O158
Oral Session
Detection of broad spectrum beta-lactamases

COMPARISON OF SEVERAL COMBINATION DISK TESTS FOR THE DETECTION OF METALLO-BETA-LACTAMASE-PRODUCING PSEUDOMONAS AERUGINOSA

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Objectives

Rapid and accurate detection of metallo-beta-lactamase (MBL)-producing *Pseudomonas aeruginosa* (PA) is essential to implement correct treatment and infection control procedures. Several inhibitor-based tests have been proposed to screen suspicious PA isolates prior to confirmatory molecular techniques. In this study, we evaluated the performance of several combination disk tests (CDT) to detect or to exclude MBL in PA.

Methods

From February to June 2013, Belgian hospital laboratories were invited to send to the National Reference Center five clinical multi-drug resistant (MDR)-PA isolates (resistant to >3 antimicrobials classes). We evaluated CDT on PA with carbapenem MIC >2 µg/mL (either imipenem or meropenem; CARBA-R group) and on isolates with carbapenem MIC >2 µg/mL and resistant to 3 other antimicrobial classes (3nd generation cephalosporins, quinolones and aminoglycosides; MDR-group). CDT evaluated included paper disks with imipenem (10µg) ±EDTA (930µg) and Rosco tablets (imipenem 10 µg ±EDTA, imipenem/meropenem 10 µg ±dipicolinic acid (DPA)). Synergism between imipenem/meropenem alone and a DPA tablet was evaluated on Mueller Hinton (MH) and on MacConkey (Mac) agars as per manufacturers' recommendations. Paper disks CDT using imipenem (10µg) ± cloxacillin 4000 µg was tested to confirm the absence of Ambler B carbapenemase. All isolates were genotypically characterized by PCR assays targeting *bla*$_{KPC}$, *bla*$_{NDM}$, *bla*$_{VIM}$ and *bla*$_{IMP}$ genes.

Results

Among the 230 received PA isolates, 166 were categorized as CARBA-R (including 84 subcategorized as MDR). Fifty PA strains were carrying a *bla*$_{VIM}$ gene and one isolate *bla*$_{IMP}$ gene. Overall, imipenem ±EDTA (paper disks) and imipenem ±DPA (Rosco tablets) displayed highest performance: sensitivity (98%), specificity (96/94%), positive predictive value (PPV) (91/88%) and negative predictive value (NPV) (99%) respectively. Disk synergy between the carbapenems and DPA tablets yielded a sensitivity of 100% but showed mediocre specificities (25% on MH and 9% on Mac). No difference in sensitivity/specificity was observed between CARBA-R and MDR-groups. To exclude the presence of MBL, paper disks imipenem and imipenem-cloxacillin yielded sensitivity and specificity of 93% and 94% in the CARBA-R group and 92% and 96% in the MDR-group.

Combination disk test	Interpretation cut-off (diameter difference in mm)	CARBA-R group (n=166)				MDR group (n=84)			
		Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Imipenem ±cloxacillin (paper)	positive ≥5	93	94	97	86	92	96	94	94
Imipenem ±EDTA (paper)	positive ≥7	98	96	91	99	98	95	96	97
Imipenem ±EDTA (tablet)	positive ≥10	86	94	86	94	85	95	95	83
Imipenem ±DPA (tablet)	positive ≥5	98	94	88	99	98	95	96	97
Meropenem ±DPA (tablet)	positive ≥5	98	86	76	99	98	86	90	97
Synergism DPA & imipenem/meropenem (MH) (tablet)	not applicable	100	25	38	100	100	31	66	100
Synergism DPA & imipenem/meropenem (Mac) (t)	not applicable	100	9	33	100	100	11	60	100

Conclusion

In our setting, CDT associating imipenem ±EDTA or ±DPA performed best for the detection of MBL *P. aeruginosa*. Imipenem/imipenem-cloxacillin test showed a good sensitivity for exclusion of MBL and should be used only in PA strains with increased MIC of carbapenem.