

Abstracts for a conference on trace elements in diet, nutrition, and health: essentiality and toxicity

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Category 1: Trace element intakes, dietary patterns, bioavailability, and tissue distributions

1.P01

The effect of enrichment with sunflower seed, sesame seed and alpha tocopherol acetate to linoleic acid quantity in cookies

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try (ICP-MS) with size exclusion column. Analysis of sulforaphane, the natural anticancer agent in broccoli sprout was performed using HPLC with reversed phase column. Selenium-enriched broccoli sprout extract was then applied on human prostate cancer cell line (LNCaP, PC-3 and DU-145). Cell proliferation inhibition was observed using MTT assay, while prostate-specific antigen (PSA), a well-accepted prognostic indicator of prostate disease, was analyzed immunoenzymatically. The most abundant form of selenium in selenium-enriched sprouts was S-methylselenocysteine. There was no differential sensitivity of both selenium-enriched and normal broccoli sprouts in prostate cancer cells at higher concentration. On the other hand, in the lower concentration, the effect of selenium-enriched broccoli sprouts in inhibiting cell proliferation and PSA secretion was superior than normal broccoli sprouts. We speculate that the same effect given by both sprouts in higher concentration was due to sulforaphane effect, as an active compound in the normal broccoli sprouts, while in the lower concentration, the anticancer effect of sulforaphane was increased by the presence of selenium compounds.

2.S08

Adding iron to white tea may decrease its antioxidant capacity in humans

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We have proposed the hypothesis that iron may interact with polyphenols in the lumen and, thereby, modulate their antioxidant ability in vivo. Luminal interactions of polyphenols with iron are frequently addressed in studies of iron absorption. Presumably iron–polyphenol chelates are formed during digestion, and this results in dramatically lower iron absorption. It follows that formation of iron–polyphenol chelates may inhibit the absorption of polyphenols. We tested in humans the hypothesis that adding iron to tea diminishes the increase in antioxidant capacity in plasma, expected from tea ingestion. Ten women, aged 25–55 years, received white tea infusion or a mixture of white tea infusion and iron lactate in a randomized cross-over design. Blood samples were drawn before the administration of and 30,

45, and 90 min after the consumption of the test drinks. The antioxidant capacity of plasma was measured with the ferric-reducing ability of plasma (FRAP) assay. The phenolic content of plasma was measured as total catechins and as content in selected phenolics with an HPLC assay. White tea increased the antioxidant capacity and the phenolic content of plasma ($p < 0.0001$) in a time-dependent manner ($p < 0.0001$). Iron inhibited the rise in antioxidant capacity and in the phenolic content of plasma ($p = 0.0057$). These results suggest that iron may modify the antioxidant properties of polyphenols and are in support of the hypothesis. Potential inhibition of polyphenol absorption as a result of luminal interactions between iron and phenolics is a plausible mechanism that may explain the observed effect and reserves further investigation. This study elucidates the complex luminal interactions between iron and polyphenols. The evaluation of the overall antioxidant capacity of the complex food systems contributes to the discussion on the optimal intakes of polyphenol and iron.

Category 3: Cardiovascular and pulmonary diseases

3.P01

Antioxidant markers and elemental levels in Azorean patients with coronary artery disease: a preliminary study

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Atherosclerosis (ATH) and related vascular diseases are the first cause of morbidity and mortality in Portugal, including the Azores' Archipelago. The oxidation of low density lipoproteins (LDL) is considered to be an important event in the development of the disease. Accordingly, by preventing LDL oxidation, antioxidants can possibly reduce the risk or the progression of

ATH. Essential trace elements as Cu, Se, Zn, and Fe are involved in endogenous antioxidant systems, mainly as cofactors of antioxidant enzymes. Other elements, like K and Ca, might play a role in atherogenesis while implicated in physiological and metabolic processes which are known to be disturbed in ATH. The aim of the present study was to evaluate some blood antioxidant markers and blood elemental levels in 20 Azorean subjects (ten men and ten women, aged 40 to 65 years) with coronary artery disease previously submitted to percutaneous revascularization (PCI). The whole blood glutathione peroxidase (Se-GPx) and erythrocyte superoxide dismutase activities were measured, as well as serum vitamin E levels (by HPLC). The concentrations of K, Ca, Fe, Cu, Zn, and Se in plasma and blood cells were determined by PIXE. Results were analyzed by taking into account several cardiovascular risk factors, namely, gender, hypertension, dyslipidemia, and total plasma homocysteine (tHcy) concentration. Se-GPx activity and vitamin E levels were significantly lower (24 and 15%, respectively) in the PCI group than in controls. In blood cells, significant differences in Ca (19 ± 5 vs 24 ± 6 $\mu\text{g/mL}$) and Zn (14 ± 1 vs 12 ± 2 $\mu\text{g/mL}$) levels were observed in PCI women (but not in men) compared to the respective counterparts. Also in PCI women, both serum triglyceride and plasma tHcy concentrations were above reference values and higher than in men. Results suggest a decreased antioxidant status in PCI patients. In particular, women appear to be less protected than men, as reflected in some cardiovascular risk factors.

3.P02

Blood trace element levels in patients with stabilized atherosclerosis

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Cardiovascular diseases remain the leading cause of mortality in Western populations. Dyslipidemia, hypertension, diabetes, obesity, and tobacco smoking are the main risk factors for atherosclerosis and its

thrombotic complications. However, these factors alone cannot account for all of the deaths caused by vascular pathologies. The possible interaction of some trace element levels with atherogenic diseases is not completely clarified. On the other hand, the intra- and extracellular concentrations of elements playing an important function in the electrolytic equilibrium could partially be associated with cardiovascular dysfunctions and other associated pathologies. The aim of this study was to evaluate trace elements (Fe, Ni, Cu, Zn, Se) and electrolytic-balance-associated elements (K and Ca) in plasma and blood cells of patients with stabilized atherosclerosis. Significant differences between patient and control groups were observed in blood cell K, Fe, and Zn concentrations, while plasma K, Ca, Fe, and Zn levels exhibited significant differences between groups. Results will be discussed taking into account the main function of those elements and the etiology of atherosclerosis. The relationship of results with the studied cardiovascular risk factors will be also considered.

3.P03

Magnesium in the serum of patients treated surgically

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Magnesium is one of the most important elements, fulfilling significant and complex functions in the body. Changes in concentration of magnesium in the serum can be linked with the occurrence of many varied pathological states. The aim of this work was to present some findings from our studies that we carried out earlier concerning concentration of magnesium in serum in patients with hypertension, disorders of the synostosis, thrombophlebitic complications of the lower limbs, after removal of the gall bladder by laparoscopy or laparotomy, with disturbances of the rhythm of the heart. In all the mentioned groups of patients with postoperative complications,