



Selenium-rich Tea's Potential Apply Value as Sports Supplements

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ABSTRACT

In recent years, the research on the relationship between selenium and exercise capacity has become a hot research topic. Selenium is a necessary trace element in human body. This paper aims to elaborate the chemical composition of selenium and biological effects, discuss the relationship between selenium supplement and exercise capacity, and then investigate the potential applications of selenium-rich tea as sports supplements.

Key words: selenium; exercise; selenium-rich tea

INTRODUCTION

Scientific researches show that there is a close relationship between selenium and cancer, hypertension, metabolic syndrome, diabetes and other kinds of diseases. As a result of a wide range of biological effects, selenium has become a hot research topic of scholars.

The chemical composition and main biological effects of selenium

The chemical structure of selenium

In nature world, there are organic selenium and inorganic selenium. Organic selenium can play the role of biological activity. One of presence of organic selenium is dissociation factor, the other one is covalent binding of amino acids [1].

The biological effects of Selenium

Antioxidation: Selenium is an important component of glutathione peroxidase, it can catalyse GSH and peroxide oxidation reduction reaction specifically in vivo, such as hydrogen peroxide, superoxide anion and hydroxyl free radical, acyl lipid free radical, so as to protect the membrane from damage, maintain normal function of cell. The antioxidant capacity of selenium is 500 times higher than that of vitamin E [3].

Cardiovascular protection: Selenium can remove hydroperoxide and waste which produced in human metabolism and it can destruct the cholesterol which deposition in the arterial wall. As a result, timely supplement of selenium can prevent cardiovascular and cerebrovascular disease, coronary heart disease, arteriosclerosis and other diseases. Many investigations and animal experiments found that the cardiovascular and cerebrovascular morbidity of the group that have high selenium content in blood is low [4-5].

Detoxication: Selenium is a protective agent against toxic substances. It has a close affinity with metal in the human body, because it could combine with heavy metals such as mercury and methyl mercury, cadmium, etc. Then become the metal selenium protein complexes which could detoxicate, so metal excreted from the body, thereby protecting the liver cells. Animal experiments also found that selenium can reduce the acute damage of aflatoxin B1, and reduce the extent and the mortality of hepatic lobule [6].

Improve immune system: It has been found that selenium could enhance macrophage phagocytic function, promote

proliferation and differentiation of lymphocyte and enhance the cytotoxicity of lymphocytes. Furthermore, selenium can promote T cells and B cells secrete cytokines and regulate immune function through a variety of biological effects, which could promote the production of the antibodies [7].

The content and distribution of selenium in tea

Almost all Chinese tea contain selenium, the content of selenium is ranged from 0.017 to 6.590 mg/kg. Different types of tea with different selenium content, the average selenium content of green tea is 0.1371mg/kg in non-high selenium product region, but it is 1.4928mg/kg in high selenium product region. The selenium enriched tea is mainly produced in Hubei, Shaanxi, Guizhou, Sichuan and other part of the tea growing areas in China, those tea product areas form selenium enriched tea production areas [8].

RESULTS AND DISCUSSION

Selenium deficient animal model experiment showed that the enzyme activity of body with low intensity exercise can be inhibited when selenium deficiency, while the activity of energy metabolism can be increased significantly when the body is exercise stressed which has good selenium nutritional status. Another research result also showed that the time of endurance swimming last much longer after selenium supplement [9-10].

It is known that the oxygen consumption of athletes would increase several times during exercise. Athletes are under the condition of oxygen stress because of long term training, so the body will change both physiologically and biochemically to adapt the oxygen consumption increased dramatically. Researchers have found that selenium could change the deformability of red blood cells through changing the binding state of spectrin and erythrocyte membrane viscoelasticity which could change the deformability of red blood cells, so benefit to carry oxygen smoothly through the capillary, then the body gets sufficient oxygen. It has been showed that low selenium can lead to the damage of myocardial superoxide, mitochondrial damage and apoptosis. The antioxidative effect of selenium and its participation in the body's metabolism have a positive effect on the myocardial ischemia reperfusion injury and energy metabolism fatigue [11-12].

Guo has found that spleen lymphocyte Si (LPS) and Si (Con A) of selenium supplement mouse increased significantly after long-term training and the SI (LP) and ANAE+% in the training group also increased significantly through selenium supplement, which hints that selenium could improve the immune level of the body[13]. Some scholars consider that it is not necessary of selenium nutrition because the small degree of lipid peroxidation in quiet state. With increasing exercise intensity, the degree of lipid peroxidation increased, selenium plays an important role in inhibiting lipid peroxidation.

It has been shown that long term drinking selenium tea metabolism of mice on hyper-cholesterol diet can significantly improve the situation of plasma lipid and lipoprotein metabolism of mice on hyper-cholesterol diet [14]. Recently study showed that selenium-rich tea polysaccharides have an anti-fatigue effect in mice and the underlying mechanism is related to regulating the carbohydrate metabolism and improving tissue lipid peroxidation caused by excessive exercise [15].

CONCLUSION

The selenium of selenium-rich tea exists mainly in organic form, of which selenium in protein is the main speciation. Glycoprotein can eliminate excessive free radicals, prevent lipid peroxidation, regulate lipid metabolism, improve the body immunity, and can slow down the aging of human organs, then has a special protective effect. Furthermore, selenium-rich tea is safe and has health care function. So it has a broad application perspective as sports supplements.

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