

# CHILD HEALTH AND THE ENVIRONMENT: RESULTS FROM EU FRAMEWORK 5

## MATERNAL ENVIRONMENTAL EXPOSURE TO SELECTED XENOBIOTICS

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EU project PLUTOGRACY  
„Placental Uptake and Transfer of Environmental Chemicals Relating to Allergy in Childhood Years“

## EU project PLUTOGRACY

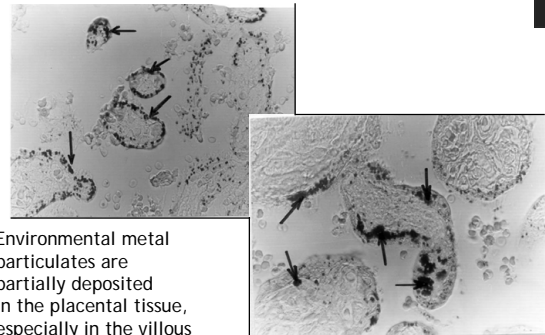
- One of the main objectives - Determination of maternal environmental exposure to selected xenobiotics - heavy metals and organochlorine compounds
- Maternal exposure used as the proxy measure for foetal exposure.

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## BACKGROUND

- ◆ For developing foetus, mother does not represent only the source of genetic information, but also the important “environmental factor”.
- ◆ Placenta = interface between mother and foetus  
≠ full barrier for transport of xenobiotics
- ◆ Many foreign substances reach the fetus via transplacental transfer.
- ◆ Intrauterine environment plays the crucial role in foetal development.
- ◆ Environmental pollutants captured in the placental tissue may affect intrauterine life quality *via* deterioration of placental microstructure and adverse effect on placental functions, including foeto-placental immune system.

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Environmental metal particulates are partially deposited in the placental tissue, especially in the villous syncytiotrophoblast (Reichrtova, E. et al, Hum Exp Toxicol 1998; 17:176-181), and partially transferred *via* placenta to foetus.

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## BACKGROUND

- ◆ The risk of immune system alteration by xenobiotics increases if the exposure starts already during prenatal development *via* transplacental transport.
- ◆ The mother has an important role to play in influencing the development of fetal and infant immune responses to allergens during gestation.
- ◆ Events taking place prenatally may play a role in determining whether or not a genetic susceptibility becomes translated into disease processes.

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## METHODS

- Collection of biological samples from healthy full-term pregnancies in 5 regions in 3 countries for chemical analyses:
  - placenta,
  - maternal peripheral blood sera, and
  - breast milk (6<sup>th</sup> week after delivery)
- Xenobiotics selected for chemical analyses:
  - Heavy metals - lead (Pb) and cadmium (Cd)
  - Organochlorine compounds (21 compounds) - chlorinated benzenes, organochlorine insecticides, polychlorinated biphenyls (PCBs)

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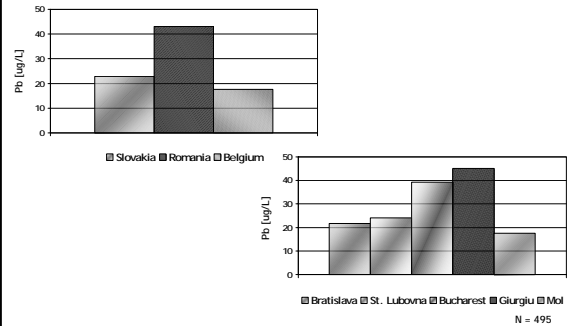
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## METHODS

- Concentrations of Pb and Cd in the samples of maternal blood and placenta were determined by flameless atomic absorption spectrometry (AAS)
- Concentrations of organochlorine compounds in the samples of maternal blood, placenta and breast milk were determined by GC/MS (Gas Chromatography / Mass Spectrometry)

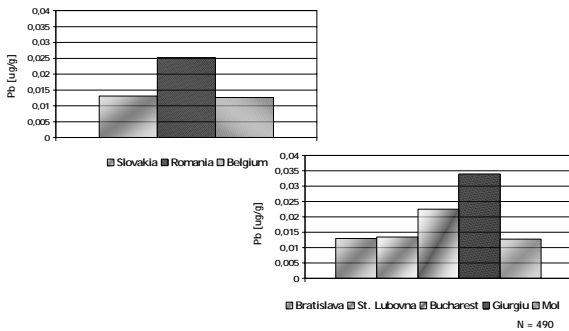
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## Concentrations of Pb (Medians) in Maternal Blood- countries & regions



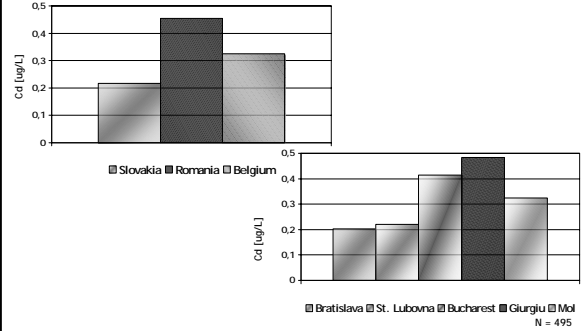
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## Concentrations of Pb (Medians) in Placenta - countries & regions



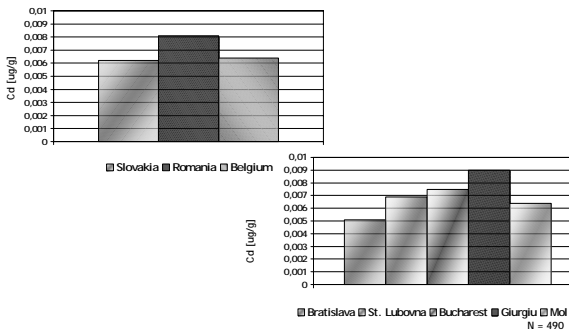
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## Concentrations of Cd (Medians) in Maternal Blood- countries & regions



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## Concentrations of Cd (Medians) in Placenta - countries & regions



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## RESULTS

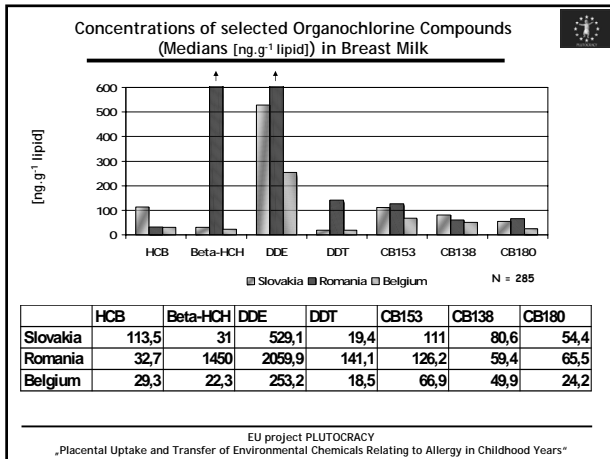
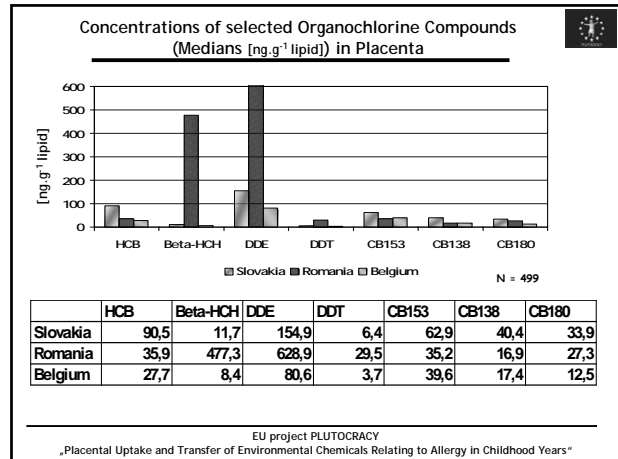
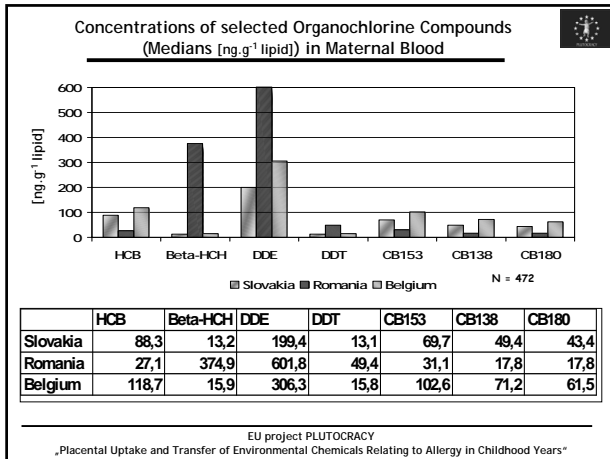
→ The highest concentrations of Pb and Cd were found in the placental and blood samples from Romania, if compared to Slovakia and Belgium ( $p < 0.001$  and  $p < 0.05$ , respectively).

→ Positive correlations were found between

- Pb concentrations in the placental and blood samples:  $r = 0.64$ ,  $p < 0.001$
- Cd concentrations in the placental and blood samples:  $r = 0.55$ ,  $p < 0.001$

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## RESULTS / DISCUSSION

→ Concentrations of organochlorine insecticides were very significantly higher in Romania if compared to Slovakia and Belgium samples. From both Romanian regions (Bucharest and Giurgiu), higher concentrations were found in region Giurgiu ( $p < 0.01$ ).

→ One of the likely reasons could be past/recent use of pesticides in agriculture in Romania. Furthermore, stockpiles of obsolete compounds represent an important source of pesticide environmental contamination (184 tones of DDT, Toxaphene and Heptachlor are stocked in historical deposit), deposits are spread over the whole country territory and from existing 709 pesticide waste deposits, around 30% comprise not identified substances (UNIDO Project, 2003).

→ Relatively high concentrations of DDT and other chlorinated pesticides are still measured in water and sediments in Romania (Holoubek et al, 2001).

UNIDO Project No. GE/ROM/02/020: Preliminary Inventories Report - Enabling Activities to Facilitate Early Action in the Implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in Romania. May 2003  
Holoubek I. et al. Persistent, bioaccumulative and toxic compounds in Central and Eastern Europe - hot spots. Airs Hig Rada Toksikol. 52, 2001, p. 239-51.

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## DISCUSSION / CONCLUSIONS

- ↪ Significant differences in environmental exposure to both, selected toxic metals and organochlorine compounds were found among pregnant women from Belgium, Romania and Slovakia.
- ↪ Placental contamination does not reflect maternal exposure during pregnancy only, but exposure within preconception period as well.
  - As the next step, results will be analysed further with respect to the role of additional factors, e.g. maternal diet, occupation, parity, and other variables possibly influencing maternal/foetal exposure to selected compounds.
  - Finally, biomarkers of environmental exposure will be evaluated together with clinical and laboratory markers of allergy development in cohort of 18-months old children.

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