SELENIUM

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SELENIUM is a trace, non-metal mineral that plays a vital role in daily biochemical reactions. It acts as a cofactor for a group of enzymes known as selenoproteins. These selenoproteins include glutathione peroxidase, which protects the body from oxidative damage, and thyroxine reductase, which aids thyroid function. The known biological functions of selenium include defense against oxidative stress, regulation of the thyroid hormone, and regulation of the redox status of vitamin C.[1, 2]

The major source of natural selenium is selenomethionine, which is an amino acid abundantly found in plants and highly absorbable in the gut.[3] Several other inorganic forms of selenium, such as selenate and selenite, have lower bioavailability and absorption.[4] Selenium is stored in the body, mainly in the form of selenomethionine, which directly relates to the selenium load in the diet and not physiological needs.[5] This means that as more selenium is included in the diet, more is stored in the body.

It is of great importance to mention that the liver enzyme, glutathione peroxidase, is one of the main reservoirs of selenium. In a study on rats, it was shown that 25% of their total body selenium presented in the liver.[6] Selenomethionine is then metabolized into other selenium compounds, such as selenite, selenophosphate, selenocysteine, etc.[7-9] Selenium is primarily excreted through the urinary system in the form of selenite, which is important in maintaining selenium balance.[10]

Selenium is required in small amounts and its deficiency is very unlikely. The manifestations of its deficiency may take years to develop and repletion generally occurs within weeks to months. Selenium deficiency has been linked to some serious health issues, such as myocarditis[10] and cardiomyopathy (Keshan disease).[11] Selenium deficiency leading to

Food	Selenium (mcg)
Brazil nuts, ¼ cup	380
Snapper, baked, 3 oz	148
Halibut, baked, 3 oz	113
Salmon, baked, 3 oz	70
Scallops, steamed, 3 oz	70
Clams, steamed, 20	52
Oysters, raw, ¼ cup	35
Wheat germ, toasted, ¼ cup	28
Sunflower seeds, ¼ cup	25
Ground beef, 3 oz	17
Whole Wheat bread, 1 slice	16
Egg, 1	12
Milk, 2% fat, 1 cup	6
Cheddar cheese, 1 oz	4

heart issues was first described in China in the early 1930s and was ascribed to low levels of selenium in the soil.[12] Selenium deficiency has also been recognized to cause fibrosis in cartilage (Kashin-Beck disease).[13] In an animal study, it was shown that vitamin E deficiency in association with selenium deficiency may result in liver and heart damage.[14]

In the U.S., most cases of selenium depletion or deficiency have been caused by severe gastrointestinal problems that impact selenium absorption, such as Crohn's disease, ulcerative colitis, and some gastrointestinal surgeries.[15-17]

People with acute, severe illness who develop inflammation and widespread infection may also have decreased levels of selenium in their blood but show significant improvement with selenium supplementation.[18]

Selenium deficiency may worsen the effects of iodine deficiency on thyroid function. Conversely, adequate selenium nutritional status may help protect against some of the neurological effects of iodine deficiency.[19-21]

A dietary intake of approximately 40 micrograms of selenium per day may be necessary to maintain an optimal level of glutathione peroxidase. Brazil nuts, seafood, and wheat germ are the richest sources.

However, excessive intake of selenium may result in selenosis, with manifestations including skin and nail changes, tooth decay, and neurologic abnormalities.[22, 23] The Tolerable Upper Intake Level (UL) is the highest level of daily nutrient intake that is likely to pose no risk of adverse effects in most individuals. The USDA recommends a selenium intake of less than the UL, which is around 400 micrograms per day.

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