

# The effect of organic matter content on PCDDs/PCDFs in bottom sediments

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**Introduction:** Dioxins (PCDDs/PCDFs) belong to the group of compounds known as Persistent Organic Pollutants (POPs). High accumulation rate of PCDDs/PCDFs in aquatic ecosystems is connected with to their low solubility in the water phase. This predisposes the substances to an association with the organic and mineral particulates present in the water and their further accumulation in the bottom sediment [1]. Organic matter is one of the most important components of bottom sediments, and is mainly responsible for the sorption properties of bottom sediments [2]. The aim of studies was to determine the impact of organic matter on the content of PCDDs/PCDFs in bottom sediments and pore water collected from two dam reservoirs: Rożnów (the Dunajec River) and Rybnik (the Ruda River). Both reservoirs are located in the Malopolska and Silesian provinces (south Poland).

**Methods:** Following compounds of carbon were analyzed: total organic carbon (TOC), carbon humic acid (Cha), fulvic acids (Cfa) and carbon hydrolysing (Cnh), black carbon (Cbc) and dissolved organic carbon (DOC). PCDDs/PCDFs in bottom sediments were analyzed using High Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS). Analyses of PCDDs/PCDFs in pore water were carried out using the Abraxis ELISA Dioxin/Furan test.

**Results:** The content of  $\Sigma$ PCDDs/PCDFs in bottom sediments ranged from 22.53 to 225.27.92 ng/kg in the case of Rożnów Reservoir, and from 29.90 to 1171.30 ng/kg in the case of Rybnik Reservoir, showing 3.8-fold higher average concentrations noted in the Rybnik (501.02 ng/kg) over Rożnów Reservoir (131.02 ng/kg). Also TEQ values showed higher concentrations in Rybnik ranging from 1.65 to even 32.68 ng TEQ/kg (average 12.34 ng TEQ/kg), than in Rożnów being from 1.35 to 12.76 ng TEQ/kg (average 6.32 ng TEQ/kg).

In contrast, Rożnów Reservoir was characterized by almost two-fold higher average PCDDs/PCDFs concentration in pore water (58.40 ng EQ/L) over the Rybnik Reservoir (33.12 ng EQ/L).

This can be related to the content of carbon in the sediments of both reservoirs. In the case of Rożnów Reservoir the TOC ranged between 2.30 and 24.60 g/kg, while in sediments from Rybnik Reservoir fluctuated from 1.90 to 166 g/kg.

**Discussion:** All samples exceed the pollution limit for bottom sediments amounting to 0.85 ng TEQ/kg d.m. In addition, 20% of sediment samples from the Rybnik Reservoir also exceed the PELs threshold (Probable Effect Levels for PCDD/PCDFs) amounting to 21.5 ng TEQ/kg s.m. We observed a significant relationship between the content of TOC and Ckf, Cnh and Cbc and the content of PCDD/PCDFs in bottom sediments (Rybnik Reservoir). Organic carbon content is likely to be factor controlling PCDDs/PCDFs concentrations in the bottom sediments and pore water of the studied reservoirs.

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**References:** [1] Urbaniak M. et al. (2014) *Environ Sci Pollut Res* **21**: 4441–4452 [2] Tadini A.M. et al. (2015) *Sci Total Environ* **506-507**: 234-240.