

TITLE: Multidrug-resistant *Escherichia coli* E-ST1775-H137 carrying *mcr-1.1*, *bla*_{CTX-M-2} and *bla*_{CMY-2} recovered from an urban stream in southeastern Brazil

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ABSTRACT

Polymyxins are important antimicrobials used to treat infections caused by multidrug-resistant (MDR) bacteria, including *Escherichia coli*. The co-occurrence of genes encoding MCR-type and extended-spectrum β -lactamases at the human-animal-environment interface has raised concerns worldwide. Therefore, we performed an investigation of colistin resistance in *Escherichia coli* isolates obtained from aquatic environments in cities belonging to the state of São Paulo, Brazil. The water samples were filtered using sterile membrane filters, which were placed on MacConkey agar supplemented with colistin. A lactose-positive colony of each sample was selected and the isolates were identified by sequencing of the 16S rRNA gene. The minimum inhibitory concentration (MIC) to antimicrobials was determined using the broth microdilution method. The *mcr*-type genes (*mcr-1* to *mcr-9*) were screened by conventional PCR. The whole-genome sequencing (WGS) was performed using the Illumina HiSeq platform. Molecular typing, resistome, virulome and plasmidome were carried out using bioinformatics analysis. A total of 45 *E. coli* isolates were obtained. Among the isolates, one of which, named EW827, was recovered from a stream located in the city of Ribeirão Preto, exhibited a MDR profile, harbored the gene *mcr-1* and were submitted to WGS. Isolate EW827 was resistant to polymyxins, β -lactams, fluoroquinolones, aminoglycosides, tetracyclines, folate pathway antagonists, and phenicols. Molecular typing revealed that EW827 belonged to phylogroup E, ST1775 (CC350) and carried the *fimH137* allele. Resistome analysis detected resistance genes to colistin (*mcr-1.1*), β -lactams (*bla*_{CTX-M-2}, *bla*_{CMY-2}), aminoglycosides (*aadA1*), tetracyclines (*tetA*), folate pathway antagonist (*sulI*), phenicols (*catA1*), and macrolides [*mdf(A)*]. Besides, a mutation in the quinolone resistance-determining region of GyrA (Ser83Leu) was also found. Virulome analysis showed several virulence determinants associated with extraintestinal pathogenic *E. coli*. Inc11-ST12 and IncX4 replicon types were identified carrying *bla*_{CMY-2} and *mcr-1.1*, respectively, while the *bla*_{CTX-M-2} gene was harbored by a Tn21-like element on the chromosome. The presence of an *E. coli* isolate exhibiting multidrug resistance and carrying *mcr-1.1*, *bla*_{CTX-M-2}, and *bla*_{CMY-2} in urban water calls attention to the dissemination of clinically relevant antimicrobial resistance genes in the environmental sphere.

Keywords: *Escherichia coli*; Multidrug-resistant; Colistin; Plasmid; Water

Development Agencies: This study was supported by FAPESP [grant no. 2018/19539-0 and 2018/01890-3], CAPES [grant no. 88882.180855/2018-01, 88887.464733/2019-00, 88887.314388/2019-00, 88887.519091/2020-00, and Finance code 001], and CNPq [grant no. 130086/2021-5].