Laboratory leaders are turning to rapid AST to advance antimicrobial stewardship

With antimicrobial resistance on the rise, rapid AST offers a lifeline for critically ill patients and supports improved antibiotic stewardship

Gradientech

29 Jan 2025

Rapid AST systems are revolutionizing infection management by providing actionable data within hours. In an era of rising antimicrobial resistance, these systems empower clinicians to swiftly tailor treatments, to curb resistance selection, and improve clinical care of critically ill patients.



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Sepsis and bloodstream infections (BSIs) remain among the most urgent medical emergencies, requiring rapid intervention. In regions with high rates of antibiotic resistance, such as Southern and Eastern Europe, this urgency is magnified, making innovative diagnostic tools critical.

Rapid antibiotic susceptibility testing (AST) systems are stepping into this landscape, looking to reshape sepsis management. Professor Gian Maria Rossolini, a leading clinical microbiologist at the University of Florence and Florence Careggi University Hospital, shares insights with SelectScience® on the future of AST and its potential to revolutionize patient care.

The challenge of antibiotic resistance in sepsis

Antibiotic resistance presents significant hurdles in diagnosing and managing sepsis. While traditional AST methods offer reliable results, they are time-intensive, requiring at least 24 hours, often longer. In high-resistance settings, empirical treatments have a higher risk of failing to treat the pathogen. Professor Rossolini emphasized this point, "In settings where antimicrobial resistance is prevalent, like in Italy, it's very important to have information on AST. Having this information earlier, of course, allows us to confirm that the initial empiric treatment is appropriate or adjust treatment more rapidly."

Rapid AST systems are designed to address this gap. These tools can move beyond the time constraints of conventional methods, providing actionable data within hours rather than days. They empower clinicians to shift from empirical to targeted therapy earlier, reducing the risks and duration of inappropriate treatment in critically ill patients.

Transforming workflows with rapid AST

Ultra-rapid AST systems are game-changers due to their speed and precision. One example is Gradientech's **QuickMIC®**, which uses advanced microfluidics and sensitive imaging optics to determine minimum inhibitory concentration (MIC) values within 2–4 hours from a positive blood culture. Traditional methods often take at least 48 hours to deliver results. This **resource** on rapid phenotypic AST for Gram-negative bacteria highlights how these features may significantly impact sepsis management.

"This acceleration can result in releasing results two days earlier compared to conventional workflows," Rossolini explains. "It allows for faster turnaround of actionable information, helping clinicians to adjust antimicrobial treatments from empiric to targeted treatment much sooner." For sepsis patients in critical care, where delays in effective treatment significantly impact outcomes, this can mean the difference between cure and failure.

The QuickMIC system is also modular, enabling laboratories to stack instruments and scale their capacity efficiently. This flexibility is particularly beneficial in healthcare systems with a mix of laboratory sizes, meaning that all laboratories can afford to introduce rapid AST independent of the sample volumes.

Advancing antimicrobial stewardship practices

"Rapid AST helps reduce the spectrum of antimicrobials used, minimizing selective pressure and supporting de-escalation strategies."

Professor Gian Maria Rossolini, Medical Doctor and Clinical Microbiologist

Rapid AST systems do more than save time to definitive therapy; they play a vital role in promoting antimicrobial stewardship. By providing susceptibility results in a fraction of the time, these systems help guide escalation or de-escalation of treatments within shorter times.

“Increasingly, stewardship is a critical component of managing infections,” Rossolini noted. “Rapid AST helps reduce the spectrum of antimicrobials used, minimizing selective pressure and supporting de-escalation strategies. It’s equally useful for escalation, ensuring earlier coverage for pathogens resistant to empiric therapy.”

In high-resistance environments, this rapid feedback is indispensable. Rapid AST systems can mitigate the overuse of broad-spectrum antibiotics, the use of which accelerates resistance development, while also ensuring that highly resistant pathogens are not undertreated.

Integrating rapid AST into clinical workflows

Despite their promise, integrating rapid AST systems into routine workflows poses challenges. Laboratories must adapt to implement these technologies into their 24/7 diagnostic operations. “Routine workflows would need to change,” Rossolini said, “but the advantage is clear – faster information on AST, especially for critical care patients.”

For QuickMIC users, simplicity in workflow integration is a standout feature. The system’s user-friendly design allows laboratory staff to insert a pre-filled cassette, add the sample, and start the run with minimal hands-on time. This ease of use is particularly attractive for labs considering rapid AST adoption.

However, cost remains a barrier. Rapid AST systems are often more expensive than traditional methods, which could limit their routine use to critically ill patients or research-focused applications. Rossolini stressed the need for evidence showing that these systems improve patient outcomes, justifying their higher costs.

Combining molecular and phenotypic approaches

While rapid molecular diagnostics have become increasingly common, they cannot entirely replace phenotypic methods like QuickMIC. Molecular systems are excellent for detecting specific resistance genes directly from clinical specimens, but they lack the capacity to detect new or unknown resistance mechanisms, while the confirmed presence of resistance genes is not always a reliable predictor of actual clinically significant resistance.

Rossolini highlights the complementary role of rapid phenotypic systems, “rapid phenotypic systems could provide information comparable to conventional testing,

complementing molecular diagnostics and, in some cases, providing additional insights." This integrated approach ensures comprehensive and reliable diagnostics, particularly in complex cases where resistance mechanisms may not be fully understood.

The future of rapid AST

"We will move to rapid testing in the future, as it provides clear advantages in antimicrobial use and patient outcomes."

Professor Gian Maria Rossolini, Medical Doctor and Clinical Microbiologist

The future of AST lies in a shift from conventional testing to rapid methods that deliver comparable or superior results at an affordable cost. Rossolini predicts that rapid AST systems will be widely adopted, provided they can meet the dual challenges of efficacy and cost-effectiveness.

"In principle, I think we will move to rapid testing in the future, as it provides clear advantages in antimicrobial use and patient outcomes," he said. "But it must be affordable and of validated superiority against conventional systems to justify this move."

For diagnostic tools like QuickMIC, this future seems within reach. Its ability to provide rapid, precise MIC values aligns with the growing demand for faster diagnostics in critical care settings. By helping clinicians make informed decisions earlier, these systems could dramatically improve outcomes for sepsis patients, particularly in high-resistance regions.

However, broad adoption will require more than just technological innovation. Laboratory directors, microbiologists, and infectious disease specialists must collaborate to develop workflows that maximize the potential of rapid AST while addressing logistical and financial barriers. Evidence from ongoing research projects, like those conducted by Rossolini and his team, will play a pivotal role in driving this transition.

Bridging innovation and practice

As rapid AST systems like QuickMIC gain traction, they represent more than just a technological leap; they embody a shift in how we approach sepsis management in an era of rising antibiotic resistance. For regions like Southern Europe, where resistance rates challenge even the broadest empirical therapies, these tools offer hope and a path forward.

By combining speed, precision, and ease of use, rapid AST systems stand to reshape both laboratory diagnostics and clinical practice, enabling healthcare teams to deliver faster and more targeted care when it matters most. For early adopters and researchers at the

forefront of AST, these innovations signal a promising step toward better patient outcomes and a more sustainable future in antimicrobial stewardship.

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