



## Sewage Surveillance: a Potential Tool to Reveal Antibiotic Resistance in the Community

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### Abstract:

The World Health Organization has identified antimicrobial resistance (AMR) as a global health threat. To preserve antimicrobials, global and local authorities recommend monitoring the general community for the presence and emergence of AMR. However, monitoring the general community for AMR is challenging due to numerous practical, ethical and regulatory constraints. Untreated wastewater from wastewater treatment plants (WWTPs) may provide an ongoing sampling opportunity of the wider general community to monitor AMR outside the healthcare setting. We aim to use WWTPs samples as a monitoring tool to establish a baseline of AMR in the general community of Sydney, Australia, for the following clinically important pathogens: extended-spectrum beta-lactamases (ESBL) Enterobacteriaceae, carbapenemase-producing Enterobacteriaceae (CPE), vancomycin-resistant enterococci (VRE) and methicillin-resistant *Staphylococcus aureus* (MRSA). We obtained influent wastewater samples from 25 Sydney WWTPs. Samples were plated on selective culture media, and four pathogens and their resistance patterns were identified using MALDI-TOF and VITEK 2. Geospatial information system (GIS) and statistical analysis in R was used to visualize and test AMR data for the significant influence of environmental or demographic factors in the catchment area of each WWTP. Our sampling events during 2017-2018 were relatively stable for bacterial loads, averaging log CFU/ml  $6.08 \pm 0.4$ . ESBL isolates were consistently isolated from all the sampling sites for each sampling period, while CPE and VRE isolates were uncommonly isolated for the same periods. MRSA isolates were only



sporadically found across the 25 WWTP catchment regions in three of four sampling periods. GIS analysis found a significant influence of community factors (population density and level of education) for only ESBL. Healthcare-related factors (e.g. number of hospitals, general practitioners and residential aged care facilities) did not significantly influence the prevalence of AMR in any of the WWTP regions. This is the first time wastewater has been used to survey AMR in the general community. Our preliminary findings support continuous wastewater epidemiology as a surveillance method of AMR in the general community for monitoring changes in trends in prevalence and seasonality of pathogens.

### Biography:

Kazi Mohammed Zillur Rahman is a student at Centre for Marine Science and Innovation, School of Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, Australia

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