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# Genetic relatedness of multidrug-resistant *Escherichia coli* cultured from geographically diverse outpatient, midstream urine specimens

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**Abstract**

Genomic DNA from 70 demographically matched geographically diverse pairs of urinary isolates of antimicrobial-susceptible and multidrug-resistant *Escherichia coli* was restricted using *Xba*I and analyzed by pulsed-field gel electrophoresis. Antimicrobial-susceptible isolates demonstrated limited genetic relatedness, whereas 2 epidemiologic clusters containing a total of 40 isolates (57.1%) were identified among the multidrug-resistant isolates.


*Keywords:* *Escherichia coli*; Multi-drug resistant; Urine; Pulsed-field gel electrophoresis

Urinary tract infections (UTIs) are one of the most frequently acquired human bacterial infections. *Escherichia coli* is the primary pathogen causing UTIs in both outpatients and inpatients, accounting for 75% to 90% of isolates cultured from midstream urine specimens of patients with uncomplicated UTIs (Gupta et al., 2001; Nicolle, 2001). The recent emergence of multidrug-resistant isolates of *E. coli* cultured from midstream urine specimens has been well documented, and published studies suggest that the prevalence of multidrug-resistant isolates may be increasing in the United States and Canada (Karlowsky et al., 2006; Karlowsky et al., 2002; Sahm et al., 2001). Multidrug-resistant isolates of *E. coli* from urine are typically resistant to ampicillin and trimethoprim–sulfamethoxazole (SXT), less frequently resistant to fluoroquinolones (e.g., ciprofloxacin), and rarely resistant to nitrofurantoin (Karlowsky et al., 2006; Karlowsky et al., 2003; Sahm et al., 2001). When present, fluoroquinolone resistance in *E. coli* is identified predominantly in multidrug-resistant isolates (Karlowsky et al., 2002; Karlowsky et al., 2003; Sahm et al., 2001). Clonal expansion and spread of multidrug-resistant isolates may potentially occur when patients infected or colonized with such an isolate receive any antimicrobial agent for which the isolate harbors resistance. Multidrug-resistant isolates may complicate the therapeutic management of patients with infection by increasing morbidity and treatment costs, and by limiting therapeutic options.

Although substantial published literature exist describing trends in in vitro antimicrobial susceptibility testing for urinary isolates of *E. coli*, only a few publications have reported on the relatedness of antimicrobial-resistant isolates of *E. coli* (Burman et al., 2003; Johnson et al., 2002; Manges et al., 2001; Manges et al., 2006; Petrof et al., 2002; Phillips et al., 1988). The intent of this study was to compare the degree of genetic relatedness of outpatient urinary isolates of geographically diverse demographically matched sets of isolates of *E. coli* with antimicrobial-susceptible (susceptible to ampicillin, SXT, and ciprofloxacin) and multidrug-resistant (resistant to ampicillin, SXT, and ciprofloxacin) phenotypes.

The isolates of *E. coli* selected for testing were chosen from frozen stock culture collections of 2 chronologically overlapping UTI antimicrobial surveillance studies; each isolate selected for the current study was originally cultured from an outpatient midstream urine specimen between January and June 2004 in 1 of 29 medical center laboratories (22 US, 7 Canadian) (Karlowsky et al., 2006;

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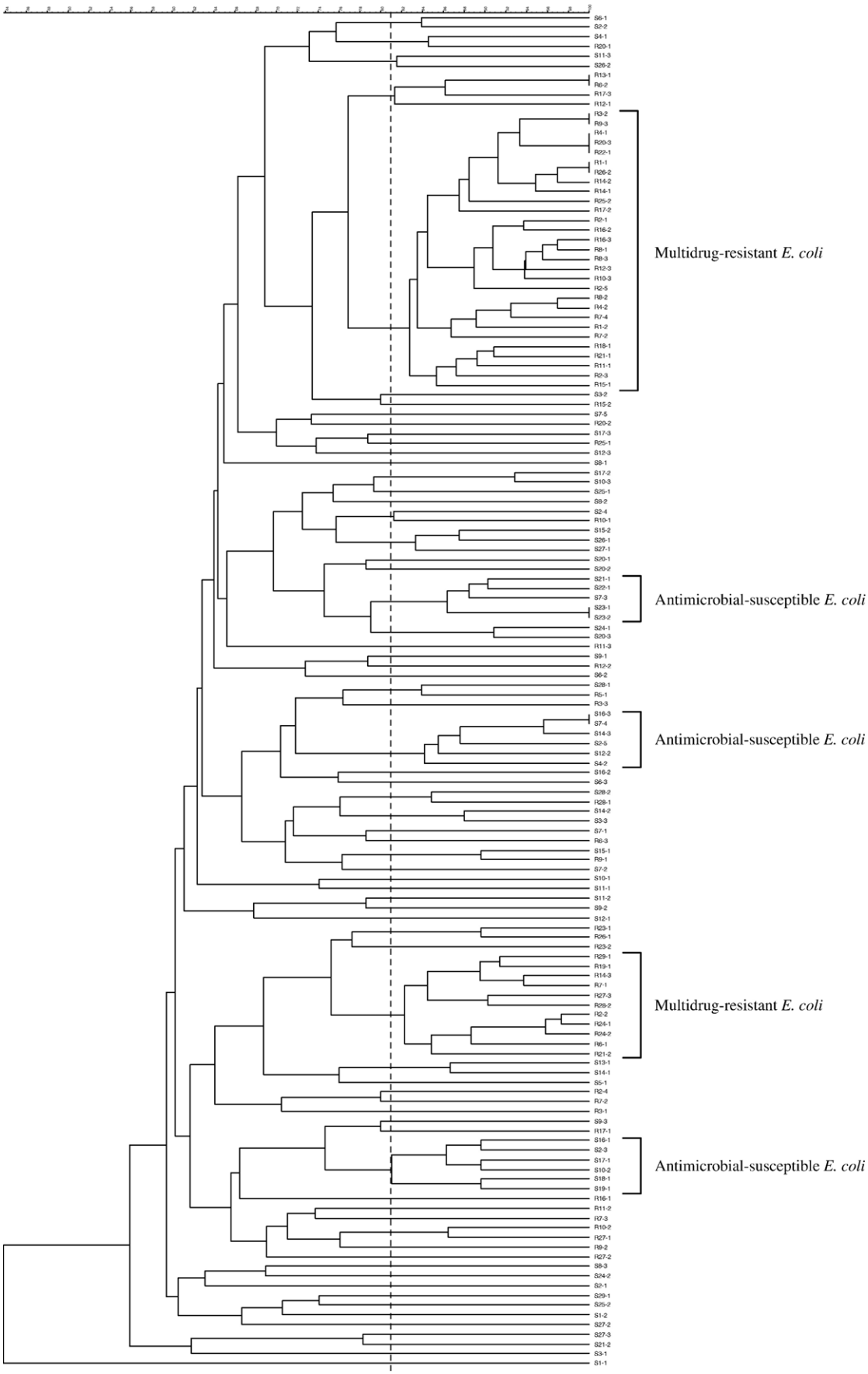
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S11-3
S26-2
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R6-2
R17-3
R12-1
R3-2
R9-3
R4-1
R29-3
R22-1
R1-1
R26-2
R14-2
R14-1
R25-2
R17-2
R2-1
R16-2
R16-3
R8-1
R8-3
R12-3
R10-3
R2-5
R8-2
R4-2
R7-4
R1-2
R7-2
R18-1
R21-1
R11-1
R2-3
R15-1
S3-2
R15-2
S7-5
R20-2
S17-3
R25-1
S12-3
S8-1
S17-2
S10-3
S25-1
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S24-1
S20-3
R11-3
S9-1
R12-2
S6-2
S28-1
R5-1
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S24-2
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S21-2
S3-1
S1-1
Multidrug-resistant E. coli
Antimicrobial-susceptible E. coli
Antimicrobial-susceptible E. coli
Multidrug-resistant E. coli
Antimicrobial-susceptible E. coli