**TH233 Effect of dietary cation-anion difference on performance and blood acid-base balance of early-lactating dairy cows under heat stress.** D. P. Bu, L. Jia, J. Q. Wang*, H. Y. Wei, and L. Y. Zhou, *Chinese Academy of Agricultural Sciences*, *Beijing, P.R. China*.

The objective of this study was to investigate the effect of dietary cation-anion difference (DCAD = Na + K - Cl - S in mEq/kg of DM) on lactation performance and blood acid-base balance of early-lactating dairy cows in hot weather. Thirty-six Holstein cows, 43 ± 13 d in milk were allocated into three groups (n=12) according to complete random block design. All diets contained 51% concentrate and 49% forage mix, which were fed ad libitum as a total mixed diet. Cows were fed either a low DCAD diet (L, +130.49 mEq/kg DM), a middle DCAD diet (M, +251.54 mEq/kg DM) or a high DCAD diet (H, +383.87 mEq/kg DM). The DCAD difference was provided through a combination of Potassium Bicarbonate and Magnesium Sulfate. Experimental duration was 7 wk. Cows were milked 3 times/d and milk yields were recorded weekly. Milk samples were collected weekly and analyzed for composition. Blood samples were taken on d 42 from coccygeal vein or artery at 4h postfeeding. The average daily minimum temperature, humidity index and THI were 30.09°C, 59.97°RH and 94.63, respectively. Milk yield and milk fat content were $31.5^{b}$, $36.9^{a}$ and $34.1^{ab}$ kg/d, and $3.56^{a}$, $3.20^{b}$ and $3.35^{ab}$ for L, M and H, respectively. With the increasing of DCAD, milk protein ($P < 0.05$) increased gradually. Blood pH and blood base excess increased predominantly via increased DCAD ($P < 0.05$). Increasing dietary DCAD tended to increase total carbon dioxide ( $P = 0.07$), $HCO_3^-$ concentration ($P = 0.07$), and glucose ($P = 0.06$). Increasing DCAD affected blood urea nitrogen ($P < 0.002$), total protein ($P < 0.001$) and serum albumin ($P < 0.001$), and serum creatine kinase ($P < 0.05$), but blood lactose ($P < 0.07$) tended to increase linearly as DCAD increased. Overall, diets with the middle level of DCAD (+251.54 mEq/kg DM) improved lactation performance and blood acid-base status in early lactation cows under heat stress.

**Key Words:** Cation-Anion Difference, Heat Stress, Blood Acid-Base Balance

**TH234 Effects of different rates of abomasal infusion of nicotinic acid on plasma NEFA concentrations in feed-restricted Holstein cows.** J. B. Pescara*, J. A. A. Pires, and R. R. Grummer, *University of Wisconsin*, *Madison*.

Five non-lactating Holstein cows were used in a 5×5 Latin square to test the effects of different rates of abomasal infusion of nicotinic acid (NA) on plasma NEFA concentration. From d 1 to 4 cows were fed at 30% of maintenance requirements once a day at 9 AM to increase plasma NEFA concentration. On d 5, feed was offered at the same level but divided in 24 equal doses and administered hourly via ruminal cannula. Treatments were hourly abomasal infusion of NA boluses at a rate of 0, 0.25, 0.5, 1 and 3 mg/kg BW per h for 12 h. Daily blood samples were collected prior to morning feeding. On d 5, blood samples were collected each hour, starting prior to treatment administration, and continuing for 24 h thereafter. Nine days were allowed between experimental periods. Plasma NEFA concentrations were 105, 326, 421, 501 and 467 ± 36 uEq/L from d 1 to 5 of feed restriction (time effect; $P < 0.001$). Mean plasma NEFA concentration during NA infusion was decreased by the highest dose ($P < 0.001$). Plasma NEFA concentration decreased ($P < 0.001$) from 448 to 138 ± 75 uEq/L 1 h after the first bolus of 3 mg NA/kg BW. A transient rebound occurred with plasma NEFA increasing to 303, 503 and 566 ± 75 uEq/L at 2, 3 and 4 h after initiation of infusion of the highest dose (trt x time effect; $P < 0.001$). However, 6 h after initiation of treatment, plasma NEFA concentration decreased to 105 ± 75 uEq/L and remained below 243 ± 75 uEq/L until termination of infusions. During the 12 h following termination of infusions, mean plasma NEFA concentration was 399, 404, 405, 407 and 743 ± 69 uEq/L, for 0, 0.25, 0.5, 1 and 3 mg NA/kg BW per h, reflecting a post-treatment rebound for only the highest NA dose (trt effect; $P < 0.001$). Plasma NEFA concentration increased to 794, 1374 and 1391 ± 36.8 uEq/L at 2, 3 and 4 h after termination of the highest dose (trt x time effect; $P < 0.001$). A dose of NA large enough to cause an antilipolytic effect is accompanied by rebound in plasma NEFA following termination of administration.

**Key Words:** Nicotinic Acid, Abomasal Infusions, Dairy Cow

**TH235 Apparent ruminal synthesis and intestinal disappearance of vitamin $B_{12}$ analogues in dairy cows.** D. E. Santschi*[1], C. L. Girard[1], and R. H. Allen[2], [1]*Dairy and Swine R&D Centre*, *Sherbrooke, QC, Canada*, [2]*University of Colorado*, *Denver, CO*.

Vitamin $B_{12}$ is synthesized only by bacteria provided cobalt supply is adequate. Ruminal bacteria also produce vitamin $B_{12}$ analogues which may have functional value for the bacteria but could not be used by the host animal. Four lactating Holstein cows equipped with ruminal, duodenal (30 cm from pylorus) and ileal (60 cm from ileo-cecal valve) cannulae were used to evaluate apparent ruminal synthesis and small intestinal disappearance of vitamin $B_{12}$ analogues. Cows were fed a TMR with chromic oxide in 12 daily meals (DMI: 19.8 ± 0.5 kg/d). Duodenal and ileal samples were collected twice daily over 4 consecutive days (d1: 0800, 1400 h; d2: 1000, 1600 h; d3: 1100, 1700 h; d4: 0900, 1500 h). Analysis of vitamin $B_{12}$ analogues was done by LC/MS. Apparent daily ruminal synthesis was calculated as the intake of vitamin in the feed subtracted from the duodenal flow. Intestinal disappearance was calculated as the amount disappearing between the two intestinal cannulae. In addition to cobalamine (CBL), the biologically active form of the vitamin, 6 analogues were identified in duodenal and ileal digesta. Although CBL was not the major form synthesized by ruminal bacteria, it was the major form absorbed in the small intestine. Average daily intake of cobalt was 50 mg with 15 mg provided by the mineral premix as cobalt carbonate. Therefore, 11 % of the average daily intake of cobalt was used for apparent ruminal synthesis of analogues of vitamin B12, of which only 4 % were incorporated into CBL.

**Table 1.**

| | CBL[1] | COB[2] | CRE[3] | MADE[4] | ADE[5] | MSADE[6] | OHBZA[7] |
|---|---|---|---|---|---|---|---|
| Apparent ruminal synthesis (mg/d) | | | | | | | |
| Mean | 49.7 | 1.8 | 21.9 | 32.1 | 5.0 | 1.6 | 14.3 |
| SE | 6.4 | 0.6 | 7.3 | 4.5 | 1.2 | 0.2 | 1.0 |
| Apparent intestinal disappearance (mg/d) | | | | | | | |
| Mean | 22.5 | -3.2 | 2.2 | 4.9 | -1.7 | -0.1 | 5.2 |
| SE | 7.6 | 1.9 | 5.2 | 10.2 | 1.9 | 0.5 | 2.7 |

[1]Cobalamin (active form); [2]Cobinamide, CBl without the ribose and the phosphate groups; Substitution of 5, 6-dimethyl benzimidazole by [3]cresol, [4]2-CH3-adenine, [5]adenine, [6]2-CH3-S-adenine, [7]5-OH-benzimidazole

**Key Words:** Dairy Cow, Vitamin $B_{12}$ Analogues, Ruminal Synthesis and Intestinal Disappearance

**TH236 Effect of different form of selenium on the polyunsaturated fatty acids of milk fat from dairy cows fed fat diets.** L. Q. Wang, J. Q. Wang*, D. P. B u, S. J. Liu, L. Wang, N. Xia, H. Y. Wei, and L. Y. Zhou, *Chinese Academy of Agricultural Sciences*, *Beijing, China*.

The objective of the present study was to evaluate influence of dietary selenized yeast and sodium selenite on polyunsaturated fatty acids of milk fat and selenium contents of plasma and milk from lactating cows fed with rich oil diets. 36 Chinese Holstein dairy cows were allocated into 3 groups as a randomized complete block design for 9 wk periods with measurements made during the last 6 wk. Cows were fed total mixed ration (TMR) with basal diet a forage-to-concentrate ratio of 60:40 and 4% soybean oil (control), basal diet plus 13.6 g of selenized yeast (13.6 mg of selenium/d) (SY), or basal diet plus 3.04 g/d of sodium selenite (13.6mg of selenium/d) (SS). Results showed that selenium concentration of plasma increasedby 8.9% and 47.7% in the SS and SY groups compared with control, respectively ( $P < 0.001$). At the same time, selenium in milk from SS and SY groups increased by 35.6% and 185.0% compared with control ( $P < 0.05$). Polyunsaturated fatty acids in SY group enhanced by 11.6% when compared with control ( $P < 0.05$). However, no difference was observed between control and SS group. These results demonstrated that dietary selenized yeast supplementation in rich fat diets could increase polyunsaturated fatty acids of milk fat.
Acknowledgement; Research supported by the Ministry of Science and Technology (2006BAD12B03).

**Key Words:** Selenized Yeast, Sodium Selenite, Polyunsaturated Fatty Acids

**TH237 Bone development in dairy heifers fed diets with and without supplemental phosphorus.** N. M. Esser*[1], P. C. Hoffman[1], W. K. Coblentz[2], M. W. Orth[3], and K. A. Weigel[1], [1]*University of Wisconsin*, *Madison*, [2]*US Dairy Forage Research Center*, *Marshfield, WI*, [3]*Michigan State University*, *East Lansing*.

The NRC 2001 P requirements for heifers (0.20-0.35 %) and endogenous levels (0.20-35 %) of P in feeds are similar suggesting supplemental P in heifer diets may be minimally required. Because long-term studies are unavailable, 183 Holstein and 182 crossbred heifers were fed diets containing 0.38 (supplemented) or 0.28 (unsupplemented) % dietary P from 4-22 mo of age in a replicated pen design to evaluate related impacts on bone development and metabolism. Two sub-populations of heifers were selected mid-trial for measurement of bone development and metabolism. Thirty-two heifers at 21 mo of age, balanced by breed and dietary treatment were evaluated for bone development. External frame measurements included hip height, length, heart girth, hip width, cannon bone circumference, pelvic length, pelvic height, and pelvic width. Heifers were given a spinal block and tails were docked with the 13 and 14th coccygeal vertebrae retained. Tissue was removed from vertebrae, defatted and evaluated for ash and mineral content. The 13th coccygeal vertebrae were scanned using peripheral quantitative computed tomography. Cortical, trabecular and total bone densities were determined. A second sub-population (n=64) of heifers 12 mo, balanced for breed and dietary treatment, were evaluated for pyridinoline and osteocalcin levels to assess bone metabolism. Data were analyzed as a completely randomized design using PROC GLM of SAS with breed, treatment and their interaction. External frame measurements revealed significant differences ($P < 0.07$) in frame size between Holstein and crossbred heifers. Supplementing P had no effect ($P > 0.10$) on external frame measurements, bone density, or bone metabolism markers. Bone P and Mg contents were lower ($P < 0.08$) and bone K content higher ($P < 0.05$) in heifers fed no supplemental P. Data suggest P supplementation to heifers modestly increased bone P content but this increase in bone P was not reflected in frame growth, bone density or bone metabolism.

**Key Words:** Phosphorus, Bone Growth, Heifers

**TH238 Dairy cows might discriminate between vitamin $D_2$ and vitamin $D_3$ in the gastro intestinal tract.** L Hymoeller*[1,2], S. K. Jensen[2], and M. O. Nielsen[1], [1]*University of Copenhagen*, *Groennegaardsvej, Frederiksberg C*, [2]*University of Aarhus*, *Blichers Allé, Tjele*.

To study uptake of vitamin $D_2$ and $D_3$ from the gastro intestinal tract of dairy cows, rumen content from 5 high yielding cows with rumen fistulas was mixed with 250 mg of both vitamin $D_2$ and $D_3$. After mixing, rumen content was returned to the rumen of the respective cows. Blood was collected from cows 0, 8, 24, 32, and 96 hours after introducing vitamins into the rumen and samples of rumen content were collected after 0, 1, 2, 4, 8, 24, and 32 hours (in vivo). From the 1 hour in vivo sample of rumen content, 6 sub-samples from each cow were incubated at body temperature and taken out after 2, 4, 8, 12, 24, and 32 hours (in vitro). Rumen and plasma samples were analysed for content of vitamin $D_2$ and $D_3$ and plasma samples also for the physiologically active liver derived metabolites: 25(OH)$D_2$ and 25(OH)$D_3$ by HPLC with UV-detection.
In vivo rumen samples showed almost identical $D_2$ and $D_3$ concentrations at all sampling times ($P \geq 0.1$). After the 2 hour sample concentrations of $D_2$ and $D_3$ rapidly declined due to dilution effects of subsequent feedings and due to rumen contents passing out of the rumen. In in vitro samples there was no degradation of $D_2$ and $D_3$.
Plasma concentrations of both $D_2$ and $D_3$ increased rapidly within the first hours of the study, from undetectable amounts at 0 hours to peak concentrations of $99 \pm 7$ and $162 \pm 7$ ng/ml (mean ± SEM), respectively, after 24 hours. The concentration of $D_3$ was significantly higher than the concentration of $D_2$ at all sampling times after the 0 hour sample ($P \leq 0.01$). Absorption rates and clearance rates were not the same for

$D_2$ and $D_3$, respectively. Initial plasma concentrations of 25(OH)$D_2$ and 25(OH)$D_3$ were 7 ± 0.8 and 52 ± 4 ng/ml, respectively, and they increased to a plateau of 36 ± 2 and 106 ± 9 ng/ml, respectively, within 32 hours. Concentrations 25(OH)$D_3$ were at all sampling times significantly higher than concentrations of 25(OH)$D_2$ ($P \leq 0.01$), but curves were parallel. No significant amounts of other metabolites than 25(OH)$D_2$ and 25(OH)$D_3$ were detected.
This study shows that when $D_2$ and $D_3$ are available for uptake in equal amounts in the gastro intestinal tract of dairy cows, there might be a preference for uptake of $D_3$ over uptake of $D_2$.

**Key Words:** Vitamin D, Discrimination, Dairy Cow

**TH239 Effects of supplements of folic acid, vitamin $B_{12}$ and rumen-protected methionine on whole body kinetics of glucose and methionine (Met) in lactating dairy cows.** A. Preynat*[1,2], H. Lapierre[2], C. Thivierge[1], M. F. Palin[2], J. J. Matte[2], A. Desrochers[3], and C. L. Girard[2], [1]*Universite Laval*, *Quebec, QC, Canada*, [2]*Agriculture and Agri-Food Canada*, *Sherbrooke, QC, Canada*, [3]*Universite de Montreal*, *St-Hyacinthe, QC, Canada*.

In order to determine the effects of rumen-protected methionine (RPM) and/or folic acid + vitamin $B_{12}$ on glucose and Met kinetics, 24 multiparous cows, assigned to 6 blocks based on previous milk yield, were fed a basal diet estimated to cover energy and protein requirements but only 76% of Met requirement and received supplements from 3 wk before to 16 wk after calving. Within each block, 2 factors were randomly assigned according to a 2 × 2 factorial arrangement: 1) no RPM (M-) or 18 g/d of RPM (M+; Mepron-85, Degussa); 2) no vitamin supplement (Vit-) or intramuscular injections of folic acid and vitamin $B_{12}$ (160 and 10 mg/wk; Vit+), (4 treatments: M-Vit-, M+Vit-, M-Vit+ and M+Vit+). At 12 wk of lactation, glucose and Met kinetics were measured using continuous infusions on different days of either D-[U-$^{13}$C]glucose, L-[1-$^{13}$C, $^{2}H_3$]Met or $^{13}$C[$NaHCO_3$]. There was no treatment effect on DMI (P=0.6). Vit+ increased milk production (P=0.01, 34.7 vs 38.9±1.0 kg/d) and yields of lactose, protein and total solids ($P \leq 0.05$). Whole body flux of glucose (absorption + gluconeogenesis + glycogenolysis) tended to increase (P=0.11, 802 vs 838±16 mmol/h) with Vit+, by an amount similar to the increase in lactose yield. There was no treatment effect on glucose oxidation, averaging 23% of glucose flux. Met flux increased (P=0.003, 20.0 vs 24.5±0.9 mmol/h) in M+ cows. Met used for protein synthesis increased with M+ (P=0.01, 14.5 vs 17.9±0.8 mmol/h) and Vit+ (P=0.06, 15.1 vs 17.3±0.8 mmol/h). Vit+ decreased the entry of Met in the transmethylation pathway, Met oxidation and plasma cysteine concentrations in M+ cows only, having no effect in M- cows (Met × vitamin, $P \leq 0.06$). Therefore, increased milk lactose and protein yields with Vit+, without change in DMI, were supported by a positive effect of B-vitamin supplement on glucose flux and Met used for protein synthesis.

**Key Words:** Dairy Cow, B Vitamins, Methionine

**TH240 Effect of organic trace mineral (4-Plex®) supplementation on dry matter intake, milk production, health events, and body weight in dairy cows.** K. S. Hackbart*[1], R. M. Ferreira[1], M. T. Socha[2], R. D. Shaver[1], M. C. Wiltbank[1], and P. M. Fricke[1], [1]*University of Wisconsin*, *Madison*, [2]*Zinpro Corp.*, *Eden Prairie, MN*.

Cows were assigned at dry-off to receive either inorganic trace mineral supplementation (C; n=32) or organic trace mineral supplementation (T; n=31). Trace minerals were provided through C or T premixes fed at 100 g/cow/d. Diets (both C and T) for dry and lactating cows contained supplemental Zn, Mn and Cu at 75, 65 and 15 ppm (DM basis), respectively. Cobalt was formulated for 2.1 and 1.1 ppm (DM basis) in dry and lactating cow diets (both C and T), respectively. Zinc, Mn and Cu sulfates and Co carbonate were used in the C premix. For T, 14 g/cow/d of 4-Plex® was fed through the premix to provide the following percentages of organic supplemental Zn, Mn, Cu and Co: dry cows - Zn (40%), Mn (26%), Cu (70%) and Co (100%); lactating cows - Zn (22%), Mn (14%), Cu (40%) and Co (100%). Premixes (C and T) were fed to dry cows (range = 40-72 d before calving) in 1.8 kg/cow/d concentrate through a computer feeder and to lactating cows (range = 69-116 d after calving) in a TMR. Post-calving daily dry matter intakes (DMI), daily milk production, and health events (lameness, ketosis, mastitis, milk fever, retained placenta) were recorded. Body weight (BW) was assessed at dry-off, calving, and monthly thereafter. Treatment did not affect DMI (C=21.37kg, T=21.35kg) or the incidence of any health events. Treatment did not affect milk production (C=41.43kg, T=42.24kg) until wk 13 (C=41.86kg, T=44.51kg; P=0.074) and wk 14 (C=41.56kg, T=44.71kg; P=0.042) post-calving. Treatment did not affect BW except at month 1, where C cows tended to be heavier (P=0.087) than T cows, and in BW change from calving to month 1, where T cows tended to lose more weight (P=0.053) than C cows. We conclude that supplementing organic trace minerals had no effect on DMI or health events and only affected milk production later in lactation, BW at 1 month post calving, and BW change from calving to 1 month post-calving.

**Key Words:** Organic Trace Minerals

**TH241 Non-acid-base factors partly responsible for increased urinary calcium excretion when anionic salts are fed.** L. Irvine[1], M. Freeman[1], D. J. Donaghy[1], and J. R. Roche*[2], [1]*University of Tasmania*, *Burnie, Australia*, [2]*DairyNZ*, *Hamilton, New Zealand*.

The reduction in milk fever associated with lower prepartum DCAD is believed to be effected through changes in acid-base balance. However, this mechanism has recently been questioned. Data indicate improvements in calcium absorption when anionic salts are fed in insufficient quantities to affect systemic acid-base balance, and, more importantly, the linear relationship between DCAD and milk fever is inconsistent with the quadratic nature of the relationship between DCAD and blood or urine pH. Fifty-two cows were randomly allocated to 4 groups on the basis of age (7.7±2.44yr), calving date (29 July±3.5d), and milk production in the first 100 d of the previous lactation (2,563±380.9), ensuring groups were balanced for breed, BW (621±52.4), and previous incidence of milk fever. Treatments included a control, a low DCAD (LOW), a high DCAD (HIGH), and a neutral DCAD (NEUTRAL), the latter supplemented with both the LOW and HIGH treatment salts. Cows were orally supplemented with the appropriate mixture of salts in water and molasses twice daily, and the control group received water and molasses. Urine was sampled mid-stream on one day each week precalving, and a blood sample was collected 14d and 7d precalving, the day of calving, and d 1, 2, 3, 4, 7 and 14 postcalving. Covariate samples were collected prior to the trial. Data were analysed using ANOVA. Urine pH was reduced and urinary Ca/creatinine ratio increased in the LOW DCAD group precalving, verifying the effectiveness of the LOW DCAD treatment in increasing Ca absorption. Ca/creatinine tended ($P<0.1$) to be greater in the NEUTRAL treatment than the HIGH treatment, indi-

cating approximately 25% of the increase in calcium absorbed when anionic salts are fed is not acid-base balance related. Neither blood Ca at calving nor milk production was affected by treatment.

**Table 1.**

| | CONTROL | LOW | HIGH | NEUTRAL | SED | P |
|---|---|---|---|---|---|---|
| Urine pH | 8.25 | 7.57 | 8.29 | 8.11 | 0.131 | <0.001 |
| Ca/Creat | 0.37 | 1.36 | 0.24 | 0.54 | 0.237 | <0.001 |
| Blood Ca | 1.82 | 1.90 | 1.69 | 1.71 | 0.172 | 0.61 |
| Milk yield | 31.4 | 30.3 | 28.3 | 31.0 | 1.69 | 0.27 |
| Fat% | 4.19 | 4.05 | 4.46 | 4.20 | 0.213 | 0.28 |
| Protein% | 3.10 | 3.15 | 3.09 | 3.11 | 0.067 | 0.83 |

**Key Words:** DCAD, Anionic Salts, Milk Fever

**TH242 Influence of a high potassium diet on the excretion of minerals after calving.** M. Rérat[1], A. Philipp[1,2], H. D. Hess[1], F. Dohme*[1], and A. Liesegang[2], [1]*Agroscope Liebefeld-Posieux Research Station ALP, Posieux, Switzerland*, [2]*University Zürich, Zürich, Switzerland*.

The aim of this study was to determine the effect of two diets, fed during the transition period and differing in their potassium content, on the mineral metabolism of dairy cows after calving. Five weeks before calving, 12 cows were paired by breed, age, number of lactations and milk production and randomly assigned to 2 dietary treatments ($K_{35}$ and $K_{15}$). The two experimental diets were based on hay and were formulated to be isoenergetic and isonitrogenous, but differed in their K content: 35 and 15 g/kg DM in $K_{35}$ and $K_{15}$, respectively. After calving all cows received the same diet based on hay $K_{35}$. The balance period started 24 to 48 h after calving and lasted for 7 d. Feces and urine were collected quantitatively and concentrations of minerals (Ca, P, and Mg) were analyzed in daily samples. Apart from d 2, urinary excretion of Mg was lower ($P < 0.05$) in group $K_{35}$ compare to group $K_{15}$. In contrast, fecal Mg excretion was higher ($P < 0.05$) with the higher dietary K content during the first 2 d of the balance period. Fecal Ca excretion of group $K_{35}$ was higher ($P < 0.05$) on d 2 and lower ($P < 0.05$) on d 7 compared to group $K_{15}$. During the last 2 d of the balance period, concentration of P in feces was lower ($P < 0.05$) in group $K_{35}$ than in group $K_{15}$. The lower urinary and higher fecal excretion of Mg in group $K_{35}$ could be related to a lower absorption of Mg in presence of a higher K level in the diet before calving. The higher fecal excretion of Ca on d 2 suggests that the Ca regulation system at the beginning of the balance period was less active in cows in group $K_{35}$ compared to group $K_{15}$. However, the lower concentrations of Ca and P in feces at the end of the balance period indicates a change in the Ca regulation system to a more active state. In conclusion these results suggest that the cows receiving a diet with high K level had a delayed activation of the Ca regulation system after calving.

**Key Words:** Potassium, Mineral Metabolism, Transition Period

**TH243 Effect of selenium yeast on selenium status, thyroid hormone concentrations and passive transfer of immunoglobulins in dairy cows and calves.** K. M. Koenig* and K. A. Beauchemin, *Agriculture and Agri-Food Canada, Research Centre*, *Lethbridge, AB, Canada*.

Forty Holstein cows (primiparous and multiparous) were fed TMR supplemented with 0.3 mg/kg Se as selenized yeast (Se yeast; Selenosource AF 2000, Diamond V Mills, Cedar Rapids, IA) or sodium selenite from 60 d prior to the expected calving date until 60 DIM to determine the effect of Se source on Se status of cows and their calves. Selenium status was assessed by measuring the Se concentration in whole blood, serum and milk, thyroid hormone concentrations in serum and the passive transfer of immunoglobulins to the calf. Cows and heifers were fed diets containing 0.38 to 0.40 mg Se/kg with no supplemental Se for 90 d before receiving the dietary Se treatments. The Se concentration of the TMR supplemented with the Se sources ranged from 0.62 to 0.81 mg/kg. Blood was collected from cows at 60 and 30 d prior to the expected calving date, at calving, and at 15, 30 and 60 DIM, and from their calves at 24 h and 56 d of age. Milk was collected at calving (colostrum) and at 15, 30 and 60 DIM. At birth, calves were removed from the dam and fed colostrum in an amount equivalent to 10% of their body weight within 12 h. There was no effect ($P > 0.05$) of dietary Se source on individual feed intake, milk yield and components, and somatic cell count. Whole blood Se concentration averaged 11% higher in cows fed Se yeast compared to selenite (291 vs 262 ± 5.9 ng/mL, $P < 0.05$). Serum Se concentration averaged 13% higher in cows fed Se yeast (128 vs 113 ± 5.8 ng/mL, $P < 0.05$). Maternal supplementation of Se yeast improved the Se status of calves at 24 h of age by increasing ($P < 0.05$) whole blood (252 vs 211 ± 16 ng/mL), serum (94 vs 75 ± 4.7 ng/mL), and colostrum (245 vs 174 ± 5.8 ng/mL) Se concentration by 19, 25 and 41% respectively. There was no effect ($P > 0.05$) of Se source on thyroid hormone concentrations or the transfer of immunoglobulins to the calf. Supplemental organic Se yeast improved the Se status of dairy cows and the transfer of Se to their calves when the dietary Se concentration of the basal diet was > 0.3 mg/kg.

**Key Words:** Selenized Yeast, Selenium, Thyroid Hormone

**TH244 Plasma concentration of nicotinic acid and derivatives in response to abomasal infusions of nicotinic acid.** J. A. A. Pires*[1], C. L. Girard[2], and R. R. Grummer[1], [1]*University of Wisconsin*, *Madison*, [2]*Dairy and Swine R&D Centre, Agriculture and Agri-Food Canada*, *Lennoxville, QC, Canada*.

The objective was to assess plasma concentrations of nicotinic acid (NA), nicotinuric acid (NUA) and nicotinamide (NAM) in response to abomasal NA infusions, given as single (experiment 1) or successive boluses (experiment 2) to feed-restricted non-lactating, non-pregnant, rumen-cannulated Holstein cows. Experiment 1 was a 4 × 4 Latin square with 1 wk periods. Each period consisted of 2.5 d of feed restriction and 4.5 d of ad libitum feed intake. Treatments were abomasal administration of 0, 6, 30 or 60 mg NA/kg BW, given as a single bolus 48 h after initiation of feed restriction. Areas under the curve during the 12 h of sampling were 0, 0.91, 26.6 and 106.1 ± 6.8 uM*min$^{-1}$ for NA, 0, 5.1, 32.8 and 46.5 ± 5.17 uM*min$^{-1}$ for NUA and 5.4, 16.3, 23.3 and 27.6 ±

2.7 uM*min$^{-1}$ for NAM, for 0, 6, 30 or 60 mg NA /kg BW, respectively (trt, quadratic: P < 0.01). Approximate NA clearance rate was 0, 3.0, 1.65 and 1.26 ± 0.36 %/min, and half life was 0, 28.6, 44.8 and 58.6 ± 7 min for 0, 6, 30 and 60 NA/kg BW (trt, quadratic: P < 0.05). Experiment 2 was a randomized complete block design with 3 treatments and 6 cows. Treatments started 48 h after initiation of feed restriction and consisted of 0, 6 or 10 mg NA/kg BW per h for 8 h. Blood samples were collected for 12 h. Average plasma NA during the 12 h of sampling was 0, 34.7 and 144.1 ± 6.7 uM (trt, trt x time, linear: P < 0.001), NUA was 0, 53.1 and 68.8 ± 8.2 uM (trt, trt × time, linear: P < 0.001), and NAM was 10.8 ± 6.0, 38.1 ± 6.8 and 35.9 ± 1.7 uM (trt × time: P < 0.001) for 0, 6 and 10 mg NA/kg BW per h, respectively. Observed antilipolytic effects of NA (Pires et al., 2007; JDS 90:3725) were achieved at plasma NA concentration less than 10 uM. Supraphysiological doses of NA are readily cleared from plasma, with concurrent appearance of NUA, which is a catabolite excreted in urine. There was a comparatively modest increase in NAM, a biologically active form of the vitamin niacin.

**Key Words:** Niacin, Bovine, Pharmacokinetics

**TH245 Carry-over effects of iodine and selenium supplements in lactating dairy cows.** M. Battaglia, M. Moschini, G. Piva*, and F. Masoero, *Università Cattolica del Sacro Cuore*, *Piacenza, Italy*.

Iodine (I) and selenium (Se) are essential trace elements due to their roles in the regulation of thyroid metabolism and anti-oxidant properties. An improvement of milk I and Se contents could be important for children and pregnant women. An experimental trial was carried out on lactating cows to determine the I and Se carry-over (CO) in milk. Twelve cows (559 kg body weight, 211 days in milk) were randomly allotted to three diet groups (n = 4) and individually fed using a Calan Broadbent© feeding system. The diets were basal diet (CTR), CTR + 23.8 mg I + 2.2 mg Se (T1), and CTR + 45.5 mg I + 4.3 mg Se (T2) and were fed to cows for twenty-eight days after a two weeks adaptation period to the CTR diet. Sources of I and Se were KI and Na2SeO3. Diet and individual milk samples were collected twice a week at -1, 1, 2, 3 and 4 weeks on treatment, and analyzed using ICP-MS. The average daily I and Se intakes were 41.7, 65.6, 87.3 mg/cow and 1.86, 4.06, 6.2 mg/cow, respectively in the CTR, T1 and T2 groups. Data were subjected to ANOVA using the repeated statement in the Mixed procedure of SAS. The statistical model included the fixed effect of diet, sampling time and diet x sampling time interaction. The autoregressive order was the covariance structure that fit the model best. The milk CO of I and Se were significantly affected by the treatment (P < 0.05) and the sampling time (P < 0.05). The CO rate of I increased (P < 0.001) linearly and were 0.14 (CTR), 0.27 (T1) and 0.28 (T2). Milk I (μg/L) means (and standard deviations) were 245.2 (59) for CTR, 607.8 (119.1) for T1 and 970 (184) for T2. While, the CO rate of Se decreased (P < 0.001) linearly and were 0.22 (CTR), 0.12 (T1) and 0.09 (T2). Milk Se (μg/L) means (and standard deviations) were 16.4 (4.5) for CTR, 16.6 (4.1) for T1 and 23.6 (5.9) for T2. Considering a milk daily intake of 150 mL, the amount of I in milk from T1 cows would supply 76%, 61% and 46% of the recommended daily I allowance for children, adults and pregnant women respectively.

**Key Words:** Iodine, Selenium, Carry-Over

**TH246 Corn silage versus alfalfa hay for dairy cows: Effects of dietary cations.** R. A. Erdman*, L. S. Piperova, and R. A. Kohn, *University of Maryland*, *College Park*.

Corn silage (CS) is becoming the predominant forage used in the dairy industry because of its cost, DM yield/hectare, ease of harvest, and preservation characteristics. Previous milk production studies suggested that diets containing corn silage alone were inferior to those containing at least some alfalfa hay (AH) or alfalfa silage. We speculated that this could due to differences in mineral and dietary cation-anion difference (DCAD) concentrations. The objective of this experiment was to test the effects of forage (CS v. AH) and mineral supplementation on production responses with 44 lactating Holstein cows during the first 20 wk postpartum. Treatments included: 1) CS-AH (50:50 forage DM basis); 2) CS as the sole forage; and 3) CS fortified with mineral supplements (CS-DCAD) (limestone and $K_2CO_3$) to match the mineral and DCAD content of the CS-AH diet. Milk production, fat and protein percentage, and 3.5% FCM of cows fed CS-DCAD was equivalent or greater to that of cows fed the CS-AH. There was a trend (P = 0.08) for increased feed efficiency with CS-DCAD as compared to CS-AH and CS. These results suggest that differences in mineral and DCAD levels might explain previously reported negative effects of all corn silage diets as compared to alfalfa-corn silage mixtures.

**Table 1. Corn silage-alfalfa hay (CS-AH) vs. corn silage (CS) and corn silage plus minerals (CS-DCAD) effects on intake and milk production**

| Item | CS-AH | CS | CS-DCAD | SEM |
|---|---|---|---|---|
| DMI, kg/d | 21.6 | 22.2 | 20.9 | 0.48 |
| Milk, kg/d | 34.2 | 33.8 | 35.4 | 1.19 |
| Fat, % | 3.84 | 4.20 | 3.97 | 0.115 |
| Protein, % | 3.09 | 3.16 | 3.14 | 0.053 |
| 3.5% FCM, kg/d | 36.8 | 38.6 | 38.9 | 1.46 |
| FCM/DMI | 1.75 | 1.75 | 1.90 | 0.055 |

**Key Words:** DCAD, Corn Silage, Alfalfa Hay