Copper Deficiency Impairs Growth of Infants Recovering from Malnutrition

Malnourished infants who receive milk-based formulas with low copper content and who experience episodes of diarrhea are at risk for developing copper deficiency. However, the routine treatment modalities for malnourished infants often do not address the potential for copper deficiency and its effect on growth and nutritional rehabilitation.

To evaluate the effect of copper deficiency on growth, the investigators studied 11 copper-deficient infants who were inpatients at a nutrition recovery center in Chile. All had low plasma copper levels (<70 μg %) and ceruloplasmin (<200 mg/L); three had neutropenia (neutrophil count <1,500/mL). These infants were compared with "control" infants (with malnutrition, but no copper deficiency) who were matched for age, sex, birth weight, weight for length, and mean stay at the center. Growth was evaluated one month before and one month after copper supplementation in both groups. Copper sulfate was given at a dose of 80 μg/kg/day for 30 days. Supplemental vitamins and 1-2 mg/kg/day of elemental iron were also administered. Infants were fed ad libitum every four hours by caretakers who where blinded to their copper status.

In the copper-deficient group, plasma copper and ceruloplasmin levels increased after one month of copper supplementation ($P<0.001$) and all but one infant achieved normal plasma copper levels >90 μg %. The control group maintained normal biochemical indices of copper status throughout.

Although weight-for-length and length-for-age values were similar in both groups, the copper-deficient infants had a lower weight-for-age ($P<0.05$) at the onset of the study. After copper supplementation, weight-for-age and weight-for-length values were significantly improved in the copper-deficient infants. These infants also demonstrated a greater rate of weight gain after supplementation than before supplementation (4.8 *v* 3.6 g/kg/day) and as compared with the control group (4.8 *v* 2.4 g/kg/day). The acceleration in weekly weight gain occurred by the second week of copper supplementation and was maintained in the copper-deficient group. However, the control infants had a gradual decline in relative weight gain over time.

Castillo-Duran C, Uauy R. *Am J Clin Nutr* 1988;47:710-714.

Editor's comment—*The authors interpreted the data to show that copper supplementation improves growth of copper-deficient infants recovering from malnutrition. However, all infants in the study, regardless of their copper status, demonstrated improved weight gain while receiving >150 kcal/kg/day for catch-up growth. Even the copper-deficient infants gained weight without copper supplementation—as did the control infants—during the two-month evaluation period at the nutrition recovery center (P<0.1, t test; editor's statistic). The fact that the control group did not maintain an accelerated weight gain, as observed in the copper-deficient group, may be attributed to differences in the degree of malnutrition. The copper-deficient infants were more severely malnourished than the controls; this explains their need to continue to gain weight at an accelerated rate for a longer period of time.*

Although the authors report that these infants did not have zinc deficiency, no information is presented on mineral status before and after study entry. Also, one cannot exclude the impact of iron and/or vitamin supplementation on the recovery of these infants. Thus, the role of copper supplementation alone on improving growth is cloudy. However, the recognition and treatment of this problem are important because copper has other important physiologic implications that are not growth-related.

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