Recent Trends of Zinc in Health and Chronic Disease

1.**Debjit Bhowmik***, 2.R.Margret Chandira, B.S.Venkataeswarlu, B.Jayakar
1. Rajiv Gandhi college of pharmacy,Uttar pradesh
2. Vinayaka missions college of pharmacy
Vinayaka Missions University
Salem-636008,Tamilna

***E-mail: debjit_cr@yahoo.com.**

Abstract

Zinc is widely recognized as an essential micronutrient with a catalytic role in over a 100 specific metabolic enzymes in human metabolism. Zinc deficiency was a major etiological factor in the syndrome of adolescent nutritional dwarfism, that had been identified mid-eastern countries. Zinc is one of the most ubiquitous of all trace elements involved in human metabolism and plays multiple roles in the perpetuation of genetic materials, including transcription of DNA, translation of RNA and ultimately cellular division. It is thus critical to understand the role of zinc in health and disease, especially during the vulnerable periods of growth and development. In severe zinc deficiency the symptoms are slowing growth and development, delayed sexual maturation, chronic and severe diarrhea, impaired wound healing, diminished appetite, impaired taste sensation. Zinc deficiency is an important public health problem, Nutritionists have been concerned that zinc deficiency affects large numbers of women and children in India and worldwide. In recent survey by WHO, zinc deficiency found most of the Indian population and Zinc supplement is used to commonly to enhance wound healing and treatment of pneumonia.

Introduction

Zinc is an essential trace element for all forms of life. The significance of zinc in human nutrition and public health was recognized relatively recently. Zinc insufficiently has been recognized by a number of experts as an important public health issue, especially in developing countries.The prevalence and clinical consequences of zinc deficiency on growth delay, diarrhea, pneumonia, disturbed neuropsychological performance and abnormalities of foetal development.

Historical perspectives of Zinc

The first major conceptual breakthrough came in 1961 with the hypothesis that Zinc deficiency was a major etiological factor in the syndrome of adolescent nutritional dwarfism that had been identified principally and extensively in mid-Eastern countries. This work made an outstanding contribution to the history of our recognisation of zinc as a micronutrient of practical importance in nutrition.

Functions of Zinc

On the cellular level, the function of zinc can be divided into three categories.
1. Catalytical
2. Structural
3. Regulatory

1. Catalytic
Nearly 100 different enzymes depend on zinc for their ability to catalyze vital chemical reactions. Zinc dependent enzymes can be found in all known classes of enzymes.

2. Structural
Zinc plays an important role in the structure of proteins and cell membrane. The structure of proteins and cell membrane. The structure and function of cell membranes are also affected by zinc. Loss of zinc from biological membranes increases their susceptibility to oxidative damage and impairs their functions.

3. Regulatory
Zinc finger proteins have been found to regulate gene expression by acting as transcription factors. Zinc also plays a role in cell signaling and has been found to influence hormone release and nerves impulse transmission.

Zinc Deficiency

Up to one-fifth of the worlds people may lack sufficient zinc in their diet, while an estimated one-third live in countries considered at high risk of Zinc deficiency, warns a comprehensive new report by an international group of medical researchers WHO Task force of IAP has recommended use of Zinc in the treatment of diarrhea.

Severe Zinc deficiency
The symptoms of severe Zinc deficiency include
a. Slowing growth and development
b. Delayed sexual maturation.
c. Chronic and severe diarrhea
d. Impaired wound healing.
e. Diminished appetite, impaired taste sensation.

Mild Zinc deficiency
Mild zinc deficiency has become apparent that milder zinc deficiency contributes to a number of health problems. Moderate Zinc supplementation have demonstrated that mild zinc deficiency contributes to impaired physical and neuropsychological development and increased susceptibility to life- threatening infections in young children.

Risk groups

1. Infants and children
2. Pregnant and lactating women.
3. Patients receiving total parenteral nutrition.
4. Older adults (65 years and older)
5. Individuals with alcoholic liver disease increased urinary zinc excretion and low liver zinc levels.
6. Individuals with inflammatory bowel disease, including crohns disease and ulcerative colitis.
7. Individuals with severe or persistent diarrhea.

Dietary Sources of Zinc

Shellfish, beef and other red meats are rich sources of zinc. Nuts and legumes are relatively good plant sources.
The Zinc content of some relatively Zinc-rich foods is listed in milligrams (mg) in the table.

Zinc rich foods

Category of foods	Zinc contents in mg| 100 calories
1.Fats and various non-nutritive foods	None to 0.2
2.Fish,fruits,cakes	0.1 to 0.5
3.Poultry,pork,diary products and whole grains cereals	0.4 to 1.2
4.Lamb,beef,leafy grains, root vegetables, shell fish and organ meats	> 1.2

The Recommended Dietary Allowance (RDA) of Zinc

Group	RDA
1.Infants(0- 1 year)	5 mg
2.Children(1-10 years)	10 mg
3.Boys(11+ years)	15 mg
4.Girls(11+ years)	12 mg
5.Pregnent women	15 mg
6. Breast feeding women 1st 6 months)	19 mg
7. Breast feeding women(2nd 6 months)	16 mg

Zinc in children

Zinc deficiency is common in children from developing countries due to lack of intake of animal foods, high dietary phylate content, inadequate food intake and increased faecal losses during diarrhea. The Nutrition Collaborative Research support program (CRSP) sponsored by the US agency for International Development, the predicted prevalence of

preschoolers with intakes of Zinc inadequate to meet basal requirements (i.e. to prevent deficiency symptoms) was 57% in Kenya, 25% in Mexico and 10% in Egypt.

1. **As a growth promoter**

Zinc supplementation may have a significant role to play in improved child growth. More recently, a number of larger studies in developing countries observed similar results with modest Zinc supplementation.

2. **Zinc and Neurocognitive Development**

Zinc supplementation has been associated with better motor development in very low birth-weight infants, more various activity in infants.Zinc deficiency may affect cognitive performance through alterations in attention, activity and other aspects of neuropsychological functioning such as planning or inhibition.

3. **Zinc in Childhood Diarrheal disease**

It is estimated that diarrhoeal diseases result in the deaths of over 3 million children in developing countries each year. The adverse effects of Zinc deficiency an immune system function are likely to increase the susceptibility of children to infectious diarrhea, while persistent diarrhea contributes to Zinc deficiency and malnutrition. Zinc supplementation in combination with oral rehydration theraphy has been shown to significantly reduce the duration and severity of acute and persistent childhood diarrhea.

4. **Zinc in sickle-cell Anaemia and Thalassemia**

Zinc is thoughty to have a stabilizing effect on the cell membrane of red blood cells in people with sickle cell disease. For this reason, it has been tried as an aid for preventing sickle cell crisis. Zinc deficiency occurs in sickle cell anaemia. Zinc may be preventing sickle-cell crisis in sickle-cell anemia.

5. **Zinc in healthy Skin**

Zinc in necessary for healthy skin, healing of wounds and growth. Zinc supplements are often used to treat skin ulcers or bed sores. Zinc is needed for protein synthesis band is important in wound healing and growth. It plays an important role in the repair and renewal of skin cellsa. Zinc is commonly taken as a supplement to help with skin conditions such as acne or eczema.The basis of Zinc theraphy lies in the fact that the mineral is necessary for normal cell division, tissue repair and renewal.

Summary and conclusion

Zinc deficiency is an important public health problem. Nutritionists have been concerned that zinc deficiency affects large numbers of women and children worldwide. Zinc affects multiple aspects of the immune systems, from the barriers of the skin to gene regulation within lymphocytes. Zinc is used in preventive trials of Zinc supplementation a significant impact has been shown on the incidence of acute lower respectory infections.Zinc is used treatment of Pneumonia, common cold and

respectory infections. Zinc supplementation may reduce the incidence of clinical attacks of malaria in children. Sufficient zinc is essential in maintaining immune system function and HIV infected individuals are particularly susceptible to Zinc deficiency. Decreased serum Zinc levels have been associated with more advanced disease and increased mortality in HIV patients. Zinc supplementation is used commonly tomenhance wound healing. Zinc has many actions that may promote debridement and wound healing in patients suffering from burns.

Reference

1. Food and Nutrition Board, Institute of Medicine. Zinc. Dietary reference intakes for vitamin A, vitamin K, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc. Washington, D.C.: National Academy Press; 2001:442-501. (National Academy Press)

2. King JC, Cousins RJ. Zinc. In: Shils ME, Shike M, Ross AC, Caballero B, Cousins RJ, eds. Modern Nutrition in Health and Disease. 10th ed. Baltimore: Lippincott Williams & Wilkins; 2006:271-285.

3. O'Dell BL. Role of zinc in plasma membrane function. J Nutr. 2000;130(5S Suppl): 1432S-1436S. (PubMed)

4. Truong-Tran AQ, Ho LH, Chai F, Zalewski PD. Cellular zinc fluxes and the regulation of apoptosis/gene-directed cell death. J Nutr. 2000;130(5S Suppl): 1459S-1466S. (PubMed)

5. Eisler, Ronald (April 1993). "Zinc Hazard to Fish, Wildlife, and Invertebrates: A Synoptic Review" (PDF). *Contaminant Hazard Reviews* (Laurel, Maryland: U.S. Department of the Interior, Fish and Wildlife Service) (10). http://www.pwrc.usgs.gov/infobase/eisler/chr_26_zinc.pdf.

6. Muyssen, Brita, T. A.; De Schamphelaere, Karel A. C.; Janssen, Colin R. (2006). "Mechanisms of chronic waterborne Zn toxicity in Daphnia magna". *Aquatic Toxicology* **77** (4): 393–401. doi:10.1016/j.aquatox.2006.01.006.