Selenium In Health and Disease

AN ESSAY

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بسم الله الرحمن الرحيم

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Introduction

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For a long time, the trace element Selenium (Se) was considered toxic for both animals and humans causing severe poisoning in some regions (Smith et al., 1936). later, the biochemical role of Se in mammals was clearly established by the discovery that it is part of the active site of the antioxidant enzyme glutathione peroxidase (Rotruck et al., 1973), Se is considered to be a protective factor against oxidative stress (Litov and Combs, 1991).

Moreover, marginal or pronounced Se deficiency states have been lately identified and the resulting clinical consequences have been described (Van Rij et al., 1979).

At present, Se impact on human health has become a rapidly growing field of scientific research. Studies have been devoted to the possibilities of using Se for the prevention or treatment of degenerative of free radical diseases such as neurological disorders, inflammatory diseases or cancer (Neve, 1991).

Aim of The Work

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The purpose of this essay is to provide a detailed account on Se status and its assessment. It will also discuss the biological role of Se in health as well as its biomedical significance in disease. The new therapeutic trends of using Se in medicine will also be reviewed.

Selenium Status

Selenium In Health and Disease

SELENIUM STATUS:

Selenium was first discovered in 1817 by the Swedish chemist Berzelius in waste deposits formed when sulfur was burned for the production of sulfuric acid. Since it was chemically similar to tellurium which was named after the Latin tellus, meaning "*the earth*", the new element was named selenium, taken from the Greek selene, meaning "*the moon*" (Schwarz and Foltz, 1957).

Selenium (Se) occurs in group VI of the periodic table with oxygen, tellurium, and sulfur. It very closely resembles sulfur in physical and chemical properties, both as elemental selenium and in its various compounds. One consistents difference, however, is that the Se compounds are generally more unstable than the corresponding sulfur analogs (Scott, 1962).

Selenium status

Selenium occurs in 3 different allotropic forms: monoclinic, amorphous and crystalline. The first 2 forms are red in color, while the third form, crystalline Se, consists of hexagonal crystals that are bluish grey in color. The latter has intresting physical properties as it is a much better conductor of electricity in light than in the dark and also generates an electric current when exposed to light. This property, discovered in 1873, has been utilized for the manufacture of photographic exposure meters, photometers, and many other instruments where the conversion of light to electrical energy can be utilized (Scott, 1962).

A- Sources of Selenium

The single significant source of Se for humans is the diet except in very rare circumstances e.g. industrial exposure or accidental consumption of Se-containing reagents (Combs and Combs, 1987). However, the amounts of Se that diets may provide can vary greatly with the locale in which foods are produced, the biologic availability of the Se that they contain, and food availability due to economically driven, culturally based, and/or personal choice in food selection (Combs, 1988).

The major source of Se in most diets are meats and cereal products, which provide approximately 50% and 25% to 35% respectively. In addition, dairy products and eggs provide 10% to 20%, while fruits and vegetables provide less than 5% of the total Se intake. Therefor, individual patterns of meat consumption can be important determinants of Se intake, with high-meat diets providing as much as twice the Se of low-meat diet (Litov and Combs, 1991).

The Se contents of food from both plant and animal origin tend to be related to the Se in the local soils. For this reason, much of the variation in the Se contents of foods is due to large scale geographic differences in the amounts and the availabilities of soil Se. Several regions in the world have soils with low amounts (i.e.< 0.5 part per million) of Se: Denmark, Eastern Finland, Newzealand, and a large belt extending across the Chinese mainland from the northeast to the south-central part of the country. Each of these regions has historical problems involving Se-deficiency disorders of Livestock. Less severe Se deficiencies in livestock occur in Canada, western Australia, parts of the United States, Pacific northwest, northeast, and southeastern seaboard. In marked contrast, soils rich in Se (e.g. in excess of 5 part per million) are found in parts of the United States (northern Great Plains, parts of the Southwest), Ireland, Colombia, Venezuela, Israel, and a few isolated locations in China (Litov and Combs, 1991).

Finland has taken a unique approach to improve the Se contents of its domestically produced foods. Starting in 1984, the addition of Se to fertilizers was to enrich the country's low-Se soil. This program resulted in increased levels of Se in both animals- and plant-derived foods and serum of the Finish people (Vaes ***et al.***, 1988).

For infants Se is often available only from breast milk and/or a commercial formula. Therefor, these foods, each of which is intended as a total diet, are of great importance with respect to the