Timely Targeted Treatments in Sepsis.

An evaluation of the real-time benefits of the Q-linea ASTar System on patient outcome by providing rapid direct blood culture sensitivities in Gram-negative organisms.

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BACKGROUND

Sepsis causes 44,000 deaths each year in the United Kingdom, with fatalities rising. Delayed antimicrobial therapy in sepsis has been shown to increase mortality by 9% for every hour treatment decisions are set back. It is widely acknowledged that the future of sepsis treatment, and further reductions in mortality rates, are more likely to be achieved with personalised medicine, and timely targeted antimicrobial therapy can be a key part of delivering improvements.

Current time to targeted minimum inhibitory concentration (MIC) based antimicrobial treatment of sepsis is ~48-72 hours from a positive blood culture flag to delivering reportable results, yet suspected sepsis cases often require empiric therapy initiation within hours and are significantly complicated by multi-drug resistant organisms.

The Q-linea ASTar System aims to reduce the time to deliver reportable antibiotic sensitivity testing to around 6 hours, improving prognosis for patients with critical bloodstream infections.

Figure 1. ASTar® fully-automated system for rapid antimicrobial susceptibility testing (AST)

MATERIALS

This study evaluated the time to antimicrobial result from positive blood culture samples using current AST methodology from direct culture (SOC) and Q-linea rapid antimicrobial susceptibility testing (rAST) methods, direct from sample (positive blood culture).

Laboratory and clinical data was collected from hospital patients with confirmed Bacterial Sepsis Infections (n=60). Isolates tested consisted of Enterobacterales (n=57), *Pseudomonas* spp. (n=3). Testing results from Sensititre and Vitek2 automated testing were processed according to manufacturer's instructions.

Figure 2. Q-linea ASTar System workflow

Blood culture flags positive

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Gram stain confirms GN- bacterial

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1 mL blood added to cartridge

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Automated sample prep, incubation and reading on ASTar System

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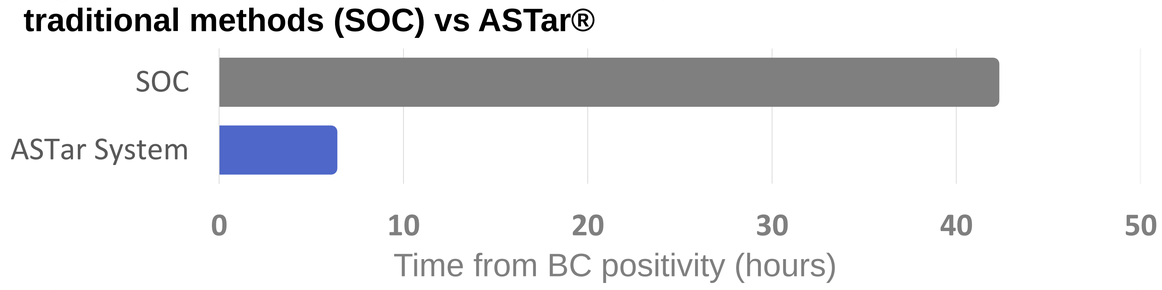
Confirmed ID allows interpretation and expert reporting

Figure 3. ASTar ® G- Kit: Simply add 1 mL blood to cartridge and add to instrument with 330 well disc

RESULTS

Figure 4. Hours to actionable result from positive blood culture for traditional methods (SOC) vs ASTar®



Total no. results		718
Total no. discrepancies		23
Essential agreement (%)		96.8
Discrepancy rates (%)		
Minor	Major	Very major
24.4	2.8	0.4

Table 1. Gold standard vs ASTar. Essential agreement (%) summary of 718 datapoints

Whiston STHK compared ASTar®, the novel rAST platform, including time to result (TTR), equivalence to in-house Vitek2 AST method and the gold-standard equivalent broth microdilution based Sensititre System.

TTR was reduced from 28 hours (SOC) to 14 hours (rAST). Average processing time per sample was recorded, and the average time recorded was 2 minutes.
A total of 96.8% of MIC values delivered by the ASTar System were within 1 dilution step to results generated by a gold-standard equivalent methodology (Sensititre plates).

Antimicrobial	Datapoints compared	Datapoints within EA (1 dilution step)	EA %
Amikacin	30	30	100
Gentamicin	32	30	93.8
Tobramycin	35	33	94.3
Ertapenem	31	31	100
Meropenem	33	33	100
Cefepime	34	33	97.1
Cefotaxime	33	33	100
Cefoxitin	31	28	**90.3**
Ceftazidime	32	31	97
Ceftazidime - Avibactam	32	31	96.9
Ceftolozane - Tazobactam	32	30	93.8
Ceftriaxone	31	31	100
Cefuroxime	31	30	96.8
Cefazolin	29	29	100
Ciprofloxacin	33	33	100
Levofloxacin	28	28	100
Trimethoprim - Sulfamethoxazol	32	32	100
Aztreonam	33	33	100
Amoxicillin - Clavulanic Acid	31	26	**83.9**
Ampicillin	27	27	100
Piperacillin - Tazobactam	34	33	97.1
Colistin	27	24	**88.9**
Tigecycline	27	26	96.3
TOTAL	**718**	**695**	**96.8**

Table 2. Essential agreement (%) of all 23 antimicrobials covered by ASTar BC G− Kit (EUCAST) against the Sensititre method.

CONCLUSIONS

Antibiotic Sensitivities gained up to 42 hours faster

- The results generated by ASTar System were in agreement with Sensititre for >95% of all clinical samples processed.
- ASTar System methodology offers quantitative MIC results equivalent to the gold standard method.

Key benefits

- The Q-linea ASTar System offers a rapid, automated and streamlined alternative to disc diffusion, delivering quantitative MIC results coupled with access to important new antibiotics.
- Samples can be processed immediately after they flag as positive.
- Earlier access to results for critically ill patients.

No requirement for highly trained staff

- Medical Lab Assistant and Associate Practitioner staff are capable of using instrument with ease, reducing pressure on Biomedical Scientists.

Robust equivalent performance to SOC

- Expert rules and exceptional phenotypes are automatically applied or flagged by the system.
- Automated result read reduces the risk of reporting incorrect results due to human error.
- Reduces MIC turnaround time by at least half.

REFERENCES

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TRADEMARKS/ LICENSING