Chemical methods for prediction of bioavailability of persistent organic pollutants in solid environmental matrices

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Hydrophobic organic contaminants (HOCs) are ubiquitous in the environment but they have a tendency to accumulate in soil where they can pose serious risks. However, the toxicity of these contaminants in soils is not directly related to their total concentration and usually decreases with pollutant-soil contact time (aging). Therefore, the current way of risk assessment based on the total soil concentration overestimates risks because it assumes that the whole fraction is biologically available. Instead of the total concentration of a contaminant in soil rather its bioavailability should be measured. Bioassays can provide direct information on bioavailability, however, the methods are often laborious, time consuming, and associated with high variability. Therefore, chemical methods fulfilling the criteria of fastness, simplicity, and low costs (such as supercritical fluid extraction (SFE) or solid phase microextraction (SPME)) have been suggested to estimate risks of the polluted sites. However, so far our knowledge of the ability of SFE and SPME to reliably predict bioavailability is limited due to the low number of pollutants and samples tested. Our studies were, therefore, designed to include soils with significantly different properties that were spiked with various compounds and aged. Samples were extracted by means of SFE and SPME and extractability of the compounds from various soils was compared to the uptake by earthworms (*Eisenia fetida*). This design enabled us to reveal which soil properties drive bioavailability and extractability and if bioavailability can be estimated using the SFE or the SPME method.