

Community-Associated Extended-Spectrum-β-Lactamase Producing

Escherichia coli Infection in Korea

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Background

- Extra-intestinal pathogenic *Escherichia coli* infection is a significant public health problem.
- Sequence type 131 (ST131) *E. coli* has played a major part in the global dissemination.
- ST131-O25H30Rx is associated with fluoroquinolone resistance and CTX-M type extended-spectrum β-lactamase .
- Recently ST131-O16 sub-clone was reported.
- The aims of study are to evaluate the recent molecular epidemiology of ESBL-producing *E. coli* and to assess the differences between community-associated and community-onset healthcare-associated isolates in a prospective, multicenter, observational study.

Methods

- Bacterial isolates: non-duplicated *E. coli* isolates from consecutive, sequentially encountered patients with community-onset episodes between March and April 2016 in two community hospitals (742 beds, Goyang-si; 132 beds, Yongin-si).
- Definition: sites of acquisition (community-associated or healthcare-associated) were determined as described by Friedman with some modifications¹ and diagnosis of infection was made based on clinical, bacteriological, and radiological investigations.
- Microbiological analysis: ESBL genotype was determined by PCR and sequencing². For the detection of ST131, all isolates were screened by PCR for O16-ST131 and O25-ST131³. *FimH* type and *H30Rx* were determined by PCR and sequencing⁴.
- Statistical analysis: Chi-square test or Fisher's exact test with the level of significance set as P value <0.05.

Reference

1. Park YS. et al. Yonsei Med J 2014;55:467-75.
2. Sidjabat HE, et al. AAC 2009;53:4733-9.
3. Johnson JR, et al. JCM 2014;52:1358-65.
4. Price LB, et al. mBio 2013;17:1-10.

Results

Table 1. Types of infections, extended-spectrum β-lactamase (ESBL) types, and the prevalence of sequence type 131 (ST131) of community-onset healthcare-associated (HA) and community-associated (CA) *Escherichia coli* episodes (N=213)

	HA (N=94)	CA (N=119)	P
Status of infection			0.7016
Infection	74 (78.7%)	98 (82.4%)	
Colonization	17 (18.1%)	19 (16.0%)	
Indeterminate	3 (3.1%)	2 (1.7%)	
Type of infection			<0.0001
Urinary tract infection	46 (62.2%)	78 (79.6%)	
Bacteremia	18 (24.3%)	9 (9.2%)	
Abscess/wound	8 (10.8%)	1 (1.0%)	
Others	2 (2.7%)	10 (10.2%)	
ESBL by genotype	25 (26.6%)	30 (25.2%)	0.8752
CTX-M group	CTX-M-15 (N=9), CTX-M-14 (N=10), CTX-M-27 (N=5), other (N=1)	CTX-M-15 (N=17), CTX-M-14 (N=9), CTX-M-27 (N=1), other (N=3)	
SHV group	Not detected	Not detected	
TEM group	Not detected, TEM-1 ^a (N=2)	Not detected, TEM-1 ^a (N=1)	
ST131 subclone	26 (27.7%)	32 (26.9%)	1.0000
O16-ST131	10 (10.6%)	7 (5.9%)	0.2152
O25-ST131	16 (17.1%)	25 (21%)	0.4893
H30	15/16 (93.8%)	20/25 (80%)	0.3759
H30Rx	5/15 (33.3%)	11/20 (55%)	0.3064
Non-ST131	68 (72.3%)	87 (73.1%)	1.0000

N, number.; Chi-square test or Fisher's exact test; ^aNarrow-spectrum β-Lactamase

Table 2. Extended-spectrum β-lactamase (ESBL) types and the prevalence of sequence type 131 (ST131) in community-onset *Escherichia coli* episodes (N=58)

	ST131 (O25+O16)	O25	H30	H30Rx	O16
ESBL positive (%)	28/58 (48.3%)	23/41 (56.1%)	20/35 (57.1%)	13/16 (81.3%)	5/17 (29.4%)
CTX-M group					0
CTX-M-15	16	16	14	13	0
CTX-M-14	9	4	4	0	5
CTX-M-27	3	3	2	0	0

N, number

Table 3. Antimicrobial resistance rate (%) of *Escherichia coli* isolated from two community hospitals

Antimicrobial agents	Resistance rate (%) of						
	Site of acquisition		Sequence type (ST)				
	HA (n=93)	CA (n=119)	ST131-O25-H30 (n=35)	ST131-O25-H30Rx (n=16)	ST131-O16 (n=17)	All ST131 (n=58)	Other STs (n=154)
Ampicillin	70	68	83	94	65	79	65
Piperacillin	69	64	80	88	65	78	62
Ampicillin/sulbactam	33	25	40	44	29	35	27
Cefoxitin	4	2	3	6	0	3	3
Cefotaxime	30	27	60	88	29	50	20
Ceftazidime	30	24	57	81	24	47	19
Meropenem	0	0	0	0	0	0	0
Imipenem	0	0	0	0	0	0	0
Ciprofloxacin	39	44	100	100	18	67	32
Gentamicin	23	25	51	56	35	43	17
Tobramycin	13	11	31	38	24	28	6
Amikacin	0	0	0	0	0	0	0
Cotrimoxazole	33	25	49	44	41	45	23

HA, community-onset healthcare-associated; CA, community-associated; all ST131, O25-H30, O25-nonH30, and O16; ^aOne isolate was excluded from the antimicrobial susceptibility test

Conclusions and Discussion

In this study, considerable ST131 *E. coli* isolations in the community were observed and about half of them were related to the history of visit to the healthcare facilities, indicating the spread of multidrug resistance *E. coli* to the community via healthcare facilities.