NDM-1-Producing Acinetobacter baumannii from Algeria

Over the last decade, nosocomial infections with Acinetobacter baumannii have been described with an increasing trend toward multidrug resistance, mostly in intensive care units (ICUs) (6, 9, 11). The main mechanism of resistance to carbapenems in A. baumannii is the production of acquired OXA-type carbapenemases, which have been frequently identified worldwide and are clustered in three major subfamilies (blaOXA-23, blaOXA-24, and blaOXA-58), and more rarely metallo-β-lactamas (VIM, IMP, and SIM types), which have been sporadically reported in some parts of the world (6, 9, 10, 11). A novel metallo-β-lactamase, NDM-1, that recently emerged first in China, Germany, Egypt, Oman, and Israel (2–4). Here we report the first NDM-1-producing A. baumannii isolate from Algeria.

A 25-year-old man previously hospitalized in the ICU of the hospital of Oran, Algeria, for severe cranial trauma subsequent to a traffic accident was transferred to the ICU of the Bicêtre hospital in July 2011. At admission, cultures from a blood catheter and from rectal swabs revealed carbapenem-resistant A. baumannii strain Ora-1. During the same period of time, no other A. baumannii isolate was recovered from the Bicêtre hospital.

Species identification and susceptibility testing (disk diffusion and Etest) were performed as previously described (1, 5, 6). A. baumannii Ora-1 was susceptible to amikacin, netilmicin, tigecycline, rifampin, and colistin and resistant to all of the β-lactams, including carbapenems, with imipenem and meropenem MICs of >32 μg/ml that are antagonized by the addition of EDTA (Table 1), as determined using the Etest method.

A crude β-lactamase extract of A. baumannii Ora-1 prepared as previously described, in phosphate buffer supplemented with 50 mM ZnCl2 (3), had very weak imipenem hydrolysis activity (specific activity = 8.6 mU/mg, only 3-fold above the background obtained with an imipenem-resistant isolate), compatible with OXA carbapenemase expression (6, 10, 11). Most of the acquired Ambler class A, class B, and class D β-lactamase genes; the naturally occurring blaAmpC- and blaOXA-51-like genes; and the 16S rRNA methylase-encoding genes (armA, rmtA, rmtB, rmtC, rmtD, and npmA) were sought by PCR followed by sequencing. Only blaNDM-1 and the chromosomally encoded blaAMPC and blaOXA-94 genes were identified. ISAba1 was inserted upstream of the blaAMPC gene, likely resulting in its overexpression (6, 11).

Conjugation and electroporation experiments using azide-resistant E. coli J53 or rifampin-resistant A. baumannii CIP7010 as the recipient were unsuccessful (data not shown) (6). Plasmid extractions revealed the presence of a plasmid of >150 kb that did not hybridize with a blaNDM-1-specific probe (3), suggesting that the blaNDM-1 gene is likely to have a chromosomal location, as described for other NDM-producing A. baumannii isolates (3, 4, 6).

The identification of a blaNDM-1 gene in a clinical A. baumannii isolate originating from Algeria, with no obvious link with the Indian subcontinent, suggests that NDM-producing A. baumannii isolates may have spread already in North Africa. Only molecular tools were capable of detecting NDM in A. baumannii, and it is likely that carbapenem resistance is the result of decreased production of outer membrane porins, together with low-level expression of NDM, for other NDM-producing A. baumannii isolates (6, 11). Finally, these results highlight the importance of international patient transfer as a source of dissemination of antimicrobial resistance.

The NDM-1 gene is likely to have a chromosomal location, as described for other NDM-producing A. baumannii isolates (3, 4, 6).

### TABLE 1 MICs of various antibiotics for A. baumannii Ora-1

<table>
<thead>
<tr>
<th>Isolate</th>
<th>MIC (μg/ml)</th>
<th>TIC</th>
<th>CTX</th>
<th>CAZ</th>
<th>ATM</th>
<th>IPM</th>
<th>IPM + EDTA</th>
<th>MEM</th>
<th>DOR</th>
<th>CS</th>
<th>TGC</th>
<th>RA</th>
<th>AN</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. baumannii Ora-1</td>
<td>&gt;256</td>
<td>&gt;256</td>
<td>&gt;256</td>
<td>&gt;32</td>
<td>&lt;1</td>
<td>&gt;32</td>
<td>&gt;32</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Notes: | TIC, ticarcillin; CTX, cefotaxime; CAZ, ceftazidime; ATM, aztreonam; IPM, imipenem; IPM + EDTA, imipenem supplemented with EDTA; MEM, meropenem; DOR, doripenem; CS, colistin; TGC, tigecycline; RA, rifampin; AN, amikacin. |
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