

Children exposure to lead in a smelter area in China: comparison of modelling tools for the prioritization of exposure pathways

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In recent years many cases of lead poisoning have been reported in China especially for children living in rural districts, close to mining and smelter areas or battery plants (Ji et al., 2011). Considering the vulnerability of children to the toxic effects of lead, such as long term cognitive and developmental impairment, this pollutant represents a significant hazard to children health and therefore constitutes a priority issue for environmental health research and control in China.

Many studies focused on the investigation of lead pollution sources and the characterization of environmental pollution and external (i.e. intake) human exposure, while the scarce availability of human biomonitoring data and limited modelling of internal exposure (i.e. Pb concentration in blood) still hamper the detailed characterization of the most significant exposure pathways for children.

Two modelling tools for the assessment of human internal exposure, i.e. MERLIN-Expo (<http://merlin-expo.4funproject.eu/>) and IEUBK (Integrated Exposure Uptake Biokinetic; USEPA, 1994), have been compared to investigate the relevance of different lead exposure pathways for children living close to a historical Pb-Zn smelter site in southern China. MERLIN-Expo is a new software tool for the integrated assessment of environmental and human exposure recently developed within the EU-funded project "4FUN". It provides a library of exposure models and allows to couple on the same platform environmental and physiologically-based pharmacokinetic models for simulating human internal exposure in complex scenarios. It can be applied to both organic and inorganic pollutants and include advance functionalities for uncertainty and sensitivity analysis. The results of this new tool were compared with the ones provided by the most commonly used IEUBK model specifically developed for the assessment of children exposure to lead.

The application of MERLIN-Expo and IEUBK models using environmental monitoring data collected in the study area (Pb concentrations in soil, air, water and food) allowed to identify the most relevant exposure routes and to explore their relative contribution to the overall children exposure. The results of the application, evaluated also through the comparison with available human biomonitoring data (Pb concentration in children blood), provided useful information for the future development of risk management measures.

REFERENCES:

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