Canadian AIDS Treatment Information Exchange
Réseau canadien d'info-traitements sida

FactSHEET

ZINC AND COPPER

What are they?

Zinc and copper are minerals required by the human body. They are a necessary component of many enzymes. Levels of zinc and copper in the body are regulated by a protein called metallothionein. As a result of this regulation, copper levels decrease as zinc levels increase and vice versa. People living with HIV/AIDS (PHAs) who wish to take zinc supplements should also supplement copper.

What do people with HIV use this supplement for?

1. To prevent the damaging effects of deficiency

Zinc deficiencies have been observed in a number of studies of PHAs. In people without HIV infection, zinc deficiencies damage immune function, decrease levels of sex hormones and may impair growth in children. In PHAs, zinc deficiencies may also compromise the immune system. According to several studies, PHAs with the lowest levels of zinc also have the lowest levels of CD4+ cells and the most advanced HIV disease. One study showed that even in PHAs without symptoms, those with the lowest zinc levels also had the lowest CD4+ counts. Other studies have linked zinc deficiencies to impaired T cell and natural killer cell function in PHAs. Finally, low levels of zinc have been associated with an increased risk of death for PHAs in several studies.

Using supplements to correct these deficiencies is controversial. Although some studies have suggested that zinc supplements are beneficial to PHAs, one group of researchers led by Dr Alice Tang disagrees. Her group has been observing the nutritional intake of 281 PHAs for between ten and 15 years. They have concluded that HIV-positive people taking additional zinc develop AIDS more quickly. On the other hand, a similar study of 269 people showed that zinc supplements had no effect on PHAs' health. The reason for these discrepancies is unkown because studies that observe people's behaviour and make conclusions from these observations do not account for outside factors to the same extent as trials designed to observe the effects of the supplements themselves. The possible ill effects of zinc mentioned above may be due to copper deficiency or some other factor particular to people in Dr Tang's study group.

Unfortunately, we lack large long-term trials of zinc supplements to clarify this picture. One Italian study of 57 PHAs included both asymptomatic people and people with AIDS. The study was done in the early to mid-90s when only AZT was available. In this study, both asymtomatic people and people with AIDS had increases in CD4+ counts after taking the equivalent of 45 mg of zinc for one month. Both groups also experienced fewer opportunistic infections. People with AIDS maintained or increased their weight after taking zinc, while those who did not continued to lose weight. After two years, no increase in death rates was observed in people who took zinc.

More recently, two small trials presented at the 1998 World AIDS Conference showed improvements in CD4+ counts with the use of zinc supplements. The supplements appeared to have no negative effects. Unfortunately, both studies have limitations: one used very high supplement levels (200 mg per day) for only a short period of time (one month). The other study used modest doses of zinc for a year and a half but involved only five people. These large differences in dosing and length of treatment provide little information about the best and safest doses of zinc to use.

2. To support and improve immune function

Zinc is crucial to immune function. Some studies have shown that zinc supplements may increase CD4+ counts. Test tube studies also show a link between zinc levels and a decreased rate of apoptosis (cell suicide) of HIV-infected cells. It appears as well that zinc improves the ability of immune cells to respond to infection. A small study of PHAs taking HAART (Highly Active Antiretroviral Therapy) showed that PHAs taking zinc experienced fewer infections, which supports the findings of earlier studies involving PHAs on AZT monotherapy.

3. To prevent wasting and impotence due to low testosterone

Low testosterone levels have been observed in both HIV-positive men and women. Although most studies have involved men, low testosterone levels have been linked to muscle wasting in both men and women. Low testosterone may also contribute to fatigue and impotence in some men. Zinc is important in hormone metabolism and is crucial to testosterone production and male sexual function. The use of zinc supplements to treat HIV-related testosterone deficiencies has not been studied. However, in a study of zinc deficiency related to sickle cell anemia, zinc supplements increased body weight and sexual function. Studies of men with zinc deficiencies related to other conditions have shown similar benefits.

4. To enhance the health of the fetus during pregnancy

Zinc deficiencies in pregnant women are related to premature births, low birth rates and growth retardation in the child. Since HIV-positive women have been shown to experience zinc deficiency, some pregnant women take zinc to protect their fetus. No studies of this use have been done. In a study of HIV-negative African-American women with low zinc levels, however, 25 mg of zinc per day led to marked improvements in birth weight.

Available forms and usage

Zinc supplements are available in several forms but the most often recommended is zinc picolinate. Studies suggest it is the most easily absorbed of the varous forms. Recommended doses of zinc for adults vary, but the doses generally suggested are 50 to 75 mg per day for men and 40 to 60 mg per day for women. Prominent HIV nutritionists such as Lark Lands and Chester Myers suggest that PHAs take zinc in combination with other nutrients. They recommend a multivitamin with minerals that includes 2 to 4 mg of copper a day. Zinc should be taken at one meal and copper at another because each mineral interferes with the other's absorption. Because cysteine is used to make metallthionein, the protein that regulates zinc and copper, many nutritionists recommend supplements of NAC (N-acetylcysteine).

Cautions and concerns

As mentioned earlier, debate continues about the safety of zinc supplements in general and of high doses in particular. The toxic level of zinc is also the object of controversy, but doses should generally not exceed 100 mg. Zinc should be taken with meals to avoid nausea and vomiting.

Credits

Author: Lori Lyons

Created: March 2000

Design: Renata Lipovitch

References

Abrams B, Duncan D et al. A prospective study of dietary intake and acquired immune deficiency syndrome in HIV-seropositive homosexual men. ***Journal of Acquired Immune Deficiency Syndromes*** 1993;6(8):949-958.

Ancarani F, Veccia S et al. Zinc Therapy in HIV-infected subjects, Abstract B28-2150. ***International Conference on AIDS*** 1993.

Baum M, Shor Posner G et al. Zinc deficiency profoundly increases risk for HIV-1 related mortality, Abstract 42337. ***International Conference on AIDS*** 1998.

Birdsall TC. Zinc Picolinate: Absorption and Supplementation. ***Alt Med Rev*** 1996;1:26-30.

Bogden JD, Baker H et al. Micronutrient status and human immunodeficiency virus (HIV) infection. ***Annals of the New York Academy of Science*** 1991

Campa A, Shor Posner G et al. Zinc supplementation in zinc deficient HIV-1 seropositive subjects, Abstract 60460. ***International Conference on AIDS***, Geneva 1998.

Cunningham-Rundles S, Bockman RS et al. Physiological and Pharmacological Effects of Zinc on Immune Response. ***Annals of the New York Academy of Sciences***.

Goldenber RL et al. The effect of zinc supplementation on pregnancy outcomes. ***Journal of the American Medical Association*** 1995:274:463-68.

Lai H, Lai S et al. Plasma, zinc, copper and mortality in HIV-1 infected homosexual men, Abstract 12118. ***International Conference on AIDS***, Geneva 1998.

Lands Lark. ***HIV Treatment Strategy Part II***. [Online] May 1998. Available at: http://www.vitatime.com/

Mocchegiani F, Veccia S, Ancarani F, et al. Benefit of oral zinc supplementation as an adjunct to zidovudine (AZT) therapy against opportunistic infections in AIDS. ***International Journal of Immunopharmacology*** 1995;17(9):719-727.

Mocchegiani E, Muzzioli M et al. Contributions of zinc to reduce CD4+ risk factor for 'severe' infection relapse in aging; parallelism with HIV. ***International Journal of Immunopharmacology*** 1999 Apr;21(4):271-81.

Murray MT. ***Encyclopedia of Nutritional Supplements.*** Rocklin: Prima Publishing, 1996.

Myers C. ***HIV & Zinc & Copper Revisited***. [Online] 1997 Mar. Available at: http://www.catie.ca/myers.nsf

Myers C. ***Zinc Supplementation in HIV/AIDS***. [Onlien]1997 June. Available at: http://www.catie.ca/myers.nsf

Neves I, Bertho AL et al. Improvement of the lymphoproliferative immune response and apoptosis inhibition upon in vitro treatment with zinc in peripheral blood mononuclear cells (PBMCs) from HIV+ individuals. ***Clinical and Experimental Immunology*** 1998 Feb;111(2):264-8.

Prasad AS, Abbasi AA, et al. Effect of zinc supplementation on serum testosterone level in adult male sickle cell anemia subjects. ***American Journal of Hematololgy*** 1981;10(2):119-27

Tang AM, Graham NM et al. Effects of micronutrient intake on survivavl in human immunodeficiency virus type I infection. ***American Journal of Epidemiology*** 1996 June;143(12):1244-56.

Tang AM, Graham NM et al. Dietary micronutrient intake and risk of progression to acquired immune deficiency syndrome (AIDS) in human immunodeficiency virus type 1 (HIV-1)-infected homosexual men. ***American Journal of Epidemiology*** 1993:138(11):937-951.

Disclaimer

Decisions about particular medical treatments should always be made in consultation with a qualified medical practitioner knowledgeable about HIV-related illness and the treatments in question.

The Canadian AIDS Treatment Information Exchange (CATIE) in good faith provides information resources to help people living with HIV/AIDS who wish to manage their own health care in partnership with their care providers. Information accessed through or published or provided by CATIE, however, is not to be considered medical advice. We do not recommend or advocate particular treatments and we urge users to consult as broad a range of sources as possible. We strongly urge users to consult with a qualified medical practitioner prior to undertaking any decision, use or action of a medical nature.

We do not guarantee the accuracy or completeness of any information accessed through or published or provided by CATIE. Users relying on this information do so entirely at their own risk. Neither CATIE nor Health Canada nor any of their employees, directors, officers or volunteers may be held liable for damages of any kind that may result from the use or misuse of any such information. The views expressed herein or in any article or publication accessed or published or provided by CATIE are solely those of the authors and do not reflect the policies or opinions of CATIE or the official policy of the Minister of Health Canada.

Permission to reproduce

Contact CATIE

by telephone
1.800.263.1638
416.203.7122

by fax
416.203.8284

by e-mail
info@catie.ca

on the Web
http://www.catie.ca

by mail
505-555 Richmond Street West
Box 1104
Toronto, Ontario
M5V 3B1
Canada

Funding has been provided by Health Canada, under the Canadian Strategy on HIV/AIDS.