

Quantitative Analysis of Per- and Polyfluoroalkyl Substances in Tinian's Drinking Water Supply Using a Novel β -Cyclodextrin-based Capture Filter

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ABSTRACT

Access to safe drinking water is essential for human health, agriculture, and livestock production. However, emerging contaminants, including per- and polyfluoroalkyl substances (PFAS), pose a growing threat to water quality worldwide. PFAS comprises a diverse class of more than 15,000 synthetic fluorinated compounds widely used in industrial processes and consumer products, including aqueous film-forming foams (AFFF), food packaging, and stain-resistant materials. Due to their exceptional chemical stability and resistance to environmental degradation, PFAS are commonly referred to as “forever chemicals.” Increasing evidence has linked PFAS exposure to adverse health outcomes, including certain cancers, immune system dysfunction, liver toxicity, and endocrine disruption. Despite these concerns, limited information exists regarding PFAS occurrence in drinking water sources on the island of Tinian. This study aims to identify and quantify PFAS in three drinking water sources using Cyclopure's PFAS Water Test Kit, developed in collaboration with the National Institute of Environmental Health Sciences (NIEHS). The test employs DEXSORB®, a β -cyclodextrin-based adsorbent capable of capturing a broad range of PFAS compounds. Following sample collection, analytes will be quantified using high-performance liquid chromatography with tandem mass spectrometry (HPLC-MS/MS), enabling detection of up to 55 PFAS analytes. We hypothesize that measurable PFAS concentrations will be detected in Tinian's tap water and local bottled water, possibly exceeding current U.S. Environmental Protection Agency (EPA) drinking water standards. This study will provide the first comprehensive assessment of PFAS contamination in Tinian's drinking water, support regional monitoring efforts, and inform water quality management strategies to protect public health.

KEYWORDS

Tinian, drinking water quality, per- and polyfluoroalkyl substances (PFAS), Cyclopure, DEXSORB, β -Cyclodextrin, high performance liquid chromatography, mass spectrometry, forever chemicals, environmental monitoring

ACKNOWLEDGEMENTS

The STEP-UP High School program is supported by the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institute of Health, Grant Number: 5R25DK078386-20.