

MORTALITY AND WASTE INCINERATOR EMISSION OF DIOXINS IN JAPAN

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Introduction

There has been an increasing concern about the environmental dioxin exposure levels in Japan. The origins of the dioxins in the environment are estimated mainly to come from waste incinerators, which then are thought to contaminate soil, water, and possibly vegetation, thus exposing threat to human health, mainly from food. The importance of the role of incinerators in dioxin contamination in Japan comes from the fact that unlike other industrialized countries, the majority of waste materials are processed through combustion. Another fact is that many of the incinerators have limited scale and operate at relatively low temperature, thus making way to unintentional production of dioxin and related compounds, and an increased level of dioxin release into the environment. The direct exposure from the emissions are estimated to consist no higher than 10% of the total exposure to dioxins in the general population. However, it is a public concern that people who live in the vicinity of waste incinerators are exposed to dioxins not only through the ambient air but also through crops and vegetables that grow in the area. The recent report of the Ministry of Labor described that employers who were directly engaged at work inside the furnace at Toyono Cleaning Center had high blood concentration of dioxins and related compounds (mean 323.3pg I-TEQ/g-fat, SD 223.2pg I-TEQ/g-fat).

In this study, we examined the correlation between the cause specific mortality rates and the dioxin level measured at the waste incinerators to see if there were any increase of mortality around those incinerators that showed high disposal of dioxins.

Material and Methods

Mortality data between 1987 and 1996 of the all 497 cities, towns, and villages in the Kanto area was obtained from the Vital Statistics of Japan. Standardized mortality ratios (SMRs) for each vicinity were calculated using the 1990 census. Diagnostic criteria between the ICD-8, ICD-9, and ICD-10 were compared and differences in categories were matched accordingly. As for exposure assessment, all dioxin concentration measurements at the waste incinerators in the area enlisted by the Ministry of Health and Welfare were obtained. Dioxin concentration measurements were multiplied by the emission volume of the incinerator. A sum of these was obtained for each vicinity, and then we divided these by the area of the vicinity. We used this as the emission index, a surrogate of the exposure status of the subjects.

Results and Discussion

There were no significant correlations between the overall mortality rate and the emission index. As for cause-specific mortality rates, there were no significant correlations between the emission index and mortality rates for malignancies such as soft-tissue sarcoma, leukemia, malignancy of the female reproductive system, and male reproductive system. There was a tendency ($p=0.098$) of positive association between the mortality rate of breast cancer and the emission index. No significant correlation was seen between the emission index and mortality due to diseases of the circulatory system or those of the respiratory system. The result of the correlation tendency of the breast cancer mortality and the dioxin emission from the incinerators are consistent with previous findings (Manz et al. 1991), although we are not able to rule out the possibility of confounding ecological factors. There are some studies that suggest that the estrogenic effects of dioxins vary from each target organ to target organ, and we note that a more detailed consideration of the mechanism is necessary.

We are currently studying further by taking into account the emission of dioxins from industrial waste incinerators, and from small scale private-owned incinerators that are not yet publicly enlisted. Simulation of the exposure to a finer extent using the exact geographical location of the incinerators and meteorological factors are also underway. We also note the need of a small-scale but a more intensive epidemiological study that examines socioeconomic status of the subjects as well as their dietary habits and other health affecting habits such as smoking and drinking.

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