

Blood Lead Levels and Neurobehavior performances in Korean Schoolchildren

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Abstract

To investigate the association between blood lead level (Pb-B) and neurobehavioral performance of school age children in Korea.

Introduction

Environmental exposure to large number of substances has been associated with developmental disabilities, many of which involve the nervous system. Neurotoxic substances usually cause adverse effects on the nervous system through direct toxic actions on the nervous system cells (EEA, 2002). Hazardous substances in the environment easily affect especially children because their central nervous systems are in the developing process; metabolic rate and food intake per weight are bigger than adults, and breathing ranges are also lower than adults. Central nervous system is a tissue most sensitively affected by Pb in the body. Pb is known as a material that reduces the stimulus transfer rate by destructing the myelin sheath of nervous cell. Childhood exposure to Pb contributes to learning problems such as reduced intelligence and cognitive development.

Methods

A total of 287 children (134 3rd- and 153 6th-grade) were assessed using Korean version of Swedish Performance Evaluation System: Simple Reaction Time, Choice

Reaction Time, Color Word Vigilance, Digit Classification, Digit Additions, Symbol Digit, and Finger Tapping Speed. Pb-B was measured by means of atomic absorption spectroscopy equipped with graphite furnace atomizer.

Results

Geometric means of Pb-B were $2.68 \pm 1.55 \mu\text{g/dl}$ in all children, $2.77 \pm 1.55 \mu\text{g/dl}$ in 3rd-grade students (Range 0.94-9.59 $\mu\text{g/dl}$), and $2.54 \pm 1.57 \mu\text{g/dl}$ (Range 0.21-5.61 $\mu\text{g/dl}$) in 6th-grade students. There were not a Pb-B of 10 $\mu\text{g/dl}$ or greater. The 6th-grade students exhibited better performance in all neurobehavioral tests. Correlation coefficients of neurobehavioral performance and Pb-B were not significant except Digit Addition that worsened with increasing Pb-B. When the subjects were divided into upper and lower Pb-B group by median, the difference of neurobehavioral performance between two groups was not significant.

Discussion

This study may provide that Pb-B of 10 $\mu\text{g/dl}$ or less has not significant effects on neurobehavioral performance in school age children. But we did not consider the effects of other important factors, such as diet and playing habits, the pollution level of environment, or parental intelligence can either strengthen or weaken the estimated association between Pb-B and neurobehavioral performance. Therefore, it is difficult to conclude that the Pb-B below 10 $\mu\text{g/dl}$, which is the recommended level of blood lead for children, does not affect to the central nervous system of children.

Key word : lead, neurobehavior