DICHLORO-DIPHENYL-TRICHLORO-ETHANE AND POLYCHLORINATED BIPHENYLS IN SOILS AND SEDIMENTS FROM THE AMAZON REGION IN BRAZIL

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Introduction

The heavy use of DDT against disease vectors since the end o f the 40´s had a deep impact on malaria incidence in Brazil, however in the Amazon Region, this type of control only based in chemical indoor spraying was not as effective as in other parts of the country. In this work we present new results of DDT and PCB in rainforest and sub-urban soils and river bottom sediments that confirm the widespread contamination of the environment with this two kinds of persistent organic pollutants[1, 2]. Regarding PCBs, although they were never produced in Brazil and the only permitted use was inside closed systems like old transformers and capacitors, we have several known areas where this contaminant is present[3]. Top soils and fluvial sediments were collected using an acetone cleaned metallic scoop in two areas of the Amazon river basin, one in the northern part at the Negro River basin, and the other one at the southern part, at the Madeira River basin (Figure 1- Puruzinho lake). Since 1997 it is not allowed to use this kind of pesticide in this region, however, the total prohibition occurred only in 2009[3].

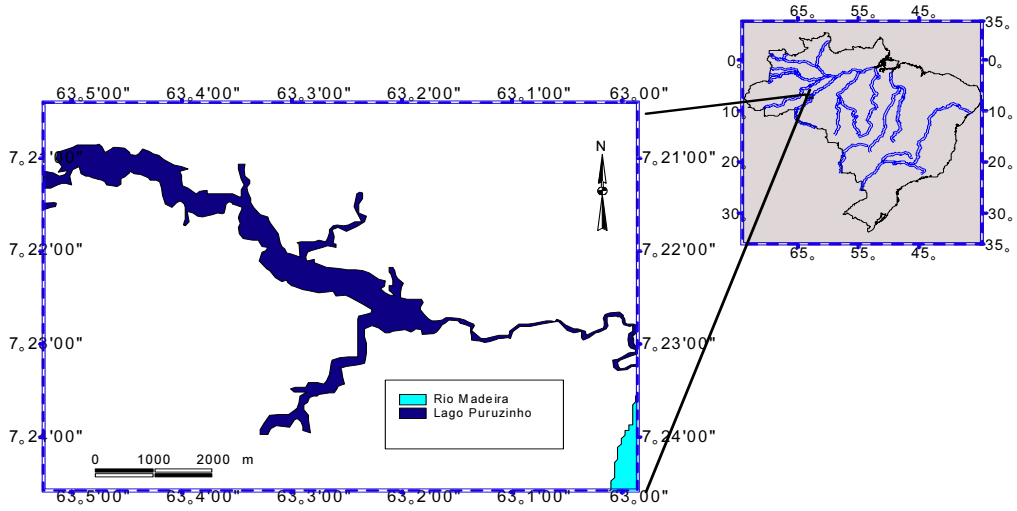

Figure 1: Study area**:** Puruzinho Lake – Humaitá /AM.

The intense use in the past and its enhanced persistence in the acidic tropical soil conditions indicate that the disappearance of this compound from the food web will take some time. As far as we know, this work describes for the first time the PCB contamination is Amazonian fluvial systems, using for that, forest and sub-urban soils and sediments from the local rivers.

Material and methods

Soil and Sediment sampling:
Top soils and fluvial sediments were collected using an acetone cleaned metallic scoop in two areas of the Amazon river basin, one in the northern part at the Negro River basin, and the other one at the Southern part, at the Madeira River basin. Samples were maintained refrigerated in ice boxes during transport to the Radioisotopes Laboratory in Rio de Janeiro and were submitted to soxhlet extraction using non-polar solvents and submitted to clean-up based on the Jensen reaction (desulfurization step).
All samples where oven-dried (30 °C), macerated and sieved in 1000μm mesh (soil) and 0.212μm mesh (bottom sediments).
All of the solvents used were of pesticide residue analysis or equivalent quality, including the dichloromethane and n-hexane from Tedia Brasil Inc.
Approximately 3 g of dried sample was extracted in a Soxhlet apparatus over 8 h with 120 mL of dichloromethane. The extracts were cleaned-up based on the Jensen reaction (desulfurization step), on 7g of aluminum oxide (Al2O3 with 11% of H2O w/w) and analytes were eluted with 20 mL of n-hexane.
Fractionation was performed using an open glass chromatographic column filled with 3 g of Florisil and topped with 2 g of anhydrous sodium sulfate. The first fraction was eluted with 15 mL of n-hexane, and the second fraction was eluted with 25 mL of n-hexane: petroleum ether (1:1).
The cleaned extracts were evaporated until 0.5 mL and completed to 1 mL with internal standard (TCMX) before are analyzed by means of split less injection on capillary gas chromatographic coupled to an electron capture detector (GC-ECD) from Shimadzu (GC-14B and CG-2010, 63Ni

Results and discussion
Table 1 presents the overall findings of this research.

Table 1: Average of ∑DDTs and ∑PCBs [ng.g-1], in soil and sediment samples from Puruzinho Lake and Negro River (AM). * Not analysed.

Sediment									
	∑DDT	∑DDE	∑DDD	∑PCB 28	∑PCB 52	∑PCB 101	∑PCB118	∑PCB 153	∑PCB 180
Puruzinho	2,60	5,51	2,07	0,70	2,05	1,55	0,31	0,86	0,23
Rio Negro	*	*	*	*	*	*	*	*	*
	Soil								
	∑DDT	∑DDE	∑DDD	∑PCB 28	∑PCB 52	∑PCB 101	∑PCB118	∑PCB 153	∑PCB 180
Puruzinho	173,58	239,67	791,66	53,99	165,82	150,86	44,24	78,24	22,96
Rio Negro	16,99	0,88	0,93	1,39	3,32	2,12	0,46	0,88	0,24

Results were expressed in $ng.g^{-1}$ and showed that the levels are one order of magnitude higher in the southern part of the Amazon where development and overall incidence of malaria is increasing.
Saldanha[4] found lower (up to 55 $ng.g^{-1}$) values at the Puruzinho Lake in samples collected in 2002.
Looking for ratios, the overall DDE/DDT and DDT/PCB relations can be depicted from table 2.

Table 2: Ratios of DDE/DDT and DDT/PCB

	Ratio ∑DDE/∑DDT		Ratio ∑DDT/∑PCB	
	Sediment	Soil	Sediment	Soil
Puruzinho	0,54	0,32	0,33	0,57
Rio Negro	*	0,02	*	0,61

The apparent increase after the 1997 ban might be explained by non registered (illegal) use of this pesticide in this part of Brazil, since its use is still common in the border countries like Bolivia and Peru.

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