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Assessment of the impact of organic mater in NDL-PCBs sequestration in industrially contaminated soils : comparison of an *in vitro* bioaccessibility and an *in vivo* relative bioavailability assays.





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# INTRODUCTION

Little reliable information on transfer of PCBs to humans *via* involuntary soil ingestion is available although young children (1-30 months) with their hand-to-mouth activity may be exposed to contaminated soils. The relative bioavailability (RBA) approach appears to be an **adequate method** to compare **the bioavailability of organic pollutants from different soils** (USEPA 2006).

Because of coats induced by such methods, we've tried to compare in vivo results to a new in vitro physiologically based methodology. This study presents preliminary in vivo results and the in vitro methodology which is employed in our laboratory.

The current study addresses both the impact of soil organic matter (OM) on bioavailability of sequestrated NDL-PCBs and an emerging *in vitro* method to assess it.

## **MATERIAL & METHODS**



INDUSTRIALLY CONTAMINATEI

> SPIKED CORN OIL

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Site name and location	Contamination historic
Korsec (Basse-Ham, 57 970)	Buried industrial waste from a former mechanical workshop. Dielectrical fluid leak from transformer.
Réverdy (Cognière, 70 230)	Dielectrical fluid leak from transformer. Former agri- food facility.
Lyon	NC
Saint-Cyprien (Loire, 42 160)	Historical dielectrical fluid leak from transformer followed by a recent fire of pallets
Ploufragan (Côtes-d'Armor)	Heavy oil processing facility

### 8 different soil-samples :

- freeze-dried.
- sieved to 500µm
- homogenised using karter

Determination of NDL-PCBs concentrations in soil using Accelerated Solvent Extraction (ASE) and GC-MS

### **Determination** :

- C<sub>ora</sub> content
- Black Carbon (BC) content

5 different sites were sampled – 8 soils took part of experiments 1 of them was an analytical standard.



# **RESULTS AND DISCUSSION**

## Characterization of soil samples



Contamination profile of soil samples.

■ PCB 52 ■ PCB 101 ■ PCB 153 ■ PCB 138 ■ PCB 180



Contamination profile appears to be similar between soil samples despite their different location





Whereas soil samples exhibit different qualities and quantities of organic matter, reduction of bioavailability, if any, is weak

Soil samples exhibit different qualities and quantities of organic matter.

Dose-response relationshipwas significantly linear.Interceptwasnon

	Slope	Significance vs Corn oil	Relative Bioavailability Factor +/- 2xSE
Corn Oil	0,057	-	100% +/- 14%
Kors. 1	0,032	<0,001	57% +/- 18%
Kors.2	0,057	NS	100 % +/- 25%
Rev. 1	0,053	NS	93% +/- 22%
Rev. 2	0,057	NS	100% +/- 16%
Lyon	0,058	NS	103% +/- 19%



## CONCLUSION

Only three soils exhibited a weaker bioavalability of sequestrated NDL-PCB.
Implication in risk assessment to contaminated field-management needs to be further investigated.

However some samples exhibited significant reduction in bioavailability compared to the oil group.

Quality of organic matter of these soils has to be further investigated

U.S. EPA 2006. Estimation of Relative Bioavailability of Lead in Soil and Soil-like Materials Using *in Vivo* and *in Vitro* Methods, Environmental Protection Agency, Office of Solid Waste and Emergency Response. European Commission. "Commission Regulation (EU) No 1259/2011 of 2 December 2011 Amending Regulation (EC) No. 1881/2006 as Regards Maximum Levels for Dioxins, Dioxin-like PCBs and Non Dioxin-like PCBs in Foodstuffs." *Off J Eur Union, L* 320 (2011): 18–23. Organization for Economic Co-operation and Development (OECD). "Guideline for Testing of Chemicals No. 207, Earthworm Acute Toxicity Test. . Paris, France." 207, 1984.