Bioanalytical Tools for the Assessment of Mixtures of Organic Micropollutants in Water, Sediment, Biota and People

Beate I Escher

UFZ Helmholtz Centre for Environmental Research – UFZ, Germany

Eberhard Karls University Tübingen, Germany

[*] Tel: +49 341 235 1244, E-mail: beate.escher@ufz.de

Chemical pollution is an increasing threat to our environment. The impact of chemical pollution will be amplified by population growth and, possibly, by some of the effects of climate change. However, conventional chemical monitoring programs have been criticized on the basis that they cannot include the full range of chemical pollutants that could occur in the environment including transformation products, and they do not account for the combined effects of mixtures of chemicals. Bioanalytical tools may therefore complement chemical analysis for cost-efficient monitoring. Bioanalytical tools are cell-based bioassays that target specific mechanisms of toxicity and give a measure of the toxicity of mixtures of known and unknown chemicals, such as persistent organic pollutants, pesticides, industrial chemicals, pharmaceuticals and their transformation products. Bioanalytical tools provide measures of the cumulative effects of chemicals that exhibit the same mode of toxic action, for which the selected bioassays are indicative plus they can give a measure of the cytotoxicity of all chemicals acting together in an environmental sample. For cell-based bioassays, which are often run in high-throughput on 384 multiwell plates, understanding of dosing and exposure of the cells is vital for a quantitative link to concentrations of chemicals in the sample. Case studies on the application of bioanalytical tools for water and biota will illustrate combination of sampling and dosing for a quantitative assessment of the mixtures of pollutants. Iceberg modelling will help to understand which fractions of the chemical pollution are known and which are unknown.