



Scientists find common AMR genes in bacteria across Indian cities

Hyderabad, 21st Mar, 2026: Antimicrobial drugs like antibiotics kill bacteria and protect us from many deadly bacterial diseases. But bacteria are becoming resistant against antibiotics; antibiotic are not able to kill these microbes as effectively anymore. This situation is called antimicrobial resistance (AMR), and is killing millions of people every year worldwide. Despite that, data on local prevalence of AMR is largely missing in India. We do not know which deadly bacteria around us might be the most resistant to available antibiotics, and if they all follow similar mechanisms to become resistant. Traditional lab culture methods do not offer such details.

Researchers from the CSIR-Centre for Cellular and Molecular Biology (CCMB) and partner institutions have published a landmark study in [Nature Communications](#) providing the first comprehensive AMR map in Indian urban wastewater. They utilized a shotgun metagenomics approach that looks into the details of bacterial genes. Through these genes, researchers can estimate how bacteria become resistant.

Conducted between March 2022 and March 2024, the study analyzed 447 samples from 19 sites across Delhi, Mumbai, Kolkata, and Chennai. The findings reveal a complex landscape - different bacteria are abundant in different cities but they follow similar ways of resisting antibiotics.

Bacteria become resistant to antibiotics, thanks to certain genes. These genes either help the bacteria make stronger cell-walls through which antibiotic cannot go into bacteria at all; or help the bacteria metabolize or throw out the antibiotic molecules from their cells or even destroy the antibiotic molecules. Bacteria can share these genes with not only their offspring but also their neighbours.

The study finds that the microbial communities shifted based on local environmental factors. For example, *Klebsiella pneumoniae* is more abundant in Chennai and Mumbai, and *Pseudomonas aeruginosa* in Kolkata. But the genes conferring resistance to various antibiotics remained consistent across all four metro cities.

Antibiotics also belong to different chemical classes such as called tetracyclines, beta-lactams and macrolides. The researchers also found that bacteria can share resistant genes against tetracyclines and beta-lactams far more easily than against macrolides.

Beyond identifying threats, the researchers propose wastewater-based pathogen surveillance for to used more widely in the country. They have provided a practical path forward for public health

despite the infrastructural challenges in various regions of the country. “We have developed and validated a Standard Operating Procedure that allows for effective sample storage at 4°C for up to seven days without compromising data quality. The samples can be sent to common testing hubs, which suits resource-limited settings. A broader participation in wastewater-based surveillance will help to detect early outbreaks and track the spread of drug-resistant pathogens in real-time,” said Dr Vinay K Nandicoori, Director, CSIR-CCMB.