ECRONICON OPEN ACCESS

EC NUTRITION
Editorial

Selenium an Essential Micronutrient for Human Health

Samwel Boaz Otieno*

VRL Kabete and School of Public Health, Kenyatta University, Nairobi, Kenya

***Corresponding Author**: Samwel Boaz Otieno, VRL Kabete and School of Public Health, Kenyatta University, Nairobi, Kenya.

Received: March 23, 2017; **Published:** March 23, 2017

Selenium is essential for human health [1-4]. It occurs naturally in metalloid form and is needed in traces for human health [5]. Selenium plays important role in body anti-oxidation system [6,7] in the process protect the body cells from free radicals. It is therefore protective against cancer, and cardiovascular diseases. It is also important in thyroid hormone metabolism, inhibits HIV virulence and reduces development of AIDS [6].

Selenium plays important biological role through incorporation into a group of proteins, seleno-proteins [8]. The many biological forms of selenium is in form of seleno-cystein, a cystein analogue that is synthesized from serine bound to tRNA. Seleno-cystein contains ionized selenium at physiological pHs [8]. All seleno-proteins has one or more seleno-cystein residues in their active sites. All seleno-proteins has enzymatic functions in which one or more seleno-cystein located at the catalytic sites, participates in redox reactions. The enzymes are involved in different metabolic reactions at cellular level. The functions vary from anti-oxidant defense, muscle development and function, thyroid hormone metabolism, and immune function [7]. The deficiencies therefore lead to several pathological conditions. Several studies has shown inverse relationship between selenium intake and incidence of different cancers.

Selenoproteins are also involved in thyroid hormone biosynthesis pathway [9]. The mechanism is through iodothyronine reductase (DIOs) enzymes. The DIOs 1 and DIOs3 are located on plasma membranes, while DIOs 2 is located on Endoplasmic Reticulum [8]. The DIOs is considered responsible for the activation and de-activation of proT4 converting it to T3 the active thyroid hormone, which regulates the growth in a gene mediated process.

Infection by HIV into the cells increases activation of mitochondria enzymes, this leads to damage and dysfunction of mitochondria [10]. The accumulation of mitochondria DNA (*mitDNA*) in the cytosol which follows the dysfunction, and over activation of mitochondria leads to increased production and accumulation of Reactive Oxygen Species (ROS) causing oxidative stress [10,11]. The accumulation of Reactive Oxygen Species (ROS) leads to activation of cytokine NF-κβ which stimulates the expression of receptors of Tissue Necrosis Factor (TNFα) [8,12,13]. ROS further oxidizes catalytic sites of seleno-protein Txr causing it to detach from N-Terminal of the Mitogen Active Protein (MAP), Apoptosis Signaling-regulating Kinase1 (ASK1). The TNFα stimulates apoptosis of cells through activation of the Apoptosis Signaling-regulating Kinase ASK 1 [12,13]. The action of ASK 1 in turn is mediated through activation of the p38 Kinase pathway and cJun N-terminal Kinase (JNK) both leads to a gene mediated apoptosis of the CD4 T cells in HIV infected patients leading a compromised immunity.

The seleno-protein GSH-px is present in blood cells and blood platelets [6]. It has been noted that the activity of GSH-px enzymes decrease rapidly at early stage of selenium deficiency [12]. GSH-px is encoded by the genes GPX1 to GPX6. HIV encodes a seleno-protein with homology to GSH-px hence depriving the host of selenium and other components needed for endogenous synthesis of the selenoprotein GSH-px. Other studies shows that homozygote polymorphism in GSH encoding genes leads to a decreased GSH-px activity and leads to increased accumulation of ROS in cells [10].

Presence of GSH-px leads to scavenging of ROS, which reduces oxidative stress in the cytosol. This causes a reduction of Trx active terminal, which leads to its attachment to the N-Terminal of ASK 1. This process inhibits the gene-mediated apoptosis in a kind of negative feedback mechanism [12,13].

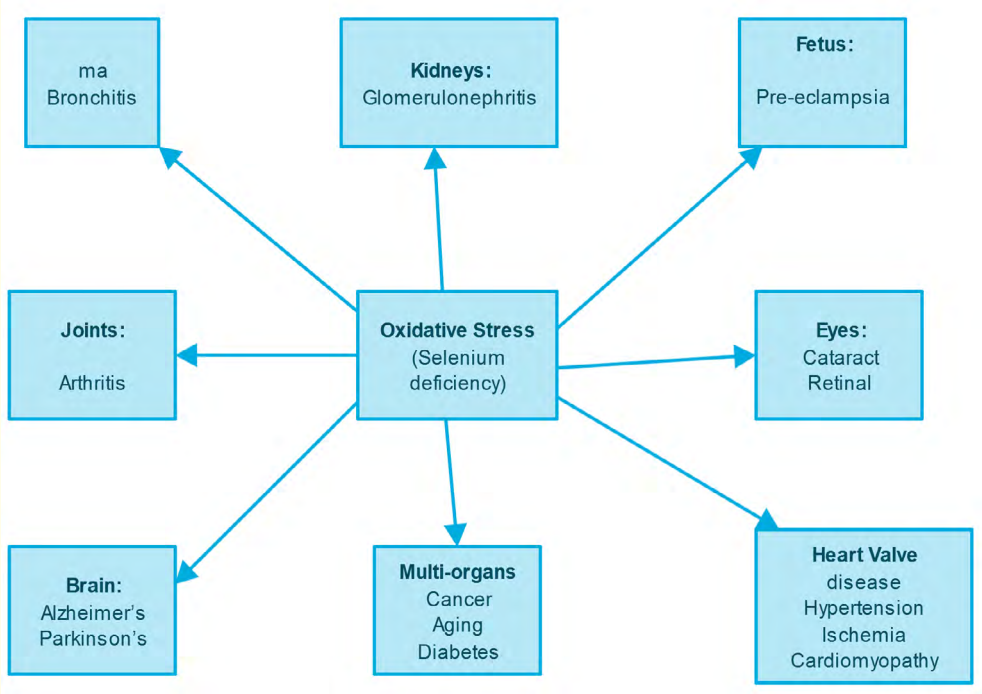

Figure 1: *Effects of Oxidative Stress due to selenium deficiency (Lien., et al.2008).*

Bibliography

1. Chilima ADC., *et al*. "Agronomic Biofortification of Maize with Selenium in Malawi". In Selenium Global Perspectives of Impacts on Humans, Animals and Environment; Banuelos, Lin, Yin and Ning (Eds) University of Science and Technology of China Press (2011): 79-80.

2. Fordyce F. "Selenium geochemistry and health". *Ambio* 36.1 (2007): 94-97.

3. Longchamp M., *et al*. "Uptake of Selenate and or Selenite in Hydroponocally grown Maize Plants and Interaction with some Essential Elements". In Selenium Global Perspectives of Impacts on Humans, Animals and Environment; Banuelos, Lin, Yin and Ning (Eds) University of Science and Technology of China Press (2011): 83-84.

4. Otieno S B., *et al*. "The study of selenium content of foods in a high HIV prevalent community, A case study of Pala Bondo District Kenya". In Selenium in the Environment and Health, Banuelos, Lin and Yin (eds): Francis and Taylor, London (2014): 62-65.

5. Foster HD. "Why HIV-1 has diffused so much more rapidly in Sub-Sahara Africa than North America". *Medical Hypothesis* 60.4 (2003): 611-614.

6. Jezek P., *et al*. "Selenium an important Antioxidant in crops biofortification". *Journal of Environmental Health* 15 (2012): 345-350.

7. Lien Ai Pharm-Huy., *et al*. "Free radicals, Antioxidants in Disease and Health". *International Journal of Biomedical Science* 4.2 (2008): 89-96.

8. Hiscott J., *et al*. "Hostile takeovers, Viral Appropriation of NFKB Pathway". *Journal of Clinical Investigation* 107.2 (2001): 143-151.

9. Otieno S B., *et al*. "The effect of Selenium on CD4 T cell count of HIV1 positive orphan children at Orongo Widows and Orphans in Kisumu Kenya". *International Journal of Science and Technology* 4.3 (2014): 233-241.

10. Perhrson BK., *et al*. "Influences of Dietary Selenium as Selenium Yeast or Sodium Selenite on Concentration of Selenium in the Milk. of Suckler Cows and Selenium Status of Calves". *Journal of Animal Science* 77.12 (1999): 3371-3376.

11. Kajuna S J. "Study of Effect of Sporolina on Immunity of Asymptomatic HIV Type 1 Positive Patients: A Randomised Control Trial" (2009).

12. Rayman MP. "Importance of Selenium in Human Health". *The Lancet* 356.9225 (2000): 233-241.

13. Sakazaki Yamamoto. "GSH-px polymorphism and effect on apoptosis in rats" (2014).

Volume 7 Issue 6 March 2017