Macro, micro and nanoplastic pollution in the aquatic and terrestrial environments: Sources, fate, exposure and ecological and toxicological impacts

CHAIRS: Heather Leslie, Dick Vethaak

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Plastic pollution represents one of the most significant environmental problems facing mankind. The topic of both macrosized and microsized plastic litter has been caught the spotlight of environmental scientists, NGOs, industry, policymakers, media, artists and the general public worldwide. Through global partnerships to reduce marine litter, actions are now being put into place to achieve the goals of marine litter reductions which the world committed itself to at Rio+20 in 2012. In the EU, the Marine Strategy Framework Directive's Descriptor 10 of Good Environmental Status gives Member States another reason to measure, monitor and mitigate their emissions of both macro and microsized plastic litter to the marine environment. The scientific community welcomes the attention to this pollution issue and is rapidly building up novel methods and new knowledge on the fate, distribution and effects of plastic pollution that results from insufficient resource efficiency in a world that consumes 100 million tonnes of plastic annually. Plastics are of concern both for their chemical toxicity associated with the toxic additives and monomers often found in plastic products, and the adverse ecological and toxicological effects caused by the solid materials themselves. To date much of the focus has been on the massive accumulation of plastic debris and its degradation products (secondary microplastics) in marine ecosystems. Pioneering scientists are starting to investigate the possibility of exposure to plastic in freshwater systems, which at the same time function as transport routes to the sea. Wastewater treatment plants have been identified as a potential source of microplastics, as many plastic particulates can be found both in sewage sludge and the treated effluents. The extent and effects of plastic pollution on terrestrial ecosystems is currently not known, although it is expected particularly in areas where biosolids are applied to agricultural lands that there will be elevated microplastic levels since these materials are extremely slow to mineralise. While scientific evidence illustrates the presence and potential dangers of microplastics in the marine environment, much must still be elucidated on the mechanisms and modes of toxic action and which kinds of species are at the greatest risk of being adversely affected. Microplastics might be a vector for hazardous substances because they can sorb persistent, bioaccumulating and or toxic chemicals (e.g. POPs, endocrine disrupters). Thus, plastic particles may facilitate the entrance of these substances into the food chain, potentially threatening human health both chemically and by particle toxicity. The session focuses on the current state-of-the-art methods and knowledge from multiple disciplines about the occurrence and fate of plastic over the full size range in the marine, freshwater and terrestrial environments. Abstracts are welcome on the following topics: distribution, sources, transport routes, bioaccumulation, food chain studies, impacts and effects of micro and nanoplastics, quantitative and qualitative methods of sampling and analysis, assessment of unkonwn plastic types and quantities, polymer degradation and breakdown, chemical sorption and leaching, and modelling.

Keywords: (Micro)plastics Nanoplastics Monitoring Analytical method development bioaccumulation MSFD particle toxicity

SESSION TYPE: Platform and Poster