LETTER TO THE EDITOR

Colistin resistant *Escherichia coli* carrying *mcr-1* in urban sludge samples: Dhaka, Bangladesh

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Abstract
Of 48 bacteria belonging to the family *Enterobacteriaceae* tested from urban sludge samples, one *Escherichia coli* isolate was resistant to colistin and possessed the resistance marker gene *mcr-1* found for the first time from Bangladesh. The colistin resistant *E. coli* was multidrug resistant showing resistance to 11 different antibiotics tested.

Keywords: Colistin resistant, *Escherichia coli*, *mcr-1*, Bangladesh, First report

Background
Antimicrobial resistance is a multi-sectoral problem which is now recognized as one of the most serious threats to human health globally. Resistance trends among *Enterobacteriaceae* are especially worrisome considering their ubiquity in the environment and animal systems, and their enhanced propensity to acquire antibiotic resistance determinants through mobile genetic elements. Indiscriminate use of antibiotics is mainly responsible for the emergence of *Enterobacteriaceae* resistant to multiple antibiotics including carbapenems.

Colistin, a cationic polypeptide, is considered as one of the last-resort drugs of choice for the treatment of multi-drug resistant, Gram negative bacteria such as carbapenem resistant *Enterobacteriaceae* (CRE). Present day increase in the incidences of multi-drug resistant bacteria has resulted in enhanced use of colistin globally, with an inevitable risk of emerging resistance. A study in Vietnam has shown increasing resistance in commensal *Escherichia coli* associated with the extensive use of colistin in livestock and poultry industry [1]. A recent study has shown colistin sulfate to be the most commonly used antibiotic in poultry industry in Bangladesh [2]. Acquired resistance to colistin is generally associated with chromosomal mutations [3], although a new plasmid-mediated transferable resistance determinant, the *mcr-1* gene, encoding a phosphoethanolamine transferase, has been described recently in China [4]. Since the plasmid encoding *mcr-1* has been established as a marker for colistin resistance, *Enterobacteriaceae* carrying this gene has been reported from many parts of the world [5]. Considering the widespread occurrence of colistin resistance and the impending danger associated with it, we screened bacteria belonging to the family *Enterobacteriaceae* isolated from sludge samples of Dhaka city for their resistance to colistin and for the presence of colistin resistance-related gene *mcr-1*. Here we report the occurrence of colistin resistant *E. coli* carrying *mcr-1* gene in urban environment of Dhaka, Bangladesh.

Methods
After preliminary identification following standard culture methods and final biochemical confirmation with API 20 E (bioMérieux, France), 48 bacterial isolates including *Escherichia coli* (n = 23), *Klebsiella pneumoniae* (n = 15), *Pseudomonas luteola* (n = 6), *Pseudomonas aeruginosa* (n = 1), *Pantoea* spp. (n = 2) and *Citrobacter freundii* (n = 1), collected from sludge samples of Dhaka city, were tested for their response to colistin.
coli-resistant E. coli carrying mcr-1 has not been isolated so far from hospital settings, and this is the first report of the occurrence of colistin resistant E. coli carrying resistant marker mcr-1 from environment of Bangladesh.

Finally, the data presented in this study show environmental dissemination of MDR E. coli carrying colistin resistance and related marker gene mcr-1 via urban sludge disposed into the water bodies. Dhaka is a densely populated city with circular river systems, and millions living in urban slums do not have access to safe drinking water. Given this, fecal–oral transmission might allow MDR enteric pathogens to transmit rapidly. Further, the high selection pressure of residual antibiotics in the urban environment, and since the colistin resistance marker mcr-1 can be transferred horizontally; there is an urgent requirement for broader surveillance in both clinical and environmental settings in Bangladesh in order to prevent further spreading of this resistance gene.

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Competing interests
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Consent for publication
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Ethics approval and consent to participate
Not applicable.

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