

# Effect of Form of Delivery of Additional Zinc (as Either a Vitamin Supplement or a Fortified Cereal Porridge) on Young Peruvian Children's Growth, Morbidity, Plasma Zinc Concentrations and Body Composition

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## INTRODUCTION

Adequate Zn nutrition is essential for normal child growth and immune function (IZiNCG 2006). Multiple intervention trials have found that Zn supplementation of young children decreases their rates of morbidity from common infections, such as diarrhea and pneumonia (Bhutta et al. 1999). A recent meta-analysis concluded that Zn supplementation enhances the growth of stunted children when the population's mean height-for-age Z-score is <-1.5 (Brown et al. 2002). The IZiNCG (2006) recommended several possible intervention strategies for improving the Zn nutrition of populations at risk of deficiency. Fortification is particularly attractive because of its relatively low cost and long term sustainability, but there is limited information on the efficacy of Zn-fortification programs. The present study was therefore designed to examine the effects of Zn fortification on the growth, morbidity, plasma-Zn concentrations and body composition of young Peruvian children at risk of stunting compared with either Zn supplementation or no additional Zn.

## METHODS

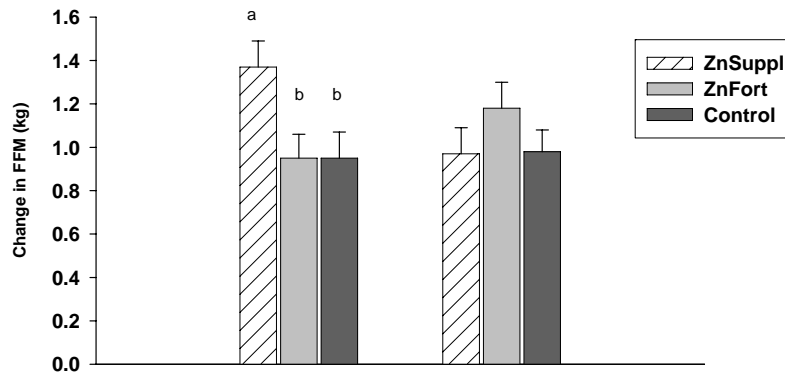
The study was designed as a randomized, double-masked, community-based intervention trial implemented among young Peruvian children with a presumed high risk of Zn deficiency. We compared the physical growth, morbidity, micronutrient status, energy intake and body composition, using deuterium dilution, of 6-8 months old Peruvian children with initial length-for-age Z-score, LAZ, <-0.50 who were randomly assigned to receive daily for 6 mo: 1) an Fe-fortified cereal porridge (CP) and a separate aqueous multivitamin (MV) supplement between meals (control, group C); 2) the same CP and MV with 3 mg Zn added to the supplement dose (group ZSu); or 3) CP with added Zn (3 mg/20g dry weight) and MV (group ZFo).

## RESULTS AND DISCUSSION

Seventeen percent of children had low initial plasma-Zn concentrations (<65 mg/dL); mean initial values did not vary by study group. Overall, children consumed a mean of 22-26 g/d dry CP and 96% of possible MV doses. After adjusting for small baseline differences in SES and morbidity, there were no group-wise post-treatment differences in weight or length increments, even among the sub-group with initial LAZ <- 1.5; and there were no differences in rates of common illnesses. Mean plasma-Zn concentration increased in group ZSu (+3.0 mg/dL), decreased in group C (-3.0 mg/dL), and did not change significantly in group ZFo (group-wise p<0.001).

There were no group-wise differences in changes in energy intake at 2-3 months or body composition at 6 months. However, children with an initial LAZ < -1.1 receiving Zn as a

liquid supplement had a mean increase in fat-free mass (FFM) that was 0.42 kg greater than children receiving the Zn-fortified porridge or no additional Zn ( $p < 0.05$ ) (Fig. 1).



**Fig. 1. Change in fat-free mass (FFM) by treatment group among children with initial length-for-age Z-score (LAZ) < -1.1 or  $\geq$  -1.1 SD.**

## CONCLUSIONS

Children's final plasma-Zn concentration increased only with Zn supplementation, but neither form of Zn affected growth or morbidity rates, possibly because the children were not Zn-deficient or the amount of additional Zn was inadequate. In addition, Zn delivered as a Zn supplement, rather than as a fortified product, resulted in a greater increase in FFM only among those with initial mild-to-moderate stunting. Further research is needed on the optimal level of Zn fortification that will result in improved health outcomes.

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