

## Revalidation for the classification method of hair minerals by PIXE and effect of stainless steel to the PIXE measurements

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### Abstract

Since 2005 we have been conducting a cohort study of 834-mother-infant pairs to determine the association between hair minerals at one month and the onset of atopic dermatitis (AD) at ten months after birth. Thirty-two minerals were measured by PIXE (particle induced X-ray emission) method. Yamada et al.<sup>1) 2)</sup> described a logistic model with explanatory variables Selenium (Se), Strontium (Sr) and a family history of AD whose performance in predicting the risk of AD was far better than that of any similar study.

In this initial research, we didn't consider the reliability of the measurement, namely intra-individual variations. Statistically, intra-individual variations should attenuate risk estimates if simply ignored. Therefore, we carried out the additional survey for 6-year-old children from our original cohort sample and divided each child's hair to make two specimens for PIXE analysis.

Since the hair mineral reflects internal metabolism information like blood, it has been believed with a

use in various fields. The issue of those large variations has been pointed out in many papers about hair minerals. As one of the statistical countermeasure, we decompose the measurement into true or exact value and intra-individual variances. Furthermore, we decompose the intra-individual variances into that due to location and that due to physical calculation to clarify the size and the cause of error<sup>3</sup>. However, it is difficult to apply the same statistical method uniformly because 32 minerals have various characteristic. Therefore, we suggested a method to classify based on distribution properties of the measurements of 32 minerals<sup>4</sup>.

We have suggested the classification method of 32 minerals. The purpose of this report is to verify validity of the method with applying the data measured under different condition and effect of stainless steel to the measurement.