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ORIGINAL ARTICLE

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Negative association between serum dioxin level and oxidative DNA damage markers in municipal waste incinerator workers

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Abstract *Objectives*: To investigate the effect of dioxin on the formation of oxidative DNA damage and urinary mutagenicity, we measured the concentrations of serum dioxins and lymphocytic 8-hydroxydeoxyguanosine (8-OH-dG) in 57 male waste incinerator workers, urinary 8-OH-dG and urinary mutagenicity in 29 male waste incinerator workers. *Methods*: Information about the subjects was obtained from a questionnaire. Concentrations of polychlorinated dibenzo- *p*-dioxin (PCDD), polychlorinated dibenzofuran (PCDF), and coplanar-polychlorinated-biphenyl (Co-PCB) in serum samples from the workers were measured with a high-resolution gas chromatograph /high-resolution mass spectrometer. Lymphocytic and urinary 8-OH-dG levels were measured with a high-performance liquid chromatography-electrochemical detector system. The urinary mutagenicity was measured with *umu* assay. *Results*: The lymphocytic 8-OH-dG level showed a negative association with the serum dioxin level (total value of TEQ-PCDD, PCDF, and Co-PCB). Urinary 8-OH-dG did not show correlation with serum dioxin level, but showed positive correlation with the smoking index. *Conclusions*: With respect to the subjects' serum dioxin level, dioxin did not increase the urinary 8-OH-dG level by oxidative DNA damage, but upregulation of the primary defenses with oxidative damage and/or DNA repair system activity might have occurred.

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Keywords Incinerator workers · Dioxin · Oxidative DNA damage · 8-Hydroxydeoxyguanosine · Urinary mutagenicity

Abbreviations 8-OH-dG: 8-Hydroxydeoxyguanosine · PCDD: Polychlorinated dibenzo- *p*-dioxin · TCDD: 2,3,7,8- Tetrachlorodibenzo- *p*-dioxin · PCDF: Polychlorinated dibenzofuran · 1,2,3,4,6,7,8-HpCDF: 1,2,3,4,6,7,8-Heptachlorodibenzofuran · Co-PCB: Coplanar-polychlorinated-biphenyl · BMI: Body mass index

Introduction

Dioxins contaminate the environment including air, water, soil, and foods such as fish, meat, and vegetables (Schecter 1991; Furst et al. 1990). The main sources of dioxins are organ chlorinated pesticide factories, pulp bleaching plants, and waste incinerators (Sweeney et al. 1990; Amendola et al. 1989; Tong and Karasek 1986). In laboratory animals, these compounds not only show toxicity to the liver, and the immunity, reproductive and developmental systems but also show carcinogenicity (ATSDR 1997; Murray et al. 1979; Rier et al. 1993; Della-Porta et al. 1987; Kociba et al. 1978; WHO/IARC 1997). The International Agency for Research on Cancer (IARC) classifies 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) as a Class 1 "Carcinogenic to humans" (WHO/IARC. 1997).

2,3,7,8- Tetrachlorodibenzo- *p*-dioxin shows the carcinogenic action for several animals, but conventional genotoxicity tests, such as mutagenicity tests using *Salmonella typhimurium* or mouse lymphoma cells, unscheduled DNA synthesis test, sister chromatid exchange, and micronucleus test, show that dioxin lacks direct genotoxicity (Yoshida and Ogawa 2000). However, TCDD does show oxidative DNA damage in several animal experiments (Tritscher et al. 1996; Shertzer et al. 1998; Park et al. 1996). Oxidative DNA