Selenium

Common Indications:

- Antioxidant
- Cancer Prevention
- Thyroid Autoimmune Modulatory
- Immunomodulatory
- Cardiovascular Health
- Metal detoxification
- Male fertility
- Mental health
- Gestational diabetes

General Comments:

Until the late 1950s, selenium was thought to be toxic. Although it can be toxic at high doses, it is now recognized as an important nutritional trace mineral. Selenium plays important roles in detoxification and antioxidant defense mechanisms in the body. Selenium functions as a redox "gatekeeper", improving antioxidant defense mechanisms. Although selenium is best absorbed in selenomethionine and selecysteine as organic forms, selenium is prepared commonly as sodium selenite and sodium selenate in variety of products.

Benefits & Mechanism of action:

Antioxidant:

- Selenium helps to reduce lipid peroxidation and neutralize the destructive hydrogen peroxide radicals.
- Selenium potentiates the antioxidant activity of vitamin E.
- Selenocysteine insertion complex suggests Selenium's activity in cancer prevention[1].

Immunomodulatory:

- Selenium is a co-factor for glutathione peroxidase, which is an important antioxidant enzyme in the immune system.
- Selenium has reported anti-viral activity, may increase T- lymphocytes, and enhances natural killer cell activity[18]. A 2013 meta-analysis reported that use of high-dose selenium (IV and PO) in patients with sepsis helped reduce mortality[20].

- A study in 2007 has found that selenium helped to suppress HIV progression and improve CD4 counts[19]. Selenium also helps to improve immune function in HIV patients and other morbidity associated with the disease[21].

Cancer prevention:

- Epidemiological studies have correlated low dietary selenium intakes with higher rates of cancer. Studies have shown that selenium reduced the risk and inversely intervened the progression of cancers in patients who have low selenium level or are smokers. Human meta-analysis report selenium has a protective effect on various cancers[1,10]:
    - Colorectal[11]
    - Prostate[9]
    - Lung[7]
    - Bladder[2]
    - Breast[4]
- Selenium may also help to reduce the side effects commonly found in cancer chemotherapy treatments including cisplatin-induce nephrotoxicity[7].

Cardiovascular Health:

- Selenium's anti-oxidant activities are reported to enable it to protect against heart attacks and strokes. A 2006 meta-analysis reported that increased levels of selenium correlate with a decreased risk of cardiovascular disease[13]. However, a 2013 systematic review reported no benefit in preventing CV disease when using selenium[14]. Some studies suggest that the cardiovascular benefits from selenium are dependent on the baseline selenium status. It is more beneficial for the patients who have serum selenium levels below 120 ng/mL for selenium supplements being impactful in reducing cardiovascular and coronary heart disease mortality; however, high serum selenium level would cause elevated blood pressure or hypertension[16,17].

Metal detoxification:

- Helps detoxify heavy metal toxins such as mercury and cadmium[27,28].

Thyroid Autoimmune Modulatory:

- Recently discovered that the deiodinase enzyme that converts thyroid hormone (T4) to triiodothyronine (T3, the active form) is a selenium- dependent enzyme[23]. A systematic review of the literature in 2010 reported that selenium supplementation reduced thyroid peroxidase antibodies and may be beneficial for those with autoimmune thyroiditis, including Hashimoto's thyroiditis[22].

Fertility:

- Several literatures suggest that low selenium level linked to low fertility in man. Testosterone synthesis and spermatogenesis require selenium as an essential source of energy. Providing selenium level in low selenium male individuals would increase sperm motility and fertility rate[29,30]. Nonetheless, an animal study showed that either excessive or insufficient amount of selenium would detrimentally affect fertility[31].

Mental Health

- Improved symptoms of depression, elevated mood, decreased anxiety and tiredness shown in 2 studies[25,26].

Diabetes

- Some studies suggest selenium intake helps improve serum glucose concentration[32,33] and other studies have found the opposite evidence in diabetes patients[15,16]. However, many studies support selenium intake in improving serum glucose concentration in gestational diabetes[35,36,37].

Dose:

- DRI* 50mcg daily

- ODA** 50 – 200mcg daily

* The Dietary Reference Intakes (DRI) are the most recent set of dietary recommendations established by the Food and Nutrition Board of the Institute of Medicine, 1997-2001. They replace previous RDAs, and may be the basis for eventually updating the RDIs.

**The Optimum Daily Allowance (ODA) represents a reference level beyond the RDI, and is often many times higher than the RDI to prevent diseases such as aging or cancer. These numbers are based on clinical use.

Cautions & Side Effects:

Selenium is a trace mineral that could be toxic if excessive amounts were ingested on a regular basis. Symptoms of selenium toxicity include loss of hair and nails, skin lesions, nervous system abnormalities, digestive dysfunction, and a garlicky breath odor. Although deaths from selenium toxicity have been reported in livestock, no deaths have occurred in humans.

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Antioxidant

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Cancer prevention

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Cardiovascular Health

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Immunomodulatory

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