Persistent Organic Pollutants (POPs)

How to Deal with Persistent Organic Pollutants (POPs)?

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The international negotiations (see Johannesburg, South Africa, December 2000 and Stockholm, Sweden, May 2001) about an 'International, Legally Binding Instrument for Implementing International Action on Certain Persistent Organic Pollutants' stimulated new interest in the environmental behavior of POPs and semivolatile chemicals in general, and also in the assessment procedures for such chemicals (reaching from scientific criteria to legal instruments). For these reasons, a series of articles with three main topics started in UWSF – Z. Umweltchem. Ökotox. and ESPR – Environ. Sci. & Pollut. Res.: (i) the international negotiations (Ed. K.-G. Steinhäuser), (ii) the application of the precautionary principle and socio-economic questions connected with the POPs convention (Ed. H. Hulpke), and (iii) scientific questions about the environmental behavior of POPs (Ed. M. Scheringer). The series began with an opening paper by W. Klöpffer and M. Scheringer in UWSF – Z. Umweltchem. Ökotox. 12 (6) 307-309 (2000), continued with five articles in UWSF No. 1–5 published to date in 2001, and will proceed with various contributions to the three topics appearing throughout the next two or three years either in UWSF (in German) or in ESPR (in English). An (extended) summary of each article will be published in the other respective journal. The summary of the opening paper was published in ESPR No. 1, 2001 (p. 63).

Biomagnification of Hexachlorobenzene

Influence of Uptake Routes in a Laboratory Test *

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Keywords: Bioaccumulation; biomagnification; foodchain; Gasterosteus aculeatus; hexachlorobenzene; sediments; *Tubifex tubifex*

Introduction

POPs (persistent organic pollutants) associated with aquatic sediments can pose a risk to aquatic foodchains since they can be re-introduced to the food web. One major pathway is the bioaccumulation of POPs by endobenthic, sediment-ingesting invertebrates (especially tubificide oligochaetes). These worms serve as food for benthivorous fish, which thereby ingest the sediment-borne chemicals and may accumulate contaminant concentrations far higher than from water exposure only, and transfer them to organisms of higher trophic levels.

Methods

In order to evaluate such a potential biomagnification, a laboratory test was developed. It consisted of a two-step foodchain including the sediment-dwelling, freshwater oligochaete *Tubifex tubifex* (Müller) and the three-spined stickleback (*Gasterosteus aculeatus*, Linné), a small teleost fish which often feeds primarily on benthic invertebrates. Artificial sediment and reconstituted water were used. To examine the influence of benthic prey on the bioaccumulation of a POP in the predator, fish were exposed to ^{14}C-labelled hexachlorobenzene via spiked water, spiked sediment, pre-contaminated prey organisms, and to combinations of these exposure routes.

Results

Summarising the results of these experiments, it could be shown that the exposure to HCB via different routes resulted in significantly higher accumulation in fish than exposure to single pathways. It was concluded that the major uptake routes for fish were the overlying water and the food, whereas the contribution of spiked sediment itself was relatively small. HCB was biomagnified in the tested laboratory food chain. Therefore, concerning secondary poisoning, the environmental risk assessment of POPs like HCB should not be based on existing bioaccumulation tests alone, since they are focussing only on exposure via the water pathway. Instead, the influence of food and sediment as exposure routes should be considered as well, using comprehensive foodchain modelling and/or laboratory studies.

Acknowledgement. Financial support was kindly granted by the German Federal Environmental Agency (R+D-No. 296 28 308).

* The full paper is published in UWSF – Umweltwissenschaften und Schadstoff-Forschung / Z Umweltchem Ökotox (in German) Vol 13, No 5, 2001 and can also be called up and cited by way of the DOI: http://dx.doi.org/10.1065/uwsf2001.08.065