

Biomonitoring study of people living near or working at a municipal solid waste incinerator, before and after two years of functioning.

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Introduction

Concern over possible health hazard from dioxins and other compounds from waste incinerators and other sources has risen in recent years. However, there is little information on the potential exposures and effects on humans of emissions from modern municipal incinerators. Incineration constitutes an important means of waste disposal in Catalonia and other industrialised societies. PCDDs/PCDFs and other organic and inorganic compounds, like PCBs, cadmium, chromium, lead and mercury, are present in variable quantity in the fly ash and flue gases from municipal solid waste incinerators (MSWI). The 2,3,7,8-Tetrachlorodibenzo-para-dioxin has been recognized as carcinogenic to humans and the carcinogenicity of several metals like arsenic, chromium, nickel and cadmium has been established. There is limited knowledge, however, of levels in exposed people living in the vicinity of a MSWI and in workers at MSWI. In two studies (1,2) on people living near an incinerator, no indication of higher risk was observed. However, high levels of dioxins have been found in soil and vegetables in the vicinity of incinerators (3) and several studies have demonstrated the influence at a local level of incinerators and other sources on PCDD/F levels in cow's milk (3). Higher concentrations of certain congeners of dioxins have been found in the blood of workers of MSWI compared with non-occupationally exposed people in USA (4) and Germany (5). The levels were also higher in workers in old incinerators than in new ones that have better technological control of pollution (6). We conducted a biomonitoring study of people living in the vicinity of a new municipal solid waste incinerator in the town of Mataró, Spain, where there are no other known industrial sources of dioxins.

Methods.

104 subjects living near (0.5 to 1.5 km from the incinerator), 97 subjects living far from (3.5 km to 4.0 km) the incinerator and 17 workers at the incinerator responded to a questionnaire and gave blood and urine samples before it started fully functioning in 1995, and 2 years later (1997). Dioxins, furans and PCBs were examined in pooled blood samples (n=22), while individual blood and urine samples were analysed for the detection of Pb, Cr, Cd and Hg.

Results and discussion

Reported dioxin stack levels were relatively low (mean 2.5-0.98 ng I-TEQ /m³). Air monitoring did not show systematic changes in levels of air pollutants. In 1995, dioxin blood levels were low, both among those living close to the incinerator (mean 13.5 ng I-TEQ/ kg fat), and those living

farther away (13.4). Two years later, dioxin levels had increased in both groups of residents by about 25%, and PCBs by about 12%. Detailed results are shown in Table 1 for PCDDs/PCDFs. Repeated analyses on a limited number of samples indicated that the margin of error in the PCDD/Fs and PCBs analyses are within the acceptable margins as defined in the WHO consultation. However, if the results of the quality control for the dioxin analyses are taken into account and the mean of two values is considered, then the increase in PCDD/F levels among residents would be of the order of 10 to 15 % rather than 25%.

Pb blood levels decreased while no difference was observed for Cr, Cd and Hg. Smaller changes were seen among workers. Given the low stack emissions from this plant and that the blood dioxin levels did not depend on distance of residence from the incinerator, it would appear unlikely that the small increase in dioxin blood levels could be attributed to the emissions from the incinerator.

Table 1. Blood levels of PCDD/PCDF (ng/kg fat) before and after two years of functioning of the MSWI in the study groups by sex and group of age.

Group of study	N	I-TEQ in 1995	N	I-TEQ in 1997	Absolute Difference	Relative Difference (%)
Residents :						
“Near” incinerator	104	13.5	93	16.7	3.2	
	23.7					
Men	49	12.9	42	16.8	3.9	
	30.2					
(3 pooled samples each period)						
Women	55	14.3	51	16.7	2.4	
	16.8					
(2 pooled samples each period))						
“Far” from incinerator	97	13.4	91	16.7	3.3	
	24.6					
Men	51	12.3	47	15.9	3.6	
	29.3					
(3 pooled samples each period)						
Women	46	15.1	44	17.9	2.8	
	18.5					
(2 pooled samples each period)						
Workers at MSWI	17	13.9	14	15.7	1.8	12.9
(1 pooled sample each period)						

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