

Rapid molecular testing to detect *Staphylococcus aureus* in positive blood cultures improves patient management



Martin McHugh
Clinical Scientist



Staphylococcal Bacteraemia



- SAB is an important burden on healthcare (31 per 100,000 AOBs 2013-14),¹ reflected in HEAT targets
- Proportion due to MRSA is decreasing but MSSA remains a problem
- Delay in appropriate antibiotics associated with worse outcomes²
 - Start empiric therapy and rationalise when culture results available
- Most blood cultures with GPCC on Gram are CoNS
 - Often contaminants not requiring Abx

¹HPS (2014) Scottish *S. aureus* bacteraemia surveillance report

²van Hal *et al* (2012) *Clin Microbiol Rev*

Xpert MRSA/SA BC Assay

- Automated DNA extraction and real-time PCR
- Detects *S. aureus* (*spa*) and methicillin resistance (*SCCmec* and *mecA*) in positive blood culture fluid
- Internal controls to verify assay efficiency
- Around 10 min hands-on time and 62 min on machine
- Kit Insert
 - 58 MRSA, 120 MSSA, 268 non-SA samples
 - MRSA 98.3% sensitive, 99.4% specific
 - MSSA 100% sensitive, 98.6% specific
 - Lots of studies agree with these figures



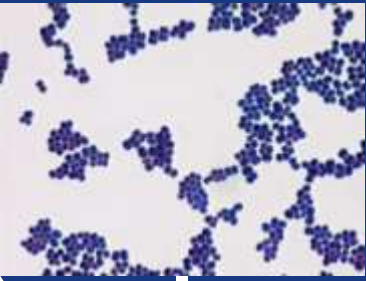
Sample collected,
sent to lab



Loaded onto BacT Alert



Gram film, media put up –
Morphology



18-24 h

~70
min

Xpert assay –
MRSA/MSSA



Latex, MALDI, MRSA
selective agar –
ID and presumptive
MRSA/MSSA

≥ 24 h

SPEC # : 01000012000 L: 01000012000 STATUS: COMP REQ # : 00000001	
SOURCE: BROTH CULT	
ORDERED: ROUTINE CULT ON PREDOMINA	
COMMENT: PREDOMINA	
PROCEDURE	RESULT
CULTURE AND SENSITIVITY	Final 07/13/06
CULTURE	NO NORMAL RESPIRATORY FLORA
Organism 1	STAPHYLOCOCCUS AUREUS PCR
Organism 2	PSEUDOMONAS AERUGINOSA PCR

Full sensitivities –
Final report

Study Aims

1. Determine the accuracy of rapid molecular testing for MRSA/MSSA in positive blood cultures with GPCC
2. Compare turn around time (TAT) with standard methods
3. Does this strategy alter patient management?

Inclusion/Exclusion Criteria

- Submitted to lab medicine Quality Improvement Team as a service evaluation
 - Recruitment 22/12/14 – 30/01/15
- Inclusion Criteria
 - Positive blood culture with Gram positive cocci in clusters
- Exclusion criteria
 - Mixed organisms on Gram film
 - Charcoal-containing blood culture bottle
 - Blood culture positive over the weekend
 - Patient tested in previous 2 weeks (unless requested by clinician)

Lab Processing

- Bottle flags positive, Gram by BMS
- If eligible, take 500 μ l bottle fluid
- (Centrifuge 3,000 rpm for 2 min)
- 50 μ L added to 2 mL elution reagent
- Vortex and add whole volume to cartridge
- Load on GeneXpert
- Result manually added to APEX record and passed to duty medic

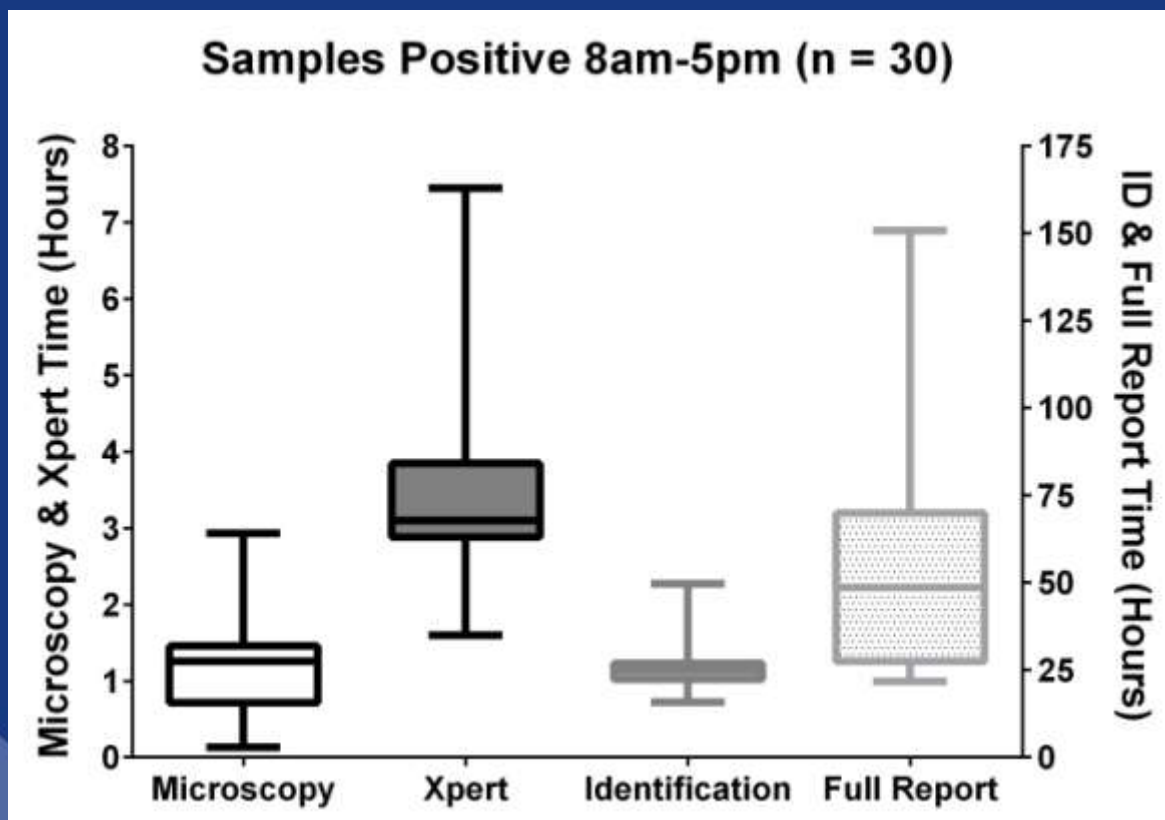
Accuracy of Rapid Molecular Testing

Test	Result			
	MRSA	MSSA	<i>S. aureus</i> not detected	Invalid
Culture	1	9	71	-
Xpert	1	9	64	7

- 80 samples from 79 patients
- 100% sensitive & specific for MRSA/MSSA
- Performance comparable to literature

Lab Turn Around Time

- Time from flagged to Apex result entry



Median: 1.3 h 3.1 h 24.7 h 48.7 h

Clinical Utility

- PCR result ~21 h earlier than culture
- From 54 instances with data, management was improved based on PCR result in 16 (30 %) cases
- Although management unchanged in 38 cases, medics felt more confident having the PCR result
- Rapid results reduced medical report time

Management not changed	Antibiotics Started	Antibiotics avoided	Antibiotics changed	Antibiotics stopped	No data	Total
38	8	5	2	1	26 ^a	80

^a Not available: data not recorded (17), Xpert failed (7), patient deceased (2)

Financial Implications

- Routine blood culture = £15
- Xpert test = £32

- Need to balance lab costs with potential savings in other areas
 - Reduce unnecessary antibiotic use
 - Less side effects, C.diff, resistance?
 - Better management of SABs
 - Improve patient outcomes, inpatient stay, transmission?

Conclusions

- Xpert MRSA/SA BC Assay performed well and was simple to do
- Could rationalise management ~21 h earlier
 - This was done in 30% of cases
- PCR improved patient and time management
 - Potential for positive knock-on effects out with lab medicine should be studied further

Acknowledgements



- Kate Templeton
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Questions?