Editorial

Long-Range Transport in the Environment

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The occurrence of pesticides and other industrial chemicals in remote regions of the earth, e.g. the arctic, has given rise to international public concern. These substances have never been emitted in such regions and, thus, must have been transported over long distances from moderate or even tropical climatic zones. The concentrations found in humans, marine and terrestrial organisms are surprisingly high, indicating a high potential for bioaccumulation, in particular in fat tissues. Moreover, these substances have been known for a long time to be chronically toxic to humans and many organisms and populations. Carcinogenic and mutagenic effects, as well as adverse effects on the endocrine and reproductive system, have been reported. Polar ecosystems are particularly vulnerable because they rely on specialized food chains with a high biomagnification potential. Chemicals can be transported over long distances in both air and water, provided they are persistent and semivolatile. Persistence alone is not sufficient for a long-range transport potential (LRTP) in air and water. The inter-media mass exchange processes between air, water, soil, and sediment, and the transformation in these media under spatially and temporally variable environmental conditions, has to be taken into account to determine the transport and fate of such substances. Atmospheric wind and turbulence, as well as ocean currents, are the driving forces for the global distribution. Temperature plays an important role in the explanation of high concentrations found in the arctic (cold condenser effect).

Mobility, in particular the long-range transport, cannot be assessed by single laboratory data as it is done, for instance, for the bioaccumulation or toxicity. An environmental systems approach is required which takes into account all relevant processes that determine the environmental transport and fate. The simultaneous processes can best be integrated by means of multimedia models. Regional and global variations can be realized by various approaches, e.g. by extending the regional model or linking boxes of several climatic zones. Full global 3D-circulation modeling can be used to explain the measured environmental concentration pattern. Such models have to be verified and validated to provide confidence concerning the conclusions drawn for regulatory purposes. Up to now, monitoring data which can be compared with calculated concentrations over longer periods of time are scarce. However, modeling and monitoring are the two complementary parts of the exposure assessment of

chemicals. This is particularly important when dealing with the complex system of the long-range transport of pesticides and other pollutants. Due to the complexity of the processes involved and the multitude of chemicals involved, the scientific basis for understanding the global fate has not yet been fully established. Screening models, indispensable for regulatory purposes, should provide a stable ranking and classifying of substances. They are also of particular importance in the process of identifying further Persistent Organic Pollutants (POPs). The UNEP-POPs convention, signed in May 2001, only provides an assessment framework that has to be specified in terms of scientific criteria. Among them is the LRTP, which is proposed as an intrinsic environmental property of a chemical which has to be used for regulation.

The Society of Environmental Toxicology and Chemistry of Europe (SETAC Europe) held its annual meeting in Madrid 6–10 May 2001. One session was devoted to the 'Long-Range Transport of Pesticides and Other Pollutants' and was chaired by the editors of this issue. It was the 3rd SETAC activity related to the LRTP following the Pellston Workshop on 'Criteria for Persistence and Long-Range Transport of Organic Chemicals in the Environment' and the special symposium on 'Spatial Aspects of Exposure Modelling' at the SETAC Europe 1999 Annual Meeting in Leipzig. All together 11 platform papers and 13 posters were presented. Eight of them were submitted and selected for publication in this issue. The presentations covered both topics, modeling and monitoring. The session was attended by many participants, thereby demonstrating the great interest in this topic shortly before the POPs convention was to be signed at the end of May, 2001 in Stockholm. The discussions were very vivid, which made the work of the chairpersons easy.

The editors would like to thank Otto Hutzinger, the editor-in-chief, and Almut Heinrich, the publisher editor of the ESPR, who provided us with the space for publishing this interesting issue. They continuously supported the editing process which has made it possible to publish this issue shortly after the meeting. It was a great pleasure to work with them.

Thanks must also be extended to the organizers of the meeting who provided the forum for this challenging scientific field. We hope that the contributions and discussions will serve to stimulate further research on the global transport and fate of pesticides and other chemicals.