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

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Background

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 this 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 on inorganic arsenic pollution due to past emissions by non-ferrous smelters in Northern Belgium.

Methods

The following datasets are available for validation: (i) biomonitoring data on As in urine from adults; (ii) data on population behaviour (diet, activity patterns, etc); (iii) As levels in homes and public places in air, dust, soil, well water and local food products. The biomonitoring campaign enrolled 1217 adults aged 19 to 79 years, recruited in the study and reference areas. Based on these measurements, an exposure scenario will be developed to estimate the external As exposure and subsequent levels in urine. Model simulations will be compared to past evaluations (e.g. Standaert et al. 2009 Epidemiology 20;6: 53-54).

Conclusions

The objective of the current research is to improve the reliability of the 2-FUN modelling tool through comparison with actual measurements and to demonstrate how uncertainty margins can improve risk governance for realistic exposure scenarios satisfying the needs of stakeholders.