DISTRIBUTION AND EFFECTS OF PERFLUOROOCTANE SULFONIC ACID (PFOS) IN AQUATIC ORGANISMS

Van de Vijver Kristin[1], Philippe Hoff[1], Freddy Dardenne[1], Walter Van Dongen[2], Eddy Esmans[2], Ronny Blust[1] and Wim De Coen[1]

[1] University of Antwerp, Department of Biology
Groenenborgerlaan 171, 2020 Antwerpen, Belgium
E-mail: inneke.vandevijver@ua.ac.be

[2] University of Antwerp, Toxicological Center
Universiteitsplein 1, 2610 Wilrijk, Belgium

Until now environmental exposure assessment was primarily focussed on organochlorine compounds, pesticides and heavy metals. Recent studies have indicated that fluorinated organic compounds (FOCs), and especially perfluorooctane sulfonate (PFOS), occur worldwide in the environment and show high persistence. Only little information is available on the degree of PFOS pollution and distribution in Western European marine and estuarine ecosystems. Scarcely documented effects on representative aquatic organisms hamper reliable hazard assessments of these chemicals. With the present study we address aspects of both exposure and effects assessment. In the first part, we evaluated the presence of PFOS in marine and estuarine organisms from the Southern North Sea and the Western Scheldt Estuary. We determined, for the first time, the PFOS-exposure levels for vertebrate and invertebrate biota from these ecosystems. During several field campaigns in 2001 and 2002, *Crangon crangon*, *Carcinus maenas* and *Asterias rubens* were collected. Tissue samples were analysed using a high performance liquid chromatography tandem mass spectrometry (HPLC/MS/MS) method. All samples that were analysed contained detectable concentrations of PFOS (>10 ng/g). The results show the existence of a PFOS pollution gradient in organisms along the Western Scheldt Estuary, with the highest concentrations close to the harbour of Antwerp. In the second part of the study, cellular receptor-reporter assays were used to unravel the toxicological mechanisms of fluorinated compounds. Thirteen different bacterial transgenic strains were tested to evaluate the cellular toxicity and mode of action of perfluorinated sulfonic acids and carboxylic acids with varying chain length. Although the results of these assays cannot be extrapolated towards the marine and estuarine ecosystem, they provide mechanistic information on relevant toxicological interactions. The effects studied included oxidative stress, heat shock response, DNA damage, DNA adduct formation and membrane disturbance. PFOS and its related compounds are causing multiple effects: membrane disturbance, oxidative stress and DNA damage. It seems that the observed effects depend on the chain length of the hydrophobic tail. The present study generated crucial new insights which will be used to further characterise the potential hazard of fluorinated organic compounds in marine and estuarine ecosystems.