Mixtures of chemical pollutants at European legislation safety concentrations: how safe are they? - DTU Orbit (31/12/2018)

Mixtures of chemical pollutants at European legislation safety concentrations: how safe are they?
The risk posed by complex chemical mixtures in the environment to wildlife and humans is increasingly debated, but has been rarely tested under environmentally relevant scenarios. To address this issue, two mixtures of 14 or 19 substances of concern (pesticides, pharmaceuticals, heavy metals, polyaromatic hydrocarbons, a surfactant, and a plasticizer), each present at its safety limit concentration imposed by the European legislation, were prepared and tested for their toxic effects. The effects of the mixtures were assessed in 35 bioassays, based on 11 organisms representing different trophic levels. A consortium of 16 laboratories was involved in performing the bioassays. The mixtures elicited quantifiable toxic effects on some of the test systems employed, including i) changes in marine microbial composition, ii) microalgae toxicity, iii) immobilization in the crustacean Daphnia magna, iv) fish embryo toxicity, v) impaired frog embryo development, and vi) increased expression on oxidative stress-linked reporter genes. Estrogenic activity close to regulatory safety limit concentrations was uncovered by receptor-binding assays. The results highlight the need of precautionary actions on the assessment of chemical mixtures even in cases where individual toxicants are present at seemingly harmless concentrations.

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