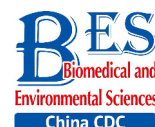


Original Article



Zinc Absorption from Representative Diet in a Chinese Elderly Population Using Stable Isotope Technique*

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Abstract

Objective To determine the dietary zinc absorption in a Chinese elderly population and provide the basic data for the setting of zinc (Zn) recommended nutrient intakes (RNI) for Chinese elderly people.

Methods A total of 24 elderly people were recruited for this study and were administered oral doses of 3 mg ⁶⁷Zn and 1.2 mg dysprosium on the fourth day. The primary macronutrients, energy, and phytic acid in the representative diet were examined based on the Chinese National Standard Methods. Fecal samples were collected during the experimental period and analyzed for zinc content, ⁶⁷Zn isotope ratio, and dysprosium content.

Results The mean (± SD) zinc intake from the representative Chinese diet was 10.6 ± 1.5 mg/d. The phytic acid-to-zinc molar ratio in the diet was 6.4. The absorption rate of ⁶⁷Zn was 27.9% ± 9.2%. The RNI of zinc, which were calculated by the absorption rate in elderly men and women, were 10.4 and 9.2 mg/d, respectively.

Conclusion This study got the dietary Zn absorption in a Chinese elderly population. We found that Zn absorption was higher in elderly men than in elderly women. The current RNI in elderly female is lower than our finding, which indicates that more attention is needed regarding elderly females' zinc status and health.

Key words: Zinc absorption; Chinese elderly people; Stable isotope technique

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INTRODUCTION

Zinc (Zn) is recognized as an essential micronutrient for humans, and it participates in all aspects of intermediary metabolism and transmission and regulates the structural and functional integrity of chromatin and biomembrane^[1-2]. Zn deficiency could lead to DNA

damage, acute infections and oral periodontal diseases, and decrease in immunity and cognitive functions^[3]. Studies have shown that approximately 33% of elderly people in the world are at risk of Zn deficiency^[4], which is caused by inadequate Zn intake^[1,4]. Even in developed countries, Zn deficiency, especially marginal Zn deficiency, is often observed in elderly subjects^[5-6].

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In China, the elderly population (aged 60 years and above) had totaled 194 million toward the end of 2012, contributing to about 14.3% of the total population. By 2030, China's elderly population is expected to reach 400 million, making the country to hold the largest elderly population^[7]. Thus, it becomes more important to maintain an optimal Zn status in the elderly population and to promote the health of Chinese elderly people. Data regarding Zn absorption are lacking for the Chinese elderly population, and the recommended nutrient intakes (RNI) of dietary Zn for elderly people is determined by western standards^[8]. However, controversy exists on whether Zn absorption is consistent among elderly people in different populations. Therefore, it is necessary to determine the dietary Zn absorption in the Chinese elderly people. Stable isotope technique is considered to be the most accurate and reliable for determining the absorption of minerals in human beings^[9-10]. The objective of the present study was to measure Zn apparent absorption in a Chinese elderly population using the stable isotope technique and provide the basic data for the setting of Zn RNI for Chinese elderly population.

METHODS

Subjects

Eleven male and thirteen female rural elderly

people (aged 60-70 years) were recruited for this study. All the subjects were in good health. In particular, accurate examinations were carried out to exclude subjects with anemia, gastrointestinal diseases, chronic metabolic diseases, or abnormal Zn nutrition status (plasma Zn < 10.7 μmol/L and C-reactive protein > 10 mg/L).

The trial was registered in the Chinese Clinical Trial Registry (No. ChiCTR-OOB-15007070). All the procedures involving human subjects were approved by the Ethical Committee of the Institute for Nutrition and Health, Chinese Center for Disease Control and Prevention. All subjects gave their written informed consent to participate in this study.

Experimental Diet

According to the basic data of the typical rural dietary pattern obtained from the China National Nutrition and Health Survey 2010-2013 (CHNNS 2010-2013) and market supply, the varieties and quantities of the foods in the experimental diet were assorted to design a 3-day recipe and repeatedly served during the whole experimental period to each subject. The food met the principles of nutrient balance, and the energy values were distributed for each meal (breakfast, lunch, and supper) according to the energy requirement. Table 1 shows the 3-day recipe used in this study.

Table 1. The Three-day Recipe in the Study

Meal Time	Day 1	Day 2	Day 3
Breakfast	Steam bread	Fried dough cake	Steam bread
	Stir-fried cauliflower	Stir-fried potato chips	Stir-fried lettuces
	Egg	Egg	Egg
	Millet congee	Millet congee	Rice porridge with bean
Lunch	Stir-fried pork slices with mushroom	Stir-fried pork slices with Chinese mushroom	Stir-fried pork with green pepper
	Stir-fried potato chips	Stir-fried spinach	Home-style bean curd
	Stir-fried egg with zucchini	Stir-fried egg with tomato	Stir-fried mushroom
	Steam bread	Steam bread	Steam bread
	Rice porridge	Cabbage soup	Tomato egg soup
	Apple	Banana	Orange
Supper	Stir-fried chicken	Stir-fried pork with green pepper	Stir-fried chicken
	Stir-fried pork with long bean	Stir-fried mushroom	Stir-fried zucchini
	Stir-fried cabbage	Stir-fried cabbage	Stir-fried potato chips
	Steam bread	Baked pancake	Baked pancake
	Rice porridge with bean	Rice porridge with bean	Rice porridge with bean
Snack	Bun	Bun	Bun

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