Performance of a Novel Microfluidic Rapid AST Assay for Gram-Negative Bloodstream Infections in Low and High Resistance Settings

P1602

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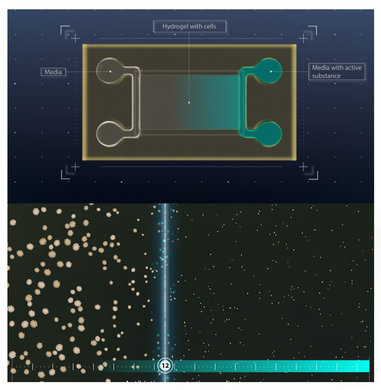
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Rapid AST and bloodstream infections

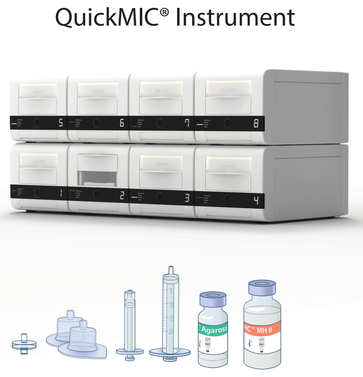
Increasing antibiotic resistance creates challenges for the management of severe diseases such as bloodstream infection. Rapid and timely antimicrobial susceptibility testing (AST) results can enable earlier definitive therapy, but traditional AST methods are slow. The QuickMIC® system enables rapid AST directly from positive blood cultures. In this study, we compare QuickMIC with routine automated AST methods in low and high background resistance settings, focusing on speed, accuracy and diagnostic turnaround time.

Consecutive gram-negative clinical blood cultures were tested with the QuickMIC (GN panel) during a 3-month period and results were compared with the routine method in use at each clinical laboratory. Samples were processed in parallel after blood cultures positivity, and the time to actionable results was measured. Bacterial isolates were collected and tested using broth microdilution (BMD) as reference.

The QuickMIC® system gives precise MIC values in 2-4 hours directly from positive blood cultures.



Antibiotic gradient formation

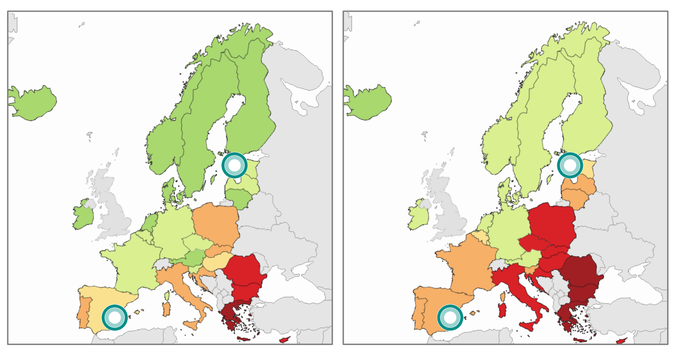

QuickMIC® Instrument


QuickMIC® Analyst

QuickMIC® Prep Kit

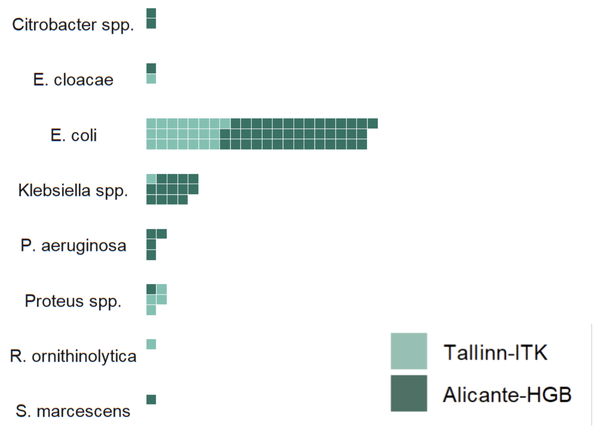
QuickMIC® GN Cassette

A) EARS-NET antibiotic resistance data, 2022

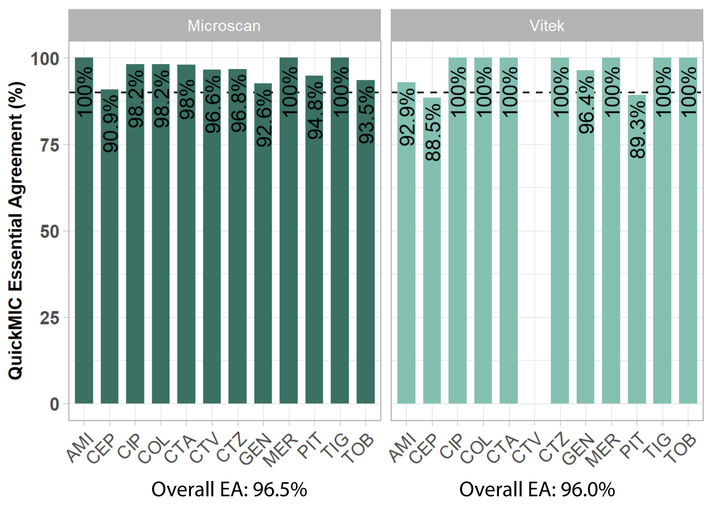

Combined resistance

Carbapenem resistance

B) Blood culture isolates collected, per location



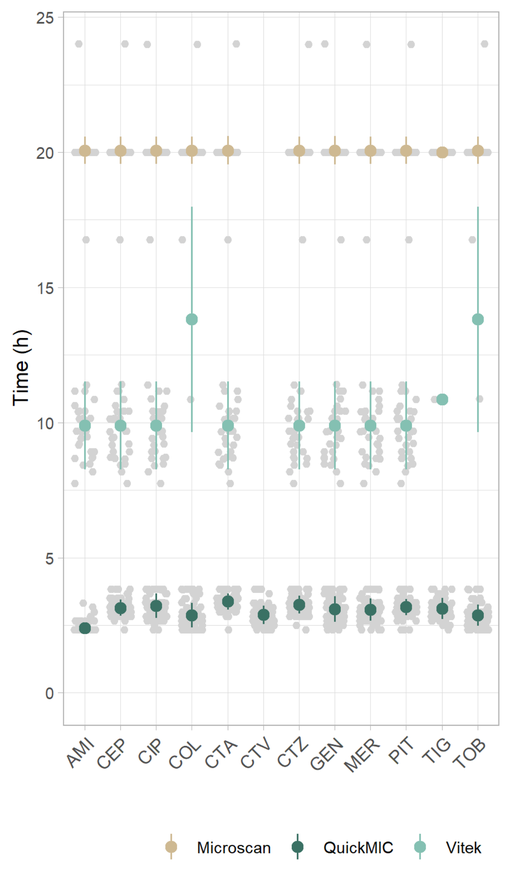
C) QuickMIC vs. routine methods, EA per antibiotic



D)

		Background resistance		QuickMIC vs. BMD	
Site	Ref. method	Res. (%)	MDR (%)	EA (%)	CA (%)
Alicante	Microscan™	44.4	28.6	96.4	98.4
Tallinn	VITEK® 2	17.2	13.8	95.7	96.7

E) Time to result



Turnaround time

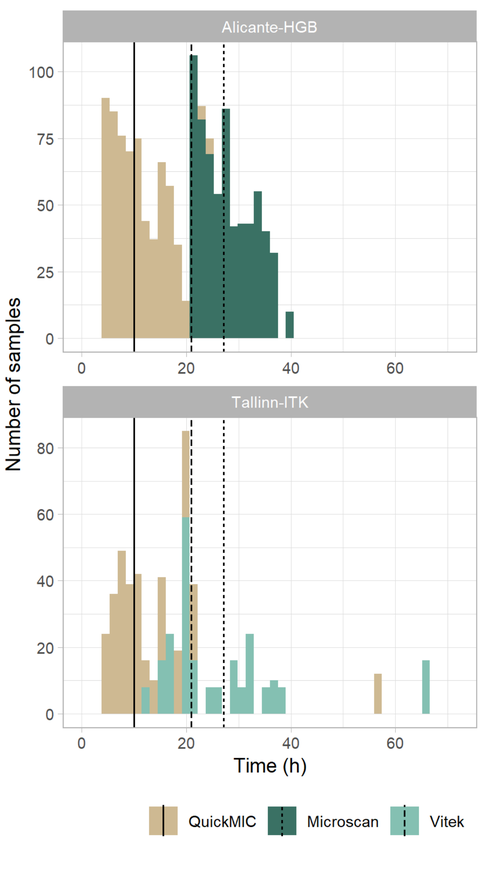


Figure 1 | A) Resistanc levels in Europe, showing combined resistance (3rd generation cephalosporins, aminoglycosides, flouroquinolones) in 2022 and the location of the study sites. Data from EARS-NET. **B)** Distribution of species in the included isolates in the study. **C)** Performance comparison of QuickMIC and automated routine AST systems (EA per antibiotic). **D)** Information about the clinical laboratories, the routine method used, background resistance (Res: resistant against at least one antibiotic, MDR: resistant to at least three antibiotic classes) and the overall QuickMIC essential agreement (EA) and categorical agreement (CA) against reference BMD results for all isolates. No major difference in performance can be seen. E) Analysis time for each tested antibiotic, for the three tested AST systems, and turnaround-time from blood culture detection to actionable result for QuickMIC compared to the routine automated AST systems in use at the clinical laboratories. Lines indicate median turnaround time.

Results

The background resistance differed between the clinical laboratories, with an overall resistance and MDR rate higher in the southern European location (Figure 1). Of the 114 collected blood cultures, 98 were included in the study. QuickMIC result accuracy as assessed by essential and categorical agreement was overall very good (88.5 to 100%). The mean in-instrument analysis time was significantly shorter for QuickMIC (3h 2min vs. 20h 4min and 9h 58min for Microscan™ and VITEK®2, respectively). The turnaround-time, defined as time from positive blood culture to actionable result, was significantly shorter for QuickMIC (10.0h SD:7.6h vs. 27.1h SD:4.9h and 20.9h SD:13.6h for Microscan™ and Vitek®2, respectively). Major and very major discrepancy rates were generally low (0.9-2%). All three methods performed well in comparison to BMD (EA: 96.1, 98.1 and 98.2% for QuickMIC®, Microscan™ and VITEK®2, respectively), and there was no significant difference in QuickMIC accuracy depending on background resistance.

Conclusions

A high degree of agreement was found between QuickMIC and the legacy AST methods VITEK®2 and Microscan™.

QuickMIC provided AST results in as little as 2 hours, compared to the ~10-20 hours required by the legacy methods.

Overall, the use of QuickMIC in the management of blood-stream infections and sepsis has the potential to improve patient outcomes and reduce healthcare costs.

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