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Original article

# Antimicrobial resistance in community-acquired urinary tract infections in Paris in 2015

*Résistance bactérienne des infections urinaires communautaires à Paris en 2015*

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## Abstract

**Background.** – Urinary tract infection (UTI) is one of the most frequent community-acquired infection. *Escherichia coli* resistance has been on the rise since 2000s.

**Methods.** – We conducted a prospective multicenter cohort study including adults who had a positive urine cytobacteriological examination (UCBE) performed in our Parisian suburb laboratory platform from October 2014 to March 2015.

**Results.** – A total of 1223 patients were included: 995 (81.4%) women and 228 (18.6%) men. Gram-negative bacilli were isolated in 91% of cases: *E. coli* accounted for 69.4% of cases. Extended-spectrum beta-lactamase-producing *Enterobacteriaceae* (ESBL-PE) prevalence was 4.2%. Resistance of ESBL-producing *E. coli* strains to amoxicillin, fluoroquinolones, nitrofurantoin, and fosfomycin was respectively 100%, 80%, <5%, and <10%. Risk factors for bacteriuria caused by ESBL-PE were older age (OR = 3.7 [1.99–14.4];  $P = 0.02$ ), recurrent UTI (OR = 3.7 [1.9–7.2];  $P = 0.05$ ), immunosuppression (OR = 9.2 [4.1–19.47];  $P = 0.01$ ), recent hospitalization within the last three months (OR = 4.5 [2.3–8.3];  $P = 0.05$ ), and recent antibiotic therapy (OR = 13.4 [6.29–31.9];  $P < 0.01$ ).

**Conclusion.** – The prevalence of ESBL-PE bacteriuria seems to be 4%. Older age, immunosuppression, recurrent UTI, recent hospitalization, and antibiotic therapy are the main risk factors associated with ESBL-PE community-acquired UTI.

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**Keywords:** Urinary tract infection; Extended-spectrum beta-lactamase; Antimicrobial resistance

## Résumé

**Contexte.** – Les infections urinaires (IU) sont les infections communautaires les plus fréquentes. La résistance d'*Escherichia coli* augmente depuis les années 2000.

**Méthodes.** – Étude prospective, multicentrique avec plateforme de centralisation de laboratoire incluant tous les patients ayant réalisé un ECBU entre octobre 2014 et mars 2015.

**Résultats.** – Un total de 1223 patients ont été inclus dont 995 (81,4 %) femmes et 228 (18,6 %) hommes. Des bacilles à Gram négatif ont été isolés dans 91 % des cas ; *E. coli* représentait 69,4 % des cas. La prévalence des entérobactéries productrices de bêta-lactamase à spectre étendu

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(BLSE) était de 4,2 %. La résistance des *E. coli* producteurs de BLSE à l'amoxicilline, fluoroquinolones, nitrofurantoïne et fosfomycine était respectivement de 100 %, 80 %, < 5 % et < 10 %. Les facteurs de risque d'une bactériurie à entérobactéries productrices de BLSE étaient l'âge avancé (OR = 3,7 [1,99–14,4] ;  $p = 0,02$ ), les IU récidivantes (OR = 3,7 [1,9–7,2] ;  $p = 0,05$ ), l'immunodépression (OR = 9,2 [4,1–19,47] ;  $p = 0,01$ ), l'hospitalisation depuis moins de trois mois (OR = 4,5 [2,3–8,3] ;  $p = 0,05$ ) et l'antibiothérapie récente (OR = 13,4 [6,29–31,9] ;  $p < 0,01$ ).

### Conclusion

La prévalence des bactériuries à entérobactéries productrices de BLSE semble atteindre les 4 %. L'âge avancé, l'immunodépression, les infections urinaires à répétition, l'hospitalisation et l'antibiothérapie récente sont les principaux facteurs de risque d'infection communautaire à entérobactéries productrices de BLSE.

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Mots clés : Antibiorésistance ; Infections urinaires ; Bêta-lactamase à spectre étendu

## 1. Introduction

Extended-spectrum beta-lactamase-producing *Enterobacteriaceae* (ESBL-PE) have been spreading worldwide since the 1980s. Many countries implemented national plans to control this public health threat [1]. Surveillance of antibiotic resistance is a core issue in several of these plans. Urinary tract infection (UTI) is the most common adult community-acquired infection in France with an estimated incidence at 625,000 case patients/year [2]. According to the Drug Resistance in community-acquired Urinary Tract Infection (DRUTI) study [3], the most frequent bacterium associated with pyelonephritis between 2003 and 2006 in France was *Escherichia coli* (84% of cases). The increase in *E. coli* resistance to third-generation cephalosporins is now well-documented and mainly due to the spread of extended-spectrum beta-lactamase enzymes. ESBL-PE encoding plasmids frequently share resistance genes for additional antimicrobial classes such as aminoglycosides and fluoroquinolones [4]. Treatment options for these ESBL-PE infections are limited and initial empirical therapy is often inadequate with subsequent consequences on outcome. Therefore, early recognition of patients at risk of ESBL-PE infection is essential for the empirical treatment prescribed by family physicians. We aimed to describe the current epidemiological data of community-acquired UTIs and to assess the risk factors associated with ESBL-PE infections in the Paris area.

## 2. Material and methods

### 2.1. Study design and patients

The study population included adults with a positive urine cytobacteriological examination (UCBE) performed between October 2014 and March 2015 at LCD group. LCD group is a technical platform that receives up to 6000 biological samples per day from 38 laboratories located in the area of Paris, among which approximately 500 samples per day for UCBE. We performed a detailed prospective investigation of the clinical features of these patients, and extracted microbiological data for isolated strains. When bacterial cultures were tested twice or more in the same patients, we selected the incident identified event.

### 2.2. Bacteriology

Significant bacteriuria was defined as  $\geq 10^3$  colony-forming units (CFUs)/ml (or  $\geq 10^4$  CFUs/ml when *Enterobacteriaceae* other than *E. coli* were present in the UCBE of women), as per the 2015 French guidelines [5]. Antibiotic susceptibility tests were performed (using VITEK 2 technique) via minimum inhibitory concentration measures with a robot (VITEK 2, BioMérieux) as per guidelines issued by the Antibiogram committee of the French Microbiology Society (French acronym CA-SFM) [6].

Suspected ESBL-PE infections were confirmed as per French guidelines [6].

### 2.3. Collected data

For each patient, demographic data including age, sex, and other conditions, and UCBE results were extracted from the technical platform computer software (Hexalis, Artigues-près-Bordeaux, France).

Putative risk factor data (diabetes mellitus, immunosuppression, urinary catheter, prostatic disease, recurrent UTIs, pregnancy, recent hospitalization, and recent antibiotic use) was collected using a questionnaire fulfilled at the laboratory by the patient and/or the secretary.

### 2.4. Statistical analysis

Data was analyzed using EpiInfo 7 software (CDC Atlanta).

A descriptive analysis was performed using frequencies and percentages for the qualitative variables and means and standard deviations for quantitative variables.

Comparisons were performed using Fischer's exact test or Kruskal-Wallis test with a significance threshold of 5% ( $P \leq 0.05$ ).

## 3. Results

A total of 1123 patients were included during the study period: 995 women (81.4%) and 228 men (18.6%). Ages ranged from 18 to 102 years (mean  $59 \pm 21.6$ ). Men were significantly older than women ( $P < 0.001$ ). The two main reasons for performing UCBE were clinical symptoms of UTI (urinary

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