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## Ecotoxicology: Conventional and new topics and methods



This issue contains in total 15 studies and reviews from more than 30 research institutions in 13 countries. The contributions cover a broad variety of topics. Investigations of the consequences of the contamination of environmental compartments with genotoxins started already more than 60 years ago and “ecogenotoxicology” is still an important discipline in genetic toxicology. The release of DNA damaging chemicals and radiation which interfere directly or indirectly with the functions and the structure of the DNA may lead to persisting mutations, cause cancer and teratogenic effects and may affect the fertility of species in the environment and lead to destabilization of ecosystems [1–3].

Plants are used since many decades as indicator organisms in this field. It was shown that they detect the effects of pesticides and herbicides, ionizing radiation and industrial chemicals and air pollutants [4–6]. It is interesting that they are more sensitive towards certain environmentally relevant genotoxins which are difficult to detect in other test systems [4] such as heavy metals and also radionuclides [7]. The present special issue describes the results of experiments with a moss species, which was rarely used [8], an in situ radiation study with the Scots pine [9] as well as „classical“ root tip experiments with *Alium*, *Nicotiana* and *Vicia* [10,11].

For the investigations of aquatic ecosystems, bivalves are among the most suitable indicator organisms [12] and experiments with two widely used species namely *Dreissena* (zebra mussel) and *Mytilus* (common or blue mussel) can be found in this volume [13,14]. Also fishes can be used to study genotoxic effects in sweet water and marine ecosystems [15,16]. The present issue contains an interesting study with a fresh water fish (streaked prochilod) [17] and a review which focuses on the use of cell lines from teleosts which can provide relevant information on potential effects in fish [18].

An important topic which was addressed in numerous studies in the past concerns the impact of water treatment procedures (chlorination, ozonation and UV radiation) on formation of mutagens. Most studies were realised with a bacterial indicators [19,20] and epidemiological investigations with humans demonstrated that chlorination by-products may led to bladder cancer [21]. Furthermore, the present volume contains additionally an review concerning the impact of UV light on DNA stability and its consequences in amphibians [22]. The investigation of soils has always been a problem in the past due to difficulties in the extraction and characterisation of contaminants. Interesting new approaches are the use of lizards [23] and earthworms [24]. Air pollution was mainly investigated by collection and extraction of particles and most investigations were performed with bacterial indicators, in some studies also mammalian cell lines and higher plants were used [25–28].

The most commonly used parameters of DNA damage in the field of ecogenotoxicology are at present measurements of the comet formation

(in single gel cell electrophoresis assays) and induction of micronuclei. Both methods can be used in experiments with a broad variety of organisms, including bivalves [13,14], fish [17], reptiles [23] and also in lower [8] and higher plants [9,10]. A newer approach which enables the detection of double strand breaks is based on the measurement of the acetylation of a specific histone ( $\gamma$ H2A) [29]. The current issue contains a contribution which describes the use of this approach for the detection of DNA damage in mussels [13]. Investigations concerning epigenetic alterations are conducted increasingly worldwide to understand the impact of toxic chemicals on gene transcriptions patterns [30]; however, they are still rarely used in environmental studies. This volume contains several interesting chapters in which changes of methylation patterns were studied in environmentally relevant organisms [8,9,23].

The contributions in this issue reflect the importance of specific “hot topics”; such as environmental pollution with nanoparticles [8,11] and cytostatics. The potential adverse effects of anticancer drugs in organisms from different trophical levels were studied recently in two large coordinated projects of the European Union (“Cytothreat” <http://www.cytothreat.eu/> and “Pharmas” [www.pharmas-eu.net](http://www.pharmas-eu.net)) and numerous articles appeared which concern this topic. In the present volume, a study is included which concerns the effects of extracts from plants (on DNA damage in lymphocytes) which had been irrigated with waters which that were contaminated with different widely used anticancer drugs [31]. Issues, which are of concern since many years that are addressed in this volume are pollution of the environment with radionuclides [9], the effects of insecticides/herbicides in particular of glyphosate [32] and of heavy metals [10], as well as air pollution with polycyclic aromatic hydrocarbons and other genotoxins [28,33].

The editors hope that readers will find this special issue informative and that it will inspire them to conduct further research aimed at understanding the effects of the release of genotoxins in the environment and to prevent adverse effects in humans and ecosystems by contamination of the biosphere with DNA damaging agents. Furthermore, we anticipate that this volume will stimulate the development of regulations concerning the release of genotoxins which may cause long lasting transgenerational effects by environmental organisations and authorities.

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