

Element Concentrations in Hair of Children Living Near the Aral Sea: Comparison with Two Districts Depending on the Distance from the Aral Sea

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Abstract

The Aral Sea locating over Kazakhstan and Uzbekistan has been getting smaller since late 1960s. The reason is that much water of two big rivers flowing to the Aral Sea was utilized for horticulture in cotton and rice fields. As the results, water volume into the Aral Sea extremely decreased, and then the Aral Sea could not maintain the original size. Present size of the Sea is about 1/3 of the original one. The residents nearby the Aral Sea, especially east and south of the Sea complain health problem. We investigated school children aged 6 to 15 years old living east side of the Sea, Kyzylorda State, Republic of Kazakhstan. Two districts were set for this survey, Kazalinsk (K-district) where was close to the Sea, and Zhanakorgan (Z-district) where was about 500km east from K-district. In both districts each 485 children were randomly selected from the resident registration book, and 815 children responded. Among them, 61 (male 15, female 46) children in K-district and 143 (male 31, female 109) children in Z-district provided hair samples. Various element concentrations in hair were determined by PIXE simultaneously. Fifteen elements (Al, Br, Ca, Cl, Co, Cu, Fe, K, Mn, Na, Pb, S, Se, Sr, and Zn) were determined in almost all samples. The other elements such as As, Cr, Hg, Mg, Mo, Ni, P, and Si were detected in many samples. Sodium concentrations of males, females and total in K-district were significantly higher than

those of Z-district. This result was considered to be influenced by salt from the Aral Sea. Br, Hg, and Ni concentrations were also higher in K-district children than in Z-district children. These results were possibly considered to be influenced by sediment in which accumulated these elements, and strong sand storm brought it. Al and Si concentrations were significantly higher in Z-district children than in K-district children. This may be considered to be a reflection of natural soil contents. Ca, Cr, K, P, and S concentrations were higher in Z-district children than K-district children suggesting correlation with nutritional conditions. The concentrations of As, Co, Cu, Fe, Mn, Se, Pb and Zn did not show differences between districts.