



Syndromic Testing for Infectious Diseases

Part 4: Multiplex Panels for Positive Blood Culture Bottles

HOT TOPIC / 2018

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Utilization Message

- As you view this presentation, consider the following important points regarding testing:
 - How is the test going to be used in your practice?
 - When should the test be used?
 - How will results impact patient management?

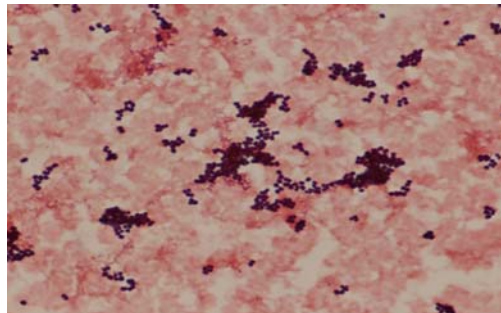
Disclosures

- Board Member: ASM
- Grant Recipient: CD Diagnostics, BioFire, Curetis, Merck, Hutchison Biofilm Medical Solutions, Accelerate Diagnostics, Allergan, The Medicines Company
- Consultant: Curetis, monies paid to Mayo Clinic
- Patent on *Bordetella pertussis/parapertussis* PCR issued, patent on a device/method for sonication with royalties paid to Mayo Clinic, patent on an anti-biofilm substance issued
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Introduction

- Bacteremia – morbidity and mortality
- Septic shock
 - Delays in administration of effective antimicrobial therapy associated with increased mortality
- Treatment may be compromised by antibacterial resistance

Conventional Blood Culture Practices

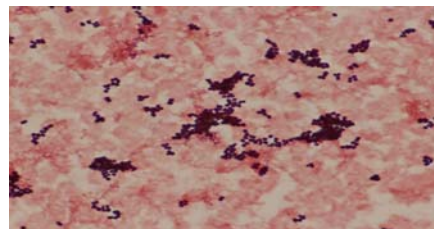


FDA-Approved Multiplex Panels for Detection of Select Organisms and Resistance Genes in Positive Blood Cultures¹

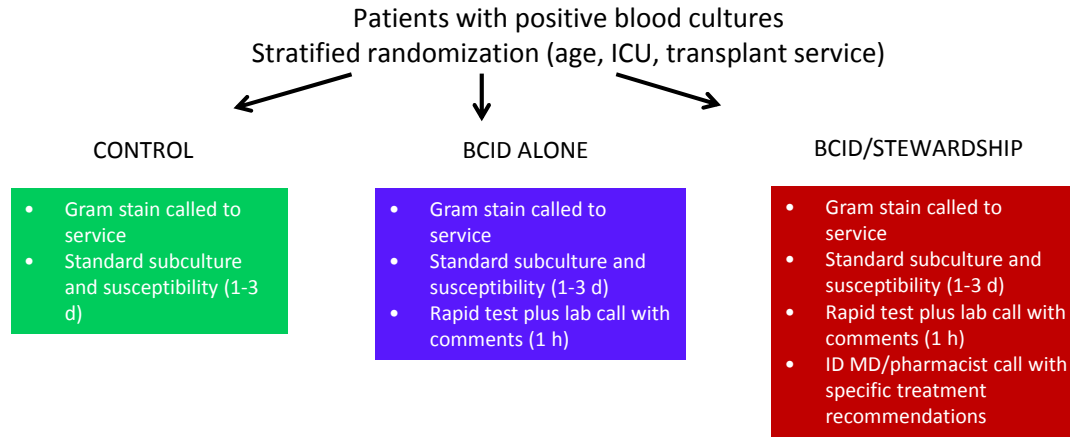
		FILMARRAY BCID	VERIGENE	
			GRAM-POSITIVE BLOOD CULTURE TEST	GRAM-NEGATIVE BLOOD CULTURE TEST
TOTAL NUMBER OF TARGETS		27	15	14
GRAM-POSITIVE BACTERIA	<i>Staphylococcus</i> species	✓	✓	
	<i>Staphylococcus aureus</i>	✓	✓	
	<i>Staphylococcus epidermidis</i>	✓	✓	
	<i>Staphylococcus agalactiae</i>	✓	✓	
	<i>Streptococcus</i> species	✓	✓	
	<i>Streptococcus agalactiae</i>	✓	✓	
	<i>Streptococcus pyogenes</i>	✓	✓	
	<i>Streptococcus pneumoniae</i>	✓	✓	
	<i>Streptococcus anginosus</i> group	✓	✓	
	<i>Enterococcus</i> species	✓	✓	
	<i>Enterococcus faecalis</i>	✓	✓	
	<i>Enterococcus faecium</i>	✓	✓	
GRAM-NEGATIVE BACTERIA	<i>Listeria</i> species	✓	✓	
	<i>Listeria monocytogenes</i>	✓	✓	
	<i>Klebsiella oxytoca</i>	✓		✓
	<i>Klebsiella pneumoniae</i>	✓		✓
	<i>Serratia marcescens</i>	✓		✓
	<i>Pseudomonas</i> species	✓		✓
	<i>Acinetobacter</i> species	✓		✓
	<i>Acinetobacter baumannii</i>	✓		✓
	<i>Hemophilus influenzae</i>	✓		✓
	<i>Neisseria meningitidis</i>	✓		✓
	<i>Pseudomonas aeruginosa</i>	✓		✓
	<i>Enterobacteriaceae</i>	✓		✓
<i>Escherichia coli</i>	✓		✓	
YEASTS	<i>Enterobacter</i> species	✓		✓
	<i>Enterobacter cloacae</i> complex	✓		✓
	<i>Citrobacter</i> species	✓		✓
	<i>Candida albicans</i>	✓		✓
RESISTANCE GENES	<i>Candida glabrata</i>	✓		✓
	<i>Candida krusei</i>	✓		✓
	<i>Candida parapsilosis</i>	✓		✓
	<i>Candida tropicalis</i>	✓		✓
	<i>meaA</i>	✓	✓	
	<i>vanA</i>	✓	✓	
	<i>vanB</i>	✓	✓	
	<i>bla_{TEM}</i>	✓		✓
<i>bla_{SHV}</i>			✓	
<i>bla_{CMX}</i>			✓	
<i>bla_{PER}</i>			✓	
<i>bla_{NDM}</i>			✓	
<i>bla_{VIM}</i>			✓	
TIME TO RESULT	1 HOUR	~2.5 HOURS	~2 HOURS	

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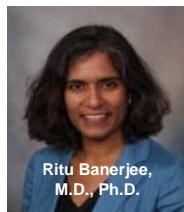
FilmArray® Blood Culture Identification Panel (BioFire)



Randomized Controlled Clinical Trial Mayo Clinic 2013-2014²



Supported by the National Institute of Allergy and Infectious Diseases of the National Institutes of Health under Award Number UM1AI104681 (Antibacterial Resistance Leadership Group)

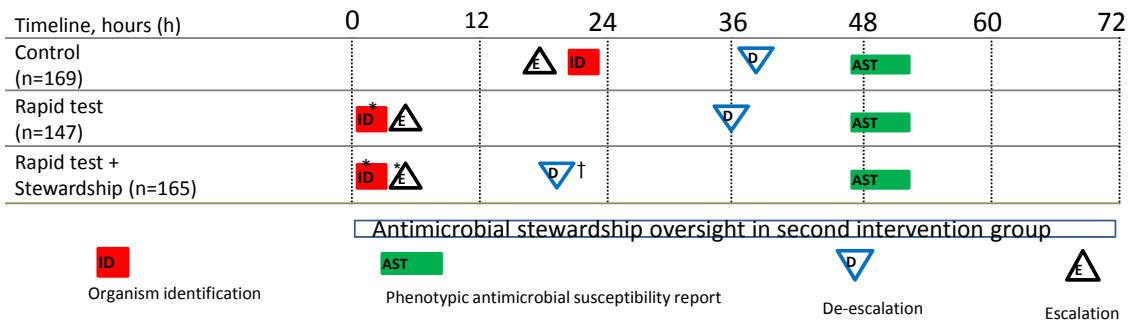


Clinical Outcomes²

Outcome	Control (n= 207)	Rapid Test (n=198)	Rapid Test + Stewardship (n=212)	P –value
Length of stay (days)	8 (5,15)	8 (5,15)	8 (5,16)	0.60
30-day mortality	22 (10.6%)	20 (10.1%)	18 (8.5%)	0.74
30-day readmission w/same organism	6 (2.9%)	6 (3%)	8 (3.8%)	0.88
Toxicity/adverse drug reaction	3 (1.4%)	3 (1.5%)	2 (0.9%)	0.82
Blood culture clearance in 3d	147 (71%)	131 (66.2%)	146 (68.9%)	0.79
<i>C. difficile</i> /Drug-resistant organism ¹ within 30d	15 (7.2%)	16 (8.1%)	21 (9.9%)	0.62

¹VRE, MRSA, extended-spectrum cephalosporin resistant *Enterobacteriaceae*, *Pseudomonas aeruginosa* and *Acinetobacter* species resistant to ≥3 antibiotic classes

Comparison of Time To Identification, Susceptibility Results, and Antibiotic Modifications²



*Significant vs. control; †Significant vs. control and rapid multiplex PCR alone

Limitations¹

- Cost (largely “add-on” tests)
- For maximal benefit, should be performed 24/7
- Does not cover all causes of bloodstream infection
- May not identify all pathogens in mixed infections
- False-positive results
- Narrow spectrum of genes associated with resistance in Gram-negative bacilli (especially BCID)

Advantages¹

- Minimal hands-on time, highly automated
- Rapid turnaround time
- To enable rapid escalation or de-escalation of antimicrobial therapy, results should be reported to providers as rapidly and directly as possible, and ideally communicated to an expert in antimicrobial stewardship who can work with providers to optimize therapy



References

1. Ramanan P, Bryson A, Binnicker M, et al. Syndromic panel-based testing in clinical microbiology. *Clin Microbiol Rev* 2018 Jan 31(1):e00024-17.
2. Banerjee R, Teng CB, Cunningham SA, et al. Randomized multiplex polymerase chain reaction-based blood culture identification and susceptibility testing. *Clin Infect Dis* 2015 Oct 1;61(7):1071-80.



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