Important role of prokaryotic viruses in sewage treatment

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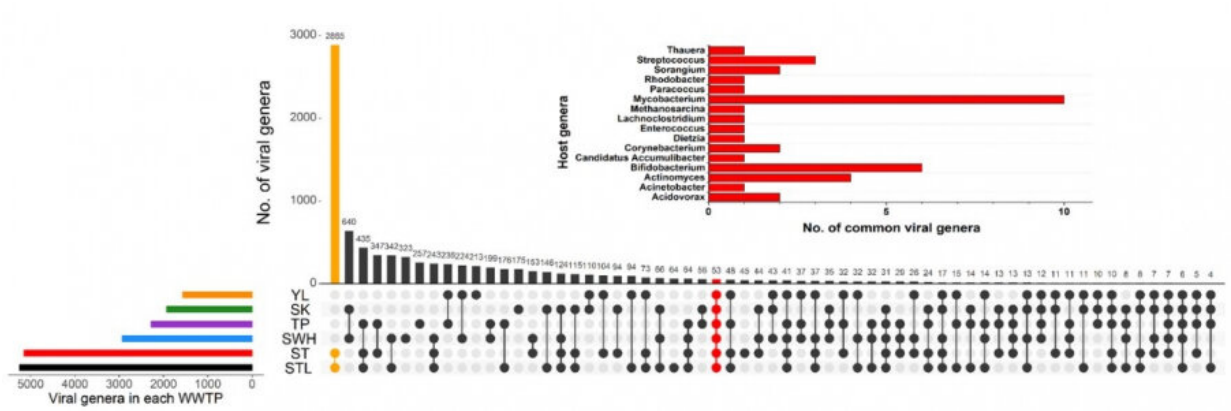

Shared viral genera in six WWTPs in Hong Kong. Credit: The University of Hong Kong

Prokaryotic viruses (phages) existing in activated sludge (AS), a biological treatment process widely used in wastewater treatment plants (WWTPs), act to regulate the composition of microbial community in the activated sludge. Phages are major bacterial predators, through virus-host interactions with key bacterial populations in AS systems, they can influence the removal efficiency of pollutants. Phages of high specificity could be used to curb undesired bacteria, e.g., the undesired foaming-associated filamentous bacteria that could disrupt the removal efficiency of AS system.

Clinically, phage therapy has been demonstrated by other research team as an effective way against the antibiotic resistant superbug Acinetobacter baumannii, and activated sludge in WWTPs is an important source for isolating phages for treating infections to save people's lives.

The research team led by Professor Tong Zhang in the Department of Civil Engineering at the University of Hong Kong (HKU) recently applied a systematic metagenomic pipeline to retrieve a catalog of around 50,000 phages from six WWTPs in Hong Kong. The study reveals the large and uncharacterised prokaryotic viral diversity in activated sludge, and largely expands the current AS prokaryotic virus catalog to provide reference for utilizing phage treatments to control undesired microorganisms in WWTPs. The findings have been published in leading science journal *Nature Communications*.

Professor Zhang said: "Prokaryotic viruses are so small that people overlooked the roles of them in WWTPs. By uncovering the extensive virus-host interactions in functional microorganisms in WWTPs, this study highlights the potential roles of phages in pollutant removal and environmental protection."

This is the first work globally to explore the connections between functional microorganisms in WWTPs and prokaryotic viruses. Future work will include analyzing the dynamics of the phage community of AS in the long term and isolating phages to control undesired bacteria in WWTPs.

This work is a part of Professor Zhang's project supported by the University Grants Committee's Theme-based Research Scheme (TRS) aimed at supporting research of strategic importance.

The research paper, "Prokaryotic viruses impact functional

microorganisms in nutrient removal and carbon cycle in wastewater treatment plants," was published in *Nature Communications*

More information: Yiqiang Chen et al, Prokaryotic viruses impact functional microorganisms in nutrient removal and carbon cycle in wastewater treatment plants, *Nature Communications* (2021). DOI: 10.1038/s41467-021-25678-1

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