

Genotypic Characterization of Common Beta-lactamase Genes in Clinically Isolated *Escherichia coli*

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Background: Beta-lactamases are the most important cause of betalactam resistance in Gram-negative bacteria. Extended-spectrum beta-lactamases (ESBLs) hydrolyze third generation cephalosporins and are prevalent among *Enterobacteriaceae*, such as, *E. coli* and *K. pneumoniae*. Infections caused by ESBL-producing bacteria are difficult-to-treat. Most ESBLs can be genotypically divided into 3 groups; TEM, SHV, and CTX-M. The type and prevalence of ESBL genes in *E. coli* isolates in our hospital are unknown.

Objectives: To determine beta-lactamase genes in *E. coli* clinical isolates and to correlate the beta-lactamase genotypes with their phenotype.

Methods: Among 116 *E. coli* isolates included, 74 were ESBL positive by double disc synergistic method

using ceftriaxone, ceftazidime and amoxicillin/clavulanic acid. Multiplex PCR was used to identify 3 common beta-lactamase genes, TEM, SHV, and CTX-M.

Results: CTX-M genes were detected in all phenotypically ESBL-positive isolates and 46 (62.2%) isolates also harbored TEM genes. Among 42 ESBL-negative *E. coli*, 33 (78.6%) and 2 (4.8%) isolates possess TEM and TEM & SHV, respectively. Genotypes of all tested isolates were presented in Table. Prediction of CTX-M producer by using the 2010/2011 CLSI zone diameter breakpoints provided 20% increase in sensitivity of ceftazidime in predicting CTX-M production in *E. coli*. However, sensitivity for ceftriaxone zone diameter breakpoints is still much better than that of ceftazidime (95.24% and 47.3%, respectively).

ESBL Phenotypes	Genotypes of beta-lactamase				
	CTX-M	CTX-M & TEM	TEM	TEM & SHV	Not classified
Positive (N=74)	28 (37.8%)	46 (62.2%)	-	-	-
Negative (N=42)	-	-	33 (78.6%)	2 (4.8%)	7 (16.7%)

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Conclusions: These results indicate that CTX-M genes are major mechanism responsible for ESBL production in *E. coli* isolates. Moreover, double disc technique demonstrated good correlation with ESBL genotype, indicating the capability of this technique to detect CTX-M-producing bacteria. The 2010/2011 CLSI zone diameter breakpoints for ceftriaxone is therefore more sensitive than ceftazidime in predicting ESBL-producing *E. coli*.