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Unrevealed Zinc Deficiency in Children Susceptible to Seasonal Allergy

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The increase of allergic diseases worldwide in recent years has drawn more attention and need for deeper studies into changes of human lifestyle and environment. The results from a few clinical studies have indicated the relevance of nutritional zinc deficiency in the increased number of allergies[1-4].

Zinc is a microelement essential for cell proliferation and differentiation and so, impaired zinc homeostasis may lead to certain health issues such as delays in physical development and puberty, troubled immune response or neural sensitivity breakdowns[5]. Zinc is the second most abundant metal in the human body after iron with 1.5-3 grams in the body and there is no organ that stores it for further need making it possible to have zinc deficiency with a poor diet[6,7].

Richter and Larivee reported in 2003 that zinc deficiency leads to increase of eosinophils in respiratory tract and Prasad et al. revealed that a zinc-deficient diet for 4 weeks led to functional impairment of the Th1 helper T cell response[8,9]. The plasma concentration of circulating zinc is 13.8-22.9 μmol/l with high turnover and skin retains 6% of it[10,11]. Zinc content in hair, skin and cardiac muscle remains relatively stable while it fluctuates in plasma, liver and in bones[12]. Zinc is detected as a trace element in hair and this is the main method to assess the nutritional balance. The method is non-invasive and is able to determine the balance of minerals over a certain period of time[13].

In 2010, researchers from Brazil measured zinc concentration in plasma and hair from infants and toddlers aged between 6-24 months of age in the relation with their physical development. They detected zinc deficiency by plasma concentration in 11.2% of participants and by hair sampling in 16.8%. The average zinc concentration in plasma was 15.4 μmol/l or 139.5 μg/gr and in hair 16 μmol/l or 134.3 μg/gr[14]. Chinese researchers in 2015 studied 4206 children aged 3-4 years old and 3896 children 4-5 years old assessing their physical development, IQ, and adaptability in the relation to zinc concentration. They found the concentration in boys to be 84.25 +34.16 μg/gr and, in girls 76.37 +29.46 μg/gr. From all 8102 children 1253 (15.46%) had zinc deficiency without significant differences in age and gender[15].

In Mongolia, Dr.Enkhjargal and Dr.Batjargal in collaboration with New Zealand researchers collected blood from 242 children aged 6-36 months old and measured blood levels of hemoglobin, ferritin, zinc, selenium and vitamin D. They reported that 78% of children had deficiency in two or more microelements[16].

In our study, we compared hair zinc concentration in 44 healthy and 24 children with seasonal rhinitis aged between 3-11 years old. We have found significant differences in hair zinc concentration of 3-5-year-old healthy boys compared to those with seasonal rhinitis (124.66±28.28 vs. 150.52±11.44 μg/gr) and also in girls with rhinitis compared to normal girls (106.26±24.31 vs. 115.0±20.03 μg/gr). In children 6-11 years of age as well zinc was diminished in hair of boys with seasonal rhinitis compared to the zinc in the hair of healthy boys (102.75±12.14 vs. 142.96±14.25 μg/gr) with a similar decease in girls (107.31±12.36 vs.158.33±12.17 μg/gr).

In our study, we used the hair for the first time to detect the trace elements in Mongolian children and tried to relate the zinc deficiency to certain allergic disorders such as seasonal rhinitis. There is a need to broaden out our research to include young children with wheezing, asthma or atopic dermatitis.

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