**Early Identification of Organic Chemicals with a Potential for Long-Term Environmental Contamination**

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It is a challenging task to identify, among all chemicals on the market, those that may lead to long-term environmental contamination. Chemical-intensive economies have repeatedly caused environmental contaminations that remained undetected for years; a case in point is perfluorinated alkyl substances, which have been used since the 1970s but were found to be ubiquitous in the environment only after 2000. Because monitoring is always limited to a certain selection of chemicals, strategies for identifying priority chemicals are needed. We present such a procedure that starts from a computer-based screening for chemicals with a potential for long-term environmental contamination. This first step is complemented with field sampling of soils and sediments and application of analytical methods for identifying organic chemicals with log *K*ow values from 1 to 8. This procedure is applied to chemicals on the Swiss market; here we focuson the first step. Relevant chemicals were extracted from Swiss customs statistics and various lists of chemical products on the market (more than 17’000 substances). For 8953 (49%) of these, it was possible to retrieve their chemical properties. 2247 of these substances are halogenated and were further investigated because halogenation facilitates analytical detection (characteristic isotopic patterns). The environmental partitioning of these chemicals was characterized with a multimedia fate model for Switzerland; chemicals that partition predominantly (more than 90%) into soil or sediment were identified (469 substances). These include various fluorinated, chlorinated and brominated aromatic and aliphatic substances with highly branched substituents, ether and tertiary amine groups, trifluoromethyl groups, phosphate ester groups. In the second step, soil samples from 15 monitoring sites of the Swiss National Soil Monitoring Network were selected; the selected sites range from urban to semi-urban and remote soils in Switzerland. In addition, sediment sampling was performed in Lake Greifensee, located in a semi-urban area. Then, analytical screening based on extraction of the soil and sediment samples by pressurized liquid extraction is performed and followed by liquid chromatography coupled to high-resolution mass spectrometry. Suspect screening of exact masses of compounds possibly covered by this analytical method is carried out. By employing this approach, we intend to reduce the number of potentially relevant chemicals to a tractable number of substances that are of actual relevance in the region investigated.