

Issue 110

In a nutshell

Although various disease states can be associated with selenium deficiency, attempts to demonstrate clinical benefit from selenium supplementation in human trials have so far mostly been small samples and had mixed results.

Selenium

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NUTRITION RESEARCH REVIEW

Study one: Selenium and “low T3 syndrome”

Selenium given early after severe trauma may be useful in countering the so-called “low T3 syndrome” that is often seen in patients in intensive care units, according to a recent Swiss study.

Subjects: 31 critically ill trauma patients with severe, multiple injury.

Method: Randomised, placebo-controlled trial using as active intervention 500 µg of selenium within the first 5 days of admission. In a sub-group of patients, supplements of vitamin E (150 mg alpha-tocopherol and zinc (13 mg) were also given.

Results: Circulating levels of selenium became normal by day 1 in the supplemented group. Supplementation was associated with an earlier and greater rise in T4 and reverse T3 hormone levels from the second day onwards ($p = 0.04$ and 0.05).

Reference: Berger MM et al. Influence of selenium supplements on the post-traumatic alterations of the thyroid axis: a placebo-controlled trial. *Intensive Care Med* 2001 Jan;27(1):91-100

Study two: Selenium in premature infants

Supplementing very low birth weight babies with selenium did not improve neonatal outcome, according to the authors of a recently published study from New Zealand.

Subjects: 534 very low birth weight infants.

Method: Randomised, double-blind, placebo-controlled trial in which infants were given either

placebo or selenium. Supplementation was continued from first week of life until the baby was discharged home or reached 36 weeks post-menstrual age.

Results: The plasma selenium rose with treatment in the supplemented group but not in the placebo group ($p < 0.001$).

There was an association between pre-treatment selenium status in both mother and infant and increased respiratory morbidity in the infant. Fewer supplemented than placebo infants had an episode of infection after the first week of life ($p < 0.038$).

However, there was no significant difference in oxygen dependency or any other outcome measure between placebo and active treatment groups.

Reference: Darlow BA et al. The effect of selenium supplementation on outcome in very low birth weight infants: a randomized controlled trial. *The New Zealand Neonatal Study Group. J Pediatr* 2000;136:473-80

Study three: Selenium in rheumatoid arthritis (RA)

There was no impact of selenium supplementation on symptoms of RA, according to a Belgian study.

Subjects: 55 patients with moderate RA.

Method: Double blind, multi-centre, placebo-controlled study. Active treatment was selenium enriched yeast (200 µg per day) for 90 days.

Results: Both placebo and active treatment groups had significant improvements in objective and

subjective measures of RA disease activity over the study period. However, there were no significant differences between active and placebo groups after treatment.

Reference: Peretz A et al. Selenium supplementation in rheumatoid arthritis investigated in a double blind, placebo-controlled trial. Scand J Rheumatol 2001;30:208-12

Comments

Selenium is a nutrient whose value in clinical medicine is still being explored. Although many disease states cause lowered selenium status, attempts to show that selenium supplementation helps those disease states have had only mixed results.

Selenium is found in both plant and animal foods. It forms part of various enzymes within the body, whose roles include antioxidation (e.g. glutathione peroxidase), muscle and sperm function. Selenium is also required for the metabolism of thyroid hormones.

Selenium status in humans is affected by the selenium content of the soil in which food is grown. For this reason, people in certain parts of the world (e.g. areas within China, New Zealand and Africa) have much lower selenium status and are at risk of becoming selenium deficient. Selenium-enriched fertilizer has been used in some countries to try to correct this soil deficiency.

Selenium deficiency can manifest as cardiomyopathy (e.g. Keshan disease), and be a contributing factor to endemic goitre. Over recent years researchers have been looking at possible links between selenium status and a much wider range of disease states, particularly chronic degenerative and inflammatory diseases. This includes cancer, ischaemic cardiovascular disease, rheumatoid arthritis and HIV. There is an epidemiological association between lower selenium levels and the development of cancer.

Selenium status is itself also affected by various disease states, including cancer, liver disease, diabetes and renal disease.

We are still at an early stage of using selenium supplementation to treat or prevent disease. A number of preliminary results and small scale trials have been reported, many of which combined selenium with other antioxidant nutrients. But there is no large body of clinical trial evidence on which to base a conclusion.

The three trials summarised in this issue are typical of this. Each involves a clinical situation where there is theoretical reason to believe that selenium supplementation might be helpful. For example, "low-T3" syndrome (a pattern of low T3/normal T4 thyroid hormones seen in response to severe trauma) might be related to the fall in selenium status which trauma causes. The first trial provides some tentative support for this notion.

On the other hand, neither the second and third supplementation trials showed any benefit from supplementation. This is despite the fact that patients in these situations have been shown to have low selenium levels.

We still have quite a way to go in deciding on the place of selenium supplementation in clinical medicine. Since selenium is toxic in overdose (and the margin between deficiency and toxicity is narrow), we will have to proceed cautiously.

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