Environment: A Victim in the Crime Scene of Antimicrobial Resistance?

Biography

Professor Hein-Min TUN is an Associate Professor at the JC School of Public Health and Primary Care, the Chinese University of Hong Kong (CUHK), the Associate Director at Microbiota-I Center (MagIC), and the PI of System Microbiology and Antimicrobial Resistance (SMART) Lab at Li Ka Shing Institute of Health Sciences, CUHK. In parallel, he is an Adjunct Professor at the Nanjing Medical University and an Honorary Associate Professor at the University of Hong Kong. His research interests range from studies on the mechanistic and functional roles of microbiome in health and diseases to One Health surveillance of antimicrobial-resistant bacteria and resistome. He published more than 100 original research articles in leading international journals. He serves the editorial boards of Cellular and Molecular Life Sciences and Frontiers in Microbiology. Moreover, he has received several international research awards including the Gold Medal at 2021 Inventions Geneva Evaluation Days, Canadian Institute of Health Research Fellowship and Dik Zwart Award.

Abstract

Antimicrobial resistance (AMR) is a global threat that impacts humans, animals, and the environment due to the overuse and misuse of antibiotics. Effective monitoring of AMR and antibiotic-resistant bacteria dynamics across relevant sectors is crucial for its understanding and controlling. The role of the environment in the transmission and evolution of resistance is increasingly recognized, especially in aquatic environments that act as key channels for the dissemination of AMR, as the routine discharge of wastewater into surface waters, which are a major source of drinking water. Here, we conducted a one-year wastewater surveillance of a hospital and its downstream wastewater treatment plant (WWTP), investigating the changes in antibiotic uses and antibiotic residues over the year. Our findings revealed that despite there is a reduction in antibiotic concentrations after treatment, significant residues still remain at the WWTP discharge point. The presence of substantial antibiotic residues in both hospital wastewater (HWW) and treated effluent underscores the urgent need for comprehensive monitoring of AMR in wastewater environments to better understand the extent of contamination and its impact on the environment. In addition, our microbiology survey also indicates that the persistance of multidrug-resistant organisms, of which blaGES-5-harbouring carbapenem-resistant *Klebsiella quasipneumonia* were identified with potential horizontal transfer events of such resistant trait locally and globally. Furthermore, my presentation will highlight the importance of implementing effective on-site treatment methods for HWW to mitigate the risks associated with AMR and the potential of wastewater monitoring data for strengthening hospital-based antimicrobial stewardship. By enhancing our understanding of the transmission dynamics and persistence of AMR in the environment, we can develop targeted interventions and strategies to combat this global threat.