Investigating heavy metal resistance in wastewater treatment microbes

Yuan Lin
Liye Wang
Ke Xu
Kan Li
Hongqiang Ren

Video Byte

Keywords: metagenomics, metaproteomics, sludge, heavy metal resistance, pollution, polyphosphate, denitrifying phosphorus removal sludge, DPRS, wastewater, Nitrospira, Nitrosomonas, community, Microbiome

Posted Date: October 15th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-969876/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Wastewater treatment protects ecosystems from pollution, including dangerous heavy metal contaminants. Nitrogen and phosphorus can be removed from wastewater by denitrifying phosphorus removal sludge (DPRS). This artificial ecosystem contains many different microbes active in anaerobic, anoxic, and aerobic processes. However, heavy metal pollution can stop DPRS from reaching its full potential. So researchers examined DPRS microbiomes in response to Cr(VI), Ni(II), and Cd(II) contamination. Using metaproteomics, they found that different microbial groups adopted different resistance mechanisms. *Nitrospira* improved its oxygen utilization, and *Nitrosomonas* produced more enzymes under heavy metal stress. Phosphorus-accumulating bacteria also produced polyphosphate, which could support community-wide detoxification, and showed a variety of other resistance responses, illuminating different microbial responses to pollutants and how diversity within a community keeps it healthy. Future studies of heavy metal resistance in sludge-based ecosystems using genome-centric metaproteomics will help improve wastewater treatment.