



# Multidrug-Resistance Among Uropathogenic *Escherichia coli* Strains

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## Dear Editor,

One of the most common bacterial infections in the world is urinary tract infection (UTI) and about 150 million cases of UTI are reported annually. It has been reported that 40% of women and 12% of men experience UTI infection at least once in their lifetime.<sup>1</sup> Both genders are affected by UTIs, but the infections are much more common in women aged 15-44 years.<sup>2</sup> This kind of infection is responsible for 40% of nosocomial infections and 50% of bacterial infections which prolongs hospitalization and increases mortality.<sup>3</sup> In addition, healthcare-associated UTI, as one of the most common infections that occur in healthcare centers, is considered a significant threat to patients due to increased mortality.<sup>1</sup> Community-acquired UTI is also one of the most prevalent community infections. Uropathogenic *Escherichia coli* (UPEC) is the primary cause of UTIs in both healthcare centers and community.<sup>4</sup> In the clinical classification, community and healthcare-associated UTIs include complicated and uncomplicated infections which determine the type of antibiotic treatment.<sup>1</sup> Further, the emergence of multi-drug resistance (MDR) during the course of UTIs is mainly related to insufficient and empirical antibiotic therapies. The association between the increased uses of extended-spectrum antibiotics and increased multi-antibiotic resistance has been documented as well.<sup>1</sup> Increasing antimicrobial resistance among UPEC strains has made the treatment of infections caused by these bacteria very problematic.<sup>4</sup> It has been reported that increasing the prevalence of MDR UPEC strains, mainly in developing countries, leads to the redundant prescription of broad-spectrum antibiotics including extended-spectrum cephalosporins and fluoroquinolones, which enhances the cost of treatment, the length of hospitalization, and antibiotic resistance spread.<sup>1</sup> Various mechanisms have been implicated in the

establishment of resistance in UPEC strains. The most important mechanism for the generation and expansion of antibiotic-resistant UPEC is the acquisition of resistance genes through mobile genetic elements including plasmid, transposons, integrons, and other elements.<sup>3</sup> Among the most important resistant strains, extended-spectrum  $\beta$ -lactamases (ESBLs) and carbapenemase-producing UPEC isolates are very challenging. ESBL-producing UPEC isolates not only are resistant to third and fourth generation cephalosporins but also other antibiotics such as tetracyclines, trimethoprim/sulfamethoxazole, and aminoglycosides. Carbapenems are the antibiotics of choice for the treatment of UTIs caused by ESBL-producing strains.<sup>4</sup> However, carbapenem-resistant UPEC strains are still not prevalent but the administration of carbapenems in the treatment of the above infections is very high due to the high prevalence of ESBL-producing UPEC strains.<sup>3</sup> In addition, there is a high probability of transferring resistance genes to the UPEC strains due to the high prevalence of carbapenemase-producing *Klebsiella pneumoniae* strains.<sup>1</sup> Therefore, carbapenem-resistant strains are likely to be developed due to gene transfer and selective pressure caused by high antibiotic usages which is alarming.<sup>1</sup> In summary, antibiotic therapy plays a critical role in the treatment of UTIs due to UPEC strains, but the increasing prevalence of antibiotic resistance has made the treatment of these infections very challenging. Thus, new therapeutic strategies such as the use of antibiotic alternatives can be considered as novel therapeutic approaches in this respect.

## Conflict of Interests Disclosures

None.

## Ethical Approval

Not applicable.

**References**

1. Kot B. Antibiotic Resistance among uropathogenic *Escherichia coli*. *Pol J Microbiol.* 2019;68(4):403-415. doi:10.33073/pjm-2019-048
2. Christy VR, Athinarayanan G, Mariselvam R, Dhasarathan P, Singh RAJA. Epidemiology of urinary tract infection in south India. *Biomed Res Clin Pract.* 2019;4:1-5. doi:10.15761/brcp.1000190
3. Asadi Karam MR, Habibi M, Bouzari S. Urinary tract infection: pathogenicity, antibiotic resistance and development of effective vaccines against uropathogenic *Escherichia coli*. *Mol Immunol.* 2019;108:56-67. doi:10.1016/j.molimm.2019.02.007
4. Firoozeh F, Saffari M, Neamati F, Zibaei M. Detection of virulence genes in *Escherichia coli* isolated from patients with cystitis and pyelonephritis. *Int J Infect Dis.* 2014;29:219-222. doi:10.1016/j.ijid.2014.03.1393