

Polychlorinated Dibenzodioxins and Dibenzofurans in Soil, Deposition and Airborne Particulate Matter in the Vicinity of a Municipal Solid Waste Incinerator

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Previous investigations (1) in the vicinity of the municipal solid waste incinerator at Bielefeld-Herford showed that the load of polychlorinated dibenzodioxins (PCDD) and dibenzofurans (PCDF) in the soil was almost equivalent to the background load in the corresponding area (Senne). Further, these investigations proved that the influence on the pollution load of the soil from various sources, such as traffic, domestic heating, industries etc., is bigger than had been assumed before.

Further measurements were conducted in the neighbourhood of the municipal solid waste incinerator as well as in an area not affected by the plant, in order to show the influence of emissions from the plant on the contamination with PCDD and PCDF of soil, deposition and airborne particulate matter.

The examinations showed that the concentration of PCDD and PCDF in soil was, in almost every case, higher in densely populated areas than in sparsely populated areas. This points towards the fact that various pollution sources, such as domestic heating, traffic and industry have a relatively large impact on the dioxin load in urban areas.

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In order to obtain results concerning the pollution of the air by polychlorinated dibenzodioxins and dibenzofurans, measurements of airborne particulate matter were carried out in the vicinity of the incineration plant and also in an area unaffected by thermal point sources. In both cases, the concentrations measured during the winter months showed a higher load than in the summer months. Figure 1 shows the distribution pattern of dioxins and furans in both areas.

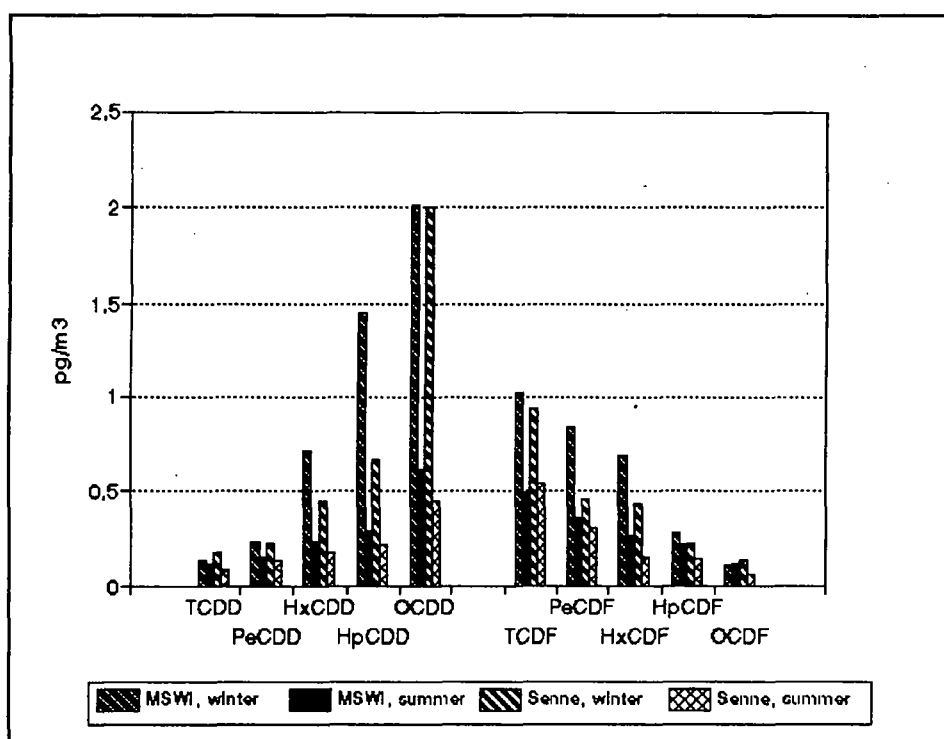


Fig. 1: Dioxin distribution pattern for airborne particulate matter in the vicinity of municipal solid waste incinerator and in an unaffected area.

In summer there is little difference in the dioxin load in both areas. The values are comparable to those of unexposed areas (2). In the winter the total dioxin concentration increases. This is probably due to the higher consumption of fuel in

winter. Partly this is also due to poorer circulation of pollutants in the different atmospheric layers. The percentage increase of hexa- and heptachlorinated dibenzodioxins in the vicinity of the incineration plant, which was also shown in earlier investigations of conifer needles, is obvious. There seems to exist a correlation between the emissions from the plant and the increase of hexa- and heptachlorinated dibenzodioxins.

A seasonal effect is also observed for dust precipitation, but in the opposite way. In the late summer the PCDD/F-concentration is in both areas higher than at the beginning of spring, due to the deposition of coarser dust particles. This is because of the dry summer climate and the, therefore consequently higher amounts of dust contained in the air. The dioxin distribution pattern is shown in Figure 2. It can be

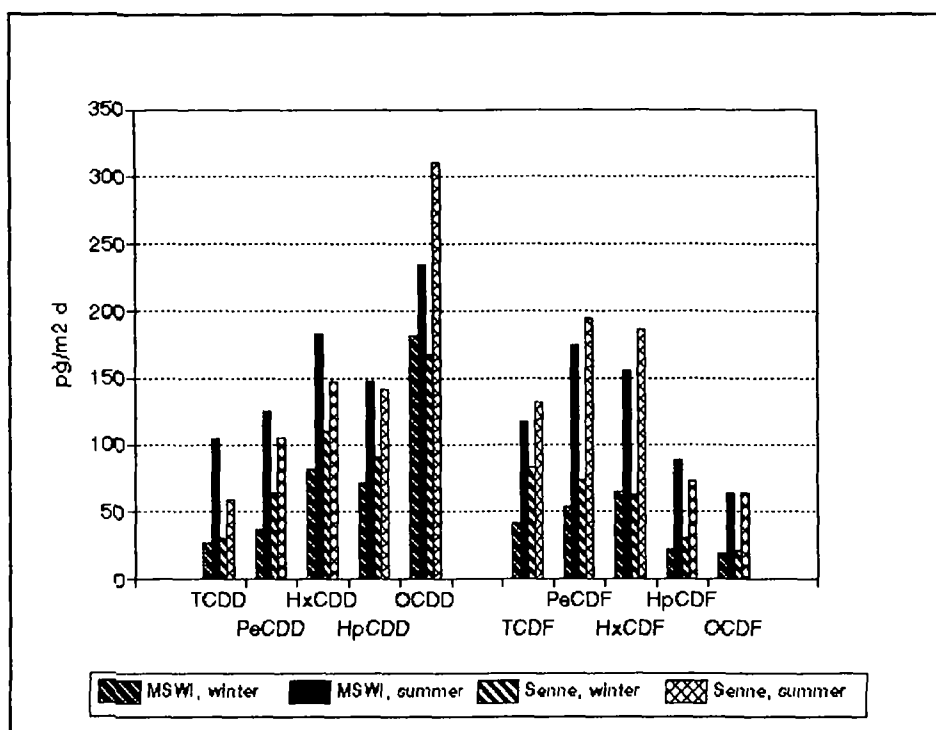


Fig. 2: Distribution pattern of polychlorinated dibenzodioxins and dibenzofurans in deposition.

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seen that the homologue distribution is different in soil and airborne particulate matter. The distribution of congeners is very close to the distribution found in the leaves and needle samples examined earlier; this does not apply to the ratio of PCDD:PCDF (1).

As far as the PCDD/PCDF-ratio is concerned, in spring the percentage of PCDD in airborne particulate matter as well as in dust precipitation is higher than in late summer. This seems to be due to the increase in emissions of domestic ash and combustion residues, indicated by the higher percentage of PCDD compared to PCDF as measured in ashes of domestic incineration. The PCDF/PCDD-ratio in the exhaust gas of the municipal solid waste incinerator is about 2 to 3.

- (1) Böske, J., Lahl, U., Ehmann, J., Kurz, R.; Dioxinmission und Müllverbrennung, Untersuchungen am Beispiel einer Altanlage; Staub - Reinhaltung der Luft, 52 (1992) 339-345
- (2) Hessische Landesanstalt für Umwelt; Dioxine und Furane in der Hessischen Umwelt -Messergebnisse aus Hessen-; Umweltplanung, Arbeits- und Umweltschutz Heft Nr. 26 (1991)