solubles, and 10% or 20% wet distillers grains. For both experiments, total urine, feces, feed intake, and orts data were collected during a 5-d collection period, following 10 and 14-d dietary adaptation. Dietary P concentration (% DM) and P intake (g/d) ranged from 0.27 to 0.29 and 12.54 to 26.30 and .27 to .42 and 17.07 to 47.25 in Exp I and II, respectively. Total P excretion was significantly related to P intake, but there was considerable variation among steers in partitioning excretion of P in urine or feces. Urinary P excretion ranged from .66 to 7.03 and .20 to 12.17 g/d in Exp I and II, respectively. These studies indicate some steers fed corn-based finishing diets excrete large quantities of P in the urine. The data were analyzed using linear regression, y = a + bx (y = P excretion, x = P intake).

Experiment I	y	a	b	R^2	P-value
	Urine	8.11	.1151	.242	.89
	Fecal	17.34	.2129	.618	.11
	Total	25.45	.3280	.636	.09
Experiment II	Urine	58.92	-.1509	.251	.53
	Fecal	-33.12	.6874	.475	.01
	Total	-25.81	.5366	.810	.0001

Key Words: Cattle, Phosphorus, Phosphorus Excretion

Ruminant Nutrition: Dairy I

M191 Effect of level of encapsulated vitamin C in starters fed to Holstein calves. J. Garrett*[1], D. Putnam[1], T. Hill[2], J. Aldrich[2], and R. Schlotterbeck[2], [1]*Balchem Encapsulates*, *New Hampton, NY*, [2]*Akey*, *Lewisburg, OH*.

The objective of this trial was to evaluate encapsulated vitamin C (EVC) (Vitashure® C; Balchem Corporation, New Hampton, NY) added to complete calf starters fed to Holstein calves. The EVC (70% ascorbic acid) is designed to be stable during feed processing and ruminal fermentation. Fifty-one calves (17 calves per treatment) were housed in individual pens bedded with straw. Calves were fed pelleted 18% CP starters that contained 59% corn, 23% soybean meal, 0.0025% decoquinate with 0, 0.05%, or 0.10% EVC. Starter and water were offered ad lib daily from 0 to 56 d. A common milk replacer powder (20% all milk protein, 20% fat, 0.005% decoquinate) was fed in two equal feedings at the rate of 454 g/d, reconstituted with water to 3.8 L liquid volume per head from 0 to 40 d. On d 41 and 42 the milk replacer was only fed in the morning (227 g of powder/d/head). Starter feed offered and refused was weighed daily. Calves (3 to 5 d old) were weighed initially and weekly thereafter. Data were analyzed as a completely randomized design in SAS® using linear and quadratic contrasts. Significance was declared at $P \leq 0.05$, trends at $P \leq 0.15$. Initial calf body weight did not differ. There were linear trends for calves fed starters with EVC to grow faster preweaning and be more efficient post-weaning. Cumulative starter intake from 0 to 8 weeks tended to respond quadratically to level of EVC, averaging 687, 787 and 750 g/d for calves fed 0, 0.05% and 0.10% EVC, respectively. Cumulative feed efficiency tended to respond linearly to level of EVC from 0 to 8 weeks, averaging 0.514, 0.526, and 0.540 (kg gain:kg feed) for calves fed 0, 0.05%, and 0.10% EVC, respectfully, and responded linearly through week 5. Change in hip width improved quadratically between 2 to 4 weeks and 2 to 6 weeks. Fecal scores and medical treatments did not differ. In summary, calves fed 0.05% and 0.10% EVC tended to gain 3.5 kg more body weight in 8 weeks than controls while tending to have higher intake of starter and improved feed efficiency.

Key Words: Calf, Encapsulated, Vitamin C

M192 Effect of feeding medium chain triglycerides on calf growth, insulin responsiveness and body composition. J. K. Mills*, M. E. van Amburgh, and D. A. Ross, *Cornell University*, *Ithaca, NY*.

The objective of this study was to determine the effects on the growth, body composition, and response to an insulin challenge in calves fed isocaloric, isonitrogenous diets that varied in the amount and type of fatty acid. Thirty-six calves were assigned to a randomized block design with three dietary treatments, ten calves per treatment and a baseline group of six calves. Animals were reared from birth to 88.1 kg live bodyweight (BW). Three different milk replacer-based diets were designed to deliver less than 2% of the lipid as medium chain triglycerides (MCT) (Control; diet contained no MCT), 32% MCT in the form of caprylate (MCT Oil) and 32% of fatty acids primarily in the form of laurate from coconut oil (CO). From d 1 to 7, calves were offered 0.28 Mcal intake energy/ kg BW0.75, adjusted weekly for BW, and 0.32 Mcal intake energy/ kg BW0.75 from d 8 to slaughter. Dry matter, energy, crude protein (CP) and fat intakes were 53.7 kg, 281.8 Mcal, 14.6 kg and 13.0 kg; 56.6 kg, 297.2 Mcal, 15.8 kg and 14.2 kg; and 53.8 kg, 280.4 Mcal, 15.4 kg and 13.3 kg for the Control, MCT Oil and CO treatments, respectively. Dry matter intake (DMI), energy, protein and fat intakes did not differ among treatments (P = 0.50, 0.45, 0.29 and 0.22, respectively). Empty body gains were 0.92, 0.79 and 0.87 kg/d for Control, MCT Oil and CO diets respectively and the MCT Oil diet significantly lower than the Control. Empty body CP, ash and water were not different among treatments (P = 0.40, 0.88 and 0.45, respectively). Empty body retained energy and fat tended to be 5.6 and 8.7% greater for calves consuming the CO diet than for those fed the Control diet (P = 0.06 and 0.11, respectively). The liver weight of calves consuming the CO diet was 330 g heavier and contained 15% more fat than the liver of the Control and MCT Oil calves (P = 0.04 and 0.002, respectively). Plasma glucose was not different among treatments during an insulin challenge (P = 0.23), however, the decrease in plasma glucose concentration was significantly greater for the calves fed the MCT Oil diet compared to the Control and CO diets (P = 0.001).

Key Words: Lipid, Body Composition, Calves

M193 The effect of milk replacer protein, fat content and feeding amount on performance of Holstein heifer calves. B. Ziegler*[1], J. Linn[2], D. Ziegler[3], H. Chester-Jones[3], C. Soderholm[1], and S. Hayes[4], [1]*Hubbard Feeds*, *Mankato, MN*, [2]*University of Minnesota*, *St. Paul*, [3]*University of Minnesota*, *Waseca*, [4]*Milk Products*, *Chilton, WI*.

Two day-old calves from 3 commercial dairies were randomly assigned to one of 5 all-milk protein milk replacer (MR) treatments by farm source and body weight (BW). Calves were housed in 2.29 x 1.17 m individual calf pens within a frame-steel curtain side-wall naturally ventilated calf barn. Average BW across treatments at day 2 of-age was 40.7 kg ± 0.34 kg. Treatments were: 1) 20% Protein:20% Fat MR fed at 0.28 kg (as-fed) in 1.77 L water; 2) same as 1 except acidified MR; 3) 28:16 MR fed at 0.34 kg in 1.77 L water; 4) 28:16 MR fed at 0.34 kg in 2.41 L water; and 5) 28:16 MR fed up to 0.51 kg in 2.56 L water. Treatments 1, 2, 3, and 4 were fed 2X for the first 35 days and then 1X daily from day 36 to 42. Treatment 5 was fed 2X daily for the first 42 days and 1X from day 43 to 49. Calves assigned to treatments 1 and 2 were fed a calf starter (CS) containing 18% CP, and those on treatments 3, 4 and 5, a CS containing 22% CP ad libitum for 56 days. Fresh water was available daily at all times. Calves fed treatment 5 had the highest ($P < 0.01$) daily gain (0.81 kg) to 56 days followed by calves fed treatment 3 (0.73 kg), treatment 4 (0.68 kg), treatment 1 (0.65 kg) and treatment 2 (0.61 kg). Total DM intake (MR + CS) to 56 days was highest ($P < 0.01$) for calves fed treatment 5 (76.8 kg) and 3 (75.6 kg) compared to treatments 1 (69.5 kg) and 2 (67.9 kg) with treatment 4 intermediate (71.3 kg). Calves fed treatment 5 were more efficient (gain/DM intake) over 56 days

than calves fed treatments 1, 2, 3, or 4 (0.59 vs 0.52, 0.51, 0.54, and 0.53 kg, respectively. Feeding an intensive MR program (treatment 5) resulted in the best gain and highest DM intake, however, a modified intensive program (treatment 3) increased CS intake and resulted in the second best calf performance to 56 days. Calf health was not affected by treatments.

Key Words: Dairy Calves, Milk Replacers, Performance

M194 The effect of milk replacer feeding programs on calf growth and health. B. L. Miller*, T. E. Johnson, H. B. Perry, and M. A. Fowler, *Land O' Lakes, Inc.*, *Webster City, IA*.

Nutrient level and feeding rate were evaluated in all milk protein calf milk replacers to determine effect on performance, scour data and growth indices of Holstein bull calves. A total of 72 calves with an initial weight of 46.8 kg were randomly assigned according to body weight and gamma globulin concentration to three milk replacer treatments: 1) 20% CP / 20% Fat fed at 0.45 kg per day; 2) 22% CP / 20% Fat fed at 0.57 kg per day; or 3) 28% / 20% Fat fed at 1.14 kg per day. Milk replacers were not medicated. Calves were individually housed in elevated stalls and fed milk replacer two times daily at 700 and 1615 hours. A common 18% CP texturized starter (90 g lasalocid / 909 kg) was fed to calves assigned to the 20 and 22 % CP milk replacers. A 22% CP texturized starter (60 g lasalocid / 909 kg) was fed to calves fed the 28 % CP milk replacer. Weight gain, daily starter consumption, feed efficiency and daily scour scores (1-4 scale: 1=normal, 2=loose, 3= water separation, 4= 3 with severe dehydration) were calculated weekly and for the seven week trial period. Specific growth indices were taken and summarized for the test period. Calves fed the 28 % CP milk replacer at the 1.14 kg per day feeding rate gained more weight, were more efficient and had a greater total body volume.

Treatment

Item	1	2	3	C.V.
Feed / gain	2.32^{b}	2.16^{b}	1.69^{a}	18.60
Scour score	1.21^{ab}	1.16^{a}	1.24^{b}	7.79
Body volume gain, l	77.44^{a}	84.28^{b}	114.32^{c}	20.37

^{a,b,c}Means within a row differ (P<0.05)

Key Words: Calves, Milk Replacers, Feeding Rate

M195 Psyllium in milk replacer increases intestinal volatile fatty acids and tissue mass in neonatal dairy calves. S. J. Cannon*[1], B. L. Miller[2], G. C. Fahey[1], L. L. Bauer[1], and J. K. Drackley[1], [1]*University of Illinois*, *Urbana*, [2]*Land O'Lakes, Inc.*, *Webster City, IA*.

Inclusion of psyllium in milk replacers might improve gastrointestinal development and function. Male Holstein calves were fed a milk replacer (22% protein, 20% fat) either without or with psyllium (1.1%) from 2 d through 4 wk of age. Milk replacer was reconstituted to 12.5% DM and fed at 12% of calf BW, adjusted weekly. Water was offered ad libitum but no starter was fed. Three calves per treatment were harvested weekly for measurements of gastrointestinal tract mass and length and to sample digesta from the rumen, abomasum, jejunum, proximal colon, and distal colon for analysis of volatile fatty acid (VFA) concentrations. Average daily gain tended to be greater (P=0.08) for control calves at wk 4. Inclusion of psyllium increased weight of the duodenum (P<0.01), jejunum (P<0.05), and colon (P<0.05) and tended (P=0.09) to increase rumen weight. Density (g/cm length) of intestinal tissue was increased in the jejunum (P<0.01) and ileum (P<0.05), and tended to increase in the duodenum (P=0.06) and colon (P=0.06) in psyllium-fed calves. Total VFA concentrations were increased in psyllium-fed calves in the proximal (P<0.001) and distal colon (P<0.001), and tended (P=0.07) to increase in the jejunum. Acetate and propionate concentrations increased (P<0.001) in the proximal and distal colon, and butyrate was increased in the proximal colon (P<0.05) in psyllium-fed calves. Acetate concentrations tended to increase in the jejunum (P=0.06). Apparent DM digestibility (93.1 vs. 94.4%) and fecal DM content (18.0 vs. 22.1%) were lower (P<0.01) for psyllium-fed calves. Water intake did not differ between treatments. Pre-feeding plasma glucose concentration tended (P=0.06) to be higher for psyllium-fed calves but urea N, total protein, BHBA, and cholesterol did not differ. Inclusion of psyllium in the milk replacer of neonatal calves may stimulate development of the gastrointestinal tract, which might benefit health.

Key Words: Psyllium, Calves, Milk Replacer

M196 Number of lactations have no effect on immunoglobulin G concentration of heifer and cow colostrum. S. I. Kehoe*, M. L. Moody, A. J. Heinrichs, and M. R. Long, *The Pennsylvania State University*, *University Park*.

Many factors affect colostrum quality and older research has indicated that colostrum quality is related to lactation number and thus heifer colostrum should not be fed to neonatal calves. To evaluate immunoglobulin differences due to parity and first milking colostrum production, colostrum samples were obtained from 2 dairy herds in central Pennsylvania from September through December 2004. Samples were milked from cows within 4-6 h of calving and refrigerated until pick up every 2-3 d. Data for each sample included cow number, lactation number, colostrum volume and calving date. Each colostrum sample was subsampled and frozen for later analysis of immunoglobulin G. Two hundred seventy three samples were utilized, including 91 first lactation, 76 second, 51 third, 28 fourth and 18 fifth lactation or greater. Data were analyzed using the general linear model of SAS 8.2. IgG means in g/L of colostrum by parity were not significant (P > 0.20) and were 25.9±1.9 for first lactation, 29.6±2.1 for second, 28.3±2.6 for third, 24.8±3.5 for fourth and 25.0±4.5 for fifth and greater. Colostrum volume for first milking was not affected by parity (P > 0.20) however did have a significant effect on IgG concentration (P < 0.01). Total volume of IgG in first milking colostrum in g was not significantly different between parities (P > 0.20) and included 184.0±18.0 for first lactation, 206.8±19.5 for second, 199.7±25.3 for third, 172.8±33.7 for fourth and 184.5±43.9 for fifth and greater lactations. From these data, concentration of IgG is = 32.021 – 2.263*volume; we conclude that colostrum IgG concentration is only affected by volume of first milking and not by number of lactations.

Key Words: Colostrum, Immunoglobulin G, Parity

M197 A mechanistic model on glucose and lipid metabolism in periparturient cows. J. Guo*, R. Peters, and R. Kohn, *University of Maryland*, *College Park*.

A mechanistic model was developed to quantitatively describe glucose and lipid metabolism in periparturient cows. The objectives were to use the model to study the interrelationship between glucose and lipid metabolism, to identify the critical metabolic events for ketosis development, and to determine the relative importance of dry matter intake (DMI), body condition score, and milk production to nutrition management of periparturient cows. The driving variables of the model were DMI, feed composition, calf birth weight, milk production, and milk components. The response variables were body fat content and concentrations of plasma glucose, glycerol, nonesterified fatty acids (NEFA) and total ketone bodies (KB). Fetal growth and milk synthesis were assigned to the highest priority for glucose demand in the model. The rate of fat mobilization was expressed as a function of glucose deficiency. The model assumed first order kinetics for utilization of NEFA and KB. Comparison of model predictions to data collected in an independent experiment revealed that the model over-predicted glucose and KB concentrations by 0.62 and 0.37 mM respectively. The rate of glucose consumption by peripheral tissues and the rate of NEFA utilization had greater impact on KB concentrations in periparturient cows than the other parameters tested in the model. Calf birth weight, DMI, milk yield, and body condition score were increased by one standard deviation to estimate the response in ketone body formation. The responses to the increases in the model parameters (e.g. the rate of fat mobilization) were evaluated to identify the critical control points in the model. It was concluded that

glucose deficiency is closely related to the rate of fat mobilization. The excessive KB could result from elevated fat mobilization for glycerol to compensate for the negative glucose balance in periparturient cows. The model shows it is important to avoid overfeeding during the pre-lactation period to prevent ketosis development.

Key Words: Mechanistic Model, Periparturient Cow, Ketosis

M198 Effects of supplementation with propylene glycol or protected fats containing low or high ratio of unsaturated fatty acids to transition cows on production and metabolism. M. Katz*[1,2], H. Lehrer[1], L. Livshits[1], D. Sklan[2], and U. Moallem[1], [1]*ARO*, *Israel*, [2]*Hebrew University*, *Israel*.

Forty-two multiparous cows were used to test the effects of supplementation with dry propylene glycol, or protected fatty acids containing high or low ratio of unsaturated fatty acids to transition cows on production and blood metabolites. Dry cows (250 d pregnant) were housed in an open barn with electronic individual feeding system and were divided on the basis of previous milk production and parity to one of six treatments: 1) CTL - control, fed prepartum dry cow diet and postpartum lactating cow diet (NRC requirements); 2) PGLY - supplemented with 909 g of dry propylene glycol (ProGlyc 55, KIMTEC) from 21 d prepartum to 21 DIM; 3) PrFA:CTL - supplemented with 230g of Energy Booster (Milk Specialties, Inc) 21 d prepartum and postpartum fed CTL diet; 4) PrFA:PrFA - supplemented with 230 g of Energy Booster 21 d prepartum to 100 DIM; 5) CaLFA:CTL - supplemented prepartum with 215 g of Megalac-R (Church & Dwight, Inc) and postpartum fed CTL diet; 6) CaLFA:CaLFA - supplemented with 215 g of Megalac-R 21 d prepartum to 100 DIM. Prepartum DMI was decreased 7.8% by PGLY and 15-16% by both supplemental fats compared to CTL (P<.0001). Milk yield was enhanced by 7% in PrFA:PrFA and CaLFA:CaLFA compared to CTL (P<.0001). Both fat supplements enhanced plasma NEFA concentrations pre and postpartum over PGLY and CTL (P<.002). In an opposite manner, pre and postpartum plasma insulin concentrations were decreased by fat supplementation compared to PGLY and CTL (P<.0001). No differences in prepartum glucose plasma concentrations were observed between treatments, but postpartum glucose in PrFA:PrFA and CaLFA:CaLFA were lower compared to PGLY and CTL (P<.002). No metabolic disorders were observed. In conclusion, pre and postpartum fat supplementation increased milk production, but seems not to improve the metabolic status of transition cows.

Key Words: Transition Cow, Propylene Glycol, Protected Fat

M199 Absorption and metabolism of propylene glycol, propanal, and n-propanol in dairy cows dosed intraruminally with propylene glycol. B. Raun, B. Røjen, and N. Kristensen*, *Danish Institute of Agricultural Sciences*, *Tjele, Denmark*.

Four lactating Holstein cows fitted with a ruminal cannula and chronic indwelling catheters in the mesenteric artery (n=4), mesenteric vein (n=4), hepatic portal vein (n=4), and hepatic vein (n=3) were used to study portal absorption and hepatic metabolism of propylene glycol (PG) and metabolites of ruminal fermentation of propylene glycol. The cows were fed 90% of ad lib intake (14 ± 1 kg DM/d; diet composition in % of DM): corn silage, 56; grass hay, 17; rapeseed cake, 12; sugar beet pulp, 12; minerals and vitamins, 2; urea, 1. The cows were milked 0600 and 1600 and fed 0800 and 2000. Cows were given 650 g of PG in 10 L of warm tap water at 0830 via the ruminal cannula. Blood samples were collected from the artery, hepatic portal vein, and hepatic vein 0.5 h before as well as 0.5, 1.5, 2.5, 3.5, 5, 6.5, 8, 9.5 and 11 h after PG dosing. Portal and hepatic blood flows were measured by down stream dilution of p-aminohippurate infused into the mesenteric vein. The peak concentrations of PG (79 ± 14 mM), propanal (2 ± 1 mM), and n-propanol (8 ± 4 mM) in the rumen were obtained 0.5, 2.5, and 3.5 h after the PG dose, respectively. The arterial concentration of PG peaked 2.5 h after dosing (6.9 ± 0.5 mM) and remained greater (0.6 ± 0.1 mM; P = 0.02) compared with control 11 h after PG dosing. The arterial concentration of propanal was not affected (P > 0.10) by PG. The arterial concentration of n-propanol increased (P = 0.03) and was 2.1 ± 0.5 mM, 3.5 h after PG dosing. The net portal flux of PG, propanal, and n-propanol increased (P < 0.05) after the PG dose and accounted for 33 ± 12% of the PG dose. The net hepatic uptake of PG, propanal, and n-propanol accounted for 55 ± 25% of the PG dose. The fast initial absorption rate of PG limited the accuracy of determining the net portal flux of PG and the net hepatic flux is probably a more reliable estimate of the availability of PG to the cow. The present study indicates that propanal and n-propanol are quantitatively important products of ruminal PG fermentation and that primarily n-propanol is absorbed to the portal vein and taken up in the liver.

Key Words: Cattle, Propylene Glycol, Metabolism

M200 Plasma concentration of glucagon-like peptide-1 (7-36) amide (GLP-1) increases after calving in dairy cows. A. Relling* and C. Reynolds, *The Ohio State University*, *Wooster*.

The gut peptide GLP-1 is an anorexic glucose-dependent secretagogue of insulin in non-ruminants. Plasma GLP-1 concentration is higher in lactating than in dry sheep, but the effects of transition on GLP-1 concentration have not been measured in cattle. The objective of our study was to determine the effects of transition on plasma concentrations of GLP-1, insulin and glucose in 32 Holstein cows selected on the basis of calving date. Cows were fed a prefresh ration to meet nutrient requirements and long hay ad libitum before calving, and a lactation TMR ad libitum after calving. Concentrations of GLP-1 and insulin (pmol/ml) and glucose (mmol/L) were measured in plasma from coccygeal vein samples taken at an average of 11 d before and 5, 12 and 19 d after calving. DMI was 14.4, 17.7 and 19.9 kg/d on day 5, 12 and 19 of lactation, respectively. Plasma concentration of insulin and glucose decreased after calving, but did not differ among samples taken after calving. In contrast, plasma concentration of GLP-1 increased linearly after calving (P <0.01). The increase in GLP-1 observed may be attributable to increased feed intake and gut mass after calving. In contrast to work in non-ruminants, we observed an uncoupled relationship between plasma concentrations of GLP-1 and insulin. This suggests that insulin secretion may be refractory to the effects of GLP-1 in early lactation cattle, perhaps as a consequence of the relatively low plasma concentration of glucose in ruminants compared with non-ruminants.

Day from calving	-11	5	12	19	SEM	$P <$
Milk yield, kg/d	-	30.6	36.6	39.7	1.5	0.001
Insulin	0.084	0.056**	0.057**	0.061**	0.006	0.006
Glucose	3.56	2.61**	2.73**	2.60*	0.11	0.001
GLP-1	0.011	0.019**	0.023**	0.025**	0.001	0.001

*P <0.01, **P < 0.001: Values differ from means for d -11 relative to calving

Key Words: Glucagon-Lke Peptide-1, Insulin, Transition

M201 Metabolic profile of transition dairy cows from northwestern Portugal. J. A. A. Pires*[1], P. L. Ruegg[1], M. D. Salgueiro[2], and A. Dias-da-Silva[3], [1]*University of Wisconsin*, *Madison*, [2]*AGROS*, *Vila do Conde, Portugal*, [3]*CECAV-UTAD*, *Vila Real, Portugal.*

The productivity of dairy farms in northwestern region of Portugal, has been steadily increasing. The objective of this study was to assess the occurrence of disease and metabolic disorders in periparturient dairy cows in this region. Data were collected between Jan-Jun 2002 from randomly selected Holstein cows (n = 349) located on commercial dairy farms (n = 25). The RHA (8489 kg) and herd size (60 cows/farm) were characteristic of the region. Blood samples were collected weekly from each cow, starting 2 weeks before expected calving until 3 to 4 weeks postpartum. Serum was analyzed for glucose, NEFA, BHBA and Ca. Data were analyzed with PROC MIXED (SAS) using repeated measures, with cow and farm defined as random variables. Categorical data were analyzed using PROC LOGISTIC. The critical thresholds for [NEFA] were defined as: >325 µEq/l when < -14 DIM, >400 µEq/l from -14 to -2 DIM, and >700

μEq/l when > 3 DIM. Sub-clinical ketosis (**SK**) was defined using [BHBA] > 14.4 mg/dl and sub-clinical hypocalcaemia (**SCa**) for [Ca] < 8 mg/dl. The prevalence of elevated NEFA was 37%, 64%, 44%, 23% and 13% in the dry period, 1st, 2nd, 3rd and 4th weeks of lactation, respectively. The prevalence of SK was 24%, 21%, 12% and 8.2% for the 1st, 2nd, 3rd and 4th weeks of lactation, respectively. The overall prevalence of SCa within 2 d post-calving was 9%, 37% and 52% for cows in 1st, 2nd and >3rd lactations. The incidence of retained placenta (**RP**), displacement of abomasum (**DA**) and clinical hypocalcaemia were 12.5%, 5.3% and 2%, respectively. The prevalence of clinical mastitis (**CM**) was 13.7%. Cumulative milk yield at 100 days was reduced by 241 kg, 352 kg and 384 kg for RP, CM and DA, respectively ($P < 0.01$). Elevated levels of NEFA before calving were associated with increased risk of DA (OR = 4.6; $P < 0.05$). Overall, there was high prevalence of elevated NEFA, starting before calving, which may have impaired liver function and explain the high prevalence of SK observed post-partum.

Key Words: Dairy Cow, Transition Period, Metabolic Profile Survey

M202 Effect of anionic salt source on peripartal dry matter intake, milk production, and blood mineral concentrations in Holstein cows. D. B. Carlson*, J. W. McFadden, and J. K. Drackley, *University of Illinois*, *Urbana*.

Our objective was to compare two anionic salt sources on DMI, milk production, and blood mineral concentrations in periparturient cows. Multiparous cows (n=56) were balanced by parity and assigned to prepartum diets containing either 1) a commercially formulated, sulfur-based anionic salt pellet (PEL), or 2) a blend of individual anionic salts (IND). Prepartum diets differed only in anionic salt source and were balanced to achieve a dietary cation-anion difference of -10 mEq/100 g DM and to provide 150 g of calcium per cow per day. Cows were fed their respective prepartum diets from d 21 before expected calving date until calving. After calving, all cows were fed a lactation diet until d 56 in lactation. Prepartum DMI was not different (P=0.31) between cows fed PEL or IND (13.0 vs. 12.2 kg/d). Postpartum DMI was not influenced (P=0.25) by prepartum treatments. Prepartum urine pH was lower (P<0.01) for IND (7.1) than for PEL (7.97). Cows fed PEL had lower (P=0.03) blood Ca concentration on d -3 to +3 relative to calving compared with IND (9.27 vs. 9.49 mg/dl). Concentrations of P, Na, K, and Cl in plasma and Mg in serum did not differ (P>0.05) around calving between prepartum treatments. From d -3 to 0 relative to calving, serum NEFA was higher (treatment x time; P<0.01) in cows fed PEL than in those fed IND, although postpartum NEFA was not different (P=0.95) between treatments. Prepartum treatment had no effect on milk yield, milk fat, milk protein, body weight, or body condition score. Cows fed PEL had a lower (P=0.04) milk lactose concentration than cows fed IND (4.73 vs. 4.80%). The individual anionic salt blend reduced urine pH and increased blood Ca around calving more than the sulfur-based pellet. However, cows fed PEL maintained sufficient blood Ca concentration around calving (>9 mg/dl); therefore, PEL was effective in maintaining Ca homeostasis and preventing hypocalcemia.

Key Words: Anionic Salt, DCAD, Periparturient Period

M203 Effect of growth conditions on mineral composition of rumen microbes. N. Singh*, E. Ungerfeld, and R. Kohn, *University of Maryland*, *College Park*.

Uptake of cations and anions by rumen microbes may affect rumen strong ion difference (SID) and pH. An in vitro study was conducted to determine the macro-mineral composition of solid and liquid-associated bacteria in rumen fluid. Effect of buffer strength, pH, feed type, and length of incubation were evaluated. Buffer concentration was 0.5x, 1x, 2x normal concentration at pH 6.8 or adjusted to pH 5.8 at normal concentration of buffer. Media with rumen fluid (4:1 v/v) was incubated with alfalfa hay or corn grain for 4, 14, or 24 h. Values were reported as g/100g and m Eq/100g dry microbial pellet for minerals and SID respectively. Differences are noted at P < 0.05. Ash content was lower for solid than liquid-associated bacteria (10.86, 15.37) but SID was not different between bacterial pellet because of a decrease in mineral concentration of Na^+, Cl^-, S, PO_4^{2-}, Mg^{2+}, K^+ and Ca^{2+}. Buffer strength increased ash content (11.99, 13.36, 15.31) but SID was not affected because of an increase in Na^+ (2.34, 3.39, 4.13), Cl^- (0.46, 0.7, 1.24), PO_4^{2-} (1.76, 1.01, 2.48) while, Mg^{2+} was lower for 0.5x than 2x (0.23, 0.32) media concentration. Ash content (13.95, 12.28) was higher for alfalfa hay than corn grain but SID was not affected (2.01, 1.48) because K^+ (1.63, 1.22), Cl^- (1.22, 0.97), Mg^{2+} (0.26, 0.22), Ca^{2+} (0.36, 0.14) and S (0.29, 0.16) concentration were higher for alfalfa hay than corn grain. Over the length of incubation ash content decreased, while SID was unchanged as Na^+ (3.61, 2.79, 3.07), K^+ (1.57, 1.41, 1.31), and Cl^- (1.48, 0.91, 0.89) decreased from 4 to 14 to 24 h of incubation. Low buffer pH decreased ash (11.80, 13.36), and SID (0.75, 2.35) by increasing Cl^- ion (0.70, 1.97), S (0.12, 0.27), PO_4^{2-} (1.01, 1.79) and decreasing Na^+ (3.39, 2.76), and Ca^{2+} (0.28, 0.19). On average microbes took up more cations than anions from the media. Calculated SID of the microbial pool decreased with pH but was not affected by other treatments due to a similar change in uptake of cations and anions. The results enable us to predict change in SID due to microbial growth and this change would further affect rumen pH.

Key Words: Strong ion Difference, Microbes, Mineral Composition

M204 Relationship among ruminal strong ions and ruminal pH. C. S. Mooney* and M. S. Allen, *Michigan State University*, *East Lansing*.

The objective of this study was to investigate relationships among strong ion concentrations in the rumen and ruminal pH. Eight ruminally cannulated Holstein cows (55 ± 16 DIM; mean ± SD) were used in an experiment with a duplicated 4 x 4 Latin square design. A 2 x 2 factorial arrangement of treatments was used with main effects of dietary starch percentage (32% vs. 21%) and conservation method of corn grain (dry, 90% DM or high-moisture, 63% DM). Ruminal fluid samples were collected through the ruminal cannula every twenty minutes for 24 h per period during which feeding behavior and ruminal pH were monitored continuously. Dietary Na, K, and Cl concentrations were 0.5%, 1.2%, and 0.3%, respectively for the 32% starch diets and 0.5%, 1.4%, and 0.4%, respectively for the 21% starch diets. Across treatments, ruminal Na, K, and Cl concentrations averaged 96.3 ± 14.7, 40.7 ± 9.3, and 12.0 ± 2.3 meq/L, (mean ± SD) respectively. Across all samples (n > 2230), ruminal pH was positively correlated with ruminal Na concentration (r = 0.65, $P < 0.0001$) and negatively correlated with ruminal K concentration (r = -0.46, $P < 0.0001$). Ruminal pH was only slightly negatively related to ruminal Cl concentration (r = -0.09, $P < 0.0001$). Ruminal Na and K concentrations were strongly negatively correlated (r = -0.67, $P < 0.0001$). Treatment affected daily mean ruminal concentrations of Na, K, and Cl. Low starch diets increased ruminal concentrations of Cl (12.8 vs. 11.1 meq/L, $P < 0.01$) and K (43.0 vs. 38.3 meq/L, $P < 0.01$) proportional to dietary concentrations of these ions and decreased ruminal concentrations of Na (94.2 vs. 98.5 meq/L, $P < 0.001$), which did not reflect the uniform concentration of Na across diets. The reduction in Na concentration by the low starch diets was also not consistent with the expected increase in saliva flow from a 13% increase in total chewing time per day. The sum of ruminal Na and K was similar across treatments (136.9 meq/L, $P > 0.28$). These results suggest that strong ion difference and charge balance in the rumen are regulated through Na flux across the ruminal epithelium.

Key Words: Ruminal pH, Strong Ions, Sodium

M205 Evaluation of a dynamic mechanistic model of phosphorus metabolism in dairy cows. E. Kebreab*, J. France, N. Odongo, V. R. Osborne, and B. W. McBride, *University of Guelph*, *Guelph, Ontario, Canada*.

Phosphorus (P) is an essential nutrient involved not only in bone development, growth and productivity, but also in most metabolic processes of the body. Quantitative aspects of P metabolism in ruminants have so far been considered mostly empirically or kinetically. A new dynamic model of P partition being developed at the University of Guelph, Canada was used to simulate P metabolism in dairy cows and was challenged with P data from the literature. The model consists of

10 state variables representing P pools in the rumen, small intestine, large intestine, and extra-cellular fluid. A database of experiments that measured P balance was constructed and statistical comparisons made with model simulations. The difference between overall observed (46.2 g/d) and predicted mean (46.3 g/d) fecal P output was 0.12 g/d. The root MSPE was 4.02 g per day, which was 8.7% of observed mean. Almost all of the calculated error (99%) was due to random variation. Milk P output was also well predicted with root MSPE of 1.08 g/d (6.1% of observed mean). Phosphorus output in urine was negligible within the ranges of P intakes of the experiments (60 to 84 g/d) and simulations reflected observed values. Not only were observed and simulated fecal P in good agreement ($r^2 = 0.87$), but also trends of change in the experiments were represented well in simulated fecal P outputs. For example, in both observed and predicted fecal P outputs, cows fed low-degradable starch diets showed better P utilization than those fed high-degradable starch diets due to greater energy availability for milk production and greater P absorption to blood. Although the major factor influencing P excretion is P intake, the model showed that energy availability and milk production also affected P excretion.

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Key Words: Phosphorus, Mechanistic Model, Pollution

M206 Quantification of net splanchnic inorganic phosphate recycling in lactating dairy cows. N Kristensen*, B Røjen, B Raun, P Lund, and J Sehested, *Danish Institute of Agricultural Sciences*, *Tjele, Denmark*.

Three Holstein cows fitted with a ruminal cannula and chronic indwelling catheters in the mesenteric artery, mesenteric vein, hepatic portal vein, and hepatic vein were used to study net recycling of inorganic phosphate (IP). The feed intake of the cows was 6, 14, and 15 kg DM/d, respectively. The diet had the following composition (% of DM): fresh clover grass cut daily, 43; soy hulls, 20; flaked barley, 20; corn silage mixed with minerals and vitamins, 16; barley straw, 1. Barley was fed at 0700 and fresh clover grass was fed at 0800. Orts were removed at 1545 and the cows were fed soy hulls and corn silage mix. The cows were milked at 0600 and 1600. Blood samples were collected every 1.5 h from the mesenteric artery, hepatic portal vein, and hepatic vein for 24h. Feces were collected during the same 24 h period. Portal blood flow was determined by down stream dilution of p-aminohippurate infused into the mesenteric vein. Plasma IP concentrations were determined using a Cobas Mira analyzer and a commercial kit (Phosphorus CP; ABX Diagnostics, Montpellier, France). Recycling of IP (mmol/d) was determined as the net portal flux of IP - absorbed P, where absorbed P = feed P - feces P. The total P intake with feed was 623, 1382, and 1644 mmol/d, respectively and the feed - fecal P difference was 213, 445, and 555 mmol/d, respectively. The arterial IP concentration was similar between cows (1.43 ± 0.08 mM). However, the portal - arterial concentration difference differed apparently between cows (mean of 16 samples within cow 0.022 ± 0.004, 0.101 ± 0.012, and 0.127 ± 0.021, respectively). The net portal flux of IP was 538, 2863, and 2829 mmol/d, respectively and the net portal flux rate was stable across the 24 h collection period. The cows recycled 325, 2418, and 2274 mmol/d of IP representing 122 ± 36% of the dietary P intake. The multicatheterized animal model is a promising model for studying recycling of IP in cattle.

Key Words: Cattle, Phosphate, Recycling

M207 Effect of manganese level in water on the performance of dairy calves from birth to 70 days of age. M. L. Raeth-Knight*, K. M. Steffenhagen, and J. G. Linn, *University of Minnesota*, *St. Paul*.

Thirty three Holstein or Holstein-Montebeliarde crossbred calves, born from November 2003 to April 2004, were blocked by sex and randomly assigned to 1 of 3 treatments for 70 days. Treatments were control water (0.003 ppm Mn), 0.25 ppm Mn in water and 0.75 ppm Mn in water. The control water was supplemented with manganese carbonate to achieve 0.25 and 0.75 ppm Mn levels. Colostrum was fed twice daily the first two days following birth, for a minimum of 4 feedings. Milk replacer, containing 20% crude protein and 20% fat, was mixed with treatment water to contain 11% solids and fed twice daily until weaning at 42 days of age. Starter (18% CP) and treatment water were offered ad libitum day 7 to day 70. Feed and water intake were recorded daily. Body weight (BW) and hip height (HH) were recorded at birth, day 28, 42 and 70. Calves were housed individually in calf hutches from day 3 to day 70. Growth and intake data were analyzed as repeated measures using PROC MIXED and birth weight within sex was included in the statistical model as a covariate. There was no significant effect (P>.1) of calf sex on performance therefore, only treatment means are presented. Manganese level of water mixed with milk replacer or offered ad libitum had no significant effect on milk replacer or starter intake or growth of calves. Free water intake averaged 2.65, 2.71, and 2.68 L/day pre-weaning (day 3-42) and 10.80, 11.83 and 11.46 L/day post-weaning (day 43-70) for control, 0.25, and 0.75 treatments, respectively. For all calves, total dry matter intake averaged 1.75 kg/day pre-weaning and 3.55 kg/day post weaning. Calf body weight for control, 0.25 and 0.75 treatments averaged 50.1, 46.8 and 50.0 kg at birth and 104.3, 99.8, and 104.4 kg at the end of trial. Manganese carbonate in water up to 0.75 ppm Mn did not significantly impact calf performance or health.

Key Words: Calf, Water, Manganese

M208 Effect of Sel-Plex™ supplementation on milk production, composition and somatic cell count of lactating dairy cows in commercial dairy herds. G. A. Harrison*, J. M. Tricarico, and S. A. Elliott, *Alltech Biotechnology, Inc.*, *Nicholasville, KY*.

Field trials with a selenium yeast supplement (Sel-Plex™, Alltech Biotechnology Inc., Nicholasville, KY) were conducted during 2003 and 2004 in 14 commercial dairy herds. Days in milk (DIM), milk production, and composition were collected from downloaded Dairy Herd Improvement (DHI) test records. Fat-corrected (FCM) and energy-corrected milk (ECM) were calculated from milk yield and composition measurements. The dataset included 1444 cows with two consecutive DHI tests and initial DIM>30. After the first monthly DHI test, Sel-Plex was included in the diet to provide 0.3 ppm added Se (DM basis) and replaced inorganic selenium. Cows were fed Sel-Plex, on average, for 20 d before the second monthly DHI test. No adjustments were made for change in DIM (191 days for initial test month and 226 days for the second month). A two-stage analysis was used. The first stage evaluated individual herd responses and the second stage evaluated the overall response from variation among herds. Cows averaged 33.6 and 33.3 kg milk per d during the pre-Sel-Plex and Sel-Plex test month, respectively. Milk yield and composition were similar between the two test months. Actual somatic cell count (SCC) was lower on the Sel-Plex test month (252,653 vs. 213,173 cells/ml; $P<0.10$). Somatic cell count expressed on the linear score scale was also lower after Sel-Plex supplementation (4.34 vs. 4.09; $P<0.10$). Replacing inorganic Se with organic Se from Sel-Plex did not affect milk production and reduced SCC in commercial dairy herds.

Key Words: Organic Selenium, Dairy Cows, Field Study

M209 Effect of chromium on intravenous glucose tolerance test results in growing dairy heifers. J. Sumner*[1], J. McNamara[1], and F. Valdez[2], [1]*Washington State University*, *Pullman*, [2]*Kemin Agri Foods North America, Inc*, *Des Moines, IA*.

The objective was to determine the effect of chromium propionate on glucose metabolism in growing dairy heifers. Three doses (5, 10, and 15 mg chromium/d) were fed to heifers of 11 to 14 mo of age. Twenty heifers were used in a replicated Latin Square with a two-week adaptation period, followed by four periods of two weeks each with a two-week flush out period between treatments. Treatments, including a 0 mg/d control, were allotted to periods in a design balanced for potential carryover effects. Chromium propionate was supplied in 0.25 kg/d of ground corn individually and heifers were observed to consume the entire dose. After 14 days on each treatment, animals were fitted with an indwelling jugular catheter and an intravenous glucose tolerance test

was conducted the following morning. Body weights increased throughout the experiment, but weights and conditions scores were unaffected by treatment. Chromium supplementation increased (P < 0.05) basal glucose (72.9 mg/dl for 0 mg Cr/day; 73.7, 79.2, and 78.0 mg/dl for the 5, 10 and 15mg/d treatments). Treatment decreased (P < 0.05) basal insulin (8.6, 6.0, 6.3 and 7.4 uU/ml for control, 5, 10 and 15mg/d treatments). Area under the curve for glucose was 891, 662, 381 and 561 mg/dl*min for 0, 5, 10, and 15 mg Cr/d (SEM 94); half-life (t1/2) was 87.9, 67.6, 66.9 and 72.3 (SEM 4.3) for control, 5, 10 and 15 mg Cr/d. Peak insulin response was 74, 76, and 82% of control for 5, 10, and 15 mg/d (P<0.05). Area under the curve for insulin was not different: 262, 274, 257 and 259 uU/ml*min (SEM 30.3). Serum NEFA were negatively correlated with glucose, such that treated animals with increased glucose had lower NEFA overall, but there was no treatment effect. Chromium supplementation to growing dairy heifers fed a grass and alfalfa based ration increases whole-body insulin sensitivity. This helps to confirm biological activity of supplementation of chromium in dairy animals.

Key Words: Chromium, Glucose Tolerance, Insulin

M210 Effects of rumen protected choline and dry propylene glycol on feed intake and blood metabolites of Holstein dairy cows. Y.-H. Chung*[1], T. W. Cassidy[1], I. D. Girard[2], P. Cavassini[3], and G. A. Varga[1], [1]*The Pennsylvania State University*, *University Park*, [2]*Probiotech International Inc.*, *Québec, Canada*, [3]*Ascor Chimici s.r.l.*, *Via Piana, Italy*.

Three trials were conducted simultaneously using a 6 x 6 Latin Square design (multiparous=6 with average dry matter intake (DMI) =16.6 kg/d and milk yield=38.3 kg/d) to study: (1) additive effects of rumen protected choline (RPC) and dry propylene glycol (PG) (trial I), (2) RPC dose-dependent effects (trial II) and (3) effects of dry PG feeding method (trial III). Treatments for trial I were: (1) control, (2) 50 g RPC top dressed, (3) 250 g dry PG mixed in the TMR and (4) the combination of (2) and (3). Treatments for trial II were: (1) control, (2) 25 g RPC top dressed and (3) 50 g RPC top dressed. Treatments for trial III were: (1) control, (2) 250 g dry PG top dressed and (3) 250 g dry PG mixed in the TMR. Daily DMI was recorded and jugular blood samples were taken every 20 min for the first 4 h and again at 8 and 12 h relative to feeding on the last day of each experimental period. In trial I, effects of treatment were observed on DMI, plasma insulin and blood nonesterified fatty acids (NEFA). Dry matter intake was higher (P<.01) in cows receiving either RPC or dry PG only, however, blood glucose did not differ among treatments. Plasma insulin was highest (P<.05) for cows receiving the combination of RPC and dry PG. Blood concentration of NEFA was reduced (P<.01) in cows receiving either RPC only or the combination of RPC and dry PG. In trial II, increasing RPC dosage increased DMI (P<.01) and linearly decreased NEFA (P<.01). In trial III, cows receiving dry PG mixed in the TMR had the highest DMI compared to cows receiving no dry PG or dry PG top dressed (P<.01). Blood concentrations of glucose, insulin and NEFA were not affected by different feeding methods. Rumen protected choline appeared to have dose-dependent effects on reducing NEFA with 11% and 23 % reduction for cows provided 25 g and 50 g RPC vs. control, respectively.

Key Words: Dry Matter Intake, Insulin, Nonesterified Fatty Acids

M211 Effects of rumen protected choline and dry propylene glycol on production responses of periparturient Holstein dairy cows. Y.-H. Chung*[1], T. W. Cassidy[1], I. D. Girard[2], P. Cavassini[3], and G. A. Varga[1], [1]*The Pennsylvania State University*, *University Park*, [2]*Probiotech International Inc.*, *Québec, Canada*, [3]*Ascor Chimici s.r.l.*, *Via Piana, Italy*.

Two trials were conducted simultaneously to study additive effects of rumen protected choline (RPC) and dry propylene glycol (PG) (trial I) and RPC dose-dependent effects (trial II) on production performances of 74 multiparous Holstein dairy cows (lactation number=2.4 and 305ME=12716 kg). Trial I included treatments of (1) control (n=18), (2) 50 g RPC (n=12), (3) 250 g dry PG (n=14) and (4) the combination of (2) and (3) (n=15). Trial II included treatments of (1) control, (2) 25 g RPC (n=15) and (3) 50 g RPC. Treatments of RPC were top dressed on the TMR once daily starting from 21 days before to 21 days after parturition. Dry PG was mixed into the TMR postpartum only until 21 days in milk (DIM). Dry matter intake (DMI) and milk yield (MY) were recorded daily and MY was recorded until 42 DIM. Body condition score (BCS), body weights and milk components were measured weekly. Calf birth weights were also recorded. Tail vein blood samples were taken weekly from -21 to +21 DIM and analyzed for blood metabolites. Additional blood samples were taken every other day one week before the expected calving date. Prepartum and postpartum data were analyzed separately except for calf birth weights. There were no significant treatment effects observed for DMI, MY, milk composition, BCS, body weights and blood glucose concentrations in either the prepartum or postpartum period. Calf birth weights were also not affected by treatments. Based on results obtained in the present study, neither RPC nor dry PG appeared to affect intake, blood glucose concentration or production responses of multiparous periparturient Holstein dairy cows.

Key Words: Blood Glucose

M212 Secretion of choline in milk is depressed in dairy cows in early lactation. J. R. Newbold*[1], E. C. L. Bleach[2], P. C. Aikman[2], and D. E. Beever[2], [1]*Provimi Research and Technology Centre*, *Sint-Stevens-Woluwe, Belgium*, [2]*University of Reading*, *Reading, Berkshire, United Kingdom*.

Milk choline concentration was measured in 24 Holstein-Friesian cows 15, 30, 60 and 90 days after calving. Cows were offered one of four TMR based on maize silage, grass silage and concentrate containing between 11.7 and 12.2 MJ ME/kg DM and 150 and 180 g CP/kg DM. Neither the lactation diets nor the pre-calving diet contained supplemental choline and diet was not expected to influence choline supply. Milk choline concentration (mg/l) increased with advancing lactation (7.8, 14.2, 25.6, 31.1 for days 15, 30, 60 and 90, respectively, s.e.d. = 2.59, P < 0.001), with no effect of diet. Milk choline yield (mg/d) increased in a similar manner (278, 604, 1086, 1264 for days 15, 30, 60, 90, respectively, s.e.d. = 104.6, P < 0.001). For all cows, milk choline concentration was correlated positively with milk fat concentration (r = 0.36, P < 0.001) and milk fat yield (r = 0.44, P < 0.01), but not with milk yield (overall mean = 41.1 kg/d), milk protein, body condition score or calculated energy balance. However, there was a significant negative correlation between milk choline concentration and calculated energy balance at day 15 (r = 0.63, P < 0.01). The biological significance of low milk choline concentration in very early lactation is unclear, but could indicate a general choline deficiency at this time.

Key Words: Choline, Milk, Cow

M213 Plasma α-tocopherol levels during the transition period in grazing Jersey cows. J. M. l. Sanchez*[1,2] and A. Zuniga[1,2], [1]*Universidad de Costa Rica*, *San Jose, Costa Rica*, [2]*Centro de Investigacion en Nutricion Animal y Escuela de Zootecnia*, *San Jose, Costa Rica*.

The objective of this study was to measure changes in plasma α-tocopherol concentration in periparturient cows consuming fresh pastures. A total of 143 blood samples were taken in a commercial Jersey herd grazing Kikuyu grass in the highlands of Costa Rica. Samples were taken twice weekly during a one month period from 22 cows. At the time of sampling, cows were within -21 and +21 d relative to calving. Cows were supplemented with grain and mineral mixtures without added vitamins. Estimated grass intake was 66% of the total DM consumption in dry cows and 50% in fresh cows. Basal plasma α-tocopherol levels during d -20 to -11 showed minor variations and were approximately 6.50 µg/ml, thereafter levels decreased to a minimum average value of 5.13 µg/ml, 95% confidence interval of 7.37 to 2.90 µg/ml at d +2. By d +20, plasma α-tocopherol concentrations increased rapidly and steadily to 8.07 µg/ml. The comparison between basal plasma α-tocopherol values in heifers and older cows did not show significant differences (P=0.113). Incidence of diseases related a vitamin E deficiency, such as clinical mastitis and retained placenta during the first month of lactation were 0.6 and 0.3%, respectively (479

registered parturitions during a 30 month period). Plasma α-tocopherol levels obtained were higher than 3.0 µg/ml (minimum suggested value for proper neutrophil function). Results of this study suggest that dairy cows grazing fresh grasses probably do not require vitamin E supplementation.

Plasma a-tocopherol mean values and 95% Conf. Int. (CI) (µg/ ml)

	Days relative to calving					
	-8	-5	-2	0	+2	+5	+8
Average	6.39	6.16	6.49	5.56	5.13	5.72	6.24
95% CI	4.81-8.17	4.44-7.88	3.61-9.17	3.42-7.70	2.90-7.37	4.16-7.28	3.92-8.56

Key Words: α-Tocopherol, Grazing Cattle, Peripartum

M214 Meta-analysis of dietary niacin supplementation trials in lactating dairy cows. E. Schwab*, D. Caraviello, and R. Shaver, *University of Wisconsin*, *Madison*.

Recent reviews regarding niacin supplementation of lactating dairy cow diets only report across- study means or percentage responses versus controls. A meta-analysis of literature data was conducted to statistically examine the response of lactating dairy cows to supplemental dietary nicotinic acid (NA). The data set comprised 27 studies published between 1980 and 1998 where lactation performance responses to 6 and 12 g/d supplemental NA were reported. Data were analyzed with the MIXED procedure of SAS to evaluate animal response to NA, expressed as the difference from control. The linear model included NA supplementation level as the fixed effect and study as the random effect. Responses to NA supplementation were weighted by the number of animals used to test the response. Response variables evaluated were DMI, milk yield and composition, feed efficiency, and plasma BHBA, NEFA, and glucose concentrations. No efficacy of 6 g/d supplemental NA was found. Supplementation with 12 g/d NA did not affect DMI, milk fat or protein percentages, or plasma metabolites. Yields of 3.5% FCM, milk fat, and milk protein were increased (P≤0.10) 0.5 kg/d, 25.8 g/d, and 17.4 g/d, respectively, and 3.5% FCM feed efficiency was increased (P≤0.10) by 0.03 units. A Type I/Type II error economic analysis of 3.5% FCM yield response showed that frequencies of the observed response being greater than the break-even response were 54% and 57% when NA costs were $0.01 and $0.005/g, respectively. Although results of our meta-analysis show that 12 g/d NA improved lactation performance, tenuous economic benefits may dissuade routine inclusion in lactation diets. Results suggest that further research focusing on dairy cows in the transition period and metabolic disorders, higher NA dosage amounts, and ruminally-protected NA products may be warranted.

Key Words: Niacin, Dairy Cow, Milk Production

Sheep Species

M215 Estimation of the apparent digestibility of soybean hulls in diets containing increasing concentrations of soybean hulls to replace corn fed to growing lambs. T. Johnson*[1] and J. Rekhis[2], [1]*Purdue University*, *West Lafayette, IN*, [2]*Manouba University*, *Sidi Thabet, Tunisia*.

The objective of this study was to determine apparent digestibility of organic matter, N, fiber, and efficiency of nutrient utilization of diets containing increasing levels of soy hulls in replacement of corn in diets fed to growing lambs. Basal diet contained 65% ground corn, 25% soybean hulls, and 10% hay crop silage (Diet D). Soy hulls replaced corn at 25%, 50%, 75% or 100% of the concentrate. All lambs were fed ad libitum concentrate (1450 - 1800 g DM/ day). Twelve wether lambs (27-34 kg BW) were assigned to a 3-period switchback. Period contained 21 d, 14 d adaptation, and 7 d total collection of urine and feces. Composition of diets A, B, C, D, and soy hulls were respectively, DM %: 84.1, 83.8, 84.9, 82.7, and 90.5; OM %: 90.5, 93.02, 93.9, 94.2, and 95.1; GE, Kcal/g: 3.95, 3.82, 3.85, 3.84, and 3.78; N %: 3.23, 3.16, 3.01, 2.68, and 2.57; ADF %: 39.9, 36.5, 27.6, 17.1, and 44.1. Intake of DM, GE, and DE were not different between treatments (Table 1). Apparent DMD of diet A with 100% replacement of corn by soy hulls was lower than the basal diet D ($P < 0.05$). Intake of ADF was increased as soy hulls replaced corn ($P < 0.01$). However, apparent digestibility of ADF was also increased as soy hulls replaced 75% of dietary corn (diet B) as compared to basal diet D ($P < 0.05$). Although GE and DE consumed by lambs fed all diets were not different, fecal-E tended to be greater in lambs fed diet A (100% replacement of corn by soy hulls) as compared to fecal-E of lambs fed diet D. Presumably greater ADF digestibility of diet B as compared to basal diet D can be attributed to an improved rumen environment for fiber digestion in lambs fed this diet.

Table 1.

Diet-replacement of corn by soy hulls	A-100%	B-75%	C-50%	D-25%	SE	Significance
DM-intake, g/d	1489.0	1514.3	1388.2	1436.5	63.5	ns
DMD, %	67.4	72.2	70.6	76.5	2.8	A vs. D, $P < 0.05$
OMD, %	69.2	73.7	75.3	74.9	3.0	ns
ADF-Dig., %	60.5	64.8	56.8	53.7	3.0	B vs. D, $P < 0.05$; B vs. C, $P = 0.10$
GE-intake, kcal/d	6.21	6.20	5.59	5.86	0.30	ns
Fecal-E., kcal/d	1.89	1.73	1.70	1.52	0.12	A vs. D, $P = 0.10$
DE, kcal/d	4.31	4.47	3.90	4.33	0.28	ns

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Key Words: Soyhulls, Lambs, Digestion

M216 Effect of substitution of alfalfa hay with dehydrated pig manure on apparent digestibility of growing diets for sheep. A. Estrada-Angulo*, A. Terrazas, J. F. Obregon, A. B. Perez, C. H. Ramos, and E. Vazquez-Garcia, *FMVZ-Universidad Autonoma de Sinaloa*, *Culiacan, Sinaloa, Mexico*.

With the objective of determining the effect of substitution of alfalfa hay with dehydrated pig manure (DHPM) on apparent digestibility of growing diets for lambs, a total fecal collection experiment was conducted. Pelibuey lambs (n = 4 males; BW= 20.12 kg) were used in a crossover design experiment. The sheep were assigned to one of two diets: 1) 10% sudan grass hay, 30% alfalfa hay,