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Evaluation of analytical performance of dRAST™ system for direct and rapid antimicrobial susceptibility testing on Gram-negative and Gram-positive organisms from positive blood cultures

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INTRODUCTION

The direct rapid antimicrobial susceptibility test (AST) from QuantaMatrix (dRAST™) is a platform using microfluidic chip technology to provide minimal inhibitory concentrations (MICs) directly on positive blood culture (PBC) samples within 6 hours. Bacterial growth is analyzed at different antibiotic concentrations by time-lapse imaging. [1-2]

AIM

This study aimed to evaluate the analytical performance of the dRAST™ system for the direct AST of bacteria from PBC of patients hospitalized in the University Hospital of Liège in comparison to results of conventional AST obtained with Vitek®2.

METHODS

The dRAST™ was performed on all PBC directly after Gram staining to determine which of the 2 antibiotic panels should be used. We selected the first bacterial isolates from each patient's PBC. A total of 148 Gram-negative and 100 Gram-positive panels were included in this evaluation. For each strain included, we performed a conventional AST with Vitek®2.

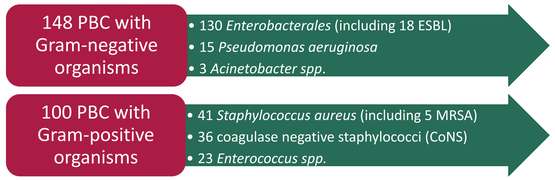


Figure 1: Summary of PBC strains included in the MIC comparison between dRAST™ (QuantaMatrix) and Vitek®2 (bioMérieux)

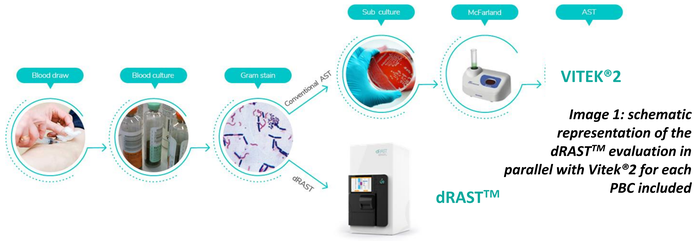
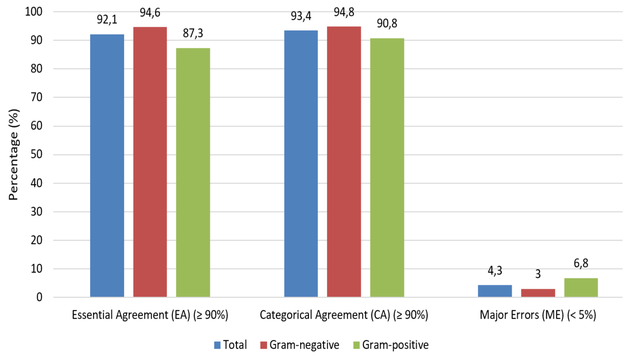


Image 1: schematic representation of the dRAST™ evaluation in parallel with Vitek®2 for each PBC included

We followed Cumitech 31A to define Categorical Agreement (CA) (≥ 90%), Essential Agreement (EA) (≥ 90%), and Major Errors (ME) (< 5%) to calculate analytical performance of the dRAST™. [3]

RESULTS

Figure 2: Evaluation of analytical performance of dRAST™ system for direct and rapid AST on Gram-negative and Gram-positive organisms from PBC compared to conventional AST obtained with Vitek®2



Compared to Vitek®2, overall performance of dRAST™ showed EA of 92,1% and CA of 93,4% including 4,3% of ME. For Gram-negative organisms, EA is of 94,6% and CA is of 94,8% including 3% of ME. For Gram-positive isolates, performance showed EA of 87,3% and CA of 90,8% including 6,8% of ME.

Table 1: Evaluation of analytical performance of dRAST™ system for direct and rapid AST on Gram-negative organisms from PBC compared to conventional AST obtained with Vitek®2

	Total		
	EA (≥ 90%)	CA (≥ 90%)	ME (< 5%)
Enterobacterales (n=130)	95,0%	94,9%	2,9%
Pseudomonas aeruginosa (n=15)	88,8%	93,3%	5,2%
Acinetobacter spp. (n=3)	100,0%	100,0%	0,0%
Total (n=148)	94,6%	94,8%	3,0%

Table 2: Evaluation of analytical performance of dRAST™ system for direct and rapid AST on Gram-positive organisms from PBC compared to conventional AST obtained with Vitek®2

	Total		
	EA (≥ 90%)	CA (≥ 90%)	ME (< 5%)
Staphylococcus aureus (n=41)	87,8%	93,2%	5,6%
CoNS (n=36)	85,5%	85,5%	9,9%
Enterococcus spp. (n=23)	91,5%	98,9%	1,1%
Total (n=100)	87,3%	90,8%	6,8%

Enterobacterales :
- ✓ Very good results
- ✓ Poorer performance with **piperacillin-tazobactam**
  - CA of 88,3% (113/128)
  - ME of 8,6% (11/128)
  - **But it is impossible to define the most reliable method between dRAST™ and Vitek®2 (none of them is considered the reference method)**

Pseudomonas aeruginosa : main discrepencies with
- ✓ Imipenem [EA = 60% (9/15), ME = 6,7% (1/15)]
- ✓ Levofloxacin [EA = 86,7% (13/15), ME = 6,7% (1/15)]
- ✓ Ceftazidime [EA = 86,7% (9/15), ME= 0% (0/15)]
- ✓ **Discrepancies are probably biased by the small sample size studied (15 strains)**

Gram-positive panel (Staphylococcus spp., Enterococcus spp.) : main discrepancies with
- ✓ Molecules not often used for the treatment of staphylococcal bacteremia (fusidic acid, erythromycin, clindamycin, rifampicin and tetracycline)
- ✓ **Linezolid:**
  - EA = 63% (63/100) [*S. aureus*: 51,2% (21/41), CoNS: 72,2% (26/36), *Enterococcus spp*: 69,6% (16/23)]
  - **But MIC measured by dRAST™ (between ≤ 0,5 and 1) and Vitek®2 (between 1 and 2) were close, allowing to categorize the strains as susceptible, with an excellent CA**

CONCLUSIONS

AST results obtained with dRAST™ are consistent with routine laboratory system Vitek®2. This innovative technology provides MICs within 6 hours, directly on PBC, thus saving precious time in the management of patients with bacteremia. The addition of an expert system on dRAST™ software will allow correction of unreliable results and provide comments and rules allowing the laboratory to give relevant information to clinicians.

REFERENCES

1. Kim H. et al. Clinical Evaluation of QMAC-dRAST for Direct and Rapid Antimicrobial Susceptibility Test with Gram-Positive Cocci from Positive Blood Culture Bottles. *Ann Clin Microbiol Vol. 21, No. 1, March 2018*

2. Huh HJ. et al. Performance evaluation of the QMAC-dRAST for staphylococci and enterococci isolated from blood culture: a comparative study of performance with the VITEK-2 system. *J Antimicrob Chemother. 2018 May 1;73(5):1267-1271*

3. Clark, R. B. et al. 2009. Cumitech 31A, Coordinating ed., S. E. Sharp. ASM Press, Washington, DC.

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