

## MERCURY EXPOSURE LEVELS AMONG SCHOOLCHILDREN AND RELATED FACTORS AND HEALTH EFFECT IN HIGH MERCURY EXPOSURE AREAS IN KOREA

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### Introduction

According to the 2007 Korea National Environmental Health Survey (KNEHS), some areas in the Gyeongsang Provinces showed very high blood mercury levels in adults. (Kunwee- County 29.6 µg/L, Yeongcheon-city 26.7 µg/L). The purpose of this study was to determine mercury exposure levels in children in this areas and related factors with their mercury levels and health effect. Reference (Kim et al., 2006; Al Attar, 2011).

### Methods

Totally, 1,097 students from grades 3 to 6 at 19 elementary schools participated in this study, including 294 students from 10 elementary schools in Kunwee County, 529 students from Yeongcheon City, 122 students from two elementary schools in Pohang City, North Gyeongsang Province, and 152 students from two elementary schools in Ulsan Metropolitan City, as identified by the KNEHS from June to September 2010. Biological samples from schoolchildren, including whole blood, urine and hair, were collected to measure total mercury were compared with health check-ups performed on the schoolchildren at the time of sampling. Total mercury concentrations in blood were measured using the Direct Mercury Analyzer 80 with the gold-amalgam collection method. Information about children was collected by questionnaire and a computerized neurobehavioral test, a balance test and a personality test, were applied.

### Results

The mean mercury levels were 2.70 µg/L in 1,091 blood samples, 2.25 µg/g-creat. in 820 urine samples and 1.03µg/g in 1,064 hair samples. Blood mercury levels in the schoolchildren was slightly higher than the result of 2.4 µg/L from a 2006 survey of elementary school children on exposure and health effects of mercury by the National Institute of Environmental Research. However, 0.3% and 4.5% of participants exceeded the reference level of blood mercury by CHBMII (15 µg/L) and the US EPA (5.8 µg/L), respectively. The reference level of urine by CHBMII (20 µg/L) was exceeded by 0.4% of participants.

As factors, residence period in the study areas, residence type, father's education level and income showed

significant associations with mercury level in the biological samples. The number of dental amalgam sides showed an association with urine mercury. Fish intake preference and fish intake frequency were important factors in mercury levels. In particular, intake of shark meat and recent intake of shark meat were associated with higher mercury levels. In this regard, participation in the performance of an ancestral rite showed a relation with higher mercury levels.

As health effects, triglycerides showed a significant relation with mercury in blood, urine and hair. Total mercury concentrations were divided into two groups: upper and lower concentration groups based on the median value. In the computerized neurobehavioral test, the upper blood mercury group showed a greater reaction time for color-word vigilance ( $p < 0.05$ ). In the balance test, the intensity value of the tremor test showed high significant relations with mercury levels ( $p < 0.01$ ).

In the personality test, self-consciousness, misdeeds and family relationships showed significant differences between the upper and lower urine mercury groups ( $p < 0.01$ ), and specific reactions, ego resilience and hyperactivity also showed some differences ( $p < 0.1$ ).

### **Conclusion**

The intake of shark meat was very important factor to high mercury exposure level. It was recommended to monitor and manage students with high mercury exposures who exceeded CHBM II and EPA guidelines, and include blood mercury testing in the Children's Health check up for this province. Some items in the neurobehavioral test, balance test and personality test showed significant relations with biological mercury levels. Therefore, monitoring and appropriate management of students showing high mercury levels are recommended in order to reduce their mercury exposure.

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