisted selection. Techniques are being developed for combining genotypic data and quantitative data into genetic evaluations, although more developments are needed to optimize the use of these techniques across the range of beef traits varying in economic importance and cost of measurement. The genetic component of economical production of specified products can be optimized with customized selection programs. An example is presented in which performance levels are predicted from genetic evaluations based on quantitative and genomic information. The implications for selection within a seedstock population are also discussed.

Key Words: Genetic improvement, Sire selection, Beef production

752 Status of bovine sperm sexing technology. J.L. Schenk*[1] and G.E. Seidel, Jr.[2], [1]*XY, Inc.*, [2]*Colorado State University*.

XY, Inc., a biotechnology company, is developing and marketing flow-sorting expertise for sexing sperm for global livestock applications. Mammalian X-chromosome-bearing sperm contain more DNA than Y-chromosome-bearing sperm (bulls; 3.8%), which is the basis of the flow-sorting procedure. Sperm stained with Hoechst 33342, a specific DNA-binding dye, fluoresce when excited with light from an argon laser. Sperm are transported past sensors at a rate of 25,000 sperm/s by a pressurized fluid stream. Properly positioned sperm sorter sensors