

Emergence of NDM-1 and OXA-72 producing *Acinetobacter pittii* clinical isolates in Lebanon

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Abstract

Acinetobacter spp. have emerged as global opportunistic pathogen causing a wide range of infections. Emergence of carbapenem resistance in these organisms is a matter of great concern. We report here the first detection of *Acinetobacter pittii* clinical isolates in Lebanon carrying either the *bla*_{NDM-1} or the *bla*_{OXA-72} gene.

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The genus *Acinetobacter* comprises to date more than 50 species, among which *Acinetobacter baumannii* is the most clinically relevant, often associated with pneumonia, septicaemia, urinary tract infections, wound infections and meningitis [1]. Treatment of infections caused by this opportunistic bacterium is a challenge as a result of its strong ability to develop resistance to a wide range of antimicrobial agents, especially carbapenems. This resistance trait is mainly related to production of acquired carbapenem-hydrolyzing class D β -lactamases and metallo- β -lactamases [2]. In the last decades, the role of non-*baumannii* *Acinetobacter* in human infections has been increasingly recognized as a result of advances in molecular biology [3]. There are several reports of multidrug-resistant strains of *Acinetobacter pittii* and *Acinetobacter nosocomialis* in healthcare facilities around the world [4].

This study was initiated by the isolation of two imipenem-resistant *A. pittii* strains recovered in two hospitals in Tripoli, North Lebanon, in 2015. The first one, designated CMUL332,

was isolated from the urine of a 4-month-old child who was admitted to the intensive care unit for fever and nephritic syndrome. The second one, CMUL334, was isolated from the urine of a 15-year-old girl patient hospitalized with febrile gastroenteritis. Bacterial identification was performed by matrix-assisted desorption ionization–time of flight mass spectrometry and partial *rpoB* gene sequencing [5]. Antimicrobial susceptibility was determined by the disk diffusion method according to the recommendations of the European Committee on Antimicrobial Susceptibility Testing (<http://www.eucast.org>). Both isolates were resistant to ticarcillin, ticarcillin/clavulanate and ceftazidime and were of intermediate susceptibility to piperacillin/tazobactam. In contrast, they remained susceptible to aminosides, tigecycline, rifampin, ciprofloxacin and colistin, except strain CMUL332, which was resistant to tobramycin and netilmicin. The Etest method confirmed the carbapenem-resistant phenotype because the minimum inhibitory concentration for meropenem was >32 mg/L and for imipenem either >32 mg/L (CMUL332) or 16 mg/L (CMUL334). Screening of *bla*_{OXA-23-like}, *bla*_{OXA-24-like}, *bla*_{OXA-58-like} and *bla*_{NDM} genes by real-time PCR revealed that CMUL332 harboured the *bla*_{NDM} gene, while CMUL334 carried the *bla*_{OXA-24 like} gene. Sequencing of the entire carbapenemase

genes showed that they encoded for NDM-I and OXA-72 variants, respectively.

OXA-72-producing *A. pittii* was first described in Colombia in 2012 from a catheter tip–positive culture of a patient who had ischaemic hepatitis and multiorgan failure [6]. This enzyme has subsequently been reported from carbapenem-resistant clinical isolates of *A. pittii* in France [7]. On the other hand, identification of NDM-positive non-*baumannii* *Acinetobacter* is now increasingly reported worldwide, concomitantly with those of *A. baumannii* isolates. Indeed, recent studies have demonstrated the emergence and the dissemination of NDM-I-producing *A. pittii* in several countries, including China [4,8], Turkey [9] and recently Brazil [10].

This study is the first report of *A. pittii* producing OXA-72 and NDM-I in Lebanon, which highlights the clinical relevance of this bacterium, in accordance with a series of recent studies [3]. Therefore, surveillance is warranted, and early detection of carbapenemase genes is recommended to avoid their major spread to more clinically relevant bacterial species.

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Conflict of Interest

None declared.

References

- [1] Peleg AY, Seifert H, Paterson DL. *Acinetobacter baumannii*: emergence of a successful pathogen. *Clin Microbiol Rev* 2008;21:538–82.
- [2] Kempf M, Rolain JM. Emergence of resistance to carbapenems in *Acinetobacter baumannii* in Europe: clinical impact and therapeutic options. *Int J Antimicrob Agents* 2012;39:105–14.
- [3] Al Atrouni A, Joly-Guillou ML, Hamze M, Kempf M. Reservoirs of non-*baumannii* *Acinetobacter* species. *Front Microbiol* 2016;7:49.
- [4] Zhang R, Hu YY, Yang XF, Gu DX, Zhou HW, Hu QF, et al. Emergence of NDM-producing non-*baumannii* *Acinetobacter* spp. isolated from China. *Eur J Clin Microbiol Infect Dis* 2014;33:853–60.
- [5] Gundi VA, Dijkshoorn L, Burignat S, Raoult D, La Scola B. Validation of partial *rpoB* gene sequence analysis for the identification of clinically important and emerging *Acinetobacter* species. *Microbiology* 2009;155:2333–41.
- [6] Montealegre MC, Maya JJ, Correa A, Espinal P, Mojica MF, Ruiz SJ, et al. First identification of OXA-72 carbapenemase from *Acinetobacter pittii* in Colombia. *Antimicrob Agents Chemother* 2012;56:3996–8.
- [7] Bonnin RA, Docobo-Pérez F, Poirel L, Villegas MV, Nordmann P. Emergence of OXA-72-producing *Acinetobacter pittii* clinical isolates. *Int J Antimicrob Agents* 2014;43:195–6.
- [8] Yang J, Chen Y, Jia X, Luo Y, Song Q, Zhao W, et al. Dissemination and characterization of NDM-I-producing *Acinetobacter pittii* in an intensive care unit in China. *Clin Microbiol Infect* 2012;18:E506–13.
- [9] Roca I, Mosqueda N, Altun B, Espinal P, Akova M, Vila J. Molecular characterization of NDM-I-producing *Acinetobacter pittii* isolated from Turkey in 2006. *J Antimicrob Chemother* 2014;69:3437–8.
- [10] Pagano M, Poirel L, Martins AF, Rozales FP, Zavascki AP, Barth AL, et al. Emergence of NDM-I-producing *Acinetobacter pittii* in Brazil. *Int J Antimicrob Agents* 2015;45:444–5.