Description of the First *Escherichia coli* Clinical Isolate Harboring the Colistin Resistance Gene *mcr-1* from the Indian Subcontinent

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The first report of plasmid-mediated colistin resistance among *Enterobacteriaceae* in China sounded alarms in the medical community worldwide (1). Since then, *Escherichia coli* isolates harboring colistin resistance encoded by the *mcr-1* gene have been globally reported (2). To our knowledge, we hereby report the first detection of *mcr-1* gene in a human *E. coli* isolate from the Indian subcontinent.

In February 2016, a total of 29 extended-spectrum-beta-lactamase (ESBL)-producing *E. coli* isolates recovered from patients with wound infections admitted to the Burn & Reconstructive Surgery Centre, Allied Hospital Faisalabad, Pakistan, were tested for plasmid-mediated colistin resistance. Phenotypic resistance to polymyxin B was determined using a Vitek-2 compact system (bioMérieux, Germany) followed by determination of the colistin MIC by broth microdilution in 96-well plate test panel (Miconaut S; Merlin, Bornheim-Hersel, Germany). One colistin-resistant *E. coli* isolate (X26) with a MIC of 4 μg/ml was collected from a 35-year-old male patient suffering from burn-associated wounds. The presence of the *mcr-1* gene was confirmed by TaqMan-based real-time PCR (3). The isolate exhibited multidrug resistance but was susceptible to carbapenems (Table 1). The presence of the *blaCTX-M-15* gene in *E. coli* X26 was confirmed by PCR and sequencing (4).

The plasmid carriage of *E. coli* isolate X26 was analyzed using a conventional plasmid profile analysis (5). The conjugative transferability of the colistin resistance was investigated by plasmid conjugation experiments using sodium azide-resistant *E. coli* K-12 J53 as a recipient strain. Transconjugants were selected on LB agar plates supplemented with colistin (4 μg/ml) and sodium azide (100 μg/ml) and subsequently confirmed by PCR for the *mcr-1* gene. PCR-based plasmid replicon typing of transconjugants showed the IncI2 type. Pulsed-field gel electrophoresis (PFGE) was performed to determine the genetic relatedness of the *E. coli* X26 isolate to recently reported *mcr-1*-carrying ESBL-producing *E. coli* isolate PK-13 of sequence type 354 (ST354) recovered from a wild migratory bird in Pakistan (6). Multilocus sequence typing (MLST) was carried out using the method developed by Wirth et al. (7). MLST results revealed *E. coli* X26 to be a new ST.

Colistin has become the last line of defense for the treatment of infections caused by Gram-negative bacteria, in particular, carbapenem-resistant *Enterobacteriaceae* (CRE). The presence of plasmid-mediated colistin resistance in Indian subcontinent, where there is already burden of CRE, is worrisome, as it threatens the use of last-resort antibiotics. Recently, we reported the presence of the *mcr-1* gene in an *E. coli* isolate

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from a wild migratory bird in Pakistan (6). The plasmid size (~63 kb), as well as the replicon type of *E. coli* isolate X26, corresponds to that described by Liu and colleagues (1) and to our recent findings (6), thus indicating that IncI2 represents a major plasmid type involved in the spread of colistin resistance in our region. The PFGE pattern and sequence type showed no genetic relatedness between *E. coli* X26 and our recently reported strain (6), suggesting that different clonal types are involved in the dissemination of the mcr-1 gene. In conclusion, the presence of plasmid-mediated colistin resistance in a clinical isolate adds to the worry as this potent gene may spread to other susceptible bacteria, making pan-resistant pathogens.

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