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Removal of the precursors of *N*-nitrosodiethylamine (NDEA), an emerging disinfection by-product, in drinking water treatment process and its toxicity on adult zebrafish (*Danio rerio*)

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Abstract

N-nitrosodiethylamine (NDEA) is one of the emerging nitrogenous disinfection by-products with probable cytotoxicity, genotoxicity and carcinogenesis. Its potential toxicological effect has received extensive attention but still been poorly understood. In this study, the changes of NDEA precursors in drinking water treatment process were studied using the trial of its formation potential (FP) and the toxicity induced by NDEA to adult zebrafish was investigated. NDEA formation potential (FP) in the raw water of Taihu Lake ranged from 46.9 - 68.3 ng/L. The precursors of NDEA was removed effectively via O₃/BAC process. Hydrophilic fraction as well as the low molecular weight fraction (< 1 kDa) had the highest NDEA FP. The toxicity results demonstrated that the acute lethal concentration of NDEA causing 50% mortality in 96 h (96 h-LC50) was 210.4 mg/L and NDEA was more likely to be accumulated in kidney, followed by in liver and gill. NDEA induced oxidative stress and antioxidant defense to zebrafish's metabolism system at concentrations over 5 µg/L. After a 42 days' exposure, a significant DNA damage was observed in zebrafish liver cells at NDEA concentrations beyond 500 µg/L. This study investigated NDEA properties in both engineering prospective and toxicity evaluation, providing comprehensive information on its control in drinking water treatment process as well as its toxicity effect on zebrafish as a model animal.

Keywords: Nitrosodiethylamine, Disinfection by-product, Precursors, Drinking water treatment, Zebrafish, In vivo toxicity assay

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