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REVIEWED ABSTRACT


Objective: To present the results of the second year of the surveillance and resistance profiles of ESBL-ENT from patients in Canadian hospitals (CH) in 2007 & 2008.

Materials and Methods: Clinical or hospital laboratory isolates were collected from January 1, 2007 to December 31, 2008 by the CANDAR project team. Isolates were submitted by CHs to the Health Research Ethics Board. Resistance to the following antimicrobials: amoxicillin/clavulanic acid, ceftriaxone, ceftazidime, imipenem, meropenem, and piperacillin/tazobactam were tested. ESBL-ENT were defined as isolates that were resistant to ceftriaxone and ceftazidime and that produced ESBL as defined by CLSI and in-house disk diffusion test. A subset of the data was tested using antimicrobial disk confirmation method as described by CLSI.

Results: A total of 6356 and 5926 ESBL-ENT were collected from CHs in 2007 and 2008, respectively. The majority (>98%) of ESBL-ENT were K. pneumoniae. The majority (>98%) of ESBL-ENT remained susceptible to amoxicillin/clavulanic acid, ceftriaxone, ceftazidime, imipenem, meropenem, and piperacillin/tazobactam as determined by CLSI and in-house disk diffusion test.

INTRODUCTION

The majority (>98%) of ESBL-ENT were resistant to amoxicillin/clavulanic acid, ceftriaxone, ceftazidime, imipenem, meropenem, and piperacillin/tazobactam as determined by CLSI and in-house disk diffusion test.

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Bacterial Isolates

Bacterial isolates were collected as part of the Canadian ward (CANDAR) Sentinel Surveillance Project in 2007 & 2008. The majority (>98%) of ESBL-ENT were K. pneumoniae. The majority (>98%) of ESBL-ENT remained susceptible to amoxicillin/clavulanic acid, ceftriaxone, ceftazidime, imipenem, meropenem, and piperacillin/tazobactam as determined by CLSI and in-house disk diffusion test.

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RESULTS

The majority (>98%) of ESBL-ENT were K. pneumoniae. The majority (>98%) of ESBL-ENT remained susceptible to amoxicillin/clavulanic acid, ceftriaxone, ceftazidime, imipenem, meropenem, and piperacillin/tazobactam as determined by CLSI and in-house disk diffusion test.

Table 1: Demographics of patients with infections due to ESBL-producing E. coli and K. pneumoniae in Canadian hospitals.

<table>
<thead>
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<th>Parameter</th>
<th>Value</th>
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<td>Age</td>
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<td>Presence of K. pneumoniae</td>
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<td>Infection</td>
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<td></td>
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<td>0.37</td>
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<tr>
<td></td>
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<td>0.37</td>
</tr>
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</table>

Characterization of ESBL Isolates

Genotypic analyses of ESBL-ENT were performed by PCR and sequencing of blaTEM, blaSHV, blaCTX-M, and blaOXA genes as previously described (3, 4). A BLAST search of the DNA sequence was conducted to determine specific genotypes.

Molecular Typing by PFGE

Genetic relationships of the ESBL-producing E. coli and K. pneumoniae were assessed using repetitive intergenic electrophoretic typing (PGF) following digestion with ApaI as previously described (3).

CONCLUSIONS

1. The prevalence of ESBL-producing Enterobacteriaceae in hospital affiliated patients across Canada is increasing.
2. The prevalence of ESBL-producing E. coli and K. pneumoniae is highest among surgical and medical inpatients in Canadian hospitals and is most commonly isolated from blood and urine specimens.
3. Multi-drug resistance was found to be associated with 83.3% of ESBL-producing E. coli and 76.5% of ESBL-producing K. pneumoniae.
4. The majority (>98%) of ESBL-ENT remained susceptible to amoxicillin/clavulanic acid, ceftazidime, imipenem, and meropenem.
5. CTX-M was the most predominant ESBL type (80.9%) with blaCTX-M (65.2%) as the predominant genotype among ESBL-producing Enterobacteriaceae.
6. Based on PFGE, the spread of ESBL-producing Enterobacteriaceae across Canada is a combination of clonal spread and the dissemination genetically unrelated strains.

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REFERENCES


Figure 1: Prevalence of ESBL-producing Enterobacteriaceae in Canadian hospital.
Figure 2: Prevalence of ESBL-producing Enterobacteriaceae by hospital ward.
Figure 3: PFGE dendrogram depicting the genetic relationships among ESBL-producing E. coli.
Figure 4: PFGE dendrogram depicting the genetic relationships among ESBL-producing K. pneumoniae.
Figure 5: Antimicrobial resistance profiles among ESBL-producing E. coli.
Figure 6: Antimicrobial resistance profiles among ESBL-producing K. pneumoniae.