

Multiplex PCR for Detection of a Successful Pathogen; *Acinetobacter baumannii* as a Real Threat in Intensive Care Unit of a University Hospital

Enayatollah Kalantar¹, Majid Madani², Amir Hatami², Mohammad Hossein Dehghan³, Monireh Ebadi¹, Morteza Nazari², Saber Saifei², Sadegh Saedi², Seyed Mahmoud Amin Marashi^{1*}

¹Department of Microbiology, School of Medicine, Alborz University of Medical Sciences, Karaj, IR Iran

²Diagnostic Laboratory, Shahid Rajaei Hospital, Alborz University of Medical Sciences, Karaj, IR Iran

³Department of Biochemistry, School of Medicine, Alborz University of Medical Sciences, Karaj, IR Iran

*Corresponding author: Seyed Mahmoud Amin Marashi, Department of Microbiology, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran. Tel: +982634336007, Fax: +98 26 34314400, E-mail: parsmicrob@gmail.com

Submitted: September 04, 2016; Revised: December 05, 2016; Accepted: December 05, 2016

Multidrug resistance in *Acinetobacter baumannii* is a growing public health concern all over the world. In the current study, the isolation and antimicrobial resistance pattern and detection of *blaOXA-51* and *lpxC* genes by multiplex PCR method was performed. All the isolates demonstrated high levels of resistance rates to amikacin, ciprofloxacin, meropenem, imipenem, ceftriaxone, gentamicin, and colistin. Screening of two resistance genes by multiplex PCR showed that all the isolates contained *blaOXA-51* and *lpxC* genes. As we previously reported, nosocomial infections caused by *A. baumannii* isolates are a major cause of morbidity and mortality in our hospital.

Keywords: *Acinetobacter baumannii*, Nosocomial infection, Multidrug-resistance, *blaOXA-51* and *lpxC* genes

1. Background

Acinetobacter baumannii is a non-motile gram-negative and aerobic bacterium commonly isolated from the hospital environment and also hospitalized patients. *A. baumannii* is a nosocomial organism and preferentially colonizes aquatic environments. This organism is often cultured from sputum or respiratory secretions, wounds, skin and urine specimens of hospitalized patients.

A. baumannii is commonly associated with serious nosocomial infections worldwide; In this regard, Iran is no exception (1-2). In health care settings, *A. baumannii* is known for its ability to colonize or infect severely ill patients, particularly elderly. Moreover, it is extremely resistant to various antibiotics (3), particularly the carbapenem-hydrolysing Class D β -lactamase, that is intrinsic in this bacterium. Similarly, colistin resistance in *A. baumannii* isolates has been reported from several countries (4).

In Iran, dissemination of *A. baumannii* clones harboring carbapenem as well as colistin was reported (5-6).

2. Context

In this study, we documented eight cases of *A. baumannii* in a teaching hospital, Karaj.

Species identification had been performed previously using biochemical tests (7). The antibiotic susceptibility of the strains was determined by the standard disk diffusion method on Mueller–Hinton agar according to CLSI guideline (8). The following antibiotics were tested: imipenem, amikacin, gentamicin, ciprofloxacin, meropenem, ceftriaxone and, and colistin.

All the *Acinetobacter* isolates were subjected to multiplex PCR assay in search for *blaOXA-51* and *lpxC* genes using specific primers (9).

Antibiotic susceptibility testing showed that all the isolates under study were resistant to ciprofloxacin, gentamicin, amikacin, meropenem, imipenem, ceftriaxone, and colistin.

Screening for carbapenemase-encoding genes by multiplex PCR showed that all the isolates contained the naturally

occurring *blaOXA-51* gene. Similarly, molecular analysis of the colistin-resistant isolates showed that all the isolates harbored *lpxC* resistance genes (Figure 1).

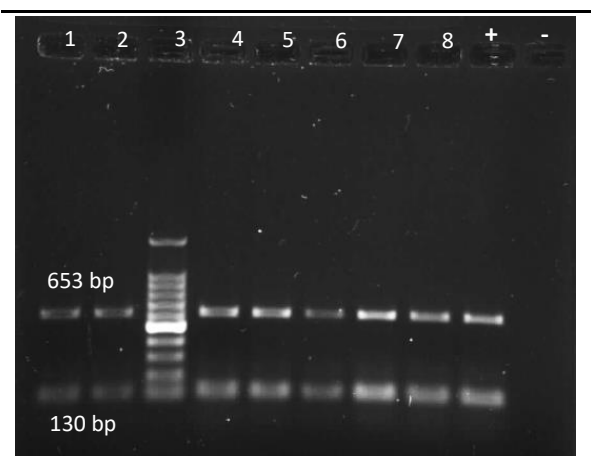


Figure 1: Detection of *blaOXA-51* and *lpxC* genes by multiplex PCR. The molecular size marker (Lane 3), Lane 9 positive control and Lane 10 negative control.

3. Conclusion

Emergence of multidrug resistance among *A. baumannii* strains is a clinical problem affecting people health worldwide, making it as an important nosocomial pathogen which is able to acquire resistance to almost all routine antibiotics, including carbapenems (10). In such cases, colistin is a key antimicrobial agent for treatment, however, increased prescription of this antibiotic has led to the emergence of colistin resistant *A. baumannii* isolates (11).

Our study involved eight unique patients identified with infection due to multidrug resistant *A. baumannii*, which can be supported by the genetic relatedness of colistin- and carbapenem-resistant genes among these isolates. Therefore, in conclusion, it is recommended that the use of antibiotics to

be well managed, and the establishment of a resistance monitoring system to be warranted.

Conflict of Interest

The authors report no conflicts of interest in this work.

Acknowledgements

This manuscript was approved by the ethics committee of Alborz University of Medical Sciences, Karaj, Iran.

Authors' Contributions

The authors declare no financial disclosure to report.

Funding/Support

This work was supported by a grant from Alborz University of Medical Sciences, Karaj, IR Iran.

References

1. Tena D, Martfá nez NM, Oteo J, Saález D, Vinde A, Azanãedo ML, et al. Outbreak of multiresistant OXA-24- and OXA-51-Producing *Acinetobacter baumannii* in an internal medicine ward. *Jpn J Infect Dis*. 2013; 66(4): 323-326.
2. Perez F, Hujer AM, Hujer KM, Decker BK, Rather PN, Bonomo RA. Global challenge of multidrug-resistant *Acinetobacter baumannii*. *Antimicrob Agents Chemother*. 2007; 51(10): 3471-3484.
3. 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(7): 3996-3998.
4. Qureshi ZA, Hittle LE, O'Hara JA, Rivera JI, Syed A, Shields RK, et al. Colistin-resistant *Acinetobacter baumannii*: beyond carbapenem resistance. *Clin Infect Dis*. 2015; 60(9): 1295-303.
5. Vakili B, Fazeli H, Shoaie P, Yaran M, Ataei B, Khorvash F, et al. Detection of colistin sensitivity in clinical isolates of *Acinetobacter baumannii* in Iran. *J Res Med Sci*. 2014; 19(Suppl 1): S67-70.
6. Farshadzadeh Z, Hashemi FB, Rahimi S, Pourakbari B, Esmaeili D, Haghighi MA, et al. Wide distribution of carbapenem resistant *Acinetobacter baumannii* in burns patients in Iran. *Front Microbiol*. 2015; 6: 1146.
7. Kalantar E, Hatami A, Rahimi F, Saedi S, Heidari A, Fallah P, et al. *Acinetobacter baumannii* infection should be considered as the most troublesome pathogens for health care institutions in Karaj. *Avicenna J Clin Microb Infect*. 2015; 6(2): 79-86.
8. Wayne P: Clinical and Laboratory Standards Institute; 2011. CLSI. Performance standards for antimicrobial susceptibility testing. 20th Informational Supplement. CLSI document M100-S21.
9. Dieffenbach CW, Lowe TM, Dveksler GS. General concepts for PCR primer design. *Genome Res*. 1993; 3(3): S30-7.
10. Bakour S, Olaitan AO, Ammari H, Touati A, Saoudi S, Saoudi K, et al. Emergence of colistin- and carbapenem-resistant *Acinetobacter baumannii* ST2 clinical isolate in Algeria: first case report. *Microb Drug Resist*. 2015; 21(3): 279-85.
11. Werneck JS, Picaõ RC, Carvalhaes CG, Cardoso JP, Gales AC. OXA-72-producing *Acinetobacter baumannii* in Brazil: a case report. *J Antimicrob Chemother*. 2011; 66(2): 452-454.

How to cite this article: Kalantar E, Madani M, Hatami A, Dehghan M-H, Ebadi M, Nazari M, Saifei S, Saedi S, Amin Marashi SM. Multiplex PCR for detection of a successful pathogen; *Acinetobacter baumannii* a real threat in intensive care unit of a university hospital. *Infection, Epidemiology and Medicine*. 2017; 3(1): 23-24.