Asian Journal of Chemistry Vol. 13, No. 3 (2001), 1247–1248

NOTE

Trace Element: A Focus on Zinc in Humans

VISHAL PATHAK, A. AHUJA, MISS R. SINGH and PRABHAT PATHAK*
Department of Chemistry, Narain (P.G.) College, Shikohabad-205 135, India

Zinc is a nutritional imperative during periods of rapid tissue growth. Tissues with high cellular turnover including skin, gastro-intestinal mucosa, spermatogonia, etc. are characteristically affected. Zinc deficiency should be identified in any case of obscure retarded growth or infertility associated with the characteristic rash. A distinctive rash most often around eyes, nose, mouth, impaired taste and smell, poor appetite, mental lethargy are the essential features of zinc deficiency.

Zinc was identified as an essential trace element in 1869 by Raulin. Although the role of zinc in the growth of microorganisms, plants and animals was well established many decades ago, its activity in humans was recognised only in 1963. Its concentration in an adult[1] ranges from 95 to 130 microgram/100 mL of serum. Zinc is reasonably abundant in meat, fish, legumes and whole grains. A consistent well-balanced diet usually meets adult needs for zinc. However, diets high in processed foods may be low in zinc.

The widespread nature of zinc's function in the human body is reflected in its distribution in body tissues, including the pancreas, liver, kidneys, lungs, muscles, bones, eyes and endocrine glands. In these tissues, zinc participates in the following three different types of metabolic functions[2]:

As an enzyme constituent: Zinc functions throughout the body as an essential part of enzyme systems. It is associated with wound healing and healthy skin. It has great influence on rapidly growing tissues. So, its effect on reproduction is highly significant.

In the immune system: Zinc affects the immune system through its essential role in the synthesis of nucleic acids (DNA and RNA) and protein. It is also required for lymphocyte transformation.

For insulin storage: Zinc combines readily with insulin in the pancreas and serves as a storage form of the hormone.

A common cause for zinc deficiency could be the presence of factors that decrease its availability. Modern milling processes remove excessive amounts of zinc from grains.

The risk of zinc deficiency is greatest among pregnant and breast-feeding women. Low levels can reduce the amount of protein available to carry iron and

vitamin-A to the tissues and reduce the appetite and taste for foods. As a result, the foetus is affected in inadequate growth and development.

Zinc absorption is subject to several influences. Factors which affect decrease in absorption include fibres, phytates, phosphate, calcium and copper while factors increasing absorption include amino acids and other chelating agents.

Zinc absorbed is carried in the blood bound to protein. It can be stored in the liver or distributed throughout the body. High zinc level in blood is excreted by urine. Blood levels of zinc decrease as presented in Table-1.

TABLE-1
CONDITIONS THAT DECREASE BLOOD ZINC LEVELS

S.No.	Conditions	Clinical effects
1.	Reduced absorption	Cirrhosis of liver, nephrotic syndrome
2.	High catabolic status	Trauma, burns, surgery
3.	Administration of chelating agents	Penicillamine, Hemolytic anaemia, Malignancies

The therapeutic use is less widely accepted. Nevertheless, some success has been reported in sickle cell anaemia and as a therapeutic decoppering agent in Wilson's disease[3]. New findings suggest that the intake of zinc can reduce the duration of common cold. Further, approximately 300 enzymes require zinc for their activities and it has a role in DNA synthesis, cell division and protein synthesis.[4]

ACKNOWLEDGEMENT

The authors thank Dr. A.K. Ahuja, M.B.B.S., F.I.S.C.D. for giving clinical informations.

REFERENCES

1. *Current Medical Science*, **11**, 4 (1996).
2. British Pharmacopoeia, (London) (1993).
3. A. Prasad, *Ann. Intern. Med.*, **4**, 125 (1996).
4. _____, *Nutrition*, **9**, 11 (1995).

(*Received:* 5 March 2001) AJC-2357