The carbapenems are regarded as the preferential therapeutic option for treatment of serious health care-associated infections with multidrug-resistant gram-negative bacteria. Although carbapenem resistance is rarely described for the Enterobacteriaceae (6), this phenotype of resistance has been increasingly reported worldwide, especially due to the emergence and spread of Klebsiella pneumoniae carbapenemase (KPC) (1, 5, 8). In this report, we describe the first detection of KPC-2-producing K. pneumoniae strains in Brazil. These strains also coproduced an extended-spectrum ß-lactamase, CTX-M-2.

Between September and November 2006, four carbapenem-resistant K. pneumoniae strains were isolated from four distinct patients hospitalized in an intensive care unit (ICU) of a tertiary hospital located in Recife, a city on the northeastern coast of Brazil. These strains were isolated from blood (two strains) or urine (two strains). The antimicrobial susceptibility profile was determined by the reference agar dilution method according to CLSI guidelines (2). The genetic relatedness of the strains in Brazil. These strains were isolated from blood (two strains) or urine (two strains). The antimicrobial susceptibility profile was determined by the reference agar dilution method according to CLSI guidelines (2). The genetic relatedness of the carbapenem-resistant K. pneumoniae strains was evaluated by pulsed-field gel electrophoresis (PFGE) using SpeI (4). The presence of blaKPC, blaCTX-M-2, bore-PSE, and blaOXA was determined by PCR using specific primers. Amplicons were sequenced and compared to sequences available in the GenBank database (http://blast.ncbi.nlm.nih.gov/Blast.cgi). Plasmid DNA was extracted from carbapenem-resistant K. pneumoniae strains using the QIAprep SpinMiniprep kit (Qiagen, Hilden, Germany). Transformation experiments with Escherichia coli DH10B were carried out by electroporation. Transformants were selected on Mueller-Hinton agar containing ampicillin (100 μg/ml), cefazidime (2 μg/ml), and ertapenem (0.5 μg/ml). The MICs of E. coli DH10B and transformants were determined using Etest strips according to the manufacturer’s recommendations (AB Biodisk, Solna, Sweden).

All carbapenem-resistant K. pneumoniae clinical strains showed resistance to broad-spectrum cephalosporins and carbapenems (Table 1). Three carbapenem-resistant K. pneumoniae strains showed a unique PFGE pattern (pattern A), which was distinct from PFGE pattern B, displayed only by a single strain (7). blaKPC and blaCTX-M-2 were detected in all clinical strains, while blaSHV and blaTEM were carried only by the PFGE pattern A strains. The carbapenem-resistant K. pneumoniae clinical isolates and transformants possessed blaKPC-2 (GenBank accession number EU784130) and blaCTX-M-2, which were carried by a single 60-kb plasmid. This fact could justify the increased MICs of several ß-lactams exhibited by the transformant (Table 1). Furthermore, as recently described, our KPC-producing isolates were found to accumulate other ß-lactam resistance enzymes (TEM-1, CTX-M-2, and SHV-11) (3).

The report of KPC-2-producing isolates is very worrisome, since these strains are resistant to all ß-lactam agents and often to other antimicrobials. This attribute limits the therapeutic options available for treatment of serious infections, which is basically restricted to tigecycline and polymyxins. In addition, the detection of such strains by routine clinical laboratories might be difficult when current standard antimicrobial susceptibility methods are employed. Moreover, blaKPC-2 is plasmid borne, making its dissemination easier, especially when carried by K. pneumoniae, an organism notorious for its ability to accumulate and transfer resistance determinants. The clonal spread observed in this Brazilian ICU confirms blaKPC-2 dissemination and points to difficulties with infection control measures for this organism.

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**REFERENCES**


**First Report of KPC-2-Producing Klebsiella pneumoniae Strains in Brazil**

**TABLE 1. MICs of selected antimicrobial agents for KPC-producing K. pneumoniae strains, the E. coli transformant, and the E. coli DH10B recipient strain**

<table>
<thead>
<tr>
<th>Isolate</th>
<th>Body site</th>
<th>PFGE pattern</th>
<th>ß-Lactamases</th>
<th>MIC (μg/ml) of ß-Lactams</th>
</tr>
</thead>
<tbody>
<tr>
<td>A28006</td>
<td>Blood A</td>
<td>KPC-2, TEM-1, SHV-11, CTX-M-2</td>
<td>IMP 4 32</td>
<td>CAZ 128 &gt;256 &gt;256 64 16 1 4 0.38 32</td>
</tr>
<tr>
<td>A28008</td>
<td>Blood A</td>
<td>KPC-2, TEM-1, SHV-11, CTX-M-2</td>
<td>IMP 4 32</td>
<td>CAZ 32 16 &gt;256 &gt;256 &gt;256 64 16 1 4 0.38 16</td>
</tr>
<tr>
<td>A28009</td>
<td>Urine A</td>
<td>KPC-2, TEM-1, SHV-11, CTX-M-2</td>
<td>IMP 32 &gt;32</td>
<td>CAZ 64 &gt;256 &gt;256 &gt;256 &gt;256 &gt;256 &gt;256 16 1 4 0.38 64 2</td>
</tr>
<tr>
<td>A28011</td>
<td>Urine B</td>
<td>KPC-2, CTX-M-2</td>
<td>IMP 16 &gt;32 &gt;256 64 &gt;256 &gt;256 &gt;256 &gt;256 8 1 4 0.50 &gt;256 2</td>
<td></td>
</tr>
<tr>
<td>E. coli DH10B B</td>
<td>NT</td>
<td>KPC-2, CTX-M-2</td>
<td>IMP 0.25</td>
<td>CAZ 0.25 &gt;0.25 &lt;0.25 0.06 0.12 12 NT 0.12 NT 0.06 4 0.38</td>
</tr>
<tr>
<td>E. coli transformant</td>
<td>NT</td>
<td>KPC-2, CTX-M-2</td>
<td>IMP 2</td>
<td>CAZ 0.5 2 4 &gt;256 32 NT 0.12 0.06 8 0.38</td>
</tr>
</tbody>
</table>

* MICs determined by agar dilution according to CLSI guidelines, except for those of tigecycline, which were determined by Etest. IMP: imipenem; MER, meropenem; ATM, aztreonam; CAZ, cefazidime; CTX, cefotaxime; FEP, cefepime; FOX, cefoxitin; TZP, piperacillin-tazobactam; GEN, gentamicin; CIP, ciprofloxacin; CRO, ceftroxime; TGC, tigecycline; PMB, polymyxin B.

* The MICs of E. coli DH10B and transformants were determined using Etest strips according to the manufacturer’s recommendations (AB Biodisk, Solna, Sweden).

* Not tested.


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