

Utilization of Algae-Derived Lipid Droplets for Water Purification of Emphasizing Pathogen

Abstract

This research investigates the innovative application of lipid droplets extracted from indigenous algae species in Qatar, aiming at enhancing water purification techniques through a sustainable method. Conducted in collaboration with Qatar University, the study leverages the abundant local algae to not only address chemical contaminants in water but also to explore the adsorption of pathogenic bacteria, contributing to the production of safer drinking water. The extraction process, developed through a partnership with Qatar University, involved a combination of cell disruption and solvent extraction, optimized to obtain high-purity lipid droplets ideal for water purification applications.

Characterization of these lipid droplets revealed their significant adsorptive capacity, not only for heavy metals and organic pollutants but crucially for pathogenic bacteria present in contaminated water. This dual functionality underscores the potential of algae-derived lipid droplets as a versatile tool in water treatment processes, offering a natural and efficient solution to two major concerns in water quality management: chemical pollutants and microbial pathogens.

Experimental results demonstrated substantial reductions in contaminant levels, affirming the lipid droplets' efficacy in purifying water. Moreover, the study delved into the interaction between these lipid droplets and various bacterial species, highlighting their capability to adsorb pathogens effectively, thereby mitigating health risks associated with waterborne diseases.

The successful application of algae lipid droplets in removing both chemical and biological contaminants from water marks a significant advancement in the field of environmental science. It aligns with Qatar's vision for sustainability and environmental stewardship, showcasing a novel approach to utilizing local biological resources for the betterment of public health and ecological well-being. This study not only reinforces the value of collaborative research between academic institutions and environmental initiatives but also sets a precedent for future studies on the integration of bio-based technologies in water treatment systems.