

Advantages of the ASTar System

Broad antimicrobial panel and true MIC results for early and optimal treatment of bloodstream infections

Current standards of care for patients with bloodstream infections are often limited by delays between blood sampling, blood culture positivity, and antimicrobial susceptibility testing (AST). Without earlier MIC data to guide narrowing of empiric therapy, patients remain at increased risk of mortality. ASTar is a fully automated rapid AST system that delivers true MIC results across a broad antimicrobial panel in approximately six hours, reducing the need for follow-up testing. By boosting workflow efficiency, reducing hands-on labour, delivering AST results faster, and facilitating the earlier start of optimal antimicrobial treatments, ASTar is a major boon for laboratory staff, clinicians, and patients.

Introduction

Effective management of patients with bloodstream infections depends on timely antimicrobial susceptibility testing (AST) and faster therapy optimisation to reduce the risk of disease progression and to help improve patient outcomes. This is particularly important in critically ill and immunocompromised patients, where delays to effective therapy are associated with poorer clinical outcomes. Additionally, rapid AST methods are needed to support antimicrobial stewardship programmes (ASPs) and address rising rates of antimicrobial resistance to ensure the continued success of antimicrobial therapies¹⁻³.

Under current standard of care, AST results for bloodstream infections are often not reported until at least the second day after blood draw – though laboratory workflows may vary. Because of these potential delays, clinicians are forced to rely on empiric therapy during the initial phase of a patient's treatment. This empiric, and potentially inappropriate, antimicrobial therapy not only drives the development of resistance but may also prolong patient hospitalisation and increase the risk of mortality^{4,5}.

Rapid AST can support earlier reassessment of empiric therapy and more informed clinical intervention, supporting timely optimisation of treatment and reducing antimicrobial exposure, while concurrently reducing hospital and ICU length of stay, thereby contributing to overall savings of healthcare costs⁶⁻⁸.

ASTar – Rapid AST Results

ASTar is a fully automated system for rapid AST. The ASTar technology is based on broth microdilution (BMD) optimised for shortened time-to-result and conducting phenotypic AST based on continuous two-fold antimicrobial dilutions, delivering true minimum inhibitory concentration (MIC) results and S, I, R (EUCAST) or S, I, SDD, R, NS (CLSI) categorisation in approximately six hours. This saves approximately 24 hours to treatment optimisation when compared to conventional workflows. Automated testing is conducted directly on positive

blood cultures without the requirement for any additional culturing steps, significantly reducing the amount of manual labour required and yielding substantial time savings for hospital personnel. Access to true MIC values early in the clinical pathway supports more informed antimicrobial selection and dosing decisions, particularly in severe or high-risk infections.

Controlled Inoculum

Accurate MIC is needed by clinicians in order to determine the correct antimicrobials and antimicrobial dosages to administer to patients. Some automated AST systems rely on a fixed dilution of positive blood cultures as input to the system. However, fixed dilution methods may result in an inconsistent inoculum. This can potentially affect the final MIC values reported and therefore the consequent treatment.

ASTar overcomes this inoculum effect by measuring actual bacterial content during sample preparation and consistently generating final inoculum concentrations that fall within EUCAST and CLSI guidelines. This enables high reliability and repeatability for each sample run, supporting clinical decision-making. Samples can be tested up to 16 hours after signalling positive with retained performance⁹.



Figure 1. The ASTar System covers a broad antimicrobial panel and range of dilutions. Packaged in a user-friendly and fully-automated rapid AST platform, the instrument delivers AST reports in ~6 hours.

Table 1. Antimicrobials and antimicrobial dilution ranges for the ASTar BC G– Kit. Reportable range is expressed as ≤ x to > y mg/L.

ASTar BC G–		Reportable range																Dilutions	
Non-fastidious		(mg/L)	0.008	0.016	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	
Amikacin	0.5	128																	9
Gentamicin	0.25	32																	8
Tobramycin	0.06	32																	10
Ertapenem	0.016	16																	11
Meropenem	0.06	64																	11
Meropenem-vaborbactam ¹	0.25	32																	8
Cefazolin	0.25	16																	7
Cefepime	0.25	64																	9
Cefotaxime	0.016	128																	14
Cefoxitin (screen)	1	64																	7
Ceftazidime	0.25	64																	9
Ceftazidime-avibactam ²	0.125	32																	9
Ceftolozane-tazobactam ³	0.125	32																	9
Ceftriaxone	0.016	128																	14
Cefuroxime	1	64																	7
Ciprofloxacin	0.125	8																	7
Levofloxacin	0.125	16																	8
Trimethoprim-sulfamethoxazole ⁴	0.06	8																	8
Aztreonam	0.25	64																	9
Amoxicillin-clavulanic acid ⁵	1	32																	6
Ampicillin	1	64																	7
Piperacillin-tazobactam ²	0.25	256																	11
Colistin	0.25	8																	6
Tigecycline	0.03	16																	10
Fastidious																			
Meropenem	0.016	8																	10
Cefotaxime	0.016	2																	8
Ceftriaxone	0.03	2																	7
Levofloxacin	0.03	8																	9
Amoxicillin-clavulanic acid ⁵	0.5	32																	7
Ampicillin	0.03	4																	8

¹ For susceptibility testing purposes, the concentration of vaborbactam is fixed at 8 mg/L

² For susceptibility testing purposes, the concentration of avibactam is fixed at 4 mg/L

³ For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L

⁴ Trimethoprim:sulfamethoxazole in the ratio 1:19

⁵ For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L

Only EUCAST breakpoints are applicable for Amoxicillin-clavulanic acid

The AST Disc

The ASTar Disc contains more than 330 culturing chambers, including those pre-filled with antimicrobials in various concentration ranges, growth control chambers, and chambers used to determine bacterial concentration for inoculum preparation. The antimicrobial panel and ASTar process includes the testing capacity for fastidious and non-fastidious pathogens in one kit, enabling testing to begin prior to the input of species ID, which is only required for the generation of the final report.

Broad Antimicrobial Panel and Adaptable Disc Space

There is a distinct need for comprehensive coverage of different antimicrobials and antimicrobial dilutions for use in AST. The ASTar BC G– Kit covers a broad range of dilutions of 24 different antimicrobials across 6–14 two-fold dilutions per antimicrobial. All 24 antimicrobials evaluate the susceptibility of non-fastidious organisms, and six of these can treat infections caused by fastidious organisms. In total, the ASTar BC G– Kit currently supports testing of 14 species across 235 bug/drug combinations. This broad coverage gives clinicians the confidence to act sooner on evidence-based AST reports, minimising therapy uncertainty with the broadest rapid AST panel on the market.

There is room to add additional types of antimicrobials in the future, without the need to remove any of the existing antimicrobials.

The Disc design accommodates a testing capacity ranging from very low to very high MIC values. All dilutions are measured simultaneously at each time point, thereby removing the need for extrapolated values and instead reporting true MIC. The comprehensive MIC-driven optimal dosing regimen guided by ASTar can reliably support the prescription of appropriate treatments. Broad panel coverage increases the likelihood that clinically relevant treatment options are available in the initial AST report, reducing delays associated with follow-up testing.



Figure 2. The Disc during AST reading. The unique proprietary technology allows automated time-lapse imaging of bacterial population growth in chambers containing different concentrations of antimicrobial agents.

Conclusion

AST is initiated directly from a positive blood culture and ASTar can be started independently of pathogen ID, which can be entered before, during, or after the AST run to create the final AST report. This shortens the total time to optimise antimicrobial treatment by approximately 24 hours in common laboratory workflows (but can save up to 48 hours) compared to conventional methodology.

Full automation reduces hands-on time to just a few minutes and helps improve data quality. The disc design supports a comprehensive AST panel and the simultaneous measurement of a broad range of antimicrobial dilutions for MIC determination.

A single ASTar test delivers both MIC data and EUCAST or CLSI breakpoint interpretation for a broad set of antimicrobials, increasing the likelihood that relevant treatment options are included in the initial AST report and minimising the need for follow-up testing.

ASTar is a comprehensive solution to AST that offers rapid results, a high standard of reporting, and clinical flexibility. For clinicians managing bloodstream infections, this enables earlier and more confident optimisation of antimicrobial therapy during the most critical phase of patient care.

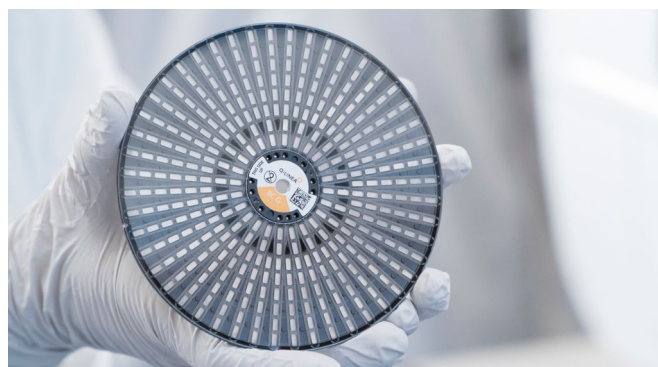


Figure 3. Optimised therapy in one run. The extensive antimicrobial susceptibility testing capabilities of the AST Disc deliver clinically actionable results in a single run.

References

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A system for fast results and improved outcomes

ASTar is a comprehensive rapid AST system that, when strategically integrated into critical points in healthcare, could potentially contribute to improved patient care and reduced hospital costs.

Rapid AST has been shown to:

- Shorten time to optimal therapy¹
- Aid antimicrobial stewardship²
- Reduce length of stay³
- Contribute to cost savings⁴

Rapid AST systems have demonstrated themselves as cost-effective solutions for the management of patients with bloodstream infections while concurrently enhancing overall quality of care. ASTar can be seamlessly integrated into the diagnostic pipeline and encompasses the core tenets of healthcare policies, regulations, and overarching goals.

References

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At Q-linea, we design, develop, and deliver innovative technology to aid physicians and technicians to improve patient outcomes and save lives. We aim to vastly reduce the time to optimal therapy and ensure antibiotics continue to be an effective treatment for future generations. Q-linea helps to create sustainable healthcare, now and in the future. For patients, physicians, and society.

Q-linea was founded in 2008 by scientists from the Rudbeck Laboratory in Uppsala, Sweden. Today, Q-linea comprises an interdisciplinary, highly motivated team that operates out of state-of-the-art, customised facilities in Sweden, Italy, and the United States of America.

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