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Target and nontarget screening of chemicals in the indoor environment for human exposure assessment - SHINE

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Worldwide, people are spending more time indoors in well-insulated buildings and are more heavily engaged with multiple electronic devices. Various types of emerging chemicals such as dirt and water repellents, flame retardants (FRs), and plasticizers can be emitted from construction materials, electronic equipment, carpets, textiles, flooring and furniture through evaporation (off gassing) or abrasion (small particles breaking off from foam, textile fibers, etc.). The indoor environment is rather complex as there are several sources of substances and some of the substances can even have multiple functions. For example, some compounds used as FRs can also be applied as plasticizers, e.g. in sealants or as additives in waxes. Other compounds reported in the literature vary from personal care products to siloxanes and from dirt and moisture repellents, like perfluoroalkyl substances (PFASs) in textile and clothing to nanoparticles. These multiple sources and dual functionality of some chemicals contribute to the total indoor exposure for humans. Chemical concentrations in indoor dust and air can correlate with body burden, but until now it is unknown if inadvertent dust ingestion (especially for young children who have regular hand-mouth contact), inhalation or dermal uptake is the main route of exposure.

The last couple of years have seen substantial efforts expended on the development of sophisticated, high tier modelling of integrated exposure, 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 emerging chemicals.

Within the SHINE project (2016-2019) we will carry out sampling and targeted analysis of emerging contaminants, e.g. brominated/organophosphate flame retardants, novel plasticizers and polymer additives, in dust and air of schools/daycare centers, homes and offices in various European countries and conduct non-target screening to identify additional contaminants and combinations of chemicals. To facilitate the nontarget high resolution mass spectrometry screening, existing information on chemicals found indoors will be compiled from various sources, e.g. the ECHA chemicals database, scientific literature. For the newly identified chemicals, the applicability and use of existing exposure models will be verified and modifications to the models will be proposed - if needed. Finally, the measured and modelled data will be compared to biomonitoring data from the literature and ongoing projects.