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RELATION OF SELECTED LIFESTYLE VARIABLES TO BLOOD PARAMETERS OF SELENIUM (Se) STATUS. J.T. Snook, V.M.Vivian and D.L. Palmquist. The Ohio State University, Columbus, OH 43210

Previously we reported that blood Se and Se-dependent glutathione peroxidase (GSHPx) levels were 10-14% lower in rural (Amish) in contrast to urban males despite a higher Se intake (AJCN 1983; 38:620). Because rural males were more active and consumed more food and nutrient supplements and less alcohol, caffeine and cigarettes, we have used multiple regression (MR) and correlation analyses to study the relation of these variables to blood levels of Se and GSHPx. Alcohol intake was the step 1 variable in the MR for plasma (PL), whole blood (WB), and red blood cell (RBC) Se and for PL GSHPx and was significantly correlated with PL GSHPx and PL, WB, and RBC Se($r$=.44, .44, .43,.38; $p < .003$). Energy expenditure was the step one variable for WB GSHPx and was significantly correlated with PL GSHPx and PL Se ($r$=-.27, -.30; $p < .05$). The $r$ for caffeine intake and PL GSHPx was .36 ($p$=.005). Supplemental iron,vitamin C and vitamin E had negative relations in MR with some Se and GSHPx parameters while vitamin C and E in food had positive associations. Se intake was significantly correlated with WB and RBC SE ($r$=.45;$p$=.01) in urban males only but was not a significant factor in the MR. Daily cigarette consumption was not a significant factor in males but was correlated with PL, WB, and RBC SE in all females in the same population groups ($r$=.40, .43, .25; $p < .05$). (Supported in part by USDA grant 5901-0410-8-0001)

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SELENIUM INTAKE AND METABOLIC BALANCE IN 10 MEN CONSUMING SELF-SELECTED DIETS IN A SELENIUM-DEFICIENT AREA OF HEBEI PROVINCE, PEOPLE'S REPUBLIC OF CHINA. X.M. Luo*, C.L. Yang*, H.J. Wei*, X. Liu*, J. Xing*, J. Liu*, C.H. Qiao*, Y.M. Feng*, Y.X. Liu*, Q. Wu*, J.S. Guo*, B.J. Stoecker*, J.F. Spallholz and S.P. Yang. Cancer Institute, Chinese Academy of Medical Sciences, Beijing, Endemic Disease Institute, Weichang, China and Texas Tech Univ., Lubbock, TX 79409

Selenium (Se) intake, urinary and fecal Se excretion of 10 healthy men (mean age 24.7±5.1 years) were determined for three consecutive days in each summer and fall of 1983. The values ($\bar{x}$±SD) for the summer trial (I) and the fall trial (II) (μg Se/day) were:

| | Intake | Urine | Feces | Balance | Apparent Absorption(%) |
|---|---|---|---|---|---|
| I. | 13.3±3.1 | 4.3±1.0 | 4.5±1.8 | 4.4±4.6 | 63.1±20.5 |
| II. | 9.2±1.0 | 2.7±1.0 | 4.3±1.8 | 2.2±2.4 | 52.4±21.5 |

The mean daily Se intakes in both summer and fall were far below the recommended range of safe and adequate Se intake of 50-200 μg/day (NAS/NRC) and are among the lowest Se intakes compared with other countries in the world. The data also suggests a seasonal variation in human Se intake. (Supported by the USDA Grant No. 59-2486-1-1-671-0 and the Shaklee Corporation.)

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EFFECT OF SELENIUM SUPPLEMENTS ON THE SELENIUM LEVELS AND GLUTATHIONE PEROXIDASE ACTIVITY OF RESIDENTS IN A SELENIUM-DEFICIENT AREA OF HEBEI PROVINCE, PEOPLE'S REPUBLIC OF CHINA. H.J. Wei*, X.M. Luo*, C.L. Yang*, J. Xing*, X. Liu*, J. Liu* C.H. Qiao*, Y.M. Feng*, Y.X. Liu*, Q. Wu*, J.S. Guo*, B.J. Stoecker*, J.F. Spallholz and S.P. Yang. Cancer Institute, Chinese Academy of Medical Sciences, Beijing and the Endemic Disease Institute, Weichang, China, and Texas Tech University, Lubbock, TX 79409

For this study fifteen adults from a Keshan Disease area of Hebei Province were selected for selenium (Se) $Na_2SeO_3$ supplementation. The adults were divided into 3 groups of 3 men and 2 women each. Group 1 received a placebo while Groups 2 and 3 received 50 and 105 μg Se daily. Plasma Se, RBC Se, Plasma glutathione peroxidase (GSHPx) and RBC GSHPx were measured on days 0, 15 and 30 of the Se supplementation period. All measured Se and GSHPx values for Group 1 remained constant. In Group 2 Plasma Se and Plasma GSHPx, RBC Se and RBC GSHPx increased moderately (4-40%) over the thirty day period. Group 3 Plasma Se, Plasma GSHPx, RBC Se and RBC GSHPx increased 49-76% over the thirty day period. All measured Se parameters were lower in control residents than in residents of Beijing by a factor of 2-3. The data suggests that a daily supplement of more than 50 μg Se/day may be needed by people in a Keshan Disease area to increase Se and GSHPx to levels found in residents of Beijing. (Supported by the USDA Grant No. 59-2486-1-1-671-0 and the Shaklee Corporation.)

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USE OF STABLE ISOTOPES TO MONITOR KINETICS OF SELENIUM (Se) EXCRETION IN NEW ZEALAND WOMEN BEFORE AND AFTER Se SUPPLEMENTATION. L.J. Edmonds*, C. Veillon*, M.F. Robinson, C.D. Thomson, Y.C. Morris*, and O.A. Levander. USDA Human Nutr. Res. Ctr., Beltsville, MD 20705; Dept. Nutr., Univ. Otago, Dunedin, New Zealand.

Gas chromatography-mass spectrometry (GC/MS) was used to monitor excretion of $^{74}Se$ or $^{76}Se$ given orally as sodium selenite to 4 healthy adult New Zealand women before and after Se supplementation. Total Se (tracer plus natural) was measured by GC/MS isotope dilution. A 40 μg dose of $^{74}Se$ started metabolic period 1 (MP 1). After 2 to 3 weeks, MP 2 began with a 200 μg dose of $^{76}Se$. Then MP 3 was initiated 5 to 6 weeks later with a 200 μg dose of $^{74}Se$. The subjects consumed their usual low-Se diet throughout the study but during MP 2 and 3 also consumed 200 μg Se/d as high-Se bread. Mean total plasma Se levels were less than 60 ng/ml during MP 1 and increased to more than 150 ng/ml during MP 3. Mean apparent absorption of the tracer was 65, 57, and 70% during MP 1, 2 and 3, respectively. Urinary excretion of the tracer was greatest during the first 24 hr after dosing and declined rapidly thereafter in all MP. Analysis of the kinetics of early urinary tracer excretion suggested that a labile apparent body Se pool was roughly doubled in MP 2 and 3 compared to MP 1. These studies suggest that the isotope dilution technique has promise for following changes in the size of apparent body Se pools. (Supported in part by the Medical Research Council of New Zealand)

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USE OF THE SHORT-TERM GLUTATHIONE PEROXIDASE RESPONSE IN SELENIUM-DEFICIENT CHICKS FOR ASSESSMENT OF BIOAVAILABILITY OF DIETARY SELENIUM. G.F. Combs, Jr., Q. Su* and K.Q. Wu* Cornell Univ., Ithaca, NY 14853 and Inst. Animal Sci., Chin. Acad. Agr. Sci., Beijing, PRC.

The immediate utilization of dietary selenium (Se) by the chick was assessed as a criterion of bioavailability of food Se. Se-depleted chicks were fed a basal diet low in Se (0.02 ppm) and supplemented with vitamin E (100 IU/kg) (VE) to 10 days of age; they were then given graded levels of Se as either $Na_2SeO_3$ or a high-Se (131 ppm) yeast by crop intubation. Chicks showed moderate increases in the activity of Se-dependent glutathione peroxidase (SeGSHpx) in liver 6 hrs after treatment. By 12 hrs a significant SeGSHpx response was also seen in plasma, and both tissues showed linear increases in SeGSHpx with Se dose (1-4 ug per 100 g BW). The 12 hr SeGSHpx response of chicks treated with up to 16 ug Se per 100 g BW was related to log Se dose; the plasma SeGSHpx response indicated that yeast-Se was utilized with ca. 61% efficacy vs. $Na_2SeO_3$. In contrast, the efficacy of yeast-Se was equivalent to that of $Na_2SeO_3$ in preventing exudative diathesis (ED) in VE-deficient chicks fed either Se source to 14 days of age. The 12 hr SeGSHpx response of VE-deficient chicks to either $Na_2SeO_3$ or Se-yeast was not affected by VE; however, it was significantly enhanced by the additions of BHT (500 ppm) and, to a lesser extent, ascorbic acid (1000 ppm) to the diet. The short-term SeGSHpx response is a valid measure of the immediate utilization of ingested Se, an aspect of Se bioavailability which can be altered by dietary antioxidants.
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SELENIUM BIOAVAILABILITY TO RATS FROM SOYBEAN AND EGG PRODUCTS. A.C. Mason*, P.J. Laughner*, C.M. Weaver* (SPON: J.A. Story). Dept. Foods & Nutrition, Purdue Univ., W. Lafayette, IN 47907.

Soy protein is lower in selenium content than eggs and meat and thus bioavailability of selenium from soy products becomes more critical for individuals subsisting on soy protein. In this study two criteria for selenium bioavailability to rats were investigated: 1) whole body and tissue retention of $^{75}Se$ from intrinsically labeled test meals; and 2) selenium-induced glutathione peroxidase activity regeneration in selected tissues. Male weanling rats were depleted of selenium with a Torula yeast diet and then placed on selenium adequate repletion diets containing egg, soy, combined egg/soy, or selenite supplemented Torula yeast as the protein source. The first meal of the repletion period contained proteins labeled as follows: egg protein from hens gavaged with $^{75}Se$-selenomethionine or $^{75}Se$-sodium selenite; soy protein labeled via nutrient solution with $Na_2{}^{75}SeO_3$ or $Na_2{}^{75}SeO_4$; combined protein in which egg protein was labeled by gavaging hens with $Na_2{}^{75}SeO_3$ or soy protein labeled via nutrient culture with $Na_2{}^{75}SeO_3$. Rats fed eggs intrinsically labeled with $Na_2{}^{75}SeO_3$ retained the most radioactivity after 21 days. Retention of radioactivity was dependent on the form of Se administered for incorporation into eggs or soybean seeds. Selenite salts were more bioavailable for short term glutathione peroxidase activity regeneration than was food Se from either soy or egg protein.

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