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Letters to the Editor

First Report of the Carbapenem-Hydrolyzing Oxacillinase OXA-58 in *Acinetobacter baumannii* Isolates in Italy

Emergence of *Acinetobacter baumannii* with resistance or reduced susceptibility to carbapenems has been reported worldwide (4). *Acinetobacter* may develop resistance to carbapenems through various mechanisms, including decreased permeability, efflux pump overexpression, and production of carbapenemases (3, 4, 9). Four of the eight carbapenemase-hydrolyzing oxacillinase (OXA) clusters have been identified in *A. baumannii*, including the OXA-23, OXA-24, OXA-51, and OXA-58 enzymes and their variants (9). In this study, the molecular basis of the carbapenem resistance in *Acinetobacter* spp. was investigated in human isolates collected from July to September 2005 at the Policlinico Umberto I, a large University Hospital of Rome. During the study period, a total of 11 consecutive isolates of *Acinetobacter* spp. (including colonizing isolates) from urine, blood, wound or throat swabs, and bronchoalveolar specimens were recovered from eight different patients, five of them hospitalized in the intensive care unit and three in other wards of the hospital. Species identification, routine antimicrobial susceptibility testing, and MIC determination were performed with the Vitek 2 system with ID-GN and ASTGN09 cards (BioMérieux, Marcy l'Etoile, France) and were interpreted according to the guidelines of the Clinical and Laboratory Standards Institute (formerly the National Committee for Clinical Laboratory Standards) (6).

Nine isolates were multidrug resistant, including resistance to the extended-spectrum cephalosporins, aztreonam, fluoroquinolones, aminoglycosides, and carbapenems (imipenem MIC, >16 μg/ml; intermediate meropenem MIC, 8 μg/ml). In these isolates, the presence of metallo-β-lactamases was excluded by using Etest metallo-β-lactamase strips (AB BIODISK, Solna, Sweden) (8). The two carbapenem-susceptible isolates showed an imipenem MIC of 2 μg/ml and a meropenem MIC of <0.25 μg/ml.

Eight nonrepetitive (one from each patient) strains were selected for further characterization (Table 1); they showed identical pulsed-field gel electrophoresis patterns, suggesting that they were closely related and were probably derived from a single *Acinetobacter* strain.

The presence of OXA carbapenemases was searched for in the eight selected strains by PCR assays using previously described primer pairs for the $bla_{\text{OXA-23}}$, $bla_{\text{OXA-40}}$, $bla_{\text{OXA-51}}$, and $bla_{\text{OXA-58}}$ genes, representative of the four OXA clusters (1, 2, 3). All of the strains, including the susceptible strain, 192, were negative for $bla_{\text{OXA-23}}$ and $bla_{\text{OXA-40}}$ but positive for $bla_{\text{OXA-51}}$-like genes. Interestingly, the seven carbapenem-resistant strains were $bla_{\text{OXA-58}}$ positive, while the susceptible strain was negative for this gene, suggesting that the OXA-58 enzyme significantly contributes to the imipenem resistance in these *Acinetobacter* strains. The $bla_{\text{OXA-58}}$ amplicons were fully sequenced, demonstrating 100% identity to the $bla_{\text{OXA-58}}$ sequence (EMBL accession no. AY570763) (7). We localized the $bla_{\text{OXA-58}}$ gene on plasmids. Plasmids of different sizes, positive for the hybridization with a specific $bla_{\text{OXA-58}}$ probe (2), were obtained from the seven carbapenem-resistant strains, while the susceptible strain, 192, was negative to this hybridization.

To our knowledge, this is the first identification of the $bla_{\text{OXA-58}}$ gene in Italy, since the gene was not detected in a carbapenem-resistant isolate from Rome analyzed in a previous study (5).

The plasmid-mediated OXA-58 described in this study could contribute to a rapid spread of carbapenem resistance in *Acinetobacter* in our hospital. Further molecular and epidemiological studies will be necessary to estimate the diffusion of this resistance determinant in this and other hospitals in our country.

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TABLE 1. Characteristics of the *A. baumanii* strains analyzed in this study

Strain and mo of isolation (yr 2005)	Ward[a]	Source[b]	Presence of bla_{oxa58}	Resistance type[c]
July				
183	ICU	TS	Positive	AMK ATM CAZ CRO CIP CTT FEP GEN **IPM** LVX PIP SXT TOB TZP
186	ICU	T/B Asp	Positive	AMK ATM CAZ CRO CIP CTT FEP **IPM** LVX PIP SXT TOB TZP
194	ICU	T/B Asp	Positive	AMK ATM CAZ CRO CIP CTT FEP **IPM** LVX PIP SXT TOB TZP
August				
181	ICU	T/B Asp	Positive	AMK ATM CAZ CRO CIP CTT FEP **IPM** LVX PIP SAM SXT TOB TZP
190	GS	CVC	Positive	AMK ATM CAZ CRO CIP CTT FEP **IPM** LVX PIP SXT TOB TZP
192	ICU	TS	Negative	ATM CAZ CRO CIP CTT FEP LVX PIP SXT TOB
193	IM	UR	Positive	AMK ATM CAZ CRO CIP CTT FEP **IPM** LVX PIP SXT TOB TZP
September				
195	GS	WS	Positive	AMK ATM CAZ CRO CIP CTT FEP **IPM** LVX PIP SXT TOB TZP

[a] ICU, intensive care unit; GS, general surgery; IM, internal medicine.
[b] T/B Asp, tracheal/bronchial aspirate; CVC, vein catheter; WS, wound swabs; TS, throat swabs; UR, urine.
[c] Antimicrobial drug abbreviations: AMK, amikacin; ATM, aztreonam; CAZ, ceftazidime; CRO, ceftriaxone; CIP, ciprofloxacin; CTT, cefotetan; FEP, cefepime; GEN, gentamicin; IPM, imipenem; LVX, levofloxacin; PIP, piperacillin; SAM, ampicillin-sulbactam; SXT, trimethoprim/sulfamethoxazole; TOB, tobramycin; and TZP, piperacillin/tazobactam. Note that imipenem resistance has been highlighted in boldface.

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