European Commission

Science for Environment Policy

# Biomonitoring study suggests exposure to environmental chemicals varies greatly across the EU

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**The framework for a Europe-wide biomonitoring programme has been established** by a new study. The preliminary investigation of 17 European countries showed that monitored levels of toxic chemicals varied significantly between countries. Although the levels were mostly within recognised health-based guidance values, in a few cases these values were exceeded. The researchers suggest that a fully-fledged European biomonitoring programme would help to develop policies to avert public health risks presented by environmental chemicals.

**Biomonitoring studies have helped to create policies that have safeguarded public health worldwide**. Lead in gasoline was banned in most countries following the discovery of high levels of the metal in blood samples taken by the American National Health and Nutrition Examination Survey (NHANES), and the use of amalgam tooth fillings — which contain mercury — is now discouraged for children and pregnant women in Europe due to the findings of the German Environmental Survey (GerES).

These researchers, who received funding from the European Community's Seventh Framework Programme and its LIFE+ Programme, performed a survey of the lifestyles and living environment of 1 844 children (5–11 years old) and their mothers, and measured the levels of harmful chemicals they were exposed to. Chemicals that were assessed included mercury in hair samples, and cotinine (a biomarker for tobacco smoke exposure), phthalates (a group of chemicals used to increase the flexibility of plastics) and cadmium (a toxic metal) in urine samples.

The study found that concentrations of these contaminants varied widely throughout the European population, but levels found in mothers and their children were mostly strongly correlated. Although most biomarker concentrations were below guidelines set by the Joint FAO/WHO Expert Committee on Food Additives (JECFA), 1.4% of children and 3.4% mothers in the study had mercury levels above these provisional threshold levels.

The main cause of heightened mercury levels was the consumption of fish. Mercury accumulates in marine creatures and is passed on to humans through consumption. Children and mothers who ate marine fish several times per week had 46% and 51% higher mercury levels, respectively, than those who ate marine fish once a week or less. Participants who lived in Spain and Portugal — countries with high levels of seafood in their national cuisine — had mercury levels between six and seven times greater than the European average. Up to 33% of the mothers with levels above the safe dose lived in countries with high fish consumption, with implications for loss of IQ points. Younger children and children from higher social classes tended to have higher levels of mercury.

Levels of two different phthalates in urine samples were significantly increased in mothers and children who lived in housing with PVC floors or walls. However phthalates were associated with a variety of sources, and were generally found in higher concentrations in younger children than older children. The relative levels of phthalate metabolites differed substantially between countries, indicating the influence of different sources, products on the market, or behavioural characteristics.

*Continued on next page.*

**Source:** Den Hond, E., Govarts, E., Willems, H. *et al* (2014). *First Steps toward Harmonized Human Biomonitoring in Europe:Demonstration Project to Perform Human Biomonitoring on a European Scale*. Environmental Health Perspectives 123: 255 - 263. DOI: 10.1289/ehp.1408616

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A strong correlation was found between the level of education of a family and exposure to certain chemicals, even after adjustments were made for confounding variables. Mercury levels in mothers with tertiary education in the family were 25% higher than those who had only a primary level of education, and different kinds of phthalates were found to be significantly higher depending on whether a member of the family had a primary, secondary or tertiary level of education. The authors suggest this may be due to as-yet-unknown lifestyle factors that vary with economic status and which were not included in the survey.

The researchers stressed that a strength of this study was its use of a harmonised protocol formed by an international group. The DEMOnstration of a study to COordinate and Perform Human biomonitoring on a European Scale (DEMOCOPHES) group that implemented the protocol ensured measures were followed to enhance the trans-national reliability of the data, such as intensive training, strict chemical analysis quality control programmes, and clear reporting and communication procedures with participants, researchers and policymakers.

The findings indicate that public health remediation measures could be stratified according to age and social groups in order to achieve the most meaningful effect upon disease burden and environmental exposure to pollutants. This framework could be used to support the development of an EU-wide dataset to monitor exposure to environmental chemicals across the community. One such dataset is being developed through the H2020 European Human Biomonitoring Initiative call, which will utilise IPChem as a centralised, accessible source of data storage. Such monitoring datasets will support policymakers in making decisions to benefit public health.

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