Demonstration and exploitation of the 2-FUN human exposure model identified as a promising tool derived from European research activities; A case study on Pb in the environment.

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Human health risk assessment and management of chemicals is a major concern for policy and industry and ultimately benefits all citizens. Exposure assessment is generally considered to be the weakest point, because current tools: (a) lack an integrated approach for assessing combined stressors, (b) often use 'worst-case' scenarios leading to over-conservative results, (c) lack uncertainty/sensitivity tools allowing the identification of risk drivers. To overcome these drawbacks, the FP6 project 2-FUN developed a prototype software package containing a library of models for exposure assessment, coupling environmental multi-media and PBPK models. The FP7 funded 4-FUN project aims at the demonstration and exploitation of the 2-FUN prototype software. Transfer to stakeholders will guarantee its long term viability. Case studies on actual datasets for both organic and inorganic pollutants will be performed to validate the 2-FUN tool. We report on a case study focusing on lead pollution mainly due to past emissions by non-ferrous smelters in Belgium (Northern Campine Area).

The following datasets are available for validating the 2-FUN tool: (i) biomonitoring data on Pb in blood from children; (ii) data on population behaviour (diet, activity patterns, etc.); (iii) Pb contamination levels in air, dust, soil, well water and locally produced food in homes and public places. The biomonitoring campaign enrolled 338 toddlers aged 2 to 6 years, recruited in the study area and in a reference area. Based on these measurements, an exposure scenario will be developed to estimate the external Pb exposure and also calculate the Pb body burden (based on PBPK modelling). Model simulations will be compared with past evaluations (e.g., Standaert A. et al. 2009 Epidemiology 20;6: S53-S54). The final objective of the current research is to improve the reliability of the 2-FUN model calculations through a systematic comparison with actual measurements and to demonstrate how uncertainty margins can improve risk governance for realistic exposure scenarios satisfying the needs of stakeholders.