

# ZINC

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**Abstract:-** Hundreds of papers have been published regarding many biological aspects of zinc. In this chapters, zinc deals with various disorders such as zinc deficiency, Down syndrome, Macular degeneration, Acne, Wound healing, zinc-carnosine and ulcers, Rheumatoid arthritis or Crohns disease, cancer impediment, Exercise, Hepatitis, Osteoporosis prevention, Renal dialysis patients, Cardiac vascular disease, Diabetes, Pregnancy and Zinc lozenges and Colds.

**Introduction:-** Zinc is involved in structural or co-factor activities for many of the enzymes such as alkaline phosphatase, carbonic anhydratase and enzymes of nucleic acid synthesis. Regarding clical aspects, zinc exhibits dermatitis, poor immune response and poor wound healing. Acro dermatitis enteropathica is also a rare inherited deficiency of membrane Zinc-transport protein ( SLC 3944 gene).

Literature Survey:-

- 1) Handbook of minerals as nutritional supplements
- 2) Ganongs Review of Medical Physiology (24<sup>th</sup> Edition)

**Methodology:-**

## Diseases related to zinc

Down syndrome: It is related to an extra copy of a gene that codes for a protein that can report for a good Deal of cell's Zinc. A beneficial effect of zinc supplementation is observed in people with Down's syndrome. These profits are not a cure of the disease but add the improved immune function, DNA repairand undesirable hormonal changes, particularly for thyroid hormones. Some reports mention that Zinc supplements in Down syndrome may enhance the risk of later Alzheimer's disease. A few reports conclude that zinc may assist people with Down syndrome to reduce Alzheimer's disease risk. Generally, the best mineral treatment for Down's syndrome is linked to a modest dose of zinc plus a modest dose of copper, with both minerals provided as well absorbed complexes.

**Muscular Degeneration**

The possible relationship of zinc and eyesight loss is considered. In AREDS( Age related eye disease study) study, subjects were provided either Placebo, zinc plus copper, an antioxidant vitamin cocktail or zinc / copper plus the cocktail for 5 years. Modest effects on eyesight protection are concluded for either zinc or antioxidant treatments in a study sub population with a little better response with the combination treatment.

**Acne**

More moderate forms of zinc deficiency lead to the occurrence of skin problems such as acne. A number of studies came to conclusion that zinc supplements can decrease acne, especially inflammatory acne. Generally, high dose zinc results in the formation of copper deficiency. One study concludes that a moderately high zinc Gluconate dose( 30 mg zinc per day) is also sufficient to treat acne. Besides oral zinc used for acne, topical use has been accepted.

**Wound Healing:** Zinc supplements are provided for wound healing have approached from topical zinc applications, which may not be applicable to oral supplementation. An oral zinc sulphate is not helpful in healing of leg ulcers, but it might be helpful in those with venous leg ulcers and low serum zinc. In this authors judgment, we still realize very little about any of the following

- Whether zinc supplements can assist with wound healing in the absence of any deficiency.
- What range of wound types might be assisted by zinc supplements.
- The degree of zinc deficiency obligatory to impair wound healing.

In this authors suggestion, since low- dose supplementation most probably won't hurt healing, such supplementation is reasonable in people recovering from wounds. Additionally, high- dose zinc supplements would not be a good plan because of possible antagonism of the absorption of copper, which is also an essential for wound healing.

**ZINC-Carnosine and Ulcers:-**

It is useful in treating gastric ulcers. The main idea is that the combination of zinc with carnosine is capable of delaying exit of zinc from the stomach and also is capable of sticking zinc to the ulcer. This retained zinc, with anti inflammatory property, enhances healing of the ulcer (the carnosine itself may also exhibit anti-inflammatory effects). The anti ulcer activity has been examined in experimental animals.

**Rhematoid Arthritis / Crohns Disease:-**

Zinc activates immune system and simultaneously inhibit some aspects of the immune system related to oxidant stress and inflammation. Zinc assists with inflammation via the other indirect antioxidant effects of zinc. Low serum zinc is

observed in people with rheumatoid arthritis, even though this might be due to cytokine release, which can decrease plasma zinc via regulatory mechanisms.

Especially in rats, inflammation greatly enhances the amount of the zinc binding protein metallothionein particularly in liver and other tissues. Rheumatoid arthritis patients in Newzealand tend not to consume even the amount of zinc recommend for healthy people . What is the beneficial effects correcting rheumatoid arthritis, if marginal Zn deficiency is common in patients. First chance is that the primary symptoms of arthritis may decrease, especially if clubbed with other therapy. Second chance is that other aspects of health might be enhanced. Unfortunately, the above two chances have not been tested to the maximum extent. For the second chance, two studies have been conducted. In a small study(only five subjects), which is not in placebo to regulated, augementation with beta analysis-histidine to Zn enhances very few, but not other parameters of bone health. Zinc supplements may also show a beneficial effect for arthritis from a pharmacological point of view. This case could be confirmed by the following aspects such as

A)More doses of Zn can be anti inflammatory in animals.

B)Topical zone exhibits anti inflammatory effect for ulcers in human beings.

C)Oral Zn-carnosine exhibits anti- ulcer property, which is a type of anti inflammatory effect.

D)An old pilot experiment reveals that very high- dose zinc supplementation leads to the occurrence of a very few clinical betterment in rheumatoid arthritis patients. Whatever it may be, compared to the situation with rheumatoid arthritis, marginal zinc deficiency assumed to be a little more established for Crohn's disease. In Crohns disease, zinc status would not be influenced by inflammatory effects on body zinc distribution, but in some subjects, there is also impaired zinc absorption is seen. Finally marginal zinc deficiency takes place in some people with rheumatoid arthritis or Crohn's disease.

### **Cancer Impediment**

Zinc exhibits an antioxidant effect as well as immuno stimulation along with cancer risk depletion. A very few experimental animal work conclude that some degrees of zinc may be linked to enhanced risk of some types of cancer. An inverse relationship is seen between zinc intake and skin cancer. Further consideration of zinc- cancer risk with the bell of supplement studies yet to be evolved.

### **Exercise**

Sternous exercise leads to the occurrence of alterations in zinc metabolism. For example , the depression of serum zinc takes place by vigorous exercise. Either good zinc status or extra zinc shows its influence on exercise performance. These are related to antioxidant actions, anti inflammatory actions(which can improve

muscle recovery), cell signaling, energy substrate utilization, hormonal effects and others. There is one experimental study of acute supplementation with zinc prior to exhaustive running. Short- term zinc supplementation exhibits some effects on blood flow properties and exercise tolerance in sub maximal evidence in 10 mem. In other small study(five subjects only) zinc plus copper supplementation reduces post exercise activation of phagocytes, a process that results in the occurrence of oxidant stress. A well known supplement for exercise is ZMA, which consists of zinc, magnesium and vitamin B6. A meeting abstract concludes some gain for ZMA particularly in exercise performance, whereas more detailed reports are essential to evaluate these findings.

### **Hepatitis**

Mild zinc deficiency makes rats highly susceptible to chemically induced liver injury, while pharmacological zinc injections exhibit the opposite effect. Regarding marginal zinc deficiency there is proof that it may happen frequently in atleast some forms of hepatitis. This proof for marginal zinc deficiency is low serum zinc in hepatitis patients, low serum 5 nucleotidase activities in subject with fulminant hepatitis, 185 low values for zinc tolerance test in one category of liver damage( though not in other), removal of a skin lesion with zinc supplementation in a few patients with hepatitis C( not a controlled study), hepatic liver content that reduces as severity of hepatitis enhances, and low polymorpho nuclear cell zinc contents in certain hepatitis patient's.

### **Osteoporosis Prevention**

Generally, zinc affects bone via multiple mechanism such as

- A) Enzymatic roles in bone matrix structure
- B) Regulatory activation of bone formation and inhibition of bone resorption.
- C) Cofactor role in alkaline phosphatase, a key enzyme in bone synthesis.
- D) Antioxidant actions (bone resorption is activated by certain oxidant stress)
- E) Enhancement of the production of hormones like IGF which shows its influence on bone health.

In an experimental study dietary zinc supplementation is related to IGF values in postmenopausal women and IGF enhances with zinc supplementation.

In an another experimental study, especially in healthy adult males in Belgium, zinc supplementation enhances blood activities of alkaline phosphatase and bone-specific alkaline phosphatase, which is participated in bone synthesis. Whatever it may be, this experimental work is hard to clarify the following causes

- 1) Young adult men in meat- eating communities tend to be in good zinc status.
- 2) Values for urine marker of bone resorption are not affected.

3) Bone metabolism creates a problem in fewer young adult men compare to women.

4) The changes in blood readings for bone specific alkaline phosphatase are difficult to clarify because blood activities should enhance with better zinc activation but reduce with better bone synthesis (slow release into blood). In another experimental work, bone loss in healthy older post menopausal women is lowered by calcium along with a zinc -inclusive trace element cocktail. Even though zinc shows a possible theoretical role in obstructing, practical research in this area has already started.

### **Renal Dialysis Patients**

Low serum zinc levels have been revealed for dialysis patients in a number of studies. There have been reports stating an inverse relationship between serum zinc and some other factors namely antibody response to immunization. According to reports zinc status is a major factor in determining health in dialysis patients. The administered zinc raises serum alkaline phosphatase, which can be indicator of zinc status in some conditions. In other experimental work with the hemodialysis patients, zinc supplementation reduces osmotic fragility as well as lipid peroxidation. which are two symptoms of zinc deficiency in rats. In still another experimental work of renal dialysis patients, zinc supplementation enhances the protein catabolic rate and in the same type of subjects, zinc supplementation can enhance serum thyroid hormone levels and show many positive effects on immune function. Generally zinc administration enhances gonadal function in dialysis patients. Zinc supplementation in dialysis patients enhances food intake and the serum cholesterol readings. One study states that an enhancement in the leukocytes and an increased response to a vaccination.

### **Cardiovascular Disease**

An indirect antioxidant actions of zinc which can prevent inflammation, which is thought to contribute to arthero sclerosis. Certain immuno suppressive actions namely preventing cytokine actions could also perform against cardiovascular-relevant inflammation. These anti-inflammatory actions maybe particularly helpful for protection against endothelial integrity. Zinc status is poor in subjects with dilated or hypertrophic cardio myopathies. There have been two studies on zinc supplementation and lipoprotein oxidation, either of which does not find any effect. Finally, zinc status leads to the occurrence of causing risk of cardiovascular disease primarily via mechanisms that do not involve lowering blood pressure our serum lipid values.

### **Diabetes**

Type 1 and type 2 diabetes enhances urinary zinc losses. Along with, based on rat study, diabetes pushes more amounts of zinc into certain pools. Additionally, there are signs of marginal zinc deficiency in diabetic subjects. Three weeks supplementation with 30 milligrams of zinc aspartate, but not placebo enhances plasma zinc and plasma activities of the zinc enzyme 5 prime nucleotidase in 20 type two diabetic postmenopausal women. In another experimental work, short-term zinc administration reduces cortisol levels in type 1 diabetic subjects, but does not change blood glucose readings. In a different study of type one diabetic subjects, zinc supplementation reduces lipid peroxidation readings, an indicator of oxidant stress. A similar effect is observed for zinc supplementation in type 2 diabetic subjects in Tunisia. In that study, zinc does not change glucose homeostasis.

### **Pregnancy**

In experimental animals adequate zinc is responsible for the normal growth and development of foetus. In the offspring, supplementation enhances birthweight and head circumference, but not neurological development at age 5. In another study in urban poor men in the U.S, low intake of dietary zinc in early pregnancy is related to the over a threshold enhancement in the risk of very preterm delivery. A recent review states that preliminary findings of 8 randomized, controlled intervention trials performed in less-developed countries. These studies explain maternal zinc supplementation shows a beneficial effect on neonatal immune system, early neonatal morbidity and infant infections. In another experimental work, prenatal supplementation with the zinc in poor women from Bangladesh does not confer benefits particularly on infants mental development. Contrary in a study of nepalese pregnant woman with low serum zinc and zinc supplementation increases the effect of Vitamin A in decreasing blindness. In a study in India exhibiting a gainful effect of zinc supplementation on hematological index in pregnant women.

### **Zinc Lozenges and Colds**

Two types of studies have been conducted regarding zinc lozenges and the common cold. In one type, a cold is induced analytically. In the another type, naturally occurring colds are observed. In type one study, zinc lozenges normally have not been shown to be effective. For the naturally occurring colds, a revised meta-analysis has been applied. There has been the concern that in some studies exhibiting a positive result may not have been blinded well (eg., the participants could taste the difference between the zinc and placebo). In a study, there is an examination of children enrolled at a school where zinc lozenges were introduced. Medical chart review is performed for periods before and after lozenges introduction for students who did or did not take the lozenges. Statistically significant reductions are reported for three parameters cold duration (though the mean difference is small), the median number of colds per year (also a

small mean difference ) and the concomitant antibiotic usage to manage colds ( a substantial mean difference).

**Conclusion:-** A large volume of research has been conducted regarding zinc and many ill health issues. In spite of all this research, there are few practical guidelines for who would gain from zinc supplements and how much should be administered. However, it is very likely that some gain from zinc supplements, particularly where health problems create adequate intake of zinc difficult because of either needs or low food intake.

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