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SARS-CoV-2 wastewater genomic surveillance: approaches, challenges, and opportunities

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Abstract

Wastewater-based genomic surveillance (WWGS) has proven effective for monitoring SARS-CoV-2 and other viruses within communities. It enables rapid detection of known and emerging mutations and provides insights into circulating lineages. Despite its advantages, WWGS faces challenges in sample processing and computational analysis, particularly in distinguishing similar lineages and identifying novel ones. Recent methods for wastewater sequencing (WWS) analysis remain largely untested amid declining clinical surveillance and ongoing viral evolution. This review examines opportunities and limitations of WWGS, focusing on sample preparation, sequencing technologies, and bioinformatics approaches, and highlights its potential to strengthen public health monitoring systems.

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