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Ecotoxicology of PFAS

Abstract

Widespread environmental contamination of per- and polyfluoroalkyl substances (PFAS) is well-established in various environmental matrices such as soils, sediments, and groundwater. Among PFAS, perfluorooctane sulfonate (PFOS), has received considerable regulatory, scientific, and even public attention and is phased out by 3M in 2000. Despite this, PFOS has been detected in several environmental samples and was listed by the Stockholm Convention as persistent, bioaccumulative, and/or toxic chemical in the year 2009. The regulatory developments for PFAS are largely focussed on human health, while the ecological receptors received less attention. The main challenge is to determine the potential risks of PFAS present in the environment and to environmental receptors. Most ecotoxicological studies for PFOA and PFOS were conducted using few test species like earthworms, zebrafish, chicken, nematodes, and aquatic plants by focussing on the traditional toxicological endpoints such as growth, reproduction, mortality and biochemical effects. Nevertheless, the studies on the toxicity of PFAS, especially cyto-genotoxic potential to higher plants and aquatic invertebrates such as water flea (*Daphnia*), a sentinel organism, are not often explored. Therefore, we investigated the chronic toxicity of PFAS on water-flea (*Daphnia*) using environmentally relevant concentrations. In addition to this, the cyto-genotoxic effects of PFAS to onion *Allium cepa* root meristem cells was also studied. Our results showed that PFOS, even at ppb concentration, can adversely affect the reproduction of water-flea. The results of this study have significant implications for the risk assessment of PFAS in aquatic ecosystems.