


Elucidating the resistance repertoire, biofilm production, and phylogenetic characteristics of multidrug-resistant *Escherichia coli* isolated from community ponds: A study from West Bengal, India

Debaraj Bhattacharyya^{1,2} | Jaydeep Banerjee¹ | Md Habib¹ |
Geetanjali Thapa¹ | Indranil Samanta³ | Pramod Kumar Nanda¹ |
Triveni Dutt⁴ | Keka Sarkar² | Samiran Bandyopadhyay¹ 

¹ICAR-Indian Veterinary Research Institute, Kolkata, India

²Department of Microbiology, University of Kalyani, Kalyani, India

³Department of Veterinary Microbiology, Faculty of Veterinary and Animal Sciences, West Bengal University of Animal & Fishery Sciences, Kolkata, India

⁴Division of Livestock Production and Management, ICAR-Indian Veterinary Research Institute, Izatnagar, India

Correspondence

Samiran Bandyopadhyay, ICAR-Indian Veterinary Research Institute, Eastern Regional Station, Kolkata, West Bengal 700 037, India.

Email: samiranvet@gmail.com; samiran.b@icar.gov.in

Keka Sarkar, Department of Microbiology, University of Kalyani, Kalyani, West Bengal 741 235, India.
Email: keka@klyuniv.ac.in

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Abstract

This study details about the phenotypic and molecular characteristics of multidrug-resistant (MDR) *Escherichia coli* in the fresh community pond water ($n = 257$) collected from three districts of West Bengal, India. In total, 57 isolates were MDR of which 38 emerged as extended spectrum and 7 as *AmpC*-type β -lactamase producers in phenotypic assay. Among β -lactamase genes, *blaCTXM-1* was predominant (87.71%) followed by *blaAmpC* (77.2%) and *blaTEM-1* (22.8%). Six MDR strains carried metallo- β -lactamase (MBL, *blaNDM-1*) gene. Tissue culture plate assay confirmed strong biofilm (SP) production in four MDR and one non-MDR isolates. In PCR-based replicon typing (PBRT), multiple plasmids of diverse replicon types (Frep, FIB, I1, FIA, K/B, HI1, and Y) were identified. The enterobacterial repetitive intergenic consensus-polymerase chain reaction (ERIC-PCR)-based phylogenetic analysis revealed a high degree of genetic divergence among the MDR isolates. Multiplex PCR-based phylogrouping categorized 11 isolates as virulent (B2/D/F), which carried *blaCTXM-1* gene and three had *blaNDM-1* gene. Relative transcriptional activity of *AcrAB* efflux pump was significantly elevated among the SP and MBL producers. The presence of MDR *E. coli* isolates, particularly those resistant to carbapenem, in pond water used for daily domestic and household work, is a cause of concern as these pathogens may sneak into human food chain causing life-threatening infections.

Practitioner Points

- Multidrug-resistant biofilm producing *E. coli* isolated from community pond water.
- A few of them were carbapenem-resistant and belonged to virulent (B2/D) types.
- Expression of *AcrAB* efflux pumps was found significantly elevated among biofilm producers and carbapenem-resistant population.