Evaluation of molecular and biochemical methods to detect carbapenemase-producing *Acinetobacter baumannii*

Claudia Thoma[1], Martina Bacchi[1], Branka Bedenic[2], Giuseppe Cornaglia[1], Annarita Mazzariol[1]

[1]Department of Diagnostics and Public Health, University of Verona, Italy
[2]Department of Clinical and Molecular Microbiology, University Hospital Centre Zagreb, Zagreb, Croatia

P0839

Background and aim

Over the last years carbapenem-resistant strains have registered a great increment that also includes an increment of multi-resistant and carbapenemase-producing *Acinetobacter baumannii*.

In this study we evaluated classical PCR, a specific real-time kit and two biochemical methods, namely CarbaAcinetoNP and BlueCarba Test, for rapid detection of carbapenemase-producing *A. baumannii*, so as to avoid its spread in the hospitals setting.

Material and methods

74 *A. baumannii* and 1 *Acinetobacter jejunii* were included in the study.

All strains were identify by Maldi-TOF Vitek MS following an extraction protocol with acetonitrile.

Antimicrobial susceptibilities to imipenem and meropenem were assayed by microdiluition method and interpreted according to the EUCAST breakpoints.

Carbapenemases detection was performed by two biochemical tests, namely CarbaAcineto NP (1) and BlueCarba Test (2), two molecular tests, namely classical PCR for common carbapenemases *bla*$_{VIM}$, *bla*$_{NDM}$, *bla*$_{OXA-23}$, *bla*$_{OXA-24}$, *bla*$_{OXA-48}$, *bla*$_{OXA-58}$ e *bla*$_{OXA-143}$, and real time PCR by Duplicα^{RealTime}MDR *A.baumannii* OXA Genotyping (Euroclone, Milan). With this kit identification of *A. baumannii* relies on the *bla*$_{OXA51}$ gene. The kit detects the most common OXA enzymes *bla*$_{OXA-23}$, *bla*$_{OXA-24}$, *bla*$_{OXA-51}$, *bla*$_{OXA-58}$ e *bla*$_{OXA-143}$.

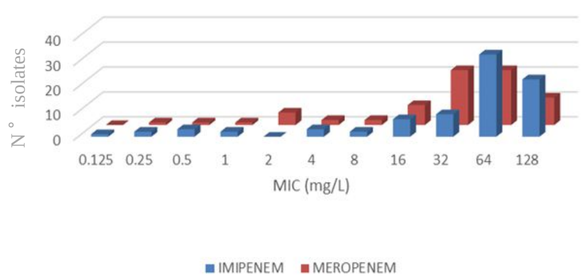

Figure 1: Mic$_s$ distribution of carbapenems for *Acinetobacter* strains

Results:

MICs carbapenems distribution is reported in Figure 1.

66 out of 74 *A. baumannii* strains plus the *A. jejuni* strain produced carbapenemases.

47 *A. baumannii* (63,5%) harboured *bla*$_{OXA-23}$, 8 *bla*$_{OXA-24}$ (10,9%), and 6 *bla*$_{OXA-58}$ (8,1%). 5 *A. baumannii* strains harboured a *bla*$_{VIM}$ gene. *A. jejuni* harboured *bla*$_{OXA-58.}$ 8 strains did not harbour any tested genes, which also accorded to their lower MICs for carbapenems (Figure 2)

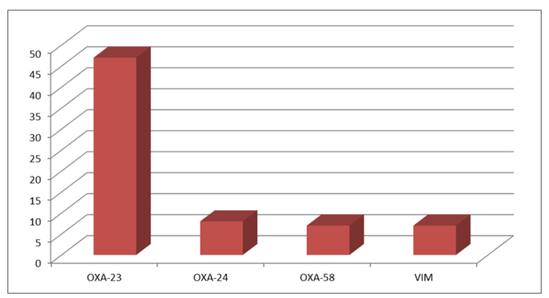

Figure 2: carbapenemases distribution for *Acinetobacter* strains

Both biochemical tests, namely CarbaAcineto NP and BlueCarba, gave positive results on 91% of carbapenemases producer strains. For four strains positive results where obtained only after streaking them on plates plus imipenem 2 mg/L for two-three days. Five strains resulted negative to both test also after being repeated several times.

Conclusions

There is an excellent agreement between the classical PCR and the Real Time PCR performed by Duplicα^{RealTime}MDR *A.baumannii* OXA Genotyping.

The latter system is also able to discriminate *A. baumannii* from other Acinetobacter spp (producing or not producing carbapenemases) and to reveal the presence of the ISAba1*bla*$_{OXA-51}$ junction.

The biochemical tests resulted less sensitive, possibly because of absent or insufficient gene expression.

References
1. Dortet L. Poire L, Errera C, Nordmann P. CarbAcineto NP test for rapid detection of carbapenemase-producing Acinetobacter spp. JCM 2014: 52: 23
2. Pires J, Novais A, Peixe L. Blue-carba, an easy biochemical test for detection of diverse carbapenemase producers directly from bacterial cultures. JCM 2013: 51: 4281-3

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UNIVERSITÀ di VERONA
Dipartimento di DIAGNOSTICA E SANITÀ PUBBLICA