A moderate increase in dietary zinc reduces DNA strand breaks in leukocytes and alters plasma proteins without changing plasma zinc concentrations.

Zyba SJ, Shenvi SV, Killilea DW, Holland TC, Kim E, Moy A, Sutherland B, Gildengorin V, Shigenaga MK, King JC.

Nutrition and Metabolism Center, Children's Hospital Oakland Research Institute, Oakland, CA.

BACKGROUND: Food fortification has been recommended to improve a population's micronutrient status. Biofortification techniques modestly elevate the zinc content of cereals, but few studies have reported a positive impact on functional indicators of zinc status.

OBJECTIVE: We determined the impact of a modest increase in dietary zinc that was similar to that provided by biofortification programs on whole-body and cellular indicators of zinc status.

DESIGN: Eighteen men participated in a 6-wk controlled consumption study of a low-zinc, rice-based diet. The diet contained 6 mg Zn/d for 2 wk and was followed by 10 mg Zn/d for 4 wk. To reduce zinc absorption, phytate was added to the diet during the initial period. Indicators of zinc homeostasis, including total absorbed zinc (TAZ), the exchangeable zinc pool (EZP), plasma and cellular zinc concentrations, zinc transporter gene expression, and other metabolic indicators (i.e., DNA damage, inflammation, and oxidative stress), were measured before and after each dietary-zinc period.

RESULTS: TAZ increased with increased dietary zinc, but plasma zinc concentrations and EZP size were unchanged. Erythrocyte and leukocyte zinc concentrations and zinc transporter expressions were not altered. However, leukocyte DNA strand breaks decreased with increased dietary zinc, and the level of proteins involved in DNA repair and antioxidant and immune functions were restored after the dietary-zinc increase.

CONCLUSIONS: A moderate 4-mg/d increase in dietary zinc, similar to that which would be expected from zinc-biofortified crops, improves zinc absorption but does not alter plasma zinc. The repair of DNA strand breaks improves, as do serum protein concentrations that are associated with the DNA repair process. This trial was registered at clinicaltrials.gov as NCT02861352.

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