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Performances of the FAST-Prep™ PBC System enabling speeded-up positive blood culture ID/AST results using Bruker MALDI-TOF MS, BD Phoenix and disk diffusion

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INTRODUCTION

Bloodstream infections are associated with significant morbidity and mortality. Rapid microbiological management of positive blood cultures (PBCs) is essential for targeted and effective antimicrobial therapy. Subculture testing requires at least24-48 hours before identification (ID) and antimicrobial susceptibility testing (AST) results.

AIM

We evaluated the performance of the FAST-Prep™ PBC System-generated Liquid Colony™ (Qvella, Ontario, Canada) compared to a standard of care subculture isolate from a PBC. The automated FAST-Prep™ PBC System isolates and concentrates pathogenic microorganisms directly from a PBC resulting in a Liquid Colony (LC) in less than 40 minutes.

METHOD

A prospective evaluation of FAST-Prep™ PBC was done over a 3-month period in 2020 at the microbiology laboratory of the Cliniques universitaires Saint-Luc, Brussels, Belgium. FAST-Prep™ PBC was performed on the first positive-detected bottle of each routine PBC episode with a monomicrobial Gram-stain result. The worklfow is presented below. Downstream microbiological results were compared with routine MALDI-TOF MS ID and AST (EUCAST 2020 breakpoints) performed on young or overnight subculturesd colonies.

2ml sampling of a monomicrobial positive blood culture

Automated isolation and concentration with FAST-Prep™ PBC

Recovery of LC

Direct MALDI-TOF MS identification with 1 µl LC (Biotyper, Bruker Daltonics, Bremen, Germany)

Direct automated or manual AST (Phoenix, Becton Dickinson, Maryland, USA) (Adagio, BioRad, Marnes-la-Coquette, France)

RESULTS

Results for **188 PBCs** tested with FAST-Prep™ were compared with routine after exclusion of 12 polymicrobial PBCs and 9 cartridge failures. Downstream testing on LCs yielded concordant ID, no ID and discordant ID in respectively 163 (86.7%), 24 (12.8%) and 1 (0.5%) PBCs compared to routine. Detailed results are presented in table 1. The misidentified strain was a *Staphylococus petrasii* erronously identified *S. capitis.* Downstream AST from LCs was performed on 38 Gram-positive isolates for a total of 458 drug-bug combinations and on 53 Gram-negative isolates for a total of 1010 drug-bug combinations. Detailed results are presented in table 2.

	PBCs tested (n)	Concorant ID % (n)	No ID % (n)	Discordant ID % (n)
Total	188	**86.7 (163)**	12.8 (24)	0.5 (1)
Gram-negative bacilli	64	**93.8 (60)**	6.2 (4)	0
Gram-positive cocci	110	**85.4 (94)**	13.6 (15)	1(1)
Gram-positive bacilli	9	**55.6 (5)**	44.4 (4)	0
Gram-negative cocci	3	**66.7 (2)**	33.3 (1)	0
Yeast	2	**100 (2)**	0	0

Table 1: Performances of MALDI-TOF MS identification from LC obtained following FAST-Prep™ PBC compared with routine MALDI-TOF MS identification results.

	PBCs tested (n)	Categorical agreement % (n)	Very major errors % (n)	Major errors % (n)	Minor errors % (n)
Total	91	**99.2 (1456/1468)**	0.4 (1/274)	0.5 (6/1151)	0.3 (5/1468)
Gram-positive cocci	38	**98.3 (450/458)**	1 (1/96)	1.7 (6/344)	0.2 (1/458)
Gram-negative bacilli	53	**99.6 (1006/1010)**	0 (0/178)	0 (0/807)	0.4 (4/1010)

Table 2: Performances of AST from LC obtained following FAST-Prep™ PBC compared with routine AST results.

CONCLUSIONS

FAST-Prep™ PBC is an automated system allowing rapid ID and AST using the LC with optimal performances compared to routine. Additional AST evaluation is essential to confirm these preliminary observations. Ultimately, a clinical study is desirable to confirm improved clinical outcomes in patients with bloodstream infection.