

# Growth Performance of Rural Chinese Primary School Children in Relation to Soil Zinc

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## INTRODUCTION

Almost one-third of the agricultural soils in China are considered Zn deficient for plants (Frossard et al. 2000). Therefore, reduced Zn levels are found in these plants. As a consequence, plants grow inadequately resulting in low yields. Crops cultivated in Zn-deficient soils will also result in lower Zn intake by people consuming these crops. Since Zn is also an important element for human growth, it is conceivable that children are at risk of growth retardation in areas with low or marginal Zn intake.

## METHODS

In 2003, a cross-sectional study on school children was conducted in three counties of Jiangsu Province, situated in Eastern China: Dafeng (n=759), Taixing (n=756) and Huaián (n=753). The primary school children aged 6-10 were recruited from 16 schools of each county by cluster sampling. Height, weight and mid-upper arm circumference (MUAC) were measured. Z-scores for height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ) below -2 were defined as stunting, underweight and wasting, according to the NCHS growth references (NCHS 1987). Results were compared among three counties using ANOVA and Chi-Square. Soil Zn data from the provincial soil survey in 2003 were kindly provided by Jiangsu Province Geological Survey Institute.

## RESULTS AND DISCUSSION

The average soil Zn concentration in Jiangsu Province (68.5 mg/kg) was lower than the nationwide average of 100 mg/kg (Liu 1996). The soil Zn concentrations were 62.0, 58.2 and 71.7 mg/kg in Dafeng, Taixing and Huaián, respectively. Differences in soil Zn concentrations among the three counties were not large, but they were statistical significant. The values of HAZ, WAZ and WHZ were significantly below 0. Prevalence of stunting, underweight and wasting for the three counties was 4.2%, 8.6% and 8.5%, respectively. Out of the three counties, Huaián County had the lowest values of HAZ, WAZ and WHZ. The prevalence of stunting, underweight and wasting was obviously higher in Huaián County than in the other two counties (See table). Children in Huaián County came from 14 villages, where soil Zn concentrations were known. No correlation was found between soil Zn concentrations and mean values of HAZ in the 14 villages ( $r = -0.23$ ,  $P = 0.4$ ).

**Table 1: Soil Zn concentrations and growth performance in three counties<sup>1,2</sup>.**

	Dafeng County	Taixing County	Huaián County
Total soil Zn (mg/kg)	62.0 ± 5.0 <sup>a</sup>	58.2 ± 2.0 <sup>b</sup>	71.7 ± 11.5 <sup>c</sup>
Height-for-age (HAZ)	-0.4 ± 0.9 <sup>a</sup>	-0.2 ± 0.9 <sup>b</sup>	-0.6 ± 1.0 <sup>c</sup>
Weight-for-age (WAZ)	-0.7 ± 0.9 <sup>a</sup>	-0.7 ± 0.9 <sup>a</sup>	-1.0 ± 1.0 <sup>b</sup>
Weight-for-height (WHZ)	-0.8 ± 0.9 <sup>a</sup>	-0.8 ± 0.9 <sup>a</sup>	-0.9 ± 1.0 <sup>b</sup>
Stunting (%)	3.2 <sup>a</sup>	1.9 <sup>a</sup>	7.6 <sup>b</sup>
Underweight (%)	7.2 <sup>a</sup>	5.4 <sup>a</sup>	13.1 <sup>b</sup>
Wasting (%)	6.9 <sup>a</sup>	6.9 <sup>a</sup>	11.8 <sup>b</sup>

<sup>1</sup> Data are presented as mean ± SD or prevalence. Stunting, underweight and wasting were defined as z-scores of height-for-age, weight-for-age and weight-for-height below -2, according to NCHS (1987).

<sup>2</sup> Significant difference using ANOVA and chi-square. Values in the same row with difference superscript letters are significantly different ( $P < 0.05$ ).

## CONCLUSIONS

There seems to be no relationship between soil Zn concentrations and growth performance in Jiangsu Province.

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## REFERENCES

- Frossard, E., Bucher, M., Machler, F., Mozafar, A., Hurrell, R. (2000) Potential for increasing the content and bioavailability of Fe, Zn and Ca in plants for human nutrition. *J Sci Food Agric* 80:861-879.
- NCHS (1987) Growth curves for children: birth to 18 years. US Department of Health, Education and Welfare, Washington, DC.
- Liu Z. (1996) Microelements in soils of China. Jiangsu Science and Technology Publishing House, Nanjing, China.