

**PIXE analysis of hairs at infant medical checkups
in Fukuoka city (first report)
– Comparison of mothers' hair at 1 month and 10 months after birth –**

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Abstract

According to the U. S. Environmental Protection Agency, more than 80,000 chemical compounds have been released and accumulated in the air, water, and ground in various forms. Moreover, thousands of new chemical agents are released annually into the environment in our food, medicines, protective materials, and the like, and are absorbed into the human body through various routes. Only a few of these have been tested and studied extensively to determine their effects on our health. The adverse effects for human beings of environmental contamination crosses international borders and persists in subsequent generations. Harmful substances are observed at high concentrations not only in humans but also in large migratory ocean fishes and polar bears in the high Arctic. Even now, researchers have only unreliable speculation about the kinds and extent of harmful substances our bodies have accumulated.

The cause of atopic dermatitis and certain allergies that have increased continuously with high economic growth is suspected to be related to environmental contamination. However, no definite evidence has yet been obtained. Excessive intake of harmful minerals and/or deficiency of essential minerals are strongly suspected, but few convincing facts have been established. Our purpose was to determine the possible relationships between atopic dermatitis and the concentration of minerals in the hair of infants and mothers, as measured by the sophisticated method of proton-induced x-ray emission (PIXE). We have now completed PIXE measurements at medical checkups of 842 mothers at one month and 408 mothers at 10 months. Since the PIXE measurements will be linked with clinical data after completion of all the samples, we report here some preliminary statistical results on the distribution of each element.

Sulfur (S) follows approximately the same normal distribution of the coefficient of variation 0.1 at both the one-month and ten-month medical checkups. Furthermore, the coefficient of variation of 0.025 after Box-Cox transformation is so small that the variation of S among the samples is considered to be approximately constant. Each of the remaining 28 elements follows an approximately normal distribution after the transformation. Since all of the elements are more or less normally distributed, the central limit theorem suggests that there was no systematic bias in the PIXE measurements. Since the measured values are such that "SE > measured values" are all included in the analysis, we conclude that these measurements may be also used in the statistical analyses.