# PAHs, PCBs AND PCDDs/Fs IN SEDIMENT SAMPLES FROM MORAVA AND DANUBE RIVER CATCHMENT AREA

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Many environmental organic pollutants are persistent in the environment, resistant to biological metabolism and highly susceptible to bioaccumulation due to their high stability in fatty animal tissue. They also have relatively high inherent chronic toxicity, the details of which are poorly understood. These types of compounds are described as "persistent organic pollutants" (POPs). The combination of bioaccumulation and, potential for chronic toxicity, combined with their stability in the environment and high mobility in the atmosphere, leads to the conclusion that action must be taken before extensive effects on ecosystem are detected. The accumulation of these compounds in soils and sediments is a potential risk for the future, they are potential "chemical time bombs". For example, sediments act as a sink for many POPs that enter aquatic ecosystems.

The sampling network is shown in Figure, it was established on the basis of the most important tributaries of rivers Morava and Danube, mostly near the confluences of these rivers (Morava river is the main river in Moravia and one of the most important tributaries of the Danube in the former CSFR). Samples were collected from sites in 1991 and from 28 sites in 1992

Sediments samples were collected by natural coring 0-10 cm and stored frozen. Dry sediment samples were analysed by HRGC/FID (PAHs), HRGC/MSD (PCDDs/Fs) and HRGC/LRMS(PCBs) by using capillary columns and labelled standards[1].

As a part of cooperation between Chemical Time Bombs Program and

Project TOCOEN (Toxic Organic COmpounds in the ENvironmnet, the contamination of sediments in Moravian and Slovakian part of Danube river catchment area by PAHs, PCBs, PCDDs/Fs was determined. The total contents of PAHs ranged between 25.5 and 4,690.3 $ng.g^{-1}$, PCBs between 4.9 and 232 $ng.g^{-1}$ and PCDDs/Fs were detected in one site in concentration 0.0005 $pg.g^{-1}$ TEQ (1991). In 1992 the total contents ranged between (PAHs), 3.5 and 557 $ng.g^{-1}$ (PCBs) and ND (<0.01) and 9.2 $pg.g^{-1}$ TEQ (PCDDs/Fs). The results from this two years study are shown on Figure.

The most polluted sites were found below the confluence of the rivers Morava and Bečva (downstream the large chemical industrial centre Přerov and some other sources).

The contamination of Danube river sediments seems to be lower (from these first informative results) than the contamination of Labe (Elbe) river sediments in Bohemia. Nondek and Frolíková[2] described the state of contamination of the 15 sites on the river Elbe and 10 on the river Jizera (one of the main tributaries of the Elbe river). The concentrations of low chlorinated PCBs (Delor 103) ranged from <20 to 1800 $ng.g^{-1}$ (Elbe), and of those high chlorinated PCBs (Delor 106) from 50 to 1900 $ng.g^{-1}$,and in the case of the river Jizera the content of PCBs in Jizera river sediments ranged from 15 to 450 $ng.g^{-1}$.

The highest content of PCBs in the small stream Bílý potok in Czech-Moravian highlands is a result of PCB spill in a factory preparing of precoated gravel. The sampling site is located 5 km from spill site and the sample was collected 7 year after spill (model site 16). This is an excellent example of long-term risk of POPs in environment, typical Chemical Time Bombs - PCBs stored in small stream and gradually introduced into the environment.

As a result of our work and the study of relevant literature we suggest a simple categorization of PAHs, PCBs, PCDDs/Fs contamination of sediments Table 1 and 2). For better risk estimation, we will have to prepare a scale with I-TEQ 2378-TCDD.

REFERENCES

1 I. Holoubek, J. Čáslavský, J. Helešic, R. Vančura, J. Kohoutek, A. Kočan, J. Petrik. J. Chovancová, Toxicol. Environ. Chem., Submitted to press.

2 L. Nondek, N. Frolíková, Chemosphere 23, 261 (1991).

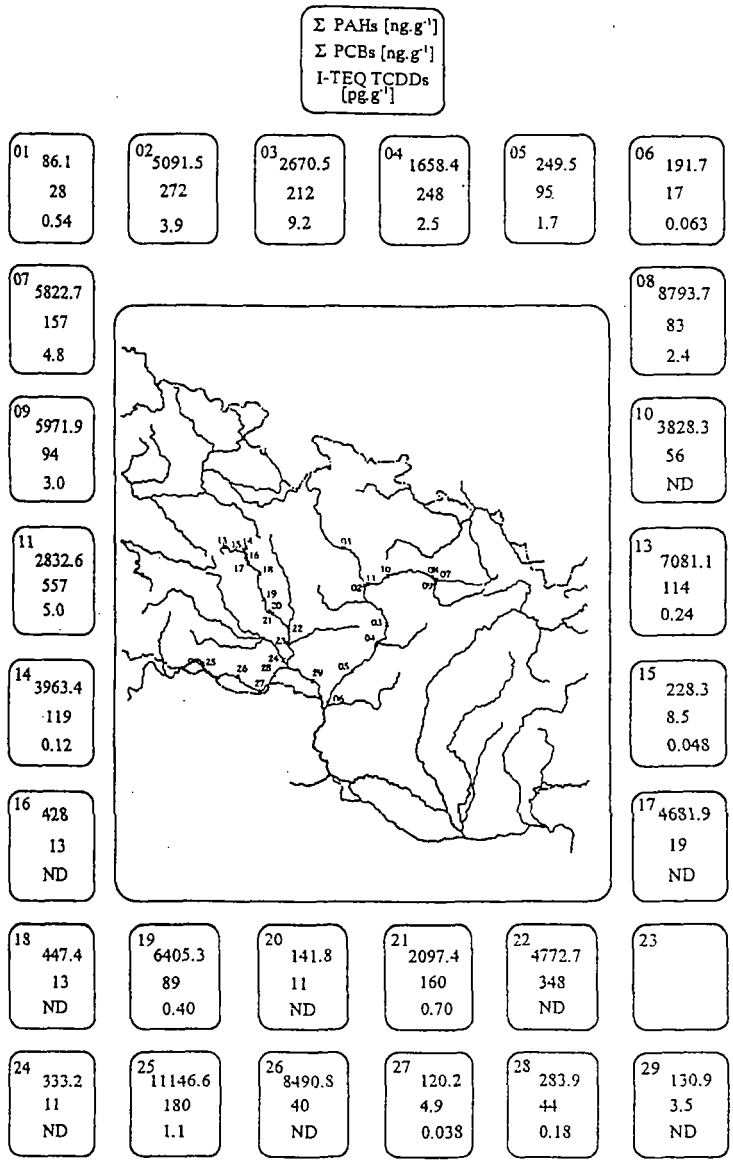
Table 1: Preliminary categorization of levels of sediment contamination by PAHs, PCBs and PCDDs/Fs

| Category | Amounts of PAHs [ng.g$^{-1}$] PCBs [ng.g$^{-1}$] PCDDs/Fs [pg,g$^{-1}$] | Description |
|---|---|---|
| I. | LD - 100<br>LD - 100<br>LD - 200 | background, remote area |
| II. | 100 - 500<br>100 - 500<br>200 - 1,000 | Slightly polluted area suburban areas |
| III. | 500 - 5,000<br>500 - 1,000<br>1,000 - 2,000 | Polluted area, with important sources of pollution |
| IV. | 5,000 - 10,000<br>1,000 - 5,000<br>2,000 - 10,000 | Heavily polluted area, big sources, large urban agglomeration |
| V. | >10,000<br>> 5,000<br>>10,000 | Very heavily polluted area large agglomeration with high density of industry |

LD - limit of detection

Table 2: : Categorization of TOCOEN model sites

| Category | Contamination by | | |
|---|---|---|---|
| | PAHs | PCBs | PCDDs/Fs |
| | Number of Sites | | |
| I. | 15 | 18 | 22 |
| II. | 6 | 9 | 6 |
| III. | 7 | 1 | 0 |
| IV. | 0 | 0 | 0 |
| V. | 0 | 0 | 0 |


Σ PAHs [ng.g-1]
Σ PCBs [ng.g-1]
I-TEQ TCDDs [pg.g-1]
01 86.1 28 0.54
02 5091.5 272 3.9
03 2670.5 212 9.2
04 1658.4 248 2.5
05 249.5 95 1.7
06 191.7 17 0.063
07 5822.7 157 4.8
08 8793.7 83 2.4
09 5971.9 94 3.0
10 3828.3 56 ND
11 2832.6 557 5.0
13 7081.1 114 0.24
14 3963.4 119 0.12
15 228.3 8.5 0.048
16 428 13 ND
17 4681.9 19 ND
18 447.4 13 ND
19 6405.3 89 0.40
20 141.8 11 ND
21 2097.4 160 0.70
22 4772.7 348 ND
23
24 333.2 11 ND
25 11146.6 180 1.1
26 8490.8 40 ND
27 120.2 4.9 0.038
28 283.9 44 0.18
29 130.9 3.5 ND