99 Impact of copper deficiency in the presence or absence of high dietary manganese on iron status of cattle. S. L. Hansen* and J. W. Spears, *North Carolina State University*, *Raleigh*.

Iron (Fe) and copper (Cu) metabolism are closely intertwined, and a deficiency of Cu may lead to a secondary Fe deficiency. The impact of a severe Cu deficiency on proteins involved in Fe metabolism in the bovine has not been studied. Therefore, a 493 day study was conducted to determine the effect of a severe long-term Cu deficiency on Fe metabolism in beef cattle. Twenty-one Angus calves were born to cows receiving one of the following treatments: 1) adequate Cu (+Cu), 2) Cu deficient (-Cu), and 3) Cu deficient plus 500 mg Mn/kg DM (-Cu+Mn). Following weaning, calves remained on the same treatment as their dam through growing (basal diet analyzed 7 mg Cu/kg) and finishing (analyzed 3 mg Cu/kg) phases. Plasma Fe concentrations were positively correlated ($P < 0.01$; $R^2 = 0.49$) with plasma Cu concentrations. Reciprocally, there was a negative relationship ($P < 0.01$; $R^2 = -0.31$) between liver Cu and Fe concentrations. This relationship is likely explained by lower ($P < 0.01$) ceruloplasmin activity in -Cu. vs. +Cu calves. Based on Western blotting of duodenal mucosal scrapings collected at harvest, concentrations of hephaestin (Hp), a Cu-dependent ferroxidase, were greater ($P = 0.01$) in -Cu+Mn compared to -Cu calves. Similarly, concentrations of the Fe export protein ferroportin (FPN) tended ($P = 0.07$) to be higher in -Cu+Mn vs. -Cu calves, likely due to lowered Fe status of -Cu+Mn calves. However, concentrations of divalent metal transporter 1 (DMT1), a protein responsible for import of Fe, Mn and Cu into cells, were lower ($P = 0.04$) in -Cu+Mn calves vs. -Cu calves. Concentrations of Hp, FPN and DMT1 did not differ ($P > 0.1$) between +Cu and -Cu calves. In summary, while Fe status of calves was impacted by changes in Cu status, Cu deficiency alone did not impact duodenal concentrations of proteins important in Fe metabolism. However, excessive dietary Mn appeared to regulate DMT1, and this regulation was able to override low body Fe signals.

Key Words: Cattle, Copper, Iron

100 The effects of trace mineral source on performance and health of newly received steers and the impact of cobalt concentration on performance and lipid metabolism in finishing steers. J. S. Schutz*[1], E. D. Sharman[1], J. J. Wagner[1], C. K. Larson[2], N. E. Davis[1], and T. E. Engle[1], [1]*Colorado State University*, *Fort Collins*, [2]*Zinpro Corporation*, *Eden Prairie, MN*.

Two hundred and sixteen Angus cross steers purchased from salebarns (230 kg ± 3.6) were utilized to determine the impact of trace mineral source and concentration on performance, tissue metabolites, and lipid metabolism. Treatments during the 27 d receiving phase consisted of: 1) Inorganic trace mineral (INORG; 125 mg Cu from CuSO4 ; 360 mg Zn from ZnSO4 ; 200 mg Mn from MnSO4 ; and 12.5 mg Co from CoCO3 hd-1â€¢d-1) and 2) Organic trace mineral (ORG; iso-amounts of Cu, Zn, Mn as amino acid complexes, and Co glucoheptonate). On d 0 and 27, blood samples were collected from three steers per pen. On d 28, steers were transitioned to a high concentrate finishing diet containing different concentrations of Co. Treatments during the finishing phase consisted of: 1) Control (no supplemental Co); 2) 0.10 mg Co/kg DM from cobalt glucoheptonate; 3) 1.0 mg Co/kg DM from cobalt glucoheptonate. The same three steers per pen were bled on d 27, 84, and 224 of the finishing phase. During the receiving phase, red blood cell superoxide dismutase activity was higher ($P < 0.03$) for ORG vs. INORG supplemented steers. During the finishing phase, overall ADG tended ($P < 0.06$) to be higher for steers receiving 1.0 mg Co/kg DM (1.65, 1.62, 1.71 kg ± 0.03 for control, 0.10 mg Co/kg DM, 1.0 mg Co/kg DM treatments, respectively). Steers receiving 1.0 mg Co/kg DM had higher YG ($P < 0.04$; 2.53, 2.29, 2.73 ± 0.11 for control, 0.10 mg Co/kg DM, 1.0 mg Co/kg DM treatments, respectively) and back fat thickness ($P < 0.04$; 1.54, 1.39, 1.71 cm ± 0.08 for control, 0.10 mg Co/kg DM, 1.0 mg Co/kg DM treatments, respectively) than steers receiving 0.10 mg Co/kg DM. Serum, liver, and longissimus muscle B12 concentrations increased ($P < 0.04$) as dietary Co concentration increased.

Key Words: Cattle, Cobalt, Trace Mineral

101 The effect of ZinMet® brand zinc methionine on feedyard performance and carcass merit in crossbred yearling steers. J. J. Wagner[1], J. J. Wagner*[1], T. E. Engle[1], and G. Walker[2], [1]*Colorado State University*, *Fort Collins*, [2]*Global Animal Products*, *Amarillo, TX*.

One hundred forty four crossbred yearling steers were utilized in a randomized block study to evaluate ZinMet® brand zinc methionine as a source of supplemental zinc for yearling feedlot steers. Treatments examined included: Control, 100 mg/kg DM supplemental zinc from zinc sulfate; and, ZinMet®, 40 mg/kg DM supplemental zinc from ZinMet® brand zinc methionine and 60 mg/kg DM supplemental zinc from zinc sulfate. There was a trend for increased live weight at d35 ($P = 0.07$) and d70 ($P < 0.18$) for steers fed ZinMet® as compared with steers fed the control trace minerals. Finished weight was similar for control and ZinMet® treatments (569.5 and 574.3 kg, respectively). The largest difference ($P < 0.05$) in average daily gain between treatments was observed for day 1 through 35 of the study (1.96 versus 1.63 kg/hd/d for the ZinMet® and control treatments, respectively). Average daily gains from day 1 through harvest were similar between treatments. Treatment was not a significant source of variation for dry matter intake (DMI). The greatest difference in DMI between treatments (0.16 kg per day, $P < 0.14$) occurred from day 1 through 34. Treatment had no effect on feed to gain or gain to feed ratio d1 through slaughter. The largest difference between treatments for feed to gain ($P < 0.17$) or gain to feed ($P < 0.16$) occurred from day 1 through 34. Treatment was not a significant source of variation describing recovered net energy for maintenance (NEm) or recovery of net energy for gain (NEg). Carcass weight, dressing percentage, yield grade, and quality grade were similar for control and ZinMet® treatments. Liver abscess rate was not different for the control and ZinMet® treatments. These data indicate that overall feedlot performance and carcass merit were similar for yearling steers fed ZinMet® brand zinc methionine or zinc sulfate as sources of supplemental zinc. Steers fed ZinMet® brand zinc methionine achieved greater ADG, DMI, and feed efficiency from d1-34 as compared with control steers.

Key Words: Zinc, Zinc Methionine, Organic Trace Minerals

102 Effect of trace mineral source on lactation performance, claw integrity and fertility of dairy cattle. J. L. Siciliano-Jones[1], M. T. Socha*[2], D. J. Tomlinson[2], and J. M. DeFrain[2], [1]*FARME Institute*, *Homer, NY*, [2]*Zinpro Corporation*, *Eden Prairie, MN*.

Two hundred fifty multiparous and primiparous cows were assigned to a study at approximately 70 d prepartum to determine the effect of trace mineral source on lactation performance, claw integrity and fertility. Cows received treatments from 3 wk prepartum through wk 35 postpartum. Treatments consisted of 1) Sulfate, all supplemental Zn, Mn, Cu and Co provided in sulfate form; and 2) CTM, where 360 mg Zn, 200 mg Mn, 125 mg Cu and 12 mg Co supplied daily by sulfate minerals were replaced with similar amounts of minerals supplied by Availa®4 (Zinpro Corporation). Individuals involved with daily animal care and/or data recording were blinded to treatment assignments. Cows from all treatments were housed in common pens and treatments were dispensed to cows via a computerized feeder. All claws of cows were examined prior to treatment administration and at 16 and 36 wk postpartum by personnel trained in identifying claw lesions. Cows fed the CTM diet tended to produce more ($P \leq 0.10$) milk and energy-corrected milk than cows fed the Sulfate diet. Cows fed the CTM diet also produced more ($P \leq 0.05$) milk protein and solids (fat + protein) than cows fed the Sulfate diet. Replacing Sulfate minerals with those supplied by CTM decreased ($P \leq 0.05$) incidence of sole ulcers at wk 36 postpartum, and tended to decrease ($P \leq 0.10$) incidence of interdigital dermatitis at wk 16 and 36 postpartum. Severity of heel erosion tended to be less ($P \leq 0.10$) for cows fed CTM than cows receiving the Sulfate diet. Despite first service conception rates tending to be greater ($P \leq 0.10$) for cows fed the Sulfate diet, there was no effect of treatment on the rate at which cows became pregnant. A greater percentage of cows fed the Sulfate diet tended ($P \leq 0.10$) to be culled from the herd prior to wk 36 postpartum than cows fed the CTM diet. Replacing Sulfate minerals with CTM resulted in improved lactation performance and claw integrity.

Key Words: Trace Mineral, Dairy Cattle, Claw Lesion

103 Effect of nano selenium and organic zinc supplementation on lactation performance and milk selenium and zinc concentrations in dairy cows. W. Wen-Xuan*[1], X. Xian-Lin[1], Z. Yun-Guo[2], and W. Heng-Jin[1], [1]*Guizhou University*, *Guiyang, Guizhou Province, P. R. China*, [2]*Xifeng Agricultural Bureau*, *Xifeng, Guizhou province, P. R. China*.

Both selenium and zinc are essential trace elements, and their deficiency has been to be associated with insufficient performance in dairy cows. In this study, twenty-seven clinically healthy multiparous Holstein cows in middle lactation (DIM=180) were randomly allocated to three blocks of 9 cows to examine the effects of nano selenium and organic zinc supplementation on lactation performance and milk selenium and zinc concentrations. Animals were fed one of three following diets: conventional diet (control), conventional diet and nano selenium (0.5mg/kg DM) (Treatment 1, T1); and conventional diet and nano selenium (0.5mg/kg DM) and organic zinc (37.8mg/kg DM) (Treatment 2, T2). There were no significant difference ($P > 0.05$) for the 10-day prefeeding data of dry matter intake (DMI); milk production and compositions of fat, and protein; and milk selenium and zinc concentrations in three blocks. The DMI in cows fed diet T1 tended to decrease compared with those on diet control (16.0 vs. 13.2; $P < 0.1$), but not for diet T1 (14.4; $P > 0.05$). Cows receiving diet control also produced increased milk production relative to cows fed diet T1 and T2 (28.07 : 25.44 : 25.12; $P < 0.1$). There were no significant difference for milk fat (3.69 : 4.06 : 4.02; $P > 0.05$) and milk protein (2.98 : 2.95 : 3.02; $P > 0.05$) among three dietary treatments. Addition of nano selenium (T1 and T2) had no effect on milk selenium concentration (0.024 : 0.027 : 0.026; $P > 0.05$); however, zinc supplementation resulted in significant higher milk zinc level than diets control and T1 (3.80 : 4.00 : 9.00; $P < 0.05$). It is suggested, from the above-mentioned parameters, that organic zinc supplementation in the diet is beneficial for increase of milk zinc concentration; whereas the palatability should be improved due to the reduced DMI in the current study.

Key Words: Nano Selenium, Organic Zinc, Dairy Cows

104 The influence of calf Se status on glutathione peroxidase-1 and glutathione peroxidase-3 activities, and liver GPx-1 messenger RNA. G. Lum*, J. Rowntree, K. Bondioli, M. McCarter, L. Southern, and C. Williams, *LSU Agricultural Center*, *Baton Rouge, LA*.

The purpose of this research was to determine the influence of dietary Se on erythrocyte glutathione peroxidase (GPx-1) and plasma glutathione peroxidase (GPx-3) activities and relative liver GPx mRNA levels in growing Holstein bull calves. Calves (n = 14) were started 28 d after birth on either a Se adequate (0.15 ppm Se) or deficient (0.01 ppm Se) diet until 180 d of age. Blood samples were taken from each calf at trial initiation, every 28 days, and at experiment end for determination of GPx-1 and GPx-3 activity. Four calves from each treatment were euthanized at d 180 of age for determination of liver GPx-1 relative mRNA level. Feed intake and average daily gain were not affected by Se level. The GPx-1 activity was greater for Se adequate than Se deficient calves ($P < 0.001$) but not until d 84 of age. The GPx-3 activity was more variable than that of GPx-1, and GPx-3 activity of the Se adequate group was only greater than that of the Se deficient group ($P < 0.05$) on d 180 of age. N-fold differences were calculated for relative GPx-1 mRNA levels between groups. There was a 50% decrease in GPx-1 mRNA for Se-deficient calves ($P < 0.05$) compared with Se-adequate calves. Regression analysis was performed on the data to determine the relationship between the various response variables. There was only a moderate relationship (r^2=0.579) between the n-fold difference in GPx-1 mRNA transcript levels and GPx-1 activity at d 180 of age, despite a correlation coefficient of 0.76. The relationship between the n-fold difference in GPx-1 mRNA and GPx-3 activity at d 180 of age was much stronger (r^2= 0.8087), with a correlation coefficient of 0.899, which was unexpected, as GPx-3 is generally considered a more variable response and therefore a short-term indicator of Se status. In our trial, GPx-1 activity reflected diet Se concentration earlier than GPx-3. Although GPx-1 mRNA was positively correlated to both enzyme activities, n-fold differences on the transcript level were most associated with GPx-3 activity.

Key Words: GPx-1, mRNA, Selenium

105 Selenium partitioning between body compartments in lactating dairy goats supplemented with various sources and levels of Se. G. Caja*[1], C. Flores[1], A. Salama[1], and G. Bertin[2], [1]*Universitat Autònoma de Barcelona*, *Bellaterra, Barcelona, Spain*, [2]*Alltech France*, *Levallois-Perret, France*.

Four concentrates supplemented with different Se sources (**SS**, sodium selenite; **SP**, Sel-Plex® selenized *Saccharomyces cerevisiae* CNCM I-3060) and Se levels (control, 0.039; SS, 0.418; SP-1, 0.423; SP-2, 0.548 mg/kg DM), were fed to 4 balanced groups of Murciano-Granadina dairy goats (7 goats/group) from early- (35 DIM) to mid-lactation (147 DIM). Ration consisted of concentrate (0.72 kg DM/d) and a Se deficient forage mixture offered ad libitum (65% chopped tall fescue hay and 35% alfalfa hay pellets) to each goat group. Forage intake measured daily (1.33 ± 0.01 kg DM/d; 0.087 mg Se/kg DM) and FCM-3.5% yield (1.76 ± 0.13 L/d) recorded weekly did not vary between goat groups. Supplementation of dietary Se dramatically increased ($P < 0.001$) the Se content in all compartments studied in a dose dependent manner. Increase in Se contents were faster in plasma and milk, peaking at wk 6 to 8 from the start of supplementation. Passage from feed to milk and hooves was related to casein and keratin contents and was more efficient, for the same Se daily dose, when the selenized yeast form (SP) was used. Se speciation indicated dramatic increases in selenomethionine and selenocysteine, which were greater in milk with SP diets ($P < 0.001$). Dietary Se correlated exponentially ($R^2 = 0.78$) with Se in milk. Content of Se in hair was more than twice the Se content in hooves, but no differences between hair and hooves were found when SS and SP were compared at the same dose. Regarding the negative control group, Se content in hair decreased during the experiment from 500 to 450 ng/g which may be useful as reference value when Se is under the requirements in red and black coated goats. In conclusion, organic Se was more effective than inorganic Se for increasing Se content in the different compartments of lactating dairy goats, indicating a greater bioavailability of Se from selenized *Saccharomyces cerevisiae* CNCM I-3060 and the possibility of producing Se enriched goat milk and cheeses as functional foods.

Table 1. Partitionnig of Se according to dietary source and dose in lactating goats

Se, ng/g	Control	SS	SP-1	SP-2	SEM	*P*
Whole blood	155^{c}	329^{b}	313^{b}	391^{a}	13	0.001
Plasma	51^{c}	123^{ab}	113^{b}	132^{a}	5	0.001
Milk	9.2^{d}	13.8^{c}	19.5^{b}	39.7^{a}	0.9	0.001
Hair	482^{c}	730^{b}	699^{b}	900^{a}	39	0.001
Hooves	204^{d}	313^{c}	394^{ab}	350^{bc}	25	0.001

$^{a, b...d}P < 0.05$

Key Words: Selenium, Micromineral, Dairy Goats

106 Effectiveness of potassium bicarbonate to increase dietary cation-anion difference in early lactation cows. R. White*[1], J. Harrison[1], R. Kincaid[2], E. Block[3], and N. St. Pierre[4], [1]*Washington State University*, *Puyallup*, [2]*Washington State University*, *Pullman*, [3]*Church and Dwight*, *Princeton, NJ*, [4]*The Ohio State University*, *Columbus*.

Thirty Holstein cows (15 per treatment) were used in a continuous design lactation study to evaluate the effectiveness of potassium bicarbonate as a cation to increase dietary DCAD from ~ 25 to 42. The study was conducted from mid August to mid December. Cows were fed individually via Calan® feeding gates one of two treatment diets formulated to be equal in all nutrients except potassium. The potassium level of the control diet was ~ 1.2 % of DM and increased to ~ 1.8% of DM using potassium carbonate (DCAD Plus®, Church & Dwight, Princeton, NJ) for the DCAD + treatment. Diets consisted of (%DM): alfalfa hay (13.4), corn silage (12.1), blue grass straw (8.6), corn distillers grains with solubles (10.3), whole cottonseed (6.2), and grain-mix (49.4). Cows were assigned at random to one of the two dietary treatments at ~ 15 DIM and continued through ~ 105 DIM. Production data and composition were analyzed as a mixed model with the fixed effects of treatment, week, and their interactions, and the random effect of cows within treatment, using an AR(1) correlation structure for the errors. Linear and quadratic orthogonal polynomial contrasts were used, and weekly means were compared with the slice option of the MIXED procedure (SAS V9.1) when one of the polynomial degree was significant. The treatment x week quadratic effect was significant (P<0.0002) for milk production indicating that the milk production curves were significantly different between the two treatments. Significant differences (P<0.065) in milk production were noted at weeks 5, 6, 7, and 8 of the study. Milk production was 43.9, 43.2, 44.2, and 42.2 kg/d for DCAD+ treatment, and 40.5, 39.7, 40.2, and 39.2 kg/d for control treatment, at weeks 5, 6, 7, and 8 of the study, respectively. Milk fat % was significantly different (P<0.05) and was 4.31 for DCAD+ and 3.96 for control. Milk true protein % was significantly (P<0.05) different and was 2.79 for DCAD+ and 2.96 for control. Results indicate that potassium bicarbonate can be used to effectively increase DCAD in early lactation cows with a resulting increase in milk production and milk fat percent.

Key Words: Dairy, DCAD, Potassium Bicarbonate

107 Phosphorus excretion in lactating cows fed diets supplemented with fat. Z. Wu*, J. D. Ferguson, and D. W. Remsburg, *University of Pennsylvania*, *Kennett Square*.

The effect of supplemental fat on P utilization in dairy cows was determined using the following 4 dietary treatments formed in a 2 × 2 factorial arrangement: low P, low fat (LPLF); low P, high fat (LPHF); high P, low fat (HPLF); and high P, high fat (HPHF). The P content of the diet was 0.34 or 0.43%, and the fat content 3.0 or 5.4%. The levels were varied by adding monosodium phosphate and soybean oil to LPLF that contained no supplemental P or fat. Soy oil was top-dressed onto the TMR. Two thirds of the diet was provided by corn silage and grass silage for all treatments. Forty mid-lactation (172 ± 32 DIM) Holsteins (16 primaparous) were used among the 4 treatments for 5 wk following a 2-wk covariate period; however, one primaparous cow in HPLF was culled during trial for reasons unrelated to treatments. Dietary P amount did not affect lactation performance, whereas increasing dietary fat reduced milk fat content. Increasing dietary P increased fecal P concentration, whereas supplementation of the diet with fat tended to reduce fecal P content. Consistent with the 2001 NRC, 0.34% dietary P appeared adequate for mid-lactation cows milking 30 kg/d, and increasing the level may increase fecal P excretion; supplemental fat may reduce P excretion. (Research was supported in part by Pennsylvania Department of Agriculture)

Table 1.

Item	LPLF	LPHF	HPLF	HPHF	SEM	P[1]	F[1]	P x F[1]
DMI, kg/d[2]	20.5	20.5	20.2	19.7	...	...	...	...
Milk, kg/d	29.8	30.0	30.0	28.5	1.0	0.75	0.51	0.49
Fat, %	3.83	3.21	4.04	3.03	0.17	0.17	0.01	0.73
Fat, kg/d	1.133	0.866	1.076	0.832	0.065	0.49	0.01	0.86
Protein, %	3.08	3.21	3.06	3.24	0.08	0.98	0.08	0.74
Protein, kg/d	0.922	0.972	0.830	0.913	0.047	0.12	0.17	0.74
Fecal P, %	0.80	0.79	1.08	0.95	0.03	0.01	0.08	0.11

[1]*P* values for the effect of P, fat, and their interaction. [2]Group-fed average.

Key Words: Phosphorus Excretion, Fat Supplementation, Milk Fat

108 Effect of feeding rumen-protected niacin on core body temperature and milk production in lactating Holstein dairy cows during summer heat stress. R. B. Zimbleman*, R. J. Collier, and T. R. Bilby, *University of Arizona*, *Tucson*.

Niacin has been shown to increase resistance to thermal stress in cattle by increasing whole body evaporative heat loss and cellular heat shock response to thermal stress in vitro. As raw niacin is extensively degraded in the rumen, this study utilized encapsulated niacin (NIASHURE®) to determine effects on body temperature, milk yield and composition. A total of 400 lactating primiparous and multiparous Holstein cows were randomly assigned to a switchback design (two 30d periods) of either control (C, no niacin n=200) or rumen-protected niacin (RPN, cows supplemented with 12g/d/cow of encapsulated niacin, n=200). Groups were balanced for DIM (166 +/- 11), milk yield, and parity prior to start of the study which was conducted from August 7th thru October 7th, 2007 on a commercial dairy in Arizona. Milk yields were recorded 3X daily and a monthly milk sample was collected for milk components. Vaginal temperatures were collected using thermochron iButtons (MAXIM Integrated Products Inc., Sunnyvale, CA) temperature loggers attached to an intravaginal device and inserted into a random sub-sample of cows (n=16) from each pen (n=2) with similar DIM, milk yields, and parity for 7 d. Body core temperatures were decreased for the RPN group during periods of peak thermal load from 1300 to 1600 h (P<0.01). Milk fat and protein percent was elevated in the RPN versus C groups (3.65 vs. 3.38 and 3.09 vs. 3.05 %, respectively; P<0.01). Subsequently both fat- and energy-corrected milk was greater for cows in the RPN group compared with cows in the C group (39.7 vs. 38.2 and 39.6 vs. 38.4 kg, respectively; P<0.01). In addition, both fat- and energy-corrected milk was increased in multiparous compared to primiparous cows (40.7 vs. 37.2 and 40.7 vs. 37.3 kg; P<0.01). However, groups did not differ in milk yield or DMI. In conclusion, supplementing lactating cows with rumen-protected niacin during summer heat stress reduced core body temperature and increased both fat and protein percent, in turn, elevating fat- and energy-corrected milk yields.

Key Words: Niacin, Heat Stress, Dairy Cattle

109 Biological activity of vitamin E in dairy cows. S. K. Jensen*, *University of Aarhus*, *Tjele, Denmark*.

α-Tocopherol (α-toc) demonstrate the highest vitamin E activity, and is available both as natural RRR-α-toc isolated from plant sources, and as a synthetic racemic mixture of all eight possible stereoisomers â€“ all-rac-α-toc. The increased use of vegetable oil for technical purposes increase the possibility for isolating different natural by-products from the oil residue, including tocopherols. Assessing the correct biological activity in form of bioavailability and biopotency is a great challenge, due to difficulties by measuring clinical endpoints in larger animals than rats and poultry. Due to the lack of good biological markers for bioactivities, bioavailability is often used as one of the surrogate markers for bioactivities. Therefore, analysis of the individual stereoisomers of α-tocopherol, is an important tool in order to quantify relative bioavailability of the individual stereoisomers. I.m. injection of 2.5 g all-rac-α-toc acetate into 4 dairy cows produced a rapid increase in plasma concentration of α-toc, and for all stereoisomers maximal concentration (Cmax) was achieved 1 day after injection, with a total α-toc concentration of 16.9±0.8 µg/ml plasma. The highest Cmax was obtained by RRR-α-toc in plasma, followed by the sum of the four 2S stereoisomers, leaving the three synthetic 2R-stereoisomers with the lowest Cmax (P<0.001). The relative bioavailability in plasma of the 2R stereoisomers was significant higher than the 2S stereoisomers (P<0.001). Expressed in terms of relative availability the average availability of 2S-α-toc is six times lower than RRR-α-toc. In milk the absolute secretion of the individual stereoisomers varied from 0.67 % of the injected amount for the 2S stereoisomers over 6.5 % on average for the three synthetic 2R stereoisomers to 16.3% for RRR-α-toc. A calculation of total α-toc secretion into the milk after a single injection of 2.5 g all-rac-α-toc acetate gave an average secretion of 6.4±0.9% (mean ± SD) of injected amount.

Key Words: Natural Vitamin E, Stereoisomers, Bioavailability