

Your AntiOxiDense™ Product Science – Selenium & Zinc Abstracts

{Note: the underlined sections within the text of the abstracts are highlighted for emphasis by us, not the authors}

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[Nutr Clin Pract.](#) 2008 Apr-May;23(2):152-60.

The role of selenium in chronic disease.

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Selenium functions as a part of proteins known as selenoproteins. Through these selenoproteins, selenium functions as a defensive mechanism for oxidative stress, for the regulation of thyroid hormone activity, and for the redox status of vitamin C and other molecules. In several of its roles, selenium functions as a dietary antioxidant and thus has been studied for its possible role in chronic diseases. This article reviews recent studies regarding selenium status or supplementation in hypertension, cardiovascular disease, cancer, and diabetes mellitus. A few studies regarding aging and mortality are also included. What can be ascertained from this current review is that the maintenance of adequate selenium nutriture and, at minimum, the prevention of a deficiency in selenium would be advisable for all individuals. In addition, the indiscriminant use of selenium supplements should be approached with caution until further randomized, controlled trials monitor the effects of such supplementation, especially on a long-term basis.

(2)

[Proc Nutr Soc.](#) 2005 Nov;64(4):527-42.

Selenium in cancer prevention: a review of the evidence and mechanism of action.

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Se is an unusual trace element in having its own codon in mRNA that specifies its insertion into selenoproteins as selenocysteine (SeCys), by means of a mechanism requiring a large SeCys-insertion complex. This exacting insertion machinery for selenoprotein production has implications for the Se requirements for cancer prevention. If Se may protect against cancer, an adequate intake of Se is desirable. However, the level of intake in Europe and some parts of the world is not adequate for full expression of protective selenoproteins. The evidence for Se as a cancer preventive agent includes that from geographic, animal, prospective and intervention studies. Newly-published prospective studies on oesophageal, gastric-cardia and lung cancer have reinforced previous evidence, which is particularly strong for prostate cancer. Interventions with Se have shown benefit in reducing the risk of cancer incidence and mortality in all cancers combined, and specifically in liver, prostate, colorectal and lung cancers. The effect seems to be strongest in those individuals with the lowest Se status. As the level of Se that appears to be required for optimal effect is higher than that previously understood to be required to maximise the activity of selenoenzymes, the question has been raised as to whether selenoproteins are involved in the anti-cancer process. However, recent evidence showing an association between Se, reduction of DNA damage and oxidative stress together with data showing an effect of selenoprotein genotype on cancer risk implies that selenoproteins are indeed implicated. The likelihood of simultaneous and consecutive effects at different cancer stages still allows an important role for anti-cancer Se metabolites such as methyl selenol formed from gamma-glutamyl-selenomethyl-SeCys and selenomethyl-SeCys, components identified in certain plants and Se-enriched yeast that have anti-cancer effects. There is some evidence that Se may affect not only cancer risk but also progression and metastasis. Current primary and secondary prevention trials of Se are underway in the USA, including the Selenium and Vitamin E Cancer Prevention Trial (SELECT) relating to prostate cancer, although a large European trial is still desirable given the likelihood of a stronger effect in populations of lower Se status.

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[Antioxid Redox Signal](#). 2005 Nov-Dec;7(11-12):1715-27.

Selenium and cancer chemoprevention: hypotheses integrating the actions of selenoproteins and selenium metabolites in epithelial and non-epithelial target cells.

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The trace element nutrient selenium (Se) discharges its well-known nutritional antioxidant activity through the Se-dependent glutathione peroxidases. It also regulates nuclear factor activities by redox mechanisms through the selenoprotein thioredoxin reductases. Converging data from epidemiological, ecological, and clinical studies have shown that Se can decrease the risk for some types of human cancers, especially those of the prostate, lung, and colon. Mechanistic studies have indicated that the methylselenol metabolite pool has many desirable attributes of chemoprevention, targeting both cancer cells and vascular endothelial cells, whereas the hydrogen selenide pool in excess of selenoprotein synthesis can lead to DNA single strand breaks, which may be mediated by some reactive oxygen species. We propose a new paradigm based on a consideration of the post-initiation biology of avascular early lesion expansion microenvironment, physiochemistry of Se delivery, and the obligatory need for angiogenesis to sustain lesion progression. Our model integrates the roles of selenoproteins and specific Se metabolites to account for cancer risk reduction or enhancement. For future studies, speciation (profiling) methods for Se metabolites and for Se forms in foods and supplements are much needed for hypothesis testing and for the development of mechanism-based Se status markers for cancer prevention. Randomized cancer prevention trials are necessary to test the efficacy of methyl selenium compounds.

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[Biofactors](#). 2007;29(4):203-12.

Diabetes, metallothionein, and zinc interactions: a review.

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Epidemiological evidence, associating diabetes with zinc (Zn) deficiencies, has resulted in numerous research studies describing the effects of Zn and associated metallothionein (MT), on reducing diabetic complications associated with oxidative stress. MT has been found to have a profound effect on the reduction of oxidative stress induced by the diabetic condition. Over expression of MT in various metabolic organs has also been shown to reduce hyperglycaemia-induced oxidative stress, organ specific diabetic complications, and DNA damage in diabetic experimental animals, which have been further substantiated by the results from MT-knockout mice. Additionally, supplementation with Zn has been shown to induce in vivo MT synthesis in experimental animals and to reduce diabetes related complications in both humans and animal models. Although the results are promising, some caution regarding this topic is however necessary, due to the fact that the majority of the studies done have been animal based. Hence more human intervention trials are needed regarding the positive effects of MT and Zn before firm conclusions can be made regarding their use in the treatment of diabetes.

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[JPEN J Parenter Enteral Nutr.](#) 2008 Sep-Oct;32(5):509-19.

Zinc supplementation in critically ill patients: a key pharmaconutrient?

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The purpose of the present paper is to provide a rationale for zinc supplementation as a potential therapeutic agent in critically ill patients by describing its role in health and disease, conducting a systematic review of current randomized trials in critical care, considering optimum route and dose of administration, and making recommendations for future research. Normal zinc homeostasis is required for a functional immune system, adequate antioxidant capacity, glucose homeostasis, and wound

healing. In addition, zinc is a required cofactor for many enzymes, transcription factors, and replication factors. In non-critically ill patients, zinc supplementation has been associated with an improvement in markers of immune function. In critically ill patients, only 4 randomized trials have examined the effect of zinc supplementation on clinical outcomes. When all 4 studies were aggregated, zinc supplementation was associated with a nonsignificant reduction in mortality (relative risk = 0.63, 95% confidence intervals 0.25-1.59, P = .33) and length of stay in intensive care (-0.35 days, -0.85 to 0.15; P = .17). Thus, because of the paucity of clinical data, there is inadequate evidence to recommend the routine use of high-dose zinc supplementation in the critically ill. A first step would be to determine the optimal dose that has a maximal positive effect on underlying inflammatory, immunologic, and metabolic processes yet is safe and tolerated by critically ill patients. Subsequently, large, rigorously designed, randomized trials are required to elucidate the efficacy of such doses of zinc supplementation in this patient population.

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[Rejuvenation Res.](#) 2008 Apr;11(2):419-23.

Zinc, metallothioneins, longevity: effect of zinc supplementation on antioxidant response: a Zincage study.

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Aging is characterized by spontaneous biochemical changes that may predispose to increased susceptibility to diseases. Zinc may remodel these changes leading to healthy aging because zinc improves antioxidant defense via CLU protein and genomic stability via PARP-1 nuclear enzyme and repairs oxidized proteins via Msr A protein. The intracellular zinc homeostasis is regulated by metallothioneins (MT), which are unable in zinc release in aging, causing impaired antioxidant response restored by zinc supplementation. Here, the choice of old subjects for zinc supplementation is discussed in relation to their genetic

background of MT and IL-6, because both affect intracellular zinc homeostasis.

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[Biogerontology](#). 2006 Oct-Dec;7(5-6):315-27.

Inflammation, genes and zinc in ageing and age-related diseases.

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Lifelong antigenic burden determines a condition of chronic inflammation, with increased lymphocyte activation and pro-inflammatory cytokine production. A large number of studies have documented changes in Zn metabolism in experimental animal models of acute and chronic inflammation and in human chronic inflammatory diseases. In particular, modification of zinc plasma concentration as well as intracellular disturbance of antioxidant intracellular pathways have been found associated to age-related inflammatory diseases, like atherosclerosis. Zinc deficiency is extremely diffused in aged people that are educated to avoid meat and other high Zn-content foods due to fear of cholesterol. Rather, they increase consumption of refined wheat products that lack of Zn, magnesium and other critical nutrients in consequence of refining process. On the other hand, plasma concentration of metallic ions like Zn is influenced by pro-inflammatory cytokines production. A major target of Zn may be NF- κ B, a transcription factor critical for the expression of many pro-inflammatory cytokines whose production is finely regulated by extra- and intracellular activating and inhibiting factors interacting with regulatory elements on cytokine genes. Moreover, this factor is regulated by the expression of specific cellular genes involved in inflammation. So it is not surprising that Zn deficiency is constantly observed in aged patients affected by infectious diseases. On the other hand, cytokine genes are highly polymorphic and some of these polymorphisms have been found associated to age-related diseases as atherosclerosis. Therefore, Zn deficiency in individuals genetically

predisposed to a disregulation of inflammation response, may play a crucial role, in causing adverse events and in reducing the probability of a successful aging.

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Bioavailability, antioxidant and immune-enhancing properties of zinc methionine

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Although a large number of transition metals and cations remarkably induce oxidative deterioration of biological macromolecules including lipids, proteins and DNA, the trace element zinc acts as a novel dietary supplement and an essential micronutrient, and serves a wide range of biological functions in human and animal health. Zinc promotes antioxidant and immune functions, stabilizes and maintains the structural integrity of biological membranes, and plays a pivotal role in skin and connective tissue metabolism and repair. Zinc is an integral constituent of a large number of enzymes including antioxidant enzymes, and hormones including glucagon, insulin, growth hormone, and sex hormones. High concentrations of zinc are found in the prostate gland and choroids of the eye. Zinc deficiency leads to biochemical abnormalities including the impairments of growth, dermal, gastrointestinal, neurologic and immunologic systems. Given its superior bioavailability, antioxidant and immune-enhancing properties, zinc methionine may serve as a novel dietary supplement to promote health benefits in humans and animals.

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