First report of the *bla*$_{OXA-58}$ gene in a clinical isolate of *Acinetobacter baumannii* in Rio de Janeiro, Brazil

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Carbapenemase production is an important mechanism of carbapenem resistance among nonfermentative Gram-negative isolates. This study aimed to report the detection of bla$_{OXA-58}$ *gene in multiresistant clinical isolates of* Acinetobacter baumannii *recovered from inpatients in a public hospital. Polymerase chain reaction tests were performed to detect the* bla$_{OXA-23-like}$, bla$_{OXA-24-like}$, bla$_{OXA-58-like}$ *and* bla$_{OXA-51-like}$ *genes. The* bla$_{OXA-58}$ *and* bla$_{OXA-23}$ *genes were detected in one and three isolates, respectively. Sequencing of the* bla$_{OXA-58-like}$ *amplicon revealed 100% identity with the* A. baumannii bla$_{OXA-58}$ *gene listed in the GenBank database. This is the first report of an OXA-58-producing* A. baumannii *isolate in Rio de Janeiro, Brazil.*

Key words: *Acinetobacter baumannii* - oxacillinases - OXA-58

Multidrug-resistant *Acinetobacter baumannii* is recognised as an important cause of nosocomial infections and a major problem confronting the intensive care unit due to its association with severe infections and the development of resistance to the major classes of antimicrobial agents (Bergogne-Bérézin & Towner 1996). According to the Meropenem Yearly Susceptibility Test Information Collection reports, *A. baumannii* was the fourth most prevalent pathogen isolated from hospitalised patients at 20 Brazilian centres and it presented high rates of resistance to all antimicrobial agents tested (Kiffer et al. 2005). Furthermore, several studies have shown the geographically widespread occurrence of carbapenem-resistant *A. baumannii* isolates over the last 10 years in Europe, North America and Latin America (Peleg et al. 2008).

Four OXA-type carbapenemases (Ambler class D) have been identified in *A. baumannii*: OXA-23-like (OXA-23, OXA-27 and OXA-49), OXA-24-like (OXA-24, OXA-25, OXA-26, OXA-40 and OXA-72), OXA-58-like and OXA-51-like. The identification of OXA-143 in carbapenem-resistant *A. baumannii* isolates in Brazilian hospitals was recently reported (Antonio et al. 2011). OXA-51-like constitutes a family of chromosomal enzymes typically present in *A. baumannii*. Outbreaks of OXA-23-producing *A. baumannii* have been reported worldwide, including in Brazil (Dalla-Costa et al. 2003, Naas et al. 2005, Zong et al. 2008, Carvalho et al. 2009, Kohlenberg et al. 2009). The occurrence of *bla*$_{OXA-58}$ in *Acinetobacter* spp is geographically widespread and consistently associated with resistance not only to carbapenems but also to many other antimicrobials, such as β-lactams, fluoroquinolones and aminoglycosides (Coelho et al. 2006, Peleg et al. 2008).

In the present study, we investigated the occurrence of genes associated with the production of carbapenem hydrolysing oxacillinases among *A. baumannii* isolates recovered from inpatients at Hospital Estadual Azevedo Lima (HEAL), a 200-bed tertiary care centre located in Niterói, state of Rio de Janeiro, Brazil.

Twenty consecutive multidrug-resistant *A. baumannii* isolates recovered from inpatients at HEAL from October 2005-June 2006 were evaluated in the present study. Only one isolate for patient was included in the analysis. The isolates were identified by both conventional and semi-automated methods (Microscan, Dade Behring, West Sacramento, CA, USA). The disk diffusion method was performed to determine the antimicrobial susceptibility of the isolates according to the Clinical and Laboratory Standards Institute guidelines (CLSI 2010) using the following antimicrobial agents: amikacin, ampicillin/sulbactam, cefepime, ceftazidime, ciprofloxacin, gentamicin, imipenem, meropenem, piperacillin/tazobactam, sulfamethoxazole/trimethoprim and tobramycin. Quality control testing was performed using *Pseudomonas aeruginosa* ATCC 27853 and *Escherichia coli* ATCC 25923. Genes encoding oxacillinases classified as OXA-23-like, OXA-24-like, OXA-51-like and OXA-58-like were investigated by multiplex polymerase chain reaction (PCR) as de-

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TABLE

Characteristics of four bla_{OXA} carrying *Acinetobacter baumannii* isolates detected in this study

Strain	Date of isolation	Ward	Isolation site	Antimicrobial resistance profile	PCR products
Ab554	May 11 2005	ICU	CVC	AMI, CAZ, CIP, FEP, GEN, IPM, MER, SXT, TOB, TZP	bla_{OXA-51}/bla_{OXA-58}
Ab680	August 15 2005	MU	TA	AMI, CAZ, CIP, FEP, GEN, IPM, MER, SXT, TZP	bla_{OXA-51}/bla_{OXA-23}
Ab822	May 18 2006	ICU	TA	AMI, CAZ, CIP, FEP, GEN, IPM, MER, SXT, TOB, TZP	bla_{OXA-51}/bla_{OXA-23}
Ab827	June 29 2006	MU	SS	CAZ, CIP, FEP, GEN, IPM, MER, SXT, TOB, TZP	bla_{OXA-51}/bla_{OXA-23}

AMI: amikacin; CAZ: ceftazidime; CIP: ciprofloxacin; CVC: central venous catheter; FEP: cefepime; GEN: gentamicin; ICU: intensive care unit; IPM: imipenem; MER: meropenem; MU: medical unit; PCR: polymerase chain reaction; SS: surgical site; SXT: trimethoprim/sulfamethoxazole; TA: tracheal aspirate; TOB: tobramycin; TZP: piperacillin/tazobactam.

scribed previously (Woodford et al. 2006). PCR products were purified using the GTX PCR and band purification kit (GE Healthcare, Buckinghamshire, UK) according to the manufacturer's instructions and were sequenced in an automated sequencer (MegaBACE 1000, GE Healthcare).

PCR analysis was performed with specific primers for all Ambler class D oxacillinases (OXA enzymes) and the bla_{OXA-58} and bla_{OXA-23} genes were detected in one and three isolates, respectively. PCR amplification products for acquired carbapenemase genes were not obtained from the other 16 isolates. All strains were positive for the bla_{OXA-51} gene, an intrinsic enzyme-encoding gene characteristic of *A. baumannii*, and no isolates presented the $bla_{OXA-24-like}$ gene.

Among the 20 *A. baumannii* isolates, only those carrying the bla_{OXA-58} and bla_{OXA-23} genes were resistant to carbapenems, which is consistent with previous observations (Héritier et al. 2005). Of the three bla_{OXA-23}-positive isolates, one was susceptible only to ampicillin/sulbactam and two were also susceptible to amikacin and tobramycin. The bla_{OXA-58}-positive isolate (strain Ab554) was only susceptible to ampicillin/sulbactam (Table).

The 599 bp bla_{OXA-58} amplicon obtained from isolate Ab554 was sequenced and analysed using the BLAST tool (www.ncbi.nlm.nih.gov/BLAST), showing 100% identity with the bla_{OXA-58} gene sequence deposited in the GenBank database (accession HQ219687).

The worldwide dissemination of bla_{OXA} genes in *A. baumannii* is a growing concern, as these strains are resistant to almost all other antibiotics in addition to the carbapenems. This is the first report on the occurrence of the bla_{OXA-23} and bla_{OXA-58} genes in *A. baumannii* recovered in the cities of Niterói and Rio de Janeiro, respectively. A recent study also reported the isolation of *A. baumannii* carrying the bla_{OXA-58} gene in São Paulo, another major Brazilian city (Antonio et al. 2011). The high clonal diversity of OXA-23-producing *A. baumannii* indicates that control the dissemination of this pathogen may be difficult (Mugnier et al. 2010, Grosso et al. 2011). Further molecular and epidemiological studies are necessary to estimate the occurrence of these resistance determinants in different areas of a large country such as Brazil.

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