Abstract

Climate change exacerbates environmental 1,4-dioxane contamination and its adverse impact on public health

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Long Island is among the top three U.S. regions with the highest levels of 1,4-dioxane contamination, a probable human carcinogen, in groundwater and public water supplies. Due to its unique geological location and long coastlines, Long Island is also highly vulnerable to climate change, which exacerbates the environmental and health impacts of 1,4-dioxane by elevating groundwater levels and altering soil and water ecosystems. This OVPR pilot application aims to provide the first evidence linking climate change to environmental risk factors for humans, raising public awareness of the adverse effects of climate change on human health. Two PIs, Drs. Fei Chen and Xinwei Mao, bring complementary and synergistic expertise in environmental carcinogens and bioremediation focused on microbial degradation of 1,4-dioxane, respectively, to this project. The objective of this pilot application is to test the hypothesis that 1,4-dioxane is a human carcinogen and that climate change alters the microbiome activity in soil for the metabolism and clearance of 1,4-dioxane. Preliminary data show that 1,4-dioxane induces malignant transformation in human cells and that *pseudonocardia* species can metabolize it. To extend these findings, we will investigate how 1,4-dioxane elicits its carcinogenicity in humans and whether climate change affects *pseudonocardia* distribution and activity, potentially resulting in new 1,4-dioxane metabolites or byproducts with different carcinogenicity. If funded, a full proposal will be developed and submitted to NIH/NIEHS as a multi-PI R01 application or a multi-PI collaborative project of Climate Change and Health Initiative (CCHI, NOT-ES-22-006) during the supporting period of this application. The data from this project will not only provide clear evidence of climate change's impact on public health but also position Stony Brook University as a leader in research linking climate change to environmental health sciences.