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Editorial: Toxic effects and ecological risk assessment of typical pollutants in aquatic environments

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Editorial on the Research Topic
Toxic effects and ecological risk assessment of typical pollutants in aquatic environments

Aquatic pollution caused by anthropogenic activities has been one of the major environmental problems worldwide for decades. Rapid industrialization and urbanization is releasing "traditional" and emerging pollutants into waters in unprecedented quantities and diversity, ultimately endangering biodiversity and human health. Meanwhile, the management and control of risks from chemical pollutants, with varying scientific composition, stringency, and efficacy, are being practiced in different countries and regions. A limiting factor for effective ecological risk assessment and management is the lack of knowledge of exposure, bioaccumulation, toxic effects, and mode of action of various types of pollutants in waters with contrasting physicochemical properties. For example, metals' environmental behavior and bioavailability are highly dependent on their speciation and water chemistry (e.g., organic matter, pH, and hardness), thus requiring site-specific risk assessments. In comparison, organic pollutants are also highly complex in terms of toxicity prediction and risk assessment due to their infinite structural diversity and mode of action. Due to different physicochemical properties and interactive effects of pollutants, the biological impacts and toxicity mechanisms of pollutants in the natural environment are more complex, posing challenges to risk assessment. Therefore, studies on the toxicity mechanisms and ecological risk assessment of typical pollutants in aquatic environments are required.

This special issue aims to highlight recent advances in research on the toxic effects and ecological risk assessment of typical pollutants in the aquatic environment. It primarily

addresses bioaccumulation, biomonitoring, toxic effects, and ecological risk assessment and control of traditional and emerging pollutants. The articles submitted to the journal were carefully selected, thus offering a high-quality collection. A total of eight articles have been accepted, and are listed below.

Wang et al. presented a paper entitled "Nano-TiO_2 adsorbed decabromodiphenyl ethane and changed its bioavailability, biotransformation and biotoxicity in zebrafish embryos/larvae". This study found that nano-TiO_2 affected the decabromodiphenyl ethane's (DBDPE) behavior in the aqueous phase and increased the bioavailability and biotoxicity of DBDPE in zebrafish embryos and larvae. These results provide a new perspective on the environmental behavior and toxicity of DBDPE.

Sun et al. presented a paper entitled "Differential comprehensive effects of food quality and ZnO nanoparticles on the key traits of early life history of *Daphnia magna*". In this study, the combined effects of poor-quality food and nanoparticles on the development and early reproductive performance of cladocerans were evaluated. The authors found that the low nutritional quality of the non-toxic *Microcystis* and ZnO NPs had significant synergistic effects on some key life history traits of *D. magna*, whereas only showed an additive effect on other life history indicators. These findings are helpful in realistically evaluating the comprehensive stress effect on zooplankton under complex conditions and exposure to coexisting pollutants.

Laine et al. presented a paper on the ecotoxicological effects of perfluorooctanoic acid (PFOA) and perfluorohexanoic acid (PFHxA) on freshwater microbial community. They compared the effects of regulated long-chain perfluorinated carboxylic acid (PFCAs) and PFOA, nonregulated short-chain PFCA, and PFHxA, on the diversity, structure, microbial growth, and activity of a freshwater microbial community. The results showed that both compounds at high concentrations altered bacterial structure but did not affect the diversity. The bacterial biovolume was inhibited by these compounds, while the inhibition of activity *via* measuring cell respiration could not be demonstrated. The authors indicated that future experiments should aim to understand how the microorganisms adapt to the continuous presence of these compounds, and what are the overall impacts of these adaptations on ecosystems.

Feijao et al. presented a paper on the impact of fluoxetine ecotoxicity on the photochemistry, energy metabolism, and enzyme activity of *Ulva lactuca* at environmentally relevant concentrations (0.3, 0.6, 20, 40, and 80 μg/L). They used non-invasive high-throughput screening tools, such as pulse amplitude modulated (PAM) fluorometry and laser-induced fluorescence (LIF) to evaluate fluoxetine exposure-induced stress on *U. lactuca* photosynthesis. The results showed that exogenous exposure to fluoxetine causes significant stress on the energy metabolism of *U. lactuca*, which would lead to increased oxidative stress and activation of photoprotective pathways such as antioxidant enzyme activity.

Qiao et al. used bibliometrics analysis and analyzed the published studies on tris(2-chloroethyl) phosphate (TCEP). They assessed the risk of TCEP to aquatic life through a comprehensive meta-data analysis on available secondary data about its toxic effects and exposure levels. Through this method the authors found that there were many toxicity effects of TCEP on freshwater organisms which can be classified as survival, neuro system, development and reproduction toxicity. This study compiled valuable information for TCEP management and control.

Dai et al. presented a paper entitled "Occurrence and risk assessment of organotin compounds in the surface water of the upper Yangtze river estuary". They collected 78 surface water samples from the drinking water source in the upper Yangtze River Estuary from 2018 to 2019, and found organotin compounds (OTC) contamination in the upper reaches of the Yangtze River Estuary. The contamination was mainly due to rainfall runoff, especially in the stormy months. They also found that the concentration of OTC in ebbing tide was higher than that in flooding tide and increased during the transition.

Yao et al. presented a paper on the mixture toxicities of fenvalerate and tebuconazole on zebrafish larvae and adults. By investigating the effects of different mixing ratios, they were able to show that fenvalerate and tebuconazole had the risk of synergistic toxic effects on zebrafish. The effects of mixture toxicity on swimming behavior of larvae were analyzed. The strongest synergistic effect was observed when fenvalerate was mixed with tebuconazole. Based on these findings, the authors recommended that the simultaneous use of both pesticides in agricultural activities near water bodies should be controlled to avoid adverse effects on aquatic organisms.

Sharma et al. presented a paper entitled "Cellular, molecular and genomic alterations in the hatchlings of *Labeo rohita* after exposure to triclosan". They used the *L. rohita* exposure experiment to obtain biomarkers for the acute stress of triclosan (TCS). The result showed that the DHPR (cytoskeletal genes) and HSP90 (heat shock genes) may be used as highly sensitive markers for the acute stress of TCS. This is the first study reporting the effect of TCS on the selected heat shock and cytoskeletal genes in a single model.

We believe the selected articles in this special issue will offer an ideal opportunity to update the knowledge on the toxic effects and ecological risk assessment of typical pollutants in aquatic environments.

Author contributions

CF is responsible for the collection and review of the entire album, and other editors assist in the review.

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Conflict of interest

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