



Book review

PERSONAL CARE COMPOUNDS IN THE ENVIRONMENT
Pathways, Fate, and Methods for Determination

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with the contributions of

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The book *Personal care compounds in the environment. Pathways, Fate, and Methods for Determination*, focuses on the ingredients in personal care products such as: polycyclic musk fragrances, household bactericides, organophosphate flame-retardants and plasticizers, endocrine-disrupting agents that enter the aquatic environment mostly via sewage treatment plants (STP). This analysis is justified by the large quantities of these compounds used annually, up to thousands tons annually, most of them applied in the neighborhood of water streams. For each substance, data on toxicity and bioaccumulation in various systems is given.

The book includes five parts, preceded by Preface, Acknowledgment, List of Contributors, List of Abbreviations, and followed by References and Subject. It gives a new insight into elimination mechanisms of xenobiotics in sewage treatment as well as on the study of the persistence of organic compounds in limnic and marine ecosystems.

In the contents of Chapter 1, an introduction to sewage treatment plant functions is provided, as well as enantioselective analyses applied in environmental research (gas chromatography, HPLC), in some cases for chiral compounds, to identify biodegradation under the assumption that only biodegradation can result in a chiral shift.

Chapter 2, *Environmental Studies: Sources and Pathways* approaches first some important aspect regarding synthetic fragrance compounds in the environment (such as polycyclic musk compounds), used frequently in washing powders, shampoos, and other products that require a pleasant smell. It is stressed that they are used in Europe in a large quantity of 2000 t annually. The studies detailed in the contents of this chapter are devoted to find high

rate elimination ways for a large, mixed-purpose plant as well as to determine whether sorption or degradation was the dominant process for polycyclic musk fragrances removal. The experimental background, mass balance assessment, sampling are topics approached in order to study the polycyclic musk and other musk fragrances behaviour in sewage treatment plants, surface waters, marine environment, and other environments.

Another topic refers to the bactericide Triclosan, considering also its transformation products (such as Methyl Triclosan) in the aquatic environment (sewage treatment plants, sewage sludge, surface waters) and other environments.

UV filters are discussed as products used in sunscreen creams to protect the skin against burns and possibly skin cancer, or in a multitude of cosmetics for various reasons (increased shelf life). Such products are discussed considering their endocrine properties, their behaviour in the aquatic environment, the enantioselectivity.

Organophosphates flame-retardants and Plasticizers are analyzed and balanced in relation with the ability of sewage treatment to eliminate these compounds from the wastewater. Because several organophosphate flame-retardants and plasticizers were demonstrated not to be eliminated in considerable amounts from wastewater treatment plants and therefore can be found in large amounts in surface waters, some problems are highlighted when the production of drinking water from surface water or enriched groundwater is required. The study offers three cases of waterworks that treat water from Ruhr River which contains up to 30% wastewater during the summer.

Endocrine-disrupting agents that include chemicals which interfere with the hormonal activities, cycles, or receptors of animals and mankind are assessed in wastewater treatment plants, and other environments. The study shows that steroid hormones and macrolide antibiotics are released into environment via the pathways of humans, urine, wastewater etc. Heavy rainfall events, which resulted in high wastewater flow rates led to a failure of the biological treatment of these compounds. The steroid hormones could not be eliminated by means of the trickling filters during wastewater treatment that should be replaced with more advanced treatment techniques.

Endocrine-disrupting agents such as nonylphenols and nonylphenol-polyetoxilates are present in some waters, sediment samples at concentrations near those for which effects have been described in the content of the chapter. They are transported at least several kilometers into the sea. These compounds are persistent and this leads to a discussion whether they should be treated as priority pollutants.

Benzothiazoles are included in this study considering the aquatic environment because they may be considered as an indicator for rubber wear-off, which is also a type of lifestyle indicator closely connected to automobile traffic. Some compounds were studied and quantified in water samples from the German Bight of the North Sea.

Chapter 3, *Analytical Chemistry Method*, describes applied methods in more depth and compound-specific information is given.

Gas-chromatography is applied for lipophilic compounds from fresh and wastewater. Sampling and extractions are fully described. Also, HPLC-MS/MS analysis is applied for steroid hormones, their aducts and macrolide antibiotics from wastewater. The methods were tested for several wastewater samples in order to investigate the fate of hormones and antibiotics during wastewater treatment.

An important part is dedicated to seawater analysis for organic micropollutants such as polycyclic musk compounds, chloroanilines, benzithiazole derivatives etc., considered quite difficult because the target concentrations are very low. A second group of methods were made available as suitable for less lipophilic compounds and reliable on high-volume solid-phase extraction of the respective seawater samples.

These analyses revealed the presence of a large variety of potentially harmful substances, some of which known as pollutants in river systems.

Also, sewage sludges have been analyzed as final dewatered sludges after anaerobic stabilization. Real sludge samples from four different origins were analyzed in comparison with four extraction procedures.

In Chapter 4, *Discussion*, ample considerations are made on the sewage treatment plants process and its improvement based on the results presented in the book.

The studies performed within this program showed that in some cases transformations and possibly mineralization are important processes. Also, some compounds were not eliminated at all in the studied sewage treatment plants. Future optimization of STP performance will require the data from this book, together with a better understanding of the basic processes of elimination of organic micropollutants (xenobiotics). There are recommended some management options for different elimination mechanisms: sorption, oxidative biotransformation, reductive transformation, oxidation procedures.

The fifth part of the book, *Summary*, wraps up the studies on the fate of xenobiotics, focusing on some personal care compounds and strategies in wastewater treatment to control and remove these substances.

The List of References includes a great number of works, the large majority being published after 2000.

As the author has shown in Preface, *This book consists of datasets from diverse projects with different backgrounds. Some are related to wastewater, some to drinking and some to surface and marine waters, while some are pure method development.*

The book is a very valuable informative and scientific tool for scientist, students, as well as other people interested in this topic.

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