

# Clinical evaluation of an innovative AST system for ultra-rapid MIC determination using positive blood cultures from patients with bacteraemia

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## Background

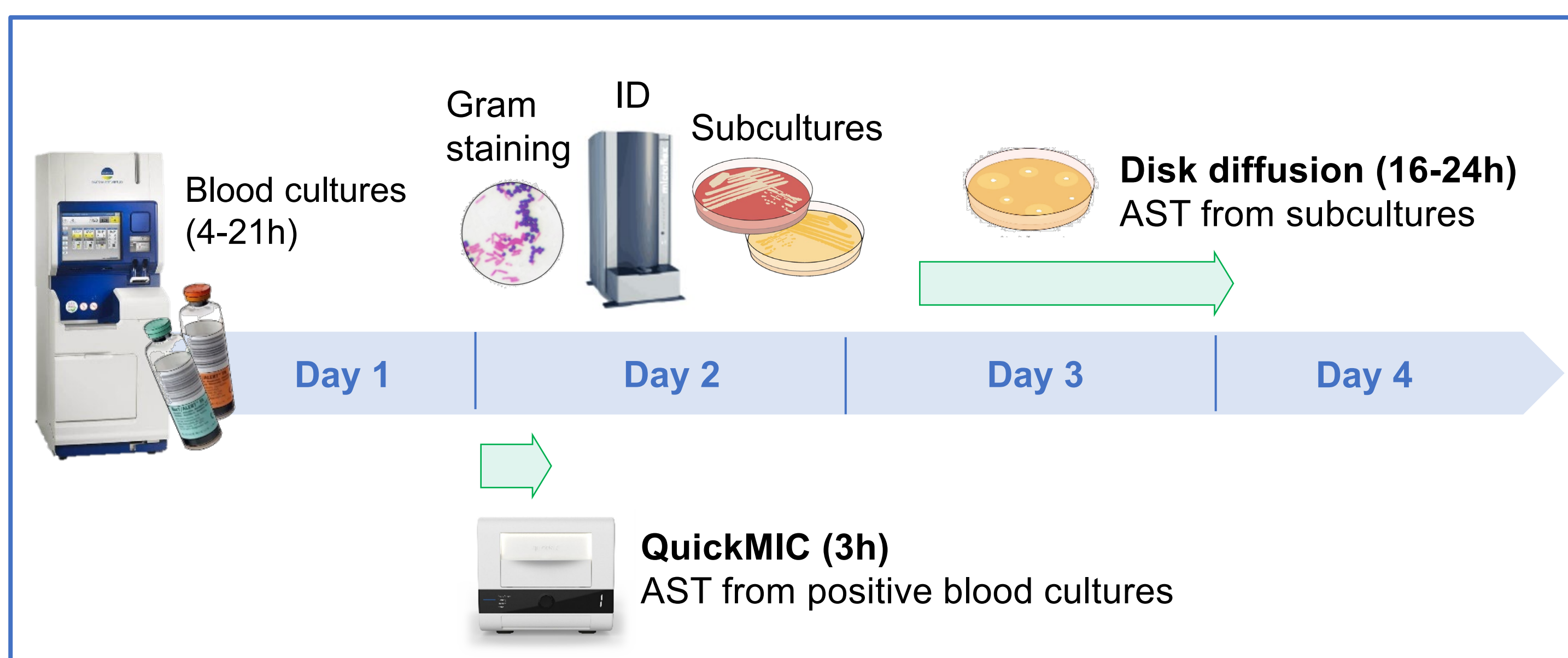
Resistant blood stream infections are on the rise, hence there is an urgent need for faster AST diagnostics to guide treatment and reduce antibiotic misuse. QuickMIC<sup>®</sup> is a novel AST system under development that utilizes microfluidics and live imaging for ultra-rapid determination of MIC values, directly from positive blood cultures. Rapid MIC determination can potentially lead to faster turnaround times and same-shift communication of critical results for patients with blood stream infections.

This study describes the first evaluation of the QuickMIC AST system in a clinical microbiology laboratory. The performance of QuickMIC was evaluated and the results were compared to those obtained by disk diffusion.

## Materials and Methods

Positive blood cultures containing non-fastidious gram-negative cultured in FA Plus Aerobic or FN Plus Anaerobic bottles (BacT/ALERT<sup>®</sup>, Biomérieux) were included in the study. The polymicrobial sample was excluded from analysis. Samples were tested against eight antibiotics with the QuickMIC AST system and by standard disk diffusion. Bacterial identification (ID), blood culture incubation times and time to result were also recorded. A total of 147 drug-bug combinations were included in the analysis.

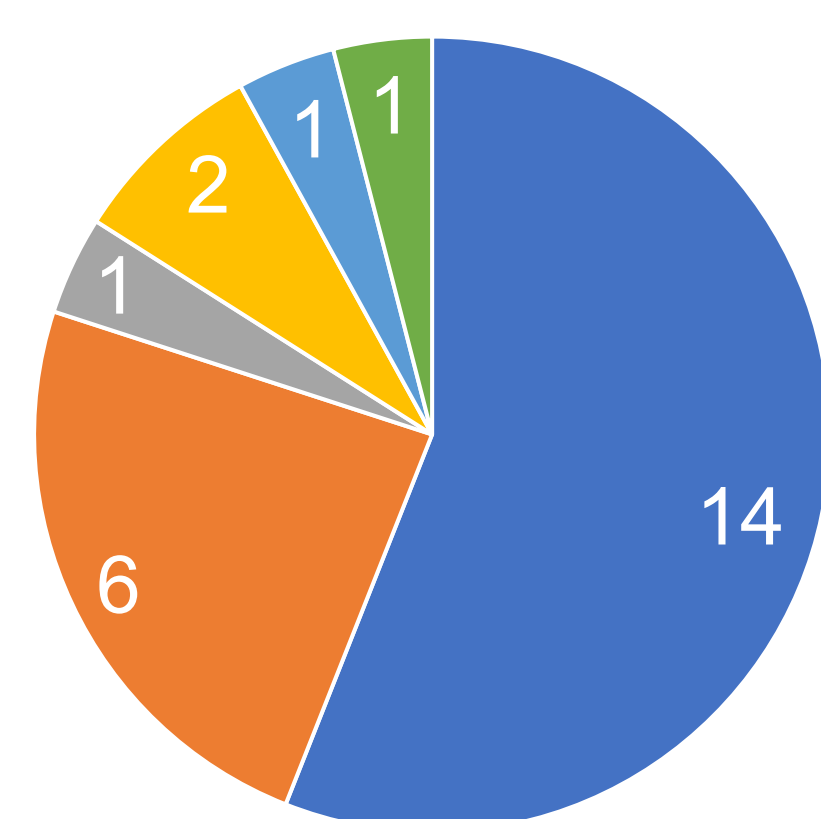
**Figure 1.** Study workflow using QuickMIC and disk diffusion as AST methods



**Figure 2.** Species distribution and phenotypic profile of positive blood cultures

Species	No.	Percentage
<i>E. coli</i>	14	56%
<i>Klebsiella spp.</i>	6	24%
<i>P. aeruginosa</i>	1	4%
<i>E. cloacae</i>	2	8%
<i>Citrobacter spp.</i>	1	4%
Polymicrobial	1	4%
<b>Total</b>	<b>25</b>	

Phenotypic profile		Percentage
Susceptible	<b>S</b>	92.3%
Susceptible, Increased Exposure	<b>I</b>	2.6%
Resistant	<b>R</b>	5.1%



Samples were mostly Enterobacterales (92%) and were analyzed after 4 h to 21 h of blood culture positivity.

## Results

- Average time to result for QuickMIC was 3h 11 min ± 24 min
- Times to result ranged between 2 h 45 min and 4 h 05 min
- Overall categorical agreement between QuickMIC and disk diffusion was 97.3%
- Five of eight antibiotics had a categorical agreement of 100%
- VMD, MD and mD were 0.7%, 0.7% and 1.4% when compared to disk diffusion

**Table 1.** Categorical agreement (CA) and discrepancies (VMD, MD, mD) between QuickMIC and disk diffusion

Antibiotic	CA	VMD	MD	mD
Amikacin	100	0	0	0
Ciprofloxacin	100	0	0	0
Cefotaxime	100	0	0	0
Ceftazidime	90	1	0	1
Gentamicin	100	0	0	0
Meropenem	95.5	0	1	0
Piperacillin/Tazobactam	95.2	0	0	1
Tobramycin	100	0	0	0
<b>Total (n=147)</b>	<b>97.3%</b>	<b>0.7%</b>	<b>0.7%</b>	<b>1.4%</b>

CA: Categorical agreement. VMD: Very major discrepancy. MD: Major discrepancy. mD: Minor discrepancy

**Table 2.** QuickMIC time to result per antibiotic

Antibiotic	Average Time	Std Deviation
Amikacin	3 h 02 min	24 min
Ciprofloxacin	3 h 13 min	25 min
Cefotaxime	3 h 07 min	25 min
Ceftazidime	3 h 07 min	24 min
Gentamicin	3 h 12 min	23 min
Meropenem	3 h 11 min	24 min
Piperacillin/Tazobactam	3 h 09 min	24 min
Tobramycin	3 h 07 min	24 min

**Table 3.** QuickMIC time to result

Time to result (all antibiotics)	
Average time	3 h 11 min
Standard deviation	24 min
Max. time	4 h 05 min
Min. time	2 h 45 min



**Figure 3.** QuickMIC instrument and GN cassette

## Conclusions

- QuickMIC delivered MIC values in an average of 3 hours
- The performance of QuickMIC was equivalent to that of disk diffusion
- Further testing is needed to gain a better understanding of the system with respect to additional drug-bug combinations