

PIXE analysis of mothers' and infants' hairs collected at medical checkups held in Fukuoka city

Y. Yoshida³, N. Kinukawa¹, S. Goto², T. Maeda³,
T. Takatsuji³, T. Nakamura³, K. Sera⁴ and Y. Nose¹

¹Department of Medical Information Science, Kyushu University Graduate School
3-1-1 Maidashi Higashi-ku Fukuoka 812-8582 Japan

²Nishina Memorial Cyclotron Center, Japan Radioisotope Association
348-58 Tomegamori, Takizawa, Iwate 020-0173, Japan

³Graduate School of Science and Engineering, Nagasaki University
1-14 Bunkyo-machi, Nagasaki 852-8521, Japan

⁴Cyclotron Research Center, Iwate Medical University
348-58 Tomegamori, Takizawa, Iwate 020-0173, Japan

Abstract

This is the second report on the study to explore possible relationships between atopic dermatitis and hair minerals of infants and mothers. The hair minerals are measured using the proton-induced x-ray emission (PIXE). The first report published last year describes the background, objective and method of the study and the distribution of the concentration of each mineral in hairs sampled from 842 mothers at one month after birth and 408 mothers at 10 month after birth. In April 2009, the PIXE measurements were completed for all of the hair samples collected from 1035 pairs of mother and child at one month after birth and 842 pairs of mother and child at ten months after birth. We compared the histograms of the concentrations of each mineral by month. Since the original histograms were extremely skewed, either log or power transformation was performed for normalization. The results indicate that the distribution of S shows approximately the same normal distribution regardless of mother or child and one month or ten months. Further more, since the coefficient of variation, that is the ratio of SD to mean, was only 0.01, indicating S is approximately constant for all samples. Elements that remarkably decreased at ten months were Ca, Cu, Se, Sr and those that increased were Al, Cl, Fe, Co, As, Br, and Rb. However, we do not have any explanation or even hypothesis to explain the remarkable changes as child grew. The present study is at the stage of a double-checking of clinical information now. The double -checking indicates that we input the same information twice independently and check if they agree with each other by software and correct the wrongly input one. In this way we may reduce the input error rate from 7/100 to 7/10,000. The study is expected to proceed as follows:

1) The results of the PIXE measurements will be reported to the participation doctors.

- 2) Association analysis of the amount of minerals, dining habit, and clinical performance.
- 3) Statistical analysis for causal relationships between mineral deficiency/excess and atopy/allergy conditions.
- 4) Redefine the participating mother/child population as a new cohort to study the effects of environment, dining and minerals on their health conditions.
- 5) Cooperation with the “Birth cohort project” by the Ministry of Environment.
- 6) Cooperation of the birth cohort study by Norway