Interactive effects of climate change and contaminants: environmental risks and human health implications

Elisabeth Maria Gross, Antonio Manuel Barros Marques, Arnaud Elger

Tuesday May 24, 8:15 AM - 10:15 AM, Salle 150

Most ecosystems are no longer controlled by earth processes but by human activities. Anthropogenic activities are responsible for effects at the global, regional and local scale: Climate warming as a global event and the local release of numerous pollutants are two of multiple stressors acting at such different spatial scales. Thus, multistressor studies combining the effects of climate change and chemical pollution are of paramount importance to understand possible additive, synergistic or antagonistic interactions from the organism to ecosystem levels, both in aquatic and terrestrial environments. Temperature increase, extreme meteorological events and additional greenhouse gas emissions are only some climate change consequences that can modify contaminant availability and its modes of action in a compound-specific way. The present session proposal would welcome original presentations (posters and platform) tackling effects of pollutants in climate change contexts at relevant levels. This includes studies at the cellular and individual level, such as bioaccumulation and bioavailability, the capacity to metabolize contaminants and physiological, behavioural and toxicological responses, including studies focusing on human health and safety aspects. We also aim for contributions working at the community or ecosystem level, working a different levels of complexity such as trophic interactions or complex food webs, taking into account relevant ecosystem processes. Each accepted contribution will be asked to provide answers to the following questions:

1) Which were the most sensitive endpoints in your study?

2) Did you observe an interaction between the target stressors?

3) Can you suggest measures to minimize potential risks of multistressor scenarios?

Multiple stresses in aquatic ecosystems: Assessment of stress response and its consequences in organisms

Claudia Wiegand, Laure Giamberini, Catherine Mouneyrac

Thursday May 26, 8:15 AM - 12:50 PM, Auditorium 800

Despite the effort to improve water qualities within the EU-WFD, structure and functioning of too many aquatic ecosystems are not yet in a good ecological status. Anthropogenic impact occurs not only via the introduction of harmful chemicals from various sources and eutrophication, but also by degrading the habitat structure, and facilitating introduction and spreading of invasive species. Hence aquatic organisms face stress being simultaneously or sequentially exposed to a variety of chemicals plus confounding physical factors (temperature, salinity, habitat degradation, etc.), and biological impacts (such as invasive species, food availability, pathogens).

Although multiple stress approaches have received growing interest in the last decade from researchers and stakeholders within the field of environmental sciences and management, knowledge is still lacking particularly concerning methodologies for studying complex systems or realistic environmental conditions. The understanding of the consequences of a variety of simultaneously occurring environmental stressors is essential to develop predictive capabilities and response strategies by scientists and the authorities.

A wide-ranging set of biomarkers, most of which at the subcellular level, enables to assess adverse effects of harmful substances in a variety of organisms. For comprehensive assessments, multi-biomarker batteries are frequently applied. Recently, the addition of indices assessing the consequences for the organism in terms of e.g. energetic resources, growth, reproduction success, or population densities, enable to better predict outcomes for higher organization level addressing the environmental relevance of the stressors.

This session welcomes investigations of the ecological relevant scenario of aquatic (limnic and marine) organisms facing multi-stress by being exposed to a mixture of chemicals in the context of confounding factors. Both laboratorial and field studies are welcome. Emphasis will be on the possible consequences for the organism, and higher organization levels, such as population, for example by modeling approaches (DEB-Tox theory or similar) in order to contribute to a powerful risk assessment.

Natural toxins: an on-growing challenge for environmental research, monitoring and management

Gemma Giménez Papiol, Nina Cedergreen, James M. Lazorchak, Karina Knudsmark Jessing

Monday May 23, 8:15 AM - 10:15 AM, Salle 150

Natural toxins are here defined as toxic compounds produced by organisms other than humans. Natural toxins embrace a highly diverse group of chemical compounds. Some of them, as for example toxins produced by microalgae (also known as marine toxins, cyanotoxins, etc.) or fungi (micotoxins), are known to be a threat to human health whether through consumption or direct exposure. In addition, they can also pose a threat to the ecosystems where they are produced, and usually there is no mitigation action available after exposure. Other natural compounds are currently used as alternatives to pesticides. Labelled as "bio" due to their natural origin, they are considered safer and their use is increasing, despite the scarcity of data on their actual toxicity and impact on human health and the environment.

The research on natural toxins has many challenges compared to manmade chemicals. As their production depends on the living conditions of the species producing the toxins, their availability, accumulation and fate can be hard to predict. The environmental conditions are one of the main drivers of microalgae proliferation; it is likely that the forecasted climate change and water shortages will have a dramatic impact on harmful algae blooms (HABs). In addition, the internationalization of food and feed trade has increased the storage and packaging of many goods, thereby favouring fungi growth. Due to consumers perceiving naturally produced pesticides to be safer than synthetically produced pesticides, combined with a less strict regulatory procedure for many bio-pesticides (including a lack of limit values for residues in food and the environment), sales of "bio-pesticides" are expected to increase in the future.

The number of natural toxins keeps on increasing, with new ones produced by microorganisms or metabolites produced by other organisms after up-taking the toxins. Research, monitoring and management on natural toxins demand a multidisciplinary and interdisciplinary approach, in order to monitor, prevent and eventually solve the challenges they pose to ecosystems, human health and economy. Impacts of HABs and fungal toxins can be found worldwide in fresh and marine waters; however, some emerging toxins or the use of the so-called biopesticides are not yet regulated, consequently they should be more carefully evaluated in order to better understand their distribution and the real hazard they represent.

The aim is to establish the state of the art of the environmental risk of this group of chemicals in comparison with the more traditional chemicals for which risk assessments and legislations exists, and identify the gaps in knowledge, management and research needs in this field.