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Micronutrient Intake was Associated with Nanomaterials

Ahmed Osman*

Department of Animal and Veterinary Sciences, Cairo University, Giza Governorate, Egypt

Introduction

Selenium is an essential trace element in the diet, required for health and growth; however, depending on the dose and chemical form, its toxicity can cause serious harm. Because of their low toxicity and ability to gradually release selenium after ingestion, we believe selenium nanoparticles (SeNPs) represent a novel prospect for nutritional supplementation. We discuss the various forms and types of SeNPs, as well as how they are synthesised, in this review. We also discuss nanoparticle absorption and bioavailability within the organism. SeNPs have anticancer and antimicrobial properties that may benefit human health as both dietary supplements and therapeutic agents [1].

Jöns Jacob Berzelius, a Swedish chemist, discovered selenium in 1817. Originally thought to be toxic, selenium was discovered in the 1950s to be an essential element for living organisms, which means that it cannot be produced by organisms and must be obtained through diet. Selenium is important for the body because of its ability to influence the activity of seleno-enzymedglutathione peroxidased and to protect cells and tissues from damage by acting as an antioxidant. Selenium may be beneficial in the prevention of a variety of diseases, including cardiovascular disease, arthritis, muscular dystrophy, and cystic fibrosis. Selenium is widely used as a dietary supplement, owing to its association with immunity and cancer.

Nanotechnology is a promising research tool in many fields, including pharmacy, diagnostics, the environment, information technology, engineering, energy, electronics, and the chemical industry. Because of their "Nano-scale," nanomaterial's have novel physical and chemical properties. Because of the unique properties of nanomaterial's, such as size, shape, surface properties, aggregation state, solubility, structure, and chemical composition, there is a large space for the development of diverse products with unique functions. The synthesis and application of selenium nanoparticles (SeNPs) have piqued the interest of researchers due to a number of advantages, including chemical stability, biocompatibility, and low toxicity with the growing concern about selenium intake in the diet; nanoparticles are being proposed as a nutritional supplement. In this review, we look at the different ways to use SeNPs [2].

The environment and living organisms contain a diverse range of selenium compounds, ranging from simple inorganic forms (e.g., selenides, halides, oxyhalides, oxides, acids, and salts of the oxyacids) to complex biogenic compounds such as selenoenzymes and selenium nucleic acids. Simple organic and methylated species, selenoamino acids, selenoproteins, selenoenzymes, selenoaminocarboxylic acids, selenium peptides, and selenium derivates of pyrimidine, purine, cholines, steroids, coenzyme A, and many others comprise large families of selenium biogenic compounds.

***Address for Correspondence:** Ahmed Osman, Department of Animal and Veterinary Sciences, Cairo University, Giza Governorate, Egypt, E-mail: ahmedosman12@gmail.com*

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Description

Soluble selenium forms are primarily absorbed in the lower part of the small intestine via various mechanisms that vary according to selenium form. The biological effects of Se are primarily determined by its incorporation into selenoproteins in the form of the amino acid selenocysteine. Passive diffusion absorbs selenite (SeO32), which is then non-enzymatically reacted with reduced glutathione to form selenodiglutathine (GS-Se-SG). Selenite (SeO42) is absorbed paracellularly via passive diffusion and then reduced to selenite in the presence of NADPH, which can react with GSH in the same manner. L-selenomethionine (SeMet) and L-selenocysteine (SeCys) are selenium amino acids that are absorbed via trans cellular pathways mediated by transporters such as Na [3].

SeNPs have received special attention in recent years due to their therapeutic properties. Elementsal (zero-valent) nanoparticles have a significant advantage over other selenium forms in that they are a high Se-density formulation with the potential for local delivery of high doses into cancer cells. Further research into intracellular mechanisms revealed that SeNPs induced apoptosis in A375 cells via oxidative stress and mitochondrial dysfunction. SeNPs appear to be potential cancer chemopreventive and chemotherapeutic agents. Furthermore, combining SeNPs with the chemotherapeutic agent Adriamycin could be a promising approach to cancer treatment. Adriamycin and SeNPs were discovered to inhibit the proliferation of cancer Bel7402 cells, and the combination resulted in higher inhibition efficiencies than either component alone [4].

The cytotoxicity of extracted biogenic SeNPs on the proliferation of the fibrosarcoma cell line (HT-1080) and the inhibitory effect of the SeNPs on matrix metalloproteinase were demonstrated (MMP). MMPs are involved in the degradation of extracellular matrix, which allows cancer cells to migrate out of the primary tumour in a process known as metastasis. SeNPs were also used to treat malignant mesothelioma in another study. Mesothelioma is a deadly cancer that develops in the lining of the peritoneal, pleural, or pericardial cavity. Selenium was delivered into malignant mesothelium cells in three molecular forms: traditional selenite salts, colloidal SeNPs, and a novel Se/C composite nanostructure formed by heterogeneous nucleation of selenium Nano clusters on the high activity surfaces of liquid crystal-derived carbon nanoparticles [5].

Conclusion

Selenium is a trace element that is required by all living organisms. The concept of its function and application has evolved over time. Many publications are looking into selenium as a potential anticancer and antioxidant agent. The formula of selenium is the main determinant of its bioavailability. Organic selenium compounds are known to be more easily absorbed than inorganic; however, SeNPs may introduce a novel approach to selenium dietary supplementation. The ability of SeNPs to be modified by natural polymers such as chitosan makes them a candidate for gradual selenium release or use as an antimicrobial or anticancer agent. Sins have a wide range of applications in human diet and disease treatment.

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Conflict of Interest

There is no conflict of interest by author.

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