HippEvo
Hippocrates Evolution

Zinc - *zinc arginate, ascorbate, aspartate, citrate, gluconate, glycinate, histidinate, methionate, oxide, picolinate, and sulfate.*

Common Indications:

- Immune system support, including the common cold; respiratory tract infections
- Wound healing
- Gastrointestinal: diarrhea, Crohn's Disease, Peptic ulcer
- Metabolic syndrome
- Insulin resistance/type 2 Diabetes
- Prostate health
- Mood disturbances and depression
- Ocular health: macular degeneration, diabetic, retinopathy, cataracts
- Thyroid hormone support

General Comments:

Zinc is an essential mineral for normal growth and development. It is a trace mineral yet abundant within our cells and tightly regulated by the body. Our bodies contain an average of 2 grams of zinc with the majority found in muscle (60%) and bone (30%). It is required for the synthesis of any new tissue. The prostate has the highest zinc level of any soft tissue in the body. Normal intake is roughly 6-15 mg/day but less than half of this is actually absorbed. Foods with high phytate content will bind and block absorption of zinc. Calcium may also block absorption if consumed in large quantities. Animal protein is quite the opposite and promotes absorption of zinc, so best foods for zinc come from animal sources. As such, vegetarians are commonly at high risk for low zinc levels.

Zinc has a significant role to play in all of the following:

- Immune Response
- Gastrointestinal – Diarrhea, Celiac, Crohns
- Neurological
- Prostate
- Fertility, Pregnancy & Lactation
- Male Fertility & Impotence
- Antioxidant
- Glycemic control & Diabetes 1 & 2
- Macular Degeneration

- Wound healing
- Acne
- ADHD
- Depression
- Taste
- Tinnitis
- Warts
- Alzheimers

Benefits and Mechanism of Action:

Helps regulate a wide variety of immune system activities, including T-lymphocytes, CD4, natural killer cells, and interleukin II. A meta- analysis of 15 clinical trials found that zinc administered within 24 hours of onset of symptoms reduces the duration and severity of the common cold in healthy people (Singh et al, 2011). Another meta-analysis found zinc effective in decreasing the incidence of acute upper respiratory tract infections in children (Roth et al, 2010).

- **Antioxidant**: Cofactor for the antioxidant enzyme Zn/Cu superoxide dismutase.

- **Wound Healing**: Facilitates wound healing, especially in burns, surgical, and other types of scars. Helps improve DNA, protein and cell synthesis.

- **Diarrhea**: A 2013 meta-analysis reported that oral zinc administration significantly decreased diarrhea duration and improved health of malnourished children (Galvao et al, 2013).

- **Depression**: A 2013 meta-analysis reported that low levels of zinc correlate with an increased incidence of depression (Swardfager et al, 2013). A population-based epidemiological study (n=2,163) reported that low dietary zinc intake was associated with an increase of depression in women and that zinc supplementation helped to decrease the incidence of depression (Maserejian et al, 2012). However, a 20-year prospective study (n=2,317) reported that zinc levels and dietary zinc intake did not have relevance for the prevention of depression in men (Lehto et al, 2013).

- **Blood sugar regulation**: Studies have reported that zinc plays an important role in insulin synthesis, storage, secretion, and action, while also being involved in various stages of carbohydrate and protein metabolism (Chausmer et al, 1998). Studies report diabetics have an increased need for zinc (Foster et al, 2013). A

2012 systematic review and meta-analysis on the effects of zinc supplementation in those with diabetes reported that zinc supplementation helped to reduce blood glucose, total cholesterol, and LDL cholesterol while improving glycemic control as demonstrated by a reduction in HbA1c (Jaywardena et al, 2012). A 2013 meta-analysis (n=3978) reported similar results (Capdor et al, 2013).

- **Prostate Health**: The prostate epithelial cells in men contain uniquely high zinc level. Zinc transporters are altered in those with prostate cancer, leading to decreased levels of zinc (Franz et al, 2013).

- **Ocular health**: Zinc is reported in laboratory and human studies to be an important mineral for ocular health, including cataracts, macular degeneration and diabetic retinopathy. A 2013 review reported that zinc was important in the prevention of diabetic retinopathy (Miao et al, 2013). A 2013 systematic review reported zinc is also important in age-related macular degeneration, although more research should be performed (Vishwanathan et al, 2013).

- **Thyroid hormone Balance**: Thyroid hormones influence zinc metabolism by affecting zinc absorption and excretion, and zinc levels affect thyroid hormone function. Low levels of zinc correlate with an increase in thyroid autoantibodies, suggesting a zinc and autoimmunity relationship (Ertek et al, 2010).

- **Other Uses**: In a 2013 meta-analysis, zinc was reported to help improve the overall performance of patients with hepatic encephalopathy, although morbidity and quality of life were not reported (Chavez-Tapia et al, 2013).

Dose: DRI* 15mg daily
ODA** 15 - 100mg 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.

Symptoms of Deficiency:

Marginal zinc deficiencies are reported to be common in the United States. Because of

its extensive range of biological activities, zinc deficiency can cause a wide range of deficiency symptoms. The symptoms of zinc deficiency are: acne, impaired sense of smell and taste, delayed wound healing, anorexia, decreased immunity, frequent infections, depression, photophobia, night blindness, problems with skin, hair and nails, menstrual problems, joint pain, and involuntary, cyclical movements of the eyeball (nystagmus).

- Increased levels of copper (Cu) is associated with decreased levels of zinc (Mao et al, 2013).
- Zinc deficiency conditions were first reported in the 1950s in growing children and adolescent males from Iran, Iraq, and Turkey. Diets low in animal protein and high in phytate-containing grains produced symptoms of dwarfism, hypogonadism and failure to mature sexually.
- Pregnant women have greater zinc needs. Deficiency can cause impaired fetal development, low birth weight infants and birth defects. Stretch marks during pregnancy are also partially due to zinc deficiency.
- Zinc deficiency can be caused by inadequate dietary intake due to foods grown on zinc-depleted soils. Food processing also removes zinc, so fast foods and processed foods are also zinc depleted.
- Protein and/or calorie-restricted diets can lead to zinc deficiency.
- Zinc depletion is frequently seen in the following medical conditions: alcoholism, macular degeneration, diabetes, malignant melanoma, liver and kidney diseases, malabsorption syndromes such as celiac sprue, and inflammatory bowel diseases such as Crohn's disease.
- Those with an increased need for zinc include individuals with: o Acne o Arthritis o Benign Prostatic Hyperplasia and prostate cancer o Common Cold o Crohn's Disease o Diabetes; insulin resistance o Immune Function o Eye conditions including macular degeneration and diabetic retinopathy o Skin Conditions o Ulcers o Vegetarians (Foster et al, 2013) o Wound Healing
- The following drugs can cause a depletion of zinc, which may increase an individual's need for zinc:

    - ACE Inhibitors
    - Clofibrate
    - Corticosteroids
    - Ethambutol
    - Loop Diuretics
    - Oral Contraceptives
    - Penicillamine
    - Thiazide Diuretics
    - Valproic Acid
    - Zidovudine

- H_2 Antagonists
- Tetracyclines
- Copper
- Iron

Side Effects and Warnings:

- Zinc is relatively non-toxic, and although toxicity has been reported in humans, it is uncommon. Ingestion of high levels of zinc can induce a copper deficiency. Doses of 45mg/day are safe, but regular intake greater than 150mg/day could be a problem. Zinc toxicity can cause diarrhea, dizziness, drowsiness, vomiting, loss of muscle coordination, and lethargy. Inhalation of zinc oxide in certain industrial environments can also be a source of excess exposure.

Food Sources:

- The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters). Whole grain breads and cereals are also good sources of zinc.

- Those with an increased need for zinc include individuals with:

  - Acne
  - Arthritis
  - Benign Prostatic Hyperplasia
  - Common Cold
  - Crohn's Disease
  - Diabetes
  - Immune Function
  - Macular Degeneration
  - Skin Conditions
  - Ulcers
  - Wound Healing
  - Vegetarian

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