

Concurrent Session 1: Selenium and Health

Suppression of colon cancer by selenium-enriched milk proteins: enhanced apoptotic response to carcinogen is associated with reduction in the frequency of *K-ras* mutations

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Background – Dietary intake of selenium (Se) through selenium-enriched food sources is one strategy for increasing human Se intake, and reducing cancer risk. Dairy products are not normally considered to be a significant source of selenium, however, feeding selenized yeast (Sel-Plex[®] Alltech) to cows results in effective and rapid incorporation into milk proteins.

Objective – This study compared a dairy-Se with yeast-Se for their effects on inhibiting colorectal oncogenesis in carcinogen-treated mice and regulation of homeostatic response to carcinogen-induced DNA damage.

Design – Dietary interventions: selenium-enriched milk-protein isolate (Tatura-Bio[®]Se, Se 0.5 or 1ppm) or milk protein control; selenized-yeast (Sel-Plex[®], Se 1 or 4ppm) with casein or casein alone as control. After 4 weeks on diet, mice received a single azoxymethane (AOM) injection to induce mutations, and were killed 6h later. Measures: plasma Se, cell proliferation and acute apoptotic response to AOM (AARGC). Separate groups of mice were given 4 weekly AOM (15mg/kg) injections to induce oncogenesis, killed 6 or 30 weeks after the last AOM injection. Measures: aberrant crypt foci (ACF), cancers and *K-ras* mutations.

Outcomes – Dairy-Se at 1ppm significantly suppressed ACF and cancers while yeast-Se at 1ppm did not. Dairy-Se significantly increased plasma Se levels and AARGC, and reduced cell proliferation and frequency of *K-ras* mutations in ACF relative to an equivalent dose of yeast-Se.

Conclusion – Dairy-Se is superior to yeast-Se in terms of Se bioavailability and capacity to suppress oncogenesis. Suppression may be a consequence of enhanced apoptotic deletion of AOM-induced DNA lesions and the subsequent reduction in frequency of *K-ras* mutations.

Selenium and prostate cancer prevention

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Background – In this paper, the role of the micronutrient selenium (Se) against prostate cancer is discussed, to illustrate the importance of a dietary component in risk reduction and control of an important chronic disease. Prostate cancer's high rate of occurrence and long lead time to clinically significant disease make it ideal for nutritional chemoprevention.

Objective – To review briefly the evidence for Se's activity against prostate cancer, and also possible interactions and synergies with other anti-cancer agents.

Outcomes – Numerous laboratory, animal, epidemiological and clinical studies have provided evidence for selenium's efficacy against prostate cancer. The long and complex process of prostate carcinogenesis presents multiple opportunities for Se to act on the development of prostate cancer from initiation to progression. Mechanisms of Se's anti-cancer action include antioxidant effects, neutralisation of carcinogens (eg cadmium), cell-cycle arrest, immune enhancement, apoptosis, anti-angiogenesis, and inhibition of tyrosine kinase. It is unrealistic to expect a "silver bullet" cure for a condition as multi-causal, complex and heterogeneous as prostate cancer. Growing evidence supports the concept of chemopreventive agent combinations, which target multiple molecular sites and provide either additive or synergistic effects, such as those demonstrated for Se and vitamin E, and green tea and lycopene against prostate cancer. It is also apparent that Se and certain phyto-compounds can both increase the effectiveness and reduce the toxicity of cancer chemotherapeutics.

Conclusions – Enough evidence exists to support a role for Se in both prevention and control of prostate cancer, especially when used in combination with certain other agents. Further research is needed to determine optimum forms and dosages.