Carbapenemase Gene Transfer among Canadian Patients Colonized or Infected with Carbapenemase-Producing Enterobacteriaceae

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Abstract (rev.)

Background: Carbapenemase-producing Enterobacteriaceae (CPE) are an emerging global health threat.

• The emergence of carbapenemase-producing Enterobacteriaceae (CPE) has important infection control and global health implications.

• In Canada, an increase in CPE incidence of 33% was observed in 39/499 patients (8.2%) had at least one follow-up specimen positive for CPE.

• 12/23 patients (52.2%) had at least one follow-up specimen positive for CPE.

• 18/77 patients (23%) showed evidence of gene transfer, with a total of 14 instances of gene transfer captured during the surveillance study (Fig 3).

Methods: 754 patients had CPE isolates submitted to our reference laboratory between Jan 2011 and Dec 2016 for molecular carbapenemase testing. All patients colonized with multiple species possessed the same carbapenemase gene were reviewed.

• Average duration of CPE colonization prior to evidence of gene transfer was calculated from a surveillance study where rectal & groin swabs were collected at 3-month intervals from 123 CPE-colonized patients.

• Most commonly, multiple species with the same carbapenemase gene were found in rectal swabs (25%, 8/32), followed by urine cultures (3/32, 9.4%), and stool specimens (2, 6.3%).

• In the surveillance study, 18/72 persistently colonized patients (25%) showed evidence of gene transfer during the study period.

• Out of 14 instances of gene transfer captured during the surveillance study, 5, 4, and 2 were detected at the 1st, 3rd, 6th, and 9th month follow-up periods, respectively.

Conclusions: A minority of CPE-colonized patients will carry multiple species of CPE. Gene transfer may be observed in persistently colonized patients.

The proportion of CPE isolates producing different carbapenem-resistant species:

- E. coli: 63 (51%)
- K. pneumoniae: 46 (37%)
- N. meningitidis: 14 (11%)
- M. xanthus: 7 (6%)
- V. parahaemolyticus: 5 (4%)

Table 1: Distribution of CPE isolates in the follow-up study

<table>
<thead>
<tr>
<th>Species</th>
<th>Index isolates (n=123)</th>
<th>Follow-up isolates (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>63 (51%)</td>
<td>9 (47%)</td>
</tr>
<tr>
<td>K. pneumoniae</td>
<td>46 (37%)</td>
<td>6 (32%)</td>
</tr>
<tr>
<td>N. meningitidis</td>
<td>14 (11%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>M. xanthus</td>
<td>7 (6%)</td>
<td>0</td>
</tr>
<tr>
<td>V. parahaemolyticus</td>
<td>5 (4%)</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 1: Single specimen type containing multiple species with the same carbapenemase gene (n=22 patients)

Figure 2: Paired specimen types detecting multiple species with the same carbapenemase gene (n=17 patients)

Figure 3: The number of instances of carbapenemase gene transfer observed in the surveillance study over the designated follow-up period

Discussion

• A significant number of CPE-colonized patients will carry multiple species of Enterobacteriaceae with the same carbapenemase gene.

• Instances of gene transfer will more commonly be detected in surveillance specimens rather than clinical specimens.

• In persistently colonized patients, carbapenemase gene transfer to new species continues to occur over time, up to at least 9 months.

References


(4) Nancy Matic, medportal.ca

Poster #349

Abstract: Figure 1: Single specimen type containing multiple species with the same carbapenemase gene (n=22 patients)

25% of 123 CPE-colonized patients had CPE isolates submitted to our surveillance study. The proportion of CPE isolates producing different carbapenem-resistant species:

- E. coli: 63 (51%)
- K. pneumoniae: 46 (37%)
- N. meningitidis: 14 (11%)
- M. xanthus: 7 (6%)
- V. parahaemolyticus: 5 (4%)