Target and non-target screening of chemicals in the indoor environment for human exposure assessment

SHINE

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Rationale

Worldwide, people spend more time indoors, in well-insulated buildings and are more heavily engaged with multiple electronic devices. Various types of emerging chemicals such as oil and water repellents, flame retardants (FRs), and plasticizers can be emitted/released from construction materials, electronic equipment, carpets, textiles, flooring and furniture through evaporation or abrasion.
The indoor environment is rather complex as there are several sources of substances and some of the substances can even have multiple functions. These multiple sources and dual functionality of some chemicals contribute to the total indoor exposure for humans.

REACH will result in the substitution of the most hazardous substances with less harmful alternatives. The substitution of chemicals is, however, a complex process that requires not only assessment of hazard characteristics of the chemicals and alternatives but also collection of information on exposure, technical performance and impact. Several substances that are restricted or banned (e.g. DEHP, PBDEs) were substituted with alternatives with less information on the hazards, indoor levels and human exposure.

The last couple of years have seen substantial efforts expended on the development of high tier models for integrated human exposure, covering (part of) the chain, starting from emission sources, over pathways including indoor air and dust up till internal doses in the human body. Examples of such models have developed under the CEFIC LRI programme (e.g. INTEGRA; DustEx, IndusChemFate) and under EU FP 7 programmes (e.g. Merlin Expo); however these models have not yet been thoroughly tested for a wide range of chemicals, including these new chemicals. As many of them will be more polar or possess other properties than previously investigated ('classical') compounds, the existing models also need to be checked for their applicability to these new chemicals.

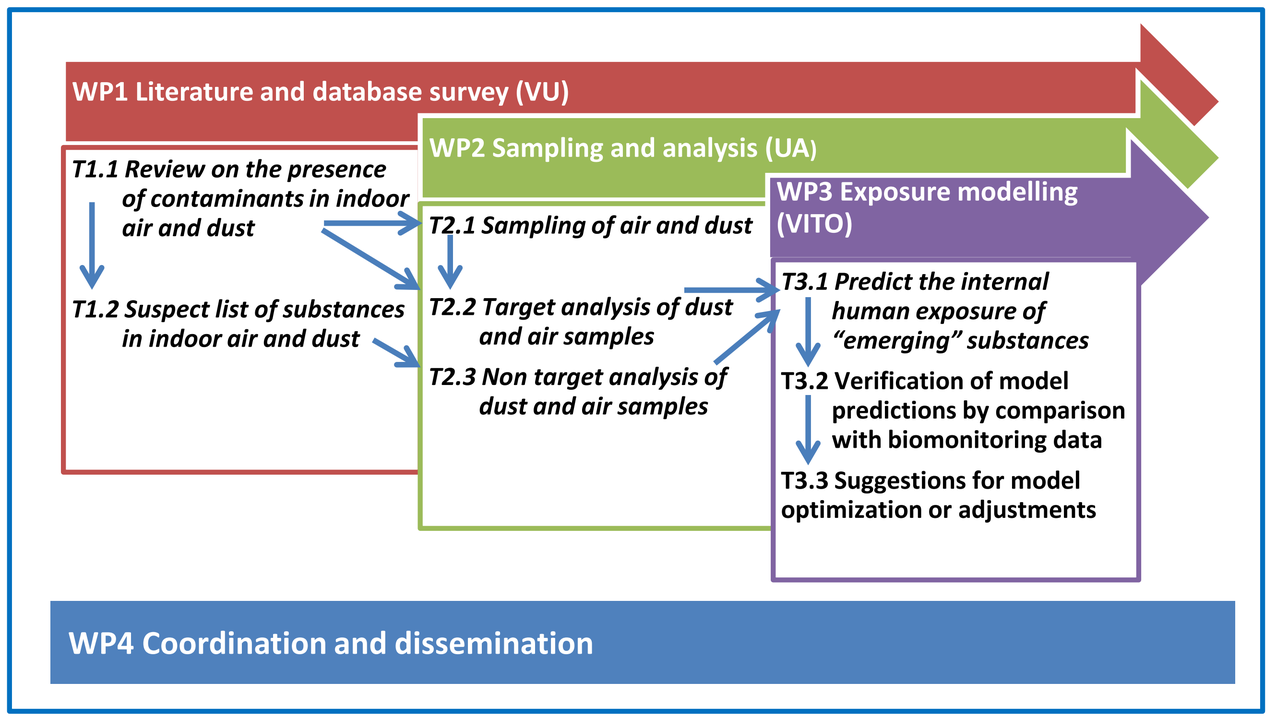
Objectives

1. To provide an **overview of existing information** on chemicals found indoors by carrying out a literature search.
2. To carry out **sampling and targeted analysis** of emerging contaminants in dust and air of schools/daycare centers, homes and offices in various European countries.
3. To conduct **non-target screening** of the same samples collected under objective 2 to identify additional contaminants and combinations of chemicals.
4. To verify if existing **exposure models** can be used for the new chemicals found, and propose modifications to the models if needed.
5. To **compare the measured and modelled data with biomonitoring data** from the literature and other projects in which partners are participating.

Outlook – first year

- Review on the presence of contaminants in indoor air and dust, with a focus on chemicals coming from consumer products, e.g. textiles, electronics, plastic, building materials
- Create a suspect list of substances in indoor air and dust to be used for non-target screening
- Sample air and dust in homes and offices in The Netherlands, Belgium, Ireland, Sweden (including daycare centers)
- Make an inventory of existing integrated exposure models and select one for further development and application

SHINE project structure



The SHINE consortium consists of key scientists from the Flemish Institute for Technological Research (VITO), Belgium; the School of Geography, Earth & Environmental Sciences, University of Birmingham, UK; the Department of Environmental Science and Analytical Chemistry, Stockholm University, Sweden; the Toxicological Center, University of Antwerp, Belgium and the Institute for Environmental Studies (IVM), Vrije Universiteit, Amsterdam, The Netherlands. The SHINE project started mid May 2016 and has a duration of 3 years, finishing mid May 2019.

SAMPLING

AIR and DUST

MODELLING

PFRs, NBFRs, HBCD, PFASs, novel plasticizers, pesticides, short-medium chained CPs, non-target analysis

References

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Acknowledgement: this project is sponsored by Cefic-LRI (LRI-17B)

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