



Biological responses of aquatic organisms and assessment water contamination and ecotoxicity

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This special issue of Environmental Science and Pollution Research highlights selected papers presented at the annual Workshop of the Fundamental and Applied Ecotoxicology Society (SEFA) which was held on 29–30 June 2016 at Reims (France) and organized by the Environmental Stress and Aquatic Biomonitoring unit (UMR-I 02 SEBIO). This learned society is open to representatives from all sectors of activity—research, the industry, administrations, education, testing laboratories, health professions, etc. Its purpose is to federate specialists in that discipline and in the fields related to ecotoxicology such as environmental chemistry, ecology, microbiology, biostatistics, and modeling. The SEFA aims to promote indispensable collaborations and exchanges among environmental specialists involved in ecotoxicology. More than 80 experts and scholars attended this conference. Thirty-two oral presentations and 29 poster presentations were given during the conference. The topics include, but not limited to:

- Change of scale: from cell to population
- Embryotoxicity/reprotoxicity
- Ecosystem monitoring
- Contamination and transfers
- Innovative approach and new tools in environmental research

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Marine and continental ecosystems are subjected to many stresses related to human activities because they emit a large number of molecules whose toxicological and ecological effects are currently poorly studied. Assessing water quality is a real challenge for the authorities. Additionally, in a changing world (extreme events, amplified seasonality, etc.), it is crucial to adapt water management actions with a view to protecting sensitive human populations as well as biodiversity and ecosystem services such as drinkability or recreational uses. To preserve the quality of resources, it appears necessary to specify the effects of environmental contamination (chemical and biological) on water quality. In this context, the application of the European Water Framework Directive (WFD; Directive 2000/60/EC) for the monitoring of water chemical contamination involves two main objectives based on (1) the assessment of the chemical status of water bodies and (2) the evaluation of the temporal trends of contamination in the different environmental compartments of aquatic ecosystems. As water is a fluctuating medium, its chemical status does not reflect the true hazards for populations and ecosystems. Moreover, the effects on aquatic populations fail to provide predictive information for adequate hazard management. However, to check the compliance of chemical analyses with Environmental Quality Standards (EQSs), the biota appears as a new interesting matrix. Similarly, the biota is proposed as an integrative matrix and recognized as a preferential matrix for several substances (Directive 2008/105/EC) in the monitoring of contamination trends. In fact, aquatic organisms can concentrate and retain substances in their tissues for a long time. Therefore, proposing aquatic organisms as a tool to assess water quality represents an interesting integrative method. Furthermore, even if analyses of bioaccumulated pollutants have the great advantage of

evidencing the bioavailable fraction of xenobiotics, they provide no information about their potential biological effects. Therefore, the relationship between exposure to pollutants and adverse effects is of growing importance in environmental risk assessment and management. In this way, the response of sentinel species at a sub-individual level could be recognized as an early-warning system to monitor the degree of contamination and also the associated risk.

This special issue cannot fully reflect all the studies and research works presented at the SEFA annual Workshop. So the special issue highlights 11 selected papers which address the assessment of bioavailability, bioaccumulation, and transfer (including trophic transfer under fluctuating environmental parameters such as temperature and pH) of various contaminants (mainly trace metals) present in different compartments (water, sediment, food) to organisms and their usefulness as bioindicator species. In addition, the responses of organisms exposed to these different contaminants were investigated at different biological levels including detoxification mechanisms, DNA integrity measurements, or the modification of different functions (digestion, spermatogenesis) and life history traits. Furthermore, several papers characterize the measurement of these biological effects (genotoxicity, reprotoxicity) with a view to a potential application to in situ aquatic biomonitoring surveys. Finally, one paper presents MOSAIC, a user-friendly web interface dedicated to statistical analyses in ecotoxicology.



Dr Melissa PALOS LADEIRO, Ph. D, is associate professor at the University of Reims, France, in the SEBIO research unit (URCA). Her expertise concerns the environmental monitoring of the continental aquatic environment through the analysis of biological responses of organisms. In particular, she aims to highlight the chemical and/or biological contaminations and its effects following immune markers in zebra mussel. Currently, her researches develop the proteomic approach (global and targeted) in view to characterize the immune function (molecular and cellular) of zebra mussel relative to biological contamination. She was involved in the coordination of seven national and three regional projects since 2011.



Pr Alain GEFARD is Professor at the University of Reims and head of the unit SEBIO (UMR-I 02 Environmental Stress and Aquatic Biomonitoring). He obtained his PhD in 2001 and his ability to supervise research (HDR) in 2008 in the field of aquatic ecotoxicology. Current research activities are oriented on (i) the use of invertebrates as bioindicators of chemical and biological contamination and (ii) the use of biological responses as biomarkers in a biomonitoring survey. He is in charge of the scientific coordination of research projects, such as “Mollusc Bivalves as inDICators of contamination of water bodies by protozoan parasites” (ANR PRCE, MOBIDIC, 2016–2019) or “Development of an integrated approach for the diagnosis of Meuse water quality” (INTERREG FWVL, 2017–2019).