

### CHLORACNE AND ELEVATED DIOXIN AND DIBENZOFURAN LEVELS IN THE BLOOD OF TWO JAPANESE MUNICIPAL INCINERATOR WORKERS AND OF THE WIFE OF ONE WORKER

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#### Introduction

We have previously reported levels of blood dioxin/dibenzofuran levels in blood of municipal incinerator workers, sometimes with elevations noted<sup>1,2</sup>. This paper extends that work to two Japanese municipal incinerator workers and their wives.

Japan has a large number of municipal waste incinerators. Some older incinerators have been shut down and replaced by more state-of-the-art facilities. Dioxin concentrations in blood of two male workers who worked at an obsolescent incinerator and in the blood of their wives are reported in this study. These levels are compared with levels in blood from the general population in Japan and in America.

The two workers had worked at the incinerator for over eight years before the facility was shut down, several years prior to their blood dioxin analyses. One worker, with a TEQ level of 360 ppt, had chloracne. The second worker, with a TEQ of 278 ppt, did not have chloracne. At the time of examination the second worker was recovering from two episodes of gastrointestinal cancer of undetermined etiology.

#### Materials and Methods

Blood was analyzed by high resolution gas chromatography-mass spectrometry at Setsunan University.

One co-author (AS) reviewed the available medical records, and interviewed and examined the workers and their wives in 1999. He also examined the closed municipal incinerator facility with representatives of Asahi TV of Japan, sponsor of this consultation.

#### Results and Discussion

The blood dioxin analyses are presented for the two workers and their wives in Table 1 and Figure 1. For comparison, our previously published results from the Japanese general population also are shown<sup>4</sup>

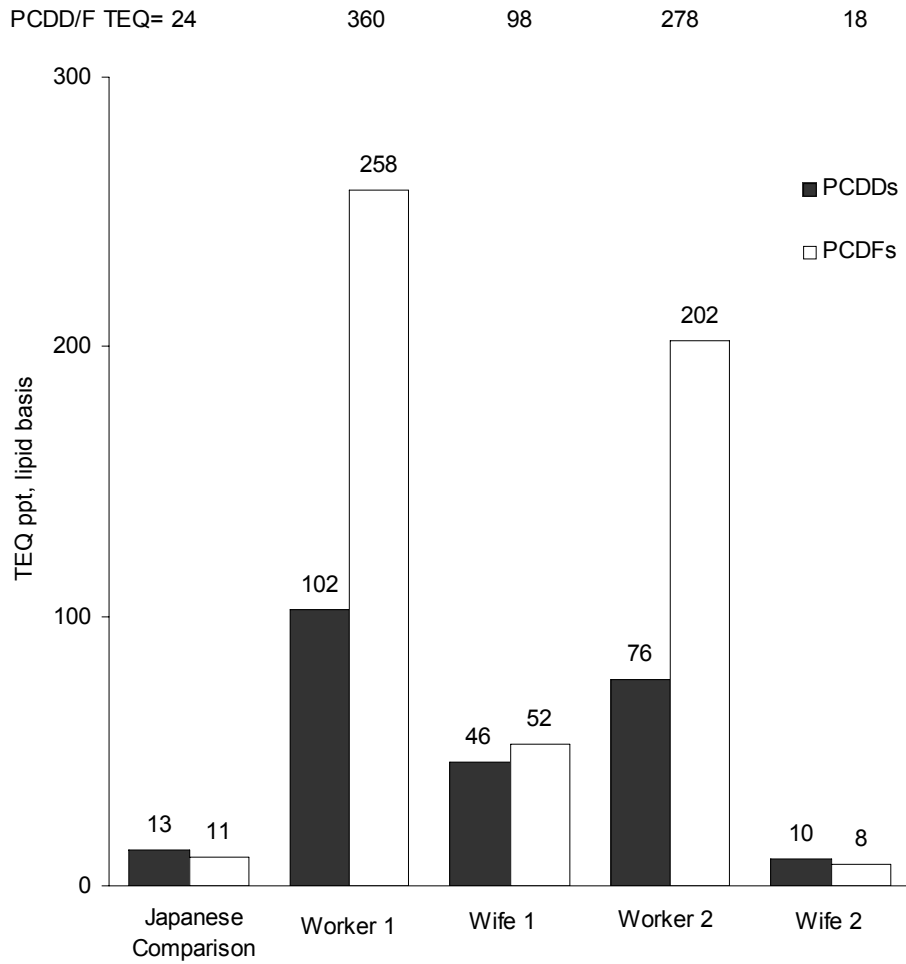
Elevated dioxin/dibenzofuran toxic equivalency (TEQ) levels were found in the blood of both workers and in the wife of one of the workers. The worker with chloracne had a TEQ level of 360 ppt. The second worker, without chloracne, had a blood TEQ of 278 ppt.

One spouse had an elevated blood TEQ of 98 ppt, whereas the other spouse had a TEQ of 18, lower than our previous finding for average Japanese blood dioxin and dibenzofuran TEQ levels of 24 ppt. We know of no previous instance where elevated dioxin blood level has been reported in the spouse of a dioxin-contaminated worker. Dibenzofurans rather than dioxins accounted for most of the TEQ. The incinerator burned household waste including polyvinyl chloride and other plastics. Increase in dibenzofurans much more than dioxins has been reported from such combustion. Dibenzofurans contributed more than dioxins to the TEQ in the contaminated workers and spouse, in contrast to the Japanese general population where dioxins predominate in their TEQ contribution. Dibenzofurans predominated also in the Yusho rice oil poisoning in Japan where chloracne was documented<sup>4</sup>.

**Table 1. TEQ<sup>3</sup> levels of dioxins and dibenzofurans in blood of two Japanese incinerator workers and their wives, and in comparison Japanese pooled blood samples<sup>4</sup>**  
pg/g (ppt) lipid basis; non-detects = 0

	Japanese Comparison	Worker 1	Wife 1	Worker 2	Wife 2
<b>PCDDs</b>					
2,3,7,8-TCDD	2.6	6.4	5.4	5.8	1.8
1,2,3,7,8-PnCDD	8.6	59.8	25.1	43.9	4.9
1,2,3,4,7,8-HxCDD	0.4	7.7	2.5	5.2	0.0
1,2,3,6,7,8-HxCDD	0.4	14.5	8.8	12.4	2.7
1,2,3,7,8,9-HxCDD	0.9	10.6	2.6	5.8	0.0
1,2,3,4,6,7,8-HpCDD	0.4	3.1	1.2	3.3	0.5
OCDD	0.1	0.1	0.2	0.0	0.0
<b>PCDFs</b>					
2,3,7,8-TCDF	0.6	0.2	0.0	0.2	0.1
1,2,3,7,8-PnCDF	0.2	0.7	0.2	0.6	0.1
2,3,4,7,8-PnCDF	7.3	122.5	29.9	96.0	5.1
1,2,3,4,7,8-HxCDF	1.1	27.8	4.2	15.9	0.8
1,2,3,6,7,8-HxCDF	0.8	50.9	9.5	39.7	1.8
1,2,3,7,8,9-HxCDF	0.1	34.4	6.8	42.4	0.0
2,3,4,6,7,8-HxCDF	0.4	5.0	0.0	0.0	0.0
1,2,3,4,6,7,8-HpCDF	0.1	15.4	1.6	7.1	0.2
1,2,3,4,7,8,9-HpCDF	0.0	1.1	0.1	0.4	0.0
OCDF	0.0	0.0	0.0	0.0	0.0
<b>Total PCDDs</b>	13	102	46	76	10
<b>Total PCDFs</b>	11	258	52	202	8
<b>PCDD/Fs</b>	24	360	98	278	18

**Figure 1. Dioxin and dibenzofuran TEQ levels in Blood of Two Japanese Incinerator Workers and Their Wives, 1999, and in Comparison Japanese Pooled Blood Samples, 1991-92** TEQ ppt, lipid basis; non-detects = 0



This work is believed to provide the first documentation of elevation of dioxin-like chemicals in Japanese municipal incinerator workers. The findings are consistent with the generally held belief that older municipal waste incinerators did not do a good job in controlling

dioxin emissions well. This case study documents chloracne at a TEQ level of 360 ppt, much lower than previously reported from Seveso Italy or elsewhere<sup>5</sup>. Further, this is believed to be the first documentation of elevated blood dioxins in the spouse of a worker exposed to dioxins and dibenzofurans. It is probable that contaminated clothing brought home by the worker and washed by his wife was the source of the elevated dioxin body burden in the wife. To the best of our knowledge, it is also possible that vegetables from a home garden contaminated with municipal incinerator ash may have been the proximate source of the wife's dibenzofuran exposure.

This report is the third in our series of reports documenting intake of dioxins and dibenzofurans in humans from municipal incinerators. This and our previous reports suggest regular monitoring of blood of municipal incinerator workers and possibly also, when elevated levels are found, of spouses. It is not the current practice in any country to routinely conduct such monitoring.

This report suggests neither a causal relation between dioxin exposure and gastrointestinal cancer nor lack of such a relation in worker 2. These data confirm the bioavailability of dioxins from municipal incinerators.

### Acknowledgement

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