Iodine (Iodide)

Iodine is an ultraessential trace element of crucial importance for the health and well-being.

Iodine is mostly concentrated in thyroid gland. A healthy adult body contains 15-20 mg of iodine, 70-80% of which is stored in the thyroid gland.

Recommended daily allowance for adult is 150 micrograms; during pregnancy and lactation period is 200 micrograms (because it is essential for the production of maternal and fetal thyroid hormones that regulate the development of fetal brain and nervous system).

Sources:

Iodized salt, fish (such as cod and tuna), seaweed, shrimp, and other seafood, which are generally rich in iodine. Dairy products (such as milk, yogurt, and cheese) and eggs, which are also good sources of iodine.

Function

Iodine is an essential constituent of the thyroid hormones: thyroxine(T4) and triiodiothyronine(T3; the most active form). Those hormones have many functions:

* Regulation of basal metabolic rate(increasing).
* Regulation of follicle and embryo development.
* Regulation of GIT motility.
* Regulation of fetal brain development.
* Regulation of heart beat.
* Regulation the rate at which old cells is replaced by new cells.
* Regulation of muscle contraction.
* Regulation of sperm and testosterone production.
* Temperature regulation.

Deficiency (Hypothyroidism)

Underingestion of I can result in goiter (enlargement of the thyroid in response to excessive stimulation by TSH). More severe deficiency results in hypothyroidism that is characterized by a swelling at the neck, bradycardia, mental and physical slowing, fatigue, weight gain, decreased thermogenesis (poor resistance to cold), and decreased metabolic rate. If hormone deficiency occurs during fetal and infant development (congenital hypothyroidism), irreversible intellectual disability (formerly called “cretinism”) and short stature can result.

Levothyroxine (T4) is preferred over T3 (triidothyronine) or T3/T4 combination products for the treatment of hypothyroidism. Levothyroxine is better tolerated than T3 preparations and has a longer half-life.

Hyperthyroidism:

This condition is the result of overproduction of thyroid hormone. Although it can be caused by over ingestion of I-containing supplements (1.1 g/day for adults). The most common cause of hyperthyroidism is Graves disease, in which an antibody that mimics the effect of TSH is produced, resulting in dysregulated production of thyroid hormone. This can cause nervousness, weight loss, increased perspiration and heart rate, protruding eyes (exophthalmos), hand tremors, diarrhea, menstrual changes, sweating, muscle weakness and goiter.

Hyperthyroidism can be treated with:

* Antithyroid drugs (propylthiouracil and methimazole).
* Radioactive iodine (This treatment causes the gland to shrink.
* Beta blockers
* **Thyroidectomy.** This is surgery to remove part of or all of the thyroid gland.

### Other Uses:

###  Radioactive iodine (RAI) is treatment for overactive thyroid (hyperthyroidism) and certain types of thyroid cancer. It kills overactive thyroid cells and shrinks an enlarged thyroid gland.

### Iodine supplement during pregnancy: Pregnancy needs more iodine. That’s because iodine intake during pregnancy is linked to brain development in fetuses.

### Protection from radiation: Potassium iodine can be taken after someone is exposed to radiation to reduce the amount of radioactive iodine that accumulates in the thyroid.

### Antiseptic and disinfectants eye drops

### Antiseptic and disinfectants skin solution a dressing.

### Preoperative ( thyroidectomy) oral solution to decrease the rate of blood flow and loss. (reduce both thyroid hormone release and thyroid gland vascularity, is beneficial to decrease intra-operative blood loss.)

**Selenium (Se)**

Selenium (Se) is an essential ultratrace element having biological functions of utmost importance for human health. It is found in the liver, kidney, nails and thyroid gland.

Selenium is a component of the 21st amino acids selenocysteine. It is identical to cysteine except that sulphur is replaced by a Se atom. It is component of all enzymes contain selenocysteine.

Twenty-five Se-proteins have been identified so far in humans, whereas only few of them have been functionally characterized like reductase and peroxidase.

**Source**

The major contributors to Se intake are typically provided by bread and cereals, meat, fish, eggs, and milk/dairy products.

Vegetables such garlic and onion can accumulate significant amounts of Se. High amounts of Se can be accumulated also by mushrooms and broccoli. Their level of Se is related to that in the soil.

In animal products, the level of Se reflects the levels used in cattle feed. In meat, eggs, and particularly fish, which are protein-rich, the Se content is relatively high. Additionally, specific organs, such as liver and kidney, may contain a particularly high concentration of Se.

Recomonded daily allowance 55 µg

**Function**

-Free radical scavenger: Se is a constituent of glutathione peroxidase that catalyzes the reduction of harmful hydrogen peroxide to water  ( preventing lipid peroxidation and protecting cells).

-Se is a constituent of iodothyronine deiodinase( converts thyroxin to triidothyronine)

- Selenium is essential for sperm function. Selenium contributes to the morphology of sperm as well as its mobility.

**Deficiency**

The deficiency results in elevating hydrogen peroxide that leads to lipid peroxidation of heart cells( cardiomyupathy), joint cells( osteoarthritis), muscle cells( muscle weakness)

* Keshan disease (KD) is a cardiomyopathy closely related with a diet deficient in the mineral selenium (endemic in area where the soil does not have selenium).
* Kashin-Beck disease is an osteoarthropathy of children and adolescents ( is a disorder of the bones and joints of the hands and fingers, elbows, knees, and ankles) in which deficiencies of both selenium and iodine are endemic( endemic in area where the soil does not have selenium).
* Muscle weakness.

**Toxicity**

Excessive selenium intake results in gastrointestinal disturbances (eg, nausea, diarrhea). Other manifestations include hair loss, abnormal nails, dermatitis, peripheral neuropathy,fatigue, irritability, and a garlic odor of the breath.

**Supplement**

* Selenium helps maintain healthy thyroid function.
* Selenium’s antioxidant properties fight cell damage that may worsen brain and nervous system diseases like Parkinson’s, Alzheimer’s, and multiple sclerosis.
* Selenium has also been studied for the treatment of dozens of other conditions. They range from asthma to arthritis to prostate cancer to infertility.

Sulfur

**It** is a macroelement**.** It is present in almost all dietary plants and animal proteins (amino acid with sulfur).

Daily requirement: 2-3 gm that can be easily satisfy through consumption of various foods.

**Function**

* It is present in many amino acids. Among these, methionine, cystine and cysteine ​​play a structural role in building both proteins (such as keratin and collagen) and enzymes involved in numerous reactions.
* Orientation of polypeptide because it forms disulfide linkage.
* It present in many vitamins like thiamin, biotin.
* It present in some compound like glutathione, heparin, bile acid.

**Deficiency**

It is not common

**Uses**

* Topical cream or lotion for seborrheic dermatits and scabies
* Sulfur cream, lotion, ointment, and bar soap are used to treat acne.
* Oral as an anti-inflammatory to protect cartilage