KOREA NATIONAL SURVEY FOR ENVIRONMENTAL POLLUTANTS IN THE HUMAN BODY 2008: HEAVY METALS IN THE BLOOD OR URINE OF THE KOREAN POPULATION

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Introduction

Recently, there have been several nationwide episodes involving imported toys contaminated with toxic metals and environmental hormones. In addition, cadmium intoxication has occurred due to soil contamination with cadmium from abandoned metal mines. In order to investigate the distribution, extent and factors influencing the levels of toxic metals in the blood or urine of the Korean general population over twenty years of age, we studied the blood or urine concentrations of heavy metals in a representative sample of 5087 Koreans in 2008.

Methods

This survey was designed to monitor the biomarkers of major pollutants in Korea for the civilian, non-institutionalized Korean population. In the KorSEP III conducted in 2008, the study population was composed of 5087 Korean adults from 193 areas in South Korea. The survey population included all non-institutionalized civilian Korean individuals over twenty years of age.
Multiple biological substrates were collected from each participant to determine the most suitable samples for an environmental health survey system. Information regarding exposure conditions of all subjects was collected by questionnaire-based interviews.

Results

The geometric means of the blood lead, mercury and manganese levels were 19.1, 3.23 and 10.8 _g/L, respectively. The geometric means of urinary arsenic and cadmium concentrations were 43.5 and 0.65 _g/L, respectively. Blood mercury and urinary arsenic levels in the Korean general population were significantly higher than in European and American populations. The higher levels of blood mercury and urinary arsenic could be explained by the greater seafood consumption among the Korean population. This

biomonitoring study of blood or urine heavy metals in the Korean general population provides important reference data stratified by demographic and lifestyle factors that will be useful for the ongoing surveillance of environmental exposure of Koreans to toxic metals.

Conclusion

The results of this study can be used to provide information regarding blood and urine metal levels in Korean adults. This study also offers data that can help derive reference values for the population body burden in Korea and evaluate the contribution of different exposure sources. However, it should be noted that this study had some limitations. Specifically, we only measured total blood mercury without measuring methyl mercury, and urinary toxic arsenic (iAs and its metabolites) without arsenic speciation. Therefore, a future study should be conducted to analyze the organic and inorganic portions of total blood mercury and urinary arsenic to clarify the proportion of organic materials that are primarily derived from seafood. Future KorEHS should include not only the adult population, but also subjects younger than 18 years who are eligible for health examination programs. Overall, analysis of the biomonitoring data from the Korean general population reported here have provided useful information regarding one Asian population for use in international comparisons in environmental health research and other related scientific areas.

References

1. Alf, E.F.; Grossberg, J.M.(1979). The geometric mean: confidence limits and significance tests. Percept. Psychophys. 26 (5), 419–421.
2. Becker, K.; Kaus, S.; Krause, C.; Lepom, P.; Schulz, C.; Seiwert, M.; Seifert, B.(2002). German Environmental Survey 1998 (GerES III): environmental pollutants in blood of the German population. Int. J. Hyg. Environ. Health 205, 297–308.
3. CDC. (2009). Fourth National Report on Human Exposure to Environmental Chemicals. National Center for Environmental Health, Division of Laboratory Sciences, Atlanta, GA.
4. Olsson, I.M.; Bensryd, I.; Lundh, T.; Ottosson, H.; Skerfving, S.; Oskarsson, A.(2002). Cadmium in blood and urine impact of sex, age, dietary intake, iron status, and former smoking-association of renal effects. Environ. Health Perspect. 110, 1185–1190.
5. Son, J.Y.; Lee, J.H.; Paek, D.M.; Lee, J.T.(2009). Blood levels of lead, cadmium, and mercury in the Korean population: results from the second Korean national human exposure and bio-monitoring examination. Environ. Res. 109, 738–744.