

# A present and global threat called Extended-Spectrum Beta-lactamases (ESBLs)



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## Editorial

The urinary tract infection (UTI) is a common cause of antibiotic prescription in general medicine. The main etiological agents of UTIs are the *Enterobacteria*, that account for about 70 to 80% of the isolated microorganisms in the laboratory routine. In most cases, the empirical treatment is initiated, without the request of the urine culture, which can result in therapeutic failures and worsening of the disease due to the development of microbial resistance [1]. Consequently, the indiscriminate use of antimicrobials can often impose barriers in the control of infections by decreasing the therapeutic options. In this epidemiological context, it is important to note that the susceptibility profile as well as the etiologic agent may also vary according to the environment in which the infection was acquired. In the last few years, the resistance of the most used antibiotics in clinical practice for treatment of Gram-negative bacteria has increased worldwide. The treatment of infections caused by these pathogens is usually performed with beta-lactam antibiotics, drugs of first choice due to their efficiency and low toxicity. Their inappropriate and excessive favored the emergence of microorganisms with different mechanisms of resistance, being the main of these, the production of beta-lactamase enzymes that have the ability to hydrolyze the structure of the beta-lactam ring, which decrease the drug effectiveness [2]. Among the different types of beta-lactamase enzymes, Extended-Spectrum Beta-lactamases (ESBL) confer resistance to third generation cephalosporins [3]. As an example, ESBL-producing *Escherichia coli* (*E. coli*) and *Klebsiella pneumoniae* are among the bacteria that few potentially effective drugs are available [4]. High prevalence of ESBL and carbapenemase producing Gram-negative bacteria had already been reported from different countries [3-6]. Only in the United States, it is estimated that ESBL-carrying Enterobacteriaceae is responsible for more than 1700 deaths per year [7]. In Brazil, a high rate of antimicrobial resistance of ESBL-producing isolated from urine showed that among 3,418 urine cultures evaluated,

Enterobacteriaceae were responsible for 584 (86.9%) cases among the 672 samples positive for UTI. ESBL-producing was detected in 29 (4.8%) of the 584 Enterobacteriaceae, of which 16 (55.2%) corresponded to the *E. coli* species and 13 (44.8%) species of *Klebsiella*. Additionally, a high proportion of the isolates presented resistance to monobactams, cephalosporins, fluoroquinolones and sulfonamides [8]. Resistance to sulfamethoxazole/trimethoprim among bacteria that causes UTIs are also on the rise (34.4% to 56.4%) [9,10]. Numbers as high as 88.9% of resistance to sulfamethoxazole/trimethoprim as well as 44.4% to gentamicin were also detected in microorganisms causing UTI in the city of São Luís, in Northeast of Brazil. In addition, except for *E. coli*, other microorganisms showed 100% of resistance to ciprofloxacin, levofloxacin and nitrofurantoin [11]. In pediatric patients, a rapid increase in the prevalence of ESBL-producing Enterobacteriaceae recovered from UTI in Qatar was described. The values ranged from 18% in 2010 to 24% in 2014 and reached 31.7% (n=201 of 635 positive cultures) in 2017. The prevalence varied among patients with different ethnic backgrounds, being more prevalent among Qataris when compared to Egyptians, Indians, and Pakistani. As an increase in the prevalence of ESBL-producing Enterobacteriaceae is being more frequently described, the use of carbapenems and amikacin are becoming the recommended therapeutic choice for the treatment of severe infections [12]. Taking all these into account, it is important to consider that the emergence and spread of ESBL-producing Enterobacteriaceae is an important public health problem with serious implications, especially in low-income countries where the time to identify these pathogens are too high and second-line treatment is often unavailable. An effort to improve the time of diagnosis and to acquire knowledge in the local prevalence ESBL-producing Enterobacteriaceae is critical to define appropriate empirical therapeutic strategies for multidrug-resistant organisms and to monitor their spread.

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