The FUture of FUllly integrated human exposure assessment of chemicals: Ensuring the long-term viability and technology transfer of the EU-FUNded 2-FUN tools as standardised solution

Results in Brief

Improved modelling of chemical exposure

Advanced modelling software has been developed to assess environmental and human exposure to chemicals. This new tool integrates multimedia and physiologically based pharmacokinetic (PBPK) and dose-response models to address the entire exposure assessment chain.

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Understanding the nature and extent of exposure is crucial to understanding the risk to human health from exposure to environmental contaminants. With growing scientific insight on exposure pathways and how chemical substances affect humans, new tools are required to address increasingly complex exposure scenarios and to
In human health risk assessment, exposure assessment is often the weakest link in the chain. This is due to a number of factors, including a lack of integrated approaches for combined stressors (mixtures) and widespread use of over-conservative 'worst-case' scenarios. It is also the result of estimation of external exposures and not of internal exposures, and a lack of uncertainty/sensitivity tools for identification of key exposure drivers.

The aim of the EU-backed 4FUN (The future of fully integrated human exposure assessment of chemicals: Ensuring the long-term viability and technology transfer of the EU-funded 2-FUN tools as standardised solution) project was to build on the previously developed modelling software 2-FUN and model and simulate human and environmental exposure to harmful chemicals.

4FUN developed advanced modelling software, called MERLIN-Expo, boasting numerous features and including the integration of multimedia and PBPK models. These were crucial to considering the future development of Equivalent Biomonitoring Reference Doses and the coverage of the total exposure assessment chain and estimates of internal exposures for different human populations. Another feature was that exposure through multiple pathways for multiple chemicals can give estimates for combined exposures.

While 2-FUN was a prototype tool containing various models for exposure assessment, 4FUN developers tested, improvised and standardised the software for market release. The aim was to demonstrate the reliability of the modelling estimations and the feasibility of building complex realistic scenarios using case studies based on actual data sets.

4FUN project developed a business model to bring the software to market, and provided support through training to ensure long-term technical and economic viability. Ultimately, MERLIN-Expo software will benefit regulators and industries as well as researchers interested in the environmental or health impacts of chemicals.

**Keywords**

Human exposure, physiologically based pharmacokinetic, dose-response, exposure assessment, 4FUN

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Project Information

**4FUN**

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