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TITLE: Alteration in successional trajectories of bacterioplankton communities in response to co-exposure of cadmium and phenanthrene in coastal water microcosms

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ABSTRACT:

Coexistence of heavy metals and organic contaminants in coastal ecosystems may lead to complicated circumstances in ecotoxicological assessment for biological communities due to potential interactions of contaminants. Consequences of metals and polycyclic aromatic hydrocarbons (PAHs) co-contamination on coastal marine microbes at the community level were paid less attention. We chose cadmium (Cd) and phenanthrene (PHE) as representatives of metals and PAHs, respectively, and mimicked contaminations using coastal water microcosms spiked with Cd (1 mg/L), PHE (1 mg/L), and their mixture over two weeks. 16S rRNA gene amplicon sequencing was used to compare individual and cumulative effects of Cd and PHE on temporal succession of bacterioplankton communities. Although we found dramatic impacts of dimethylsulfoxide (DMSO, used as a carrier solvent for PHE) on bacterial ?-diversity and composition, the individual and cumulative effects of Cd and PHE on bacterial ?-diversity were temporally variable showing an antagonistic pattern at early stage in the presence of DMSO. Temporal succession of bacterial community composition (BCC) was associated with temporal variability of water physicochemical parameters, each of which explained more variation in BCC than two target contaminants did. However, Cd, PHE, and their mixture distinctly altered the successional trajectories of BCC, while only the effect of Cd was retained at the end of experiment, suggesting certain resilience in BCC after the complete dissipation of PHE along the temporal trajectory. Moreover, bacterial assemblages at the genus level associated with the target contaminants were highly time-dependent and more unpredictable in the co-contamination group, in which some genera possessing hydrocarbon-degrading members might contribute to PHE degradation. These results provide preliminary insights into how co-exposure of Cd and PHE phylogenetically alters successional trajectories of bacterioplankton communities in the manipulated coastal water microcosms.

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