Diagnostic accurary of Accelerate Pheno system on antimicrobial susceptibility test in comparison to broth microdilution method

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INTRODUCTION

The Accelerate Pheno system is a fully automated instrument that can detect and identify (ID) a broad range of sepsis-associated pathogens and utilizes morphokinetic cellular analysis to provide antimicrobial susceptibility test (AST) for an extended panel of antibiotics. ID and AST is available within 1.5 and 7 hours, respectively.

OBJECTIVE

The objective of the study was to assess the accuracy of AST by Accelerate Pheno system using broth microdilution as the reference method.

MATERIALS AND METHODS

A total of 50 well-characterised clinical isolates (15 Gram-positive and 35 Gram-negative) were spiked into blood culture bottles containing 10 mL of blood and incubated in the BD Bactec FX incubator. Flagged bottles were then tested on the Accelerate Pheno system (software v1.2.1) according to the manufacturer´s instructions. Maldi-TOF was the reference method for ID and broth microdilution was the reference method for AST. Essential agreement (EA) is designated when the Accelerate Pheno result agrees exactly with or within ± one two-fold dilution of the reference result. Category agreement (CA) is designated when the Accelerate Pheno result agrees with the EUCAST (version 7.1) interpretive result i.e. susceptible, intermediate or resistant.

RESULTS

AST results grouped by species and the corresponding antibiotics are presented in Tables 1 and 2.

CONCLUSIONS

The performance of Accelerate Pheno system for bacterial AST varies on the species tested, with a higher performance for Gram-positive bacteria than Gram-negative bacteria. Overall, the Accelerate Pheno system has demonstrated high performance in AST except certain combinations of bacteria and antibiotics.

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RESULTS

Table 1. Assessment of the AST results for Gram-negative bacteria

	E. coli (n = 6)			*Klebsiella* spp. (n = 5)			*Citrobacter* spp. (n = 4)			*Enterobacter* spp. (n = 5)			*Acinetobacter* spp. (n = 5)			*P. aeruginosa* (n = 10)		
Antibiotic	EA *n* (%)	CA *n* (%)	DSP[a]	EA *n* (%)	CA *n* (%)	DSP[a]	EA *n* (%)	CA *n* (%)	DSP[a]	EA *n* (%)	CA *n* (%)	DSP[a]	EA *n* (%)	CA *n* (%)	DSP[a]	EA *n* (%)	CA *n* (%)	DSP[a]
Amikacin	6 (100%)	6 (100%)	0	5 (100%)	5 (100%)	0	4 (100%)	4 (100%)	0	5 (100%)	5 (100%)	0	5 (100%)	4 (80%)	1 MiE	10 (100%)	9 (90%)	1 MiE
Ampicillin-Sulbactam	NA	NA		NA	NA		NA	NA		NA	NA		NA	NA		NA	NA	
Aztreonam	NA	NA		NA	NA		NA	NA		NA	NA		NA	NA		6 (67%)	5 (56%)	4 MiE (1 NA)
Cefazolin	NA	NA		NA	NA		NA	NA		NA	NA		NA	NA		NA	NA	
Cefepime	5 (83%)	6 (100%)	0	4 (80%)	4 (80%)	1 MiE	3 (75%)	3 (75%)	1 MiE	3 (60%)	4 (80%)	1 MiE	5 (100%)	NA		6 (60%)	7 (70%)	3 ME
Ceftazidime	4 (67%)	5 (83%)	1 MiE	2 (40%)	4 (80%)	1 VME	4 (100%)	4 (100%)	0	5 (100%)	4 (80%)	1 MiE	NA	NA		4 (40%)	3 (30%)	7 ME
Ceftriaxone	5 (100%)	5 (100%)	(1 NA)	1 (100%)	1 (100%)	(4 NA)	4 (100%)	4 (100%)	0	5 (100%)	5 (100%)	0	NA	NA		NA	NA	
Ciprofloxacin	5 (83%)	4 (67%)	1 VME 1 MiE	4 (80%)	4 (80%)	1 VME	3 (75%)	4 (100%)	0	5 (100%)	3 (60%)	2 MiE	5 (100%)	5 (100%)	0	8 (80%)	9 (90%)	1 MiE
Colistin	5 (83%)	5 (83%)	1 ME	5 (100%)	5 (100%)	0	4 (100%)	4 (100%)	0	3 (75%)	3 (75%)	1 VME (1 NA)	4 (80%)	3 (60%)	2 ME	7 (70%)	8 (80%)	2 VME
Ertapenem	2 (40%)	4 (80%)	1 MiE (1 NA)	1 (100%)	0 (0%)	1 MiE (4 NA)	1 (25%)	3 (75%)	1 MiE	3 (60%)	5 (100%)	0	NA	NA		NA	NA	
Gentamicin	6 (100%)	5 (83%)	1 MiE	5 (100%)	5 (100%)	0	4 (100%)	3 (75%)	1 MiE	5 (100%)	5 (100%)	0	NA	NA		8 (80%)	7 (70%)	3 ME
Meropenem	4 (67%)	5 (83%)	1 MiE	1 (20%)	3 (60%)	2 MiE	2 (50%)	2 (50%)	2 MiE	5 (100%)	5 (100%)	0	5 (100%)	5 (100%)	0	6 (60%)	7 (70%)	3 MiE
Piperacillin-Tazobactam	4 (67%)	6 (100%)	0	5 (100%)	5 (100%)	0	4 (100%)	4 (100%)	0	3 (60%)	3 (60%)	2 ME	3 (60%)	NA		6 (60%)	6 (60%)	1 VME 3 ME
Tobramycin	4 (67%)	4 (67%)	1 VME 1 ME	5 (100%)	5 (100%)	0	4 (100%)	4 (100%)	0	4 (80%)	4 (80%)	1 MiE	NA	NA		9 (90%)	9 (90%)	1 ME
Minocycline	NA	NA		NA	NA	NA	NA	NA		NA	NA		NA	NA		NA	NA	
Total	50 (78%)	55 (86%)		38 (81%)	41 (87%)		37 (84%)	39 (89%)		46 (85%)	46 (85%)		27 (90%)	17 (85%)		70 (71%)	70 (71%)	

Table 2. Assessment of the AST results for Gram-positive bacteria

	S. aureus (n = 5)			CoNS (n = 5)			*Enterococcus* spp. (n = 5)		
Antibiotic	EA *n* (%)	CA *n* (%)	DSP[a]	EA *n* (%)	CA *n* (%)	DSP[a]	EA *n* (%)	CA *n* (%)	DSP[a]
Ampicillin	NA	NA		NA	NA		5 (100%)	4 (80%)	1 ME
Cefoxitin	NA	4 (80%)	1 MiE	NA	5 (100%)	0	NA	NA	
Ceftaroline	NA	NA		NA	NA		NA	NA	
Daptomycin	3 (60%)	5 (100%)	0	4 (80%)	5 (100%)	0	3 (60%)	NA	
Doxycycline	5 (100%)	5 (100%)	0	5 (100%)	5 (100%)	0	NA	NA	
Erythromycin	5 (100%)	5 (100%)	0	4 (80%)	5 (100%)	0	NA	NA	
Linezolid	5 (100%)	5 (100%)	0	5 (100%)	5 (100%)	0	5 (100%)	5 (100%)	0
MLSb	NA	NA		NA	NA		NA	NA	
Trimethoprim-Sulfamethoxazole	2 (40%)	4 (80%)	1 MiE	NA	NA		NA	NA	
Vancomycin	3 (60%)	5 (100%)	0	5 (100%)	5 (100%)	0	3 (60%)	3 (60%)	1 VME 1 MiE
Total	23 (77%)	33 (94%)		23 (92%)	30 (100%)		16 (80%)	12 (80%)	

[a]Discrepancies (DSP) are presented as very major error (VME, false-susceptibility), major error (ME, false-resistance) or minor error (MiE, intermediate by either of the systems). NA, data by reference method not available yet

DISCUSSIONS

For the assessment of AST results, previous studies have used agar disc-diffusion method, E-test and/or VITEK®2 system as the reference methods (1-3). To our knowledge, this is the first study that evaluated the AST results of Accelarate Pheno system using broth microdilution method together with EUCAST breakpoints as the references.

Isolates tested in this study include not only blood isolates but also isolates from other infection sites e.g. wounds. In addition, the sample size is relatively small, which may have influenced the overall performance of the Accelerate system.

REFERENCES

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