PIXE analysis of mothers' and infants' hairs collected at medical checkups held in Fukuoka city
4th report: reference values

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Abstract

Although the incidence of atopic dermatitis (AD) was rare before the 1945, it has steadily increased to become a major health concern. According to a Japanese report from the Ministry of Health, Labour and Welfare, the number of AD patients in 2002, 2005 and 2008 were 280,000, 380,000 and 1,400,000, respectively. The itching caused by the irritation can be so severe as to prevent patients from leading productive lives and has even led to suicides. Unfortunately, neither preventive measures nor effective treatments have been established. The objective of this study was to determine the possible relationships between AD and the concentration of minerals in the hair of infants and mothers, as measured by the PIXE method.

PIXE was the only possible method to measure neonate hair minerals, since some of them had too few hair strands to apply the ICP method. We have completed PIXE measurements of hairs sampled at both one and ten month regular infant checkups of 842 mother-infant pairs. These PIXE measurements were linked to a detailed clinical examination results, a dietary questionnaire and any diagnosis of AD performed by pediatricians at the ten month check up.

Though journals were founded as far back as 30 years ago to examine the medical application of hair minerals, reference values for these minerals have not been well documented. The distribution of hair minerals can depend on such factors

as sex, age, race, hair analytes preparation method, subject's health condition and environment. To enhance clinical applications of the use of hair minerals, a greater data base and a deeper statistical consideration regarding the distribution of hair minerals of healthy subjects are required. Thus, this study reports reference values calculated from healthy mother-infant pairs in Fukuoka, a Japanese non-industrial city with mild temperatures and typical four seasons. The results show that no subjects were found to have unusually large amounts of any harmful minerals such as Hg, As, or Pb. Mothers showed higher amounts of Ca, Si, Cu, Sr, Hg, Pb and Ni than infants. On the other hand, infants showed higher amount of K, Cl, Al and Ti than mothers. These findings were inconsistent with those of Di Toro's (1994) 42 mother-neonate pairs. The reference values determined from our data also disagree with those of other reports concerning most minerals. We hope to clear up these discrepancies in future reports to provide unified results that can aid in the prevention and treatment of AD.