

Concurrent Session 6: Micronutrients

Evidence for marginal selenium deficiency in Tasmania?

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Background – Tasmanian populations are hypothesised to be at risk of suboptimal selenium status. Sparse evidence from the field of veterinary science suggests historical deficiency problems in grazing animals. Human studies to date have been limited in nature and have provided conflicting results.

Objectives – The aims of this study were to determine the selenium status of a sample of northern Tasmanian adults as a pilot to a larger population study.

Design – A sample of 130 adults aged 20 – 78 yrs were recruited from the northern Tasmania region, an area hypothesised to be at risk of inadequate selenium intakes due to low soil content. Responses from a 121 item semi-quantitative FFQ, standard serving size data and food content data were used to produce dietary selenium intake estimates. Serum selenium levels were determined by graphite furnace atomic absorption and serum glutathione peroxidase activities by a spectrophotometric method (Randox Laboratories Ltd., United Kingdom).

Outcomes – Men had significantly higher estimated selenium intakes than women ($P=0.003$); mean (sd) intakes of men ($n=55$) were 95.4 (40.7) $\mu\text{g/day}$ while women ($n=75$) consumed 75.9 (26.3) $\mu\text{g/day}$. Serum selenium levels were not significantly different between genders; mean serum selenium was 1.08 (0.19) $\mu\text{mol/L}$; 73% of subjects had serum selenium levels below 1.20 $\mu\text{mol/L}$, a level reported as a glutathione peroxidase maximal activity threshold. Accordingly, there was also a strong association between serum selenium and serum glutathione peroxidase ($P < 0.001$). Current smokers and people under 35 years of age had lower selenium intakes and serum selenium levels.

Conclusion – Using these dietary estimates, greater than 85% of this cohort consume sufficient selenium as defined by EAR values. However, the biochemical results suggest that selenium intake is insufficient for maximal selenoprotein activity. There is increasing evidence that marginal selenium status may result in increased chronic disease risk. Further investigation into the selenium status of the Tasmanian population is warranted to identify groups that may be most at risk.

Tatura-Bio® Se increases plasma and muscle selenium, plasma glutathione peroxidase and expression of selenoprotein P in the colon of artificially-reared neonatal pigs

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Background – While Se intakes of Australian and New Zealand consumers are sufficient to ensure no overt signs of deficiency, the relatively low intakes may increase the risk for some cancers. However, Se supplementation is problematic, as high Se intake can be toxic, particularly if the source is inorganic. Protein-bound Se is more bioactive and less toxic than inorganic forms of Se and there is interest in delivering Se in organic forms in food products. The full value-chain approach was used to increase the Se content of milk by feeding yeast-bound Se to dairy cows and to produce a high-Se dairy supplement (Tatura-Bio® Se) for use in animal and clinical studies.

Objectives – To determine biomarkers of Se status in neonatal pigs consuming Tatura-Bio® Se.

Design - Neonatal pigs ($n=20$ at 2d of age) were trained to drink cow's milk and after a further 3d, were randomly allocated to one of two milk replacers containing Tatura-Bio® Se (1070 $\mu\text{g Se/kg DM}$) or placebo product (135 $\mu\text{g Se/kg DM}$) their respective diets (up to 1.7 MJ/kg BW) and bleed and sacrifice times (0, 7, 14, 28 and 42 d of feeding).

Outcomes – Plasma (52 v. 210 $\mu\text{g/L}$, $P < 0.001$) and muscle (63 v. 463 $\mu\text{g/kg}$, $P < 0.001$) Se and plasma glutathione peroxidase (0.124 v. 0.153 nmol NADPH oxidised/mg protein per min, $P < 0.001$) were increased in pigs consuming Tatura-Bio® Se. Tatura-Bio® Se increased the colonic expression of selenoprotein P (+112%, $P=0.06$) while expression of colonic glutathione peroxidase was unchanged ($P=0.15$).

Conclusion – These data suggest that dietary Se as Tatura-Bio® Se, a high-Se dairy supplement, can improve biomarkers of Se status and may be a useful means of increasing Se intake and reducing colonic cancer risk in humans.