Adquired Carbapenem Hydrolyzing β-Lactamases among Clinical Strains of Acinetobacter spp. from Latin America: Report from the SENTRY Antimicrobial Program

Ana C. Gales, Rodrigo E. Mendes, Fernanda M. Castrucci, Rodrigo Cayô, Ronald N. Jones, Hélio S. Sader

Infectious Diseases Division, Department of Medicine, Universidade Federal de São Paulo, (UNIFESP/E PM), São Paulo, Brazil.
JMI Laboratories, North Liberty, Iowa, USA.

Poster C2-3858
ICAC/IDSA 2008

Acquired Carbapenemase-producing  strains have been identified among clinical isolates of  in Latin America. class D β-lactamases are considered to be the main mechanism of carbapenem resistance in  strains. We evaluated the frequency of class D carbapenemase encoding genes in  strains isolated from Latin American medical centers.

Methods: 288  strains were collected from 10 medical centers in four countries: Brazil (51 isolates), Argentina (50 isolates), and Chile (1 isolate) in 2007. The isolates were centrally tested for susceptibility using the broth microdilution method as described by the Clinical Laboratory Standards Institute (CLSI; M7-A7, 2006). cation-adjusted Mueller-Hinton broth was used in validated panels manufactured by TREK Diagnostics (Cleveland, OH). MIC values were interpreted according to the CLSI (2008) and 2006 criteria. Detection of class D and class B carbapenemase-encoding genes.  strains were screened for carbapenem hydrolyzing class D and class B β-lactamases. Detection of class D carbapenemase-encoding genes was performed by PCR following the method of Turton et al. (2005). Detection of class B carbapenemase-encoding genes was performed using the API ZYM system (bioMérieux, Marcy l’Etoile, France).

Results

Introduction

Acinetobacter is an important cause of nosocomial-acquired infections in Latin America, and carbapenem resistance has been associated with acquisition of carbapenem hydrolyzing class D β-lactamases (ML).  strains constitute the main therapeutic option for treatment of Acinetobacter infections. However, carbapenem-resistant  strains are emerging and rapidly disseminated in Latin American hospitals, imposing a serious therapeutical challenge. In fact, high rates of pan-resistant isolates (susceptible only to polymyxins) have been observed among carbapenem-resistant  strains.  strains have been observed among Latin American hospitals for more than one decade. Among  strains, isolates resistant to carbapenems have been mainly associated with acquisition of carbapenem hydrolyzing class D β-lactamases. Class D carbapenemases are natural enzymes that use extended active-site loops as a substrate binding domain. The main objective of this study was to evaluate the frequency of class D and class B carbapenemase-encoding genes among  strains isolated from Latin American medical centers.

Materials and Methods

Bacterial strains. A list of 288 Acinetobacter spp. isolates were collected from ten Latin American medical centers during the year of 2007. The participant medical centers were located in nine cities of four countries: São Paulo, Brasilia, Florianópolis and Porto Alegre in Brazil, Buenos Aires and San Isidro in Argentina, Santos in São Paulo, Brazil, and Mexico. The isolates were collected from clinical samples of body sites of infection. Only a single isolate per patient was evaluated. All isolates were identified at the participating institution by routine identification methods in use at each laboratory.

Susceptibility testing. Isolates were tested for susceptibility to the broth microdilution method as described by the Clinical Laboratory Standards Institute (CLSI; M7-A7, 2006). The CLSI broth microdilution method was used to determine the minimum inhibitory concentrations (MICs) of the tested antimicrobial agents. The isolates were tested against 10 antimicrobial agents to detect and identify possible resistance patterns. Quality control was performed using Escherichia coli ATCC 25922, Staphylococcus aureus ATCC 29213 and Pseudomonas aeruginosa ATCC 27853. All QC results were within acceptable ranges.

Detection of class D and class B carbapenemase-encoding genes.  isolates were screened for their ability to hydrolyze imipenem and meropenem. Screening was performed by direct sequencing with the ABI Prism 3100 genetic analyzer (Applied Biosystems, Foster City, CA, USA). Similarity searches and alignments for both nucleotide and deduced protein sequences were performed with the BLAST program (http://www.ncbi.nlm.nih.gov/BLAST).

Overall, among the 288  strains collected, 105 (36.4%) strains exhibited MIC values ≤8 µg/ml for imipenem and meropenem and met the screening criteria for carbapenemase production. Carbapenemase resistance was highest in Argentina (60.4%), followed by Brazil (44.0%), Chile (24.0%) and Mexico (3.3%). These isolates were mainly collected from blood (52.4%) and respiratory tract samples (35.3%).

Seven carbapenem-resistant  strains carried . These strains were from Argentinean (4 isolates) and Chilean (3 isolates) medical centers. Clonal dissemination of carbapenem-resistant  strains was observed in a Chilean medical center (Table 2).

The high frequency of was mainly attributed to the spread of local isolates within Brazilian and Argentinean medical centers. Furthermore, a great genetic diversity was observed among . The occurrence of isolates concomitantly carrying  and  emphasizes the ability of to accumulate additional mechanisms of resistance.

Table 2. Distribution of class D carbapenemase-encoding genes among  strains isolated from Latin American medical centers (SENTRY Antimicrobial Surveillance Program, 2007).

<table>
<thead>
<tr>
<th>Strain</th>
<th>blaOXA-51</th>
<th>blaOXA-58</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>40A (1)</td>
<td>40A (1)</td>
</tr>
<tr>
<td>Argentina</td>
<td>40B (1)</td>
<td>40B (1)</td>
</tr>
<tr>
<td>Chile</td>
<td>40C (1)</td>
<td>40C (1)</td>
</tr>
</tbody>
</table>

Seven isolates carried either . These isolates were from Argentinean (3 isolates) and Chilean (4 isolates) medical centers. Clonal dissemination of carbapenem-resistant  strains was observed in a Chilean medical center (Table 2).

The high frequency of was mainly attributed to the spread of local isolates within Brazilian and Argentinean medical centers. Furthermore, a great genetic diversity was observed among . The occurrence of isolates concomitantly carrying  and  emphasizes the ability of to accumulate additional mechanisms of resistance.

Conclusions

References