

Selenium

What is it known as?

How does it work?

Has it been studied in heart disease?

Is it for me?

Is it safe?

Are there any reported interactions with herbs, supplements or drugs?

Are there any interactions with laboratory tests?

Where can it be found naturally?

What is the most appropriate dosage?

WHAT IS IT KNOWN AS?

Known only as selenium. It is a trace element found on the periodic table of elements with the abbreviation, Se, and the atomic number 34.

HOW DOES IT WORK?

Selenium is an antioxidant which regulates important enzymes that protect against oxidized molecules such as low density lipoproteins (LDL). It also inhibits aggregation of small blood components known as platelets which can build up on plaque within the heart arteries and lead to a heart attack. Selenium is also thought to protect the heart from damage attributed to toxic heavy metals (1).

HAS IT BEEN STUDIED IN HEART DISEASE?

Selenium supplementation has gained some support for the prevention of coronary heart disease (CHD). There appears to be an inverse relationship between selenium levels and the incidence of cardiovascular disease. A reduced selenium level in humans has been associated with an increased risk of heart

attack (acute myocardial infarction) (2). This beneficial effect may be a result of the antioxidant properties of selenium. The deficiency of selenium may also promote the formation of blood clots which may lead to heart attack (3). Whether or not supplementation with selenium actually reduces the risk of a cardiovascular event, such as heart attack, has not yet been established in clinical studies.

In congestive heart failure (CHF), selenium deficiency has been linked to a cardiomyopathy (heart muscle disorder), called Keshan disease. This disease is endemic to China and affects many children and young women (4). Selenium deficiency has also been linked

The lower the level of selenium, the higher the associated risk of heart attack.

to a cardiomyopathy found in people receiving artificial nutrition (5). Despite these associations, the role of selenium in relieving the symptoms or improving the prognosis of patients with CHF has not yet been established. As a result, selenium has not been recommended for routine use in people suffering from CHF.

IS IT FOR ME?

It is too early to tell whether or not selenium will play a role in the prevention of either CHF or CHD. Low levels appear to be associated with an increased incidence of both CHF and CHD. However despite these associations, supplementation has not been clearly demonstrated to prevent or improve these conditions.

IS IT SAFE?

Selenium supplementation is considered safe when taken in doses up to 400 mcg per day (6). However, acute toxicity may occur at higher doses with symptoms including nausea, vomiting, nail changes, fatigue and irritability (7). Chronic toxicity is similar to arsenic poisoning with symptoms including hair loss, white horizontal streaking on fingernails, paronychia, fatigue, irritability, hyperreflexia, nausea,

vomiting, garlic odor on the breath, and a metallic taste (3,7). Selenium poisoning may also be associated with facial flushing, lightheadedness, muscle tenderness, and tremor (7).

ARE THERE ANY REPORTED INTERACTIONS WITH HERBS, SUPPLEMENTS OR DRUGS?

Herb and supplement interactions

Iodine and selenium may have synergistic effects in the treatment of Kashin-Beck disease, a joint condition found in China where the soil content of selenium is poor (8).

Vitamin C taken along with selenium may actually decrease the absorption of selenium (9).

Vitamin E along with selenium may have synergistic effects (3). They both act as antioxidants.

Drug interactions

Cisplatin (Platinol-AQ) used in combination with selenium may actually exhibit increased toxicity in the presence of ethylenediaminetetraacetic acid (EDTA) (10).

ARE THERE ANY INTERACTIONS WITH LABORATORY TESTS?

Creatinine kinase, a common blood test of muscle destruction, may be elevated in the presence of selenium toxicity (6).

EKG changes suggestive of a myocardial infarction (heart attack) may occur in the setting of selenium toxicity (6).

WHERE CAN IT BE FOUND NATURALLY?

Selenium is most frequently obtained from foods grown in the soil. Soil levels are highly variable throughout the world. Some fish also provide selenium through the diet including salmon and haddock (2,11,12). In the US, the Eastern Coastal Plain and the Pacific Northwest have the lowest selenium levels. People in these regions typically ingest between 60 to 90 mcg per day (11,12). The average person in the United States ingests 125 micrograms (mcg) per day through their diet (11,12).

WHAT IS THE MOST APPROPRIATE DOSAGE?

No clear guidelines have been established for supplementation, however 200 mcg per day is felt to be appropriate (13). The real question is whether or not selenium should be supplemented for the prevention and treatment of cardiovascular disease? It seems the evidence is lacking despite a theoretical benefit due to its role as an antioxidant. Those choosing to take

Selenium dosage:

- **200 mcg per day is felt to be appropriate**
- **Vitamin E 400 mcg per day may also work synergistically with selenium**

selenium supplementation due to its potential role in CHD, CHF, or perhaps non-cardiovascular conditions, should consider the addition of vitamin E (400 mcg/day) which may actually work synergistically with selenium (3).

REFERENCES

1. Neve J. "Selenium as a risk factor for cardiovascular diseases." *J Cardiovasc Risk* 1996;3(1):42-47
2. Kardinaal AF, Kok FJ, Kohlmeier L, et al. Association between toenail selenium and risk of acute myocardial infarction in European men. The EURAMIC Study. European Antioxidant Myocardial Infarction and Breast Cancer. *Am J Epidemiol* 1997;145:373-9
3. PDR (Physician's Desk Reference) for Nutritional Supplements. 1st ed. Montvale, New Jersey. Medical Economics Company. 2001:417
4. Yang G, Ge K, Chen J, Chen X. Selenium-related endemic disease and the daily selenium requirement of humans. *Wld Rev Nutr Diet* 1988;55:98
5. Reeves WC, Marcuard SP, Willis SE, Movahed A. Reversible cardiomyopathy due to selenium deficiency. *J Parenter Enteral Nutr* 1989;13:663
6. National Academy of Science, Institute of Medicine. "Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids." [Http://www.nap.edu/pdf/0309069351/pdf_image/284.pdf](http://www.nap.edu/pdf/0309069351/pdf_image/284.pdf). (Accessed June 6 2000)
7. Ellenhorn MJ, et al. *Ellenhorn's Medical Toxicology: Diagnoses and Treatment of Human Poisoning*, 2nd ed. Baltimore, MD: Williams & Wilkins, 1997
8. Moreno-Reyes R, Suetens C, Mathieu F, et al. Kashin-Beck osteoarthropathy in rural Tibet in relation to selenium and iodine status. *N Eng J Med* 1998;339:1112-1120
9. Ip C. Interaction of vitamin C and selenium-induced inhibition of angiogenesis in mammary cancer at chemopreventive levels of intake. *Mol Carcinog* 1999;26:213-225
10. Maier RH, Purser SM, Nicholson DL, Pories WJ. "The cytotoxic interaction of inorganic trace elements with EDTA and cisplatin in sensitive and resistant human ovarian cancer cells." In *Vitro Cell Dev Biol Anim* 1997;33:218-221
11. Natural Medicines comprehensive Database. 3rd ed. Stockton, CA. *Therapeutic Research Faculty*. 2000;950
12. Koller LD, Exon JH. "The two faces of selenium-deficiency and toxicity-are similar in animals and man." *Can J Vet Res* 1986;50(3):297-306
13. Busch F. *The New Nutrition: From antioxidants to Zucchini*. John Wiley & Sons. New York, NY. 2000