

DIOXIN IN SOIL SAMPLES OF THE WROCLAW AND OLAWA REGION IN LOWER SILESIA, POLAND

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Introduction

Some intense investigation has been done by working groups in Poland¹⁻³ to get a survey on dioxins and furans emitted by combustion facilities, such as hospital waste incinerators, hazardous waste incinerators and power plants. Little is known about the possible contamination in the vicinity of potential sources. To get some orientation, soil samples were taken by the Inspectorate Wrocław close to special emitters like a medical waste combustion and a steelwork plant within the urban Wrocław area as well as the urban and rural area around the city of Olawa. Although it is only a small contribution to the knowledge and has to be discussed as well, we would like to present the dioxin data which were elaborated in the GfA laboratory in Germany.

Methods and Materials

A 10 g portion of the air-dried soil samples (homogenized fraction < 2 mm) along with quantification standards were extracted with toluene, 10 % acetone was added to the toluene phases and used for the 26 hrs soxhlet extraction. The clean-up was conducted via liquid chromatography using silica, alumina and florisil columns.

All PCDD/F analyses were performed by Capillary Gas Chromatography / High Resolution Mass Spectrometry (HRGC/HRMS) and quantification via internal ¹³C₁₂-labelled standards (isotope dilution) by means of HP 5890A/VG AutoSpec systems.

Results and Discussion

Although in 1997 a new law was enacted concerning the treatment of hazardous waste, the reduction of dioxin emissions, of course, was as well pushed ahead in Poland as an EC candidate country by the 'approaching' EC legislation in that particular field. But basically the possibly resulting contamination, e.g. in soil samples can be classified only by comparison to other data. Due to the absence of Polish guidelines, this paper discusses the results based on the guidelines of the former Federal Health Office (BGA Bundes-Gesundheitsamt) of Germany which are well in line with the measure requiring values according to the new German soil protection regulation. According to these regulations, the typical background level of soil samples should be lower than 5 ng I-TEQ/kg dry matter. Figures 1 to 4 will give a kind of focus to the chosen sampling sites in Lower Silesia. Table 1 presents the results of the investigations. Figures 5 and 6 are showing the contribution of each PCDD/F homologue group to the total PCDD/F content.

Fig. 1: Poland



Fig. 2: Lower Silesia



Fig. 3: Sampling sites Wrocław



Fig. 4: Sampling sites Oława

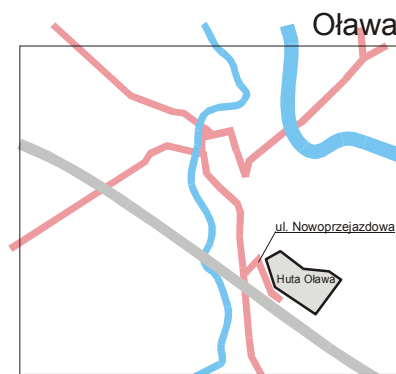


Fig. 5: Concentration of the individual homologue groups in soil samples from the Wrocław and Oława region

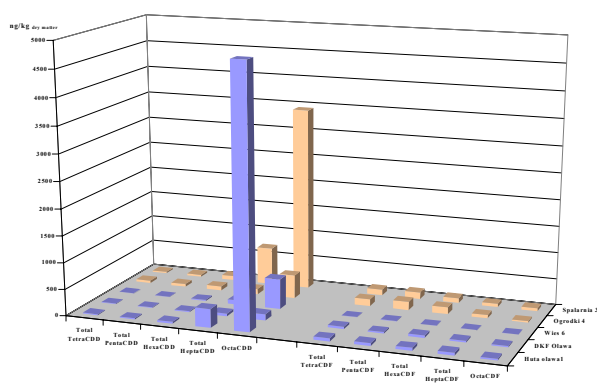


Fig. 6: Percentage proportion of the individual homologue groups to the sum of PCDD/F in soil samples from the Wrocław and Oława region

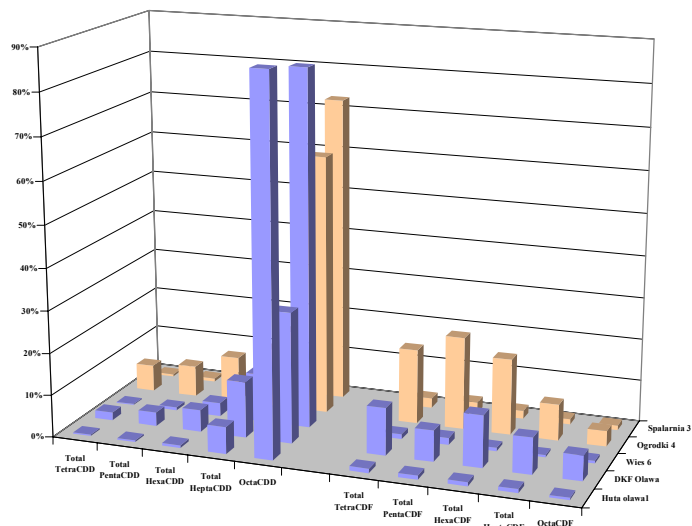


Table 1: PCDD/F concentration in soil samples from urban and rural areas in Wrocław and Oława

site		Oława	Godzikowice village	Siedlec village	Wrocław	Wrocław
sample name vicinity of ...		Huta Oława zinc foundry	DKF Oława landfill of hazardous waste	Wies 6 agricultural region	Ogrodki 4 colorful metals finishing	Spalarnia 3 medical waste combustion
Total PCDD/Fs		5,487.4	375.7	674.5	715.3	4,726.9
I-TEQ excl. LOD		13.2	5.94	2.00	16.6	21.2
TE (BGA) excl. LOD		13.2	5.26	2.15	15.9	20.6
comparison to BGA guide values:						
TE (BGA)	5 – 40	It is recommended to renounce a grazing in order to exclude the risk of a possibly higher PCDF/D milk pollution. An individual advice for farmers regarding suitable cultivation and harvesting methods is recommended as well.				
TE (BGA)	> 40	The utilisation of feeding stuffs is only recommendable in case of a proven low dioxin transfer. For above-mentioned reasons grazing shall be renounced.				
TE (BGA)	> 100	Substitution of soil at children's playgrounds, kindergartens and perhaps school yards				
TE (BGA)	>1,000	Substitution of soil at settlements, deposition of polluted soil				
TE (BGA)	>10,000	Substitution of soil in any case, disposal of the polluted soil as special waste				

all concentrations given in **ng/kg** dry matter

Table 2: Comparison of PCDD/F concentrations from former investigations in Germany

Program in the German federal state of ...	Determined PCDD/F concentrations in soil samples from green spaces in ng I-TEQ/kg dry matter (in brackets: number of samples)			
	rural area		urban area	
	mean	median	mean	median
Bremen ⁴ (Sampling depth: 0-10 cm)	3,4 (10)	3,1 (10)	4,1 (25)	3,1 (25)
Lower Saxony ⁵ (Sampling depth: 0-5 cm)	2,3 (15)	a	4,1 (15)	a
Hamburg ⁶ (Sampling depth: 0-5 cm)	a	a	14,0 (7)	6,2 (7)
North Rine-Westphalia ⁷ (Sampling depth: 0-10 cm)	4,7 (69)	4,5 (69)	8,6 (28)	7,4 (28)
Bavaria ⁸ (Sampling depth: 0-10 cm)	0,5 (46)	0,2 (46)	3,9 (27)	0,6 (27)
Baden-Württemberg ⁹ (Sampling depth: 0-10 cm)	0,7 (39)	0,4 (39)	a	11,0 (26)

a no details

The comparison with the literature-cited values given in table 2 shows typical ranges for urban resp. rural areas in Germany within the early 1990s. The PCDD/F profiles in figures 5 and 6 are likely and in a way typical as well with a high-percentage proportion of octaCDD, although the samples DKF Oława (landfill) and Ogrodki 4 (colorful metals) show unusual furan patterns. Nevertheless 4 of 5 samples exceed the guide value of 5 ng I-TEQ/kg dry matter and, of course, a correlation to the neighbouring sources cannot be postulated due to the restricted data base. Therefore more intense investigations are necessary to get certainty about the possible extent of soil contamination in urban and rural areas in Poland.

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