Rapid phenotypic AST direct from different clinical specimens as well as isolates on the same automated system

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Introduction

Two different AST workflows using the ASTar™ system (Q-linea) have been evaluated; fully-automated and semi-automated. In the former, sample preparation, inoculum adjustment as well as AST analysis are automated whereas in the latter, a manual inoculum preparation was followed by automated AST (Figure 1).

The fully-automated workflow, previously tested for positive blood cultures (1, 2), was here also tested for urine and isolates samples.

Materials and methods

To simulate urine specimens, clinical isolates were spiked into urine at 10^5 CFU/mL. To simulate blood cultures, blood culture flasks with 9 mL blood were spiked and allowed to grow until signaled positive. A 0.5 mL aliquot of blood culture or 10 mL of urine was automatically processed in the ASTar system, including bacterial isolation and inoculum adjustment (see also poster P1759, available online). The inoculum prepared in the system is $2 \times 10^5 - 8 \times 10^5$ CFU/mL, or $2 \times 10^4 - 2 \times 10^5$ CFU/mL for urine samples. For the semi-automated workflow, the inoculum was prepared using a standard McFarland method.

Between 5 to 10 two-fold dilutions of antimicrobials were tested during AST. Time-lapse microscopy was used to measure biomass, which was translated into minimum inhibitory concentration (MIC) values by proprietary algorithms and compared to reference Sensititre™ broth microdilution (BMD) results.

In addition, system performance was investigated at inoculum relevant for clinical urine samples (3).

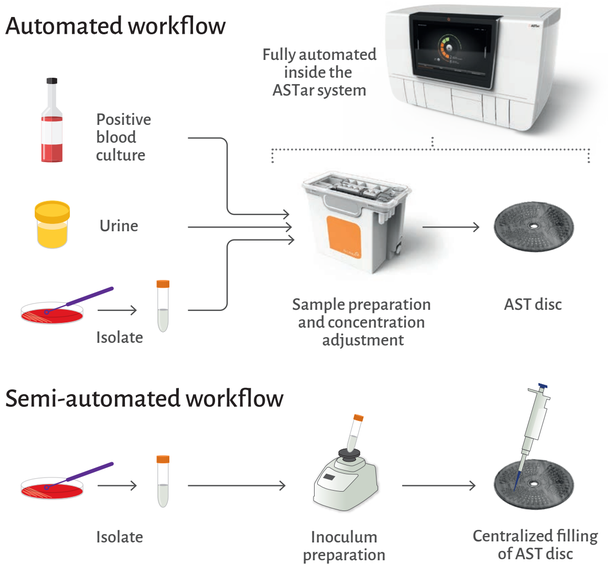

Fig 1. Simple and rapid automated or semi-automated workflows for AST from different specimen types.

Results

The system reliably measured biomass down to an inoculum of 5×10^3 CFU/mL within five hours. In the example of Figure 2, the same five hour-MIC was obtained regardless of tested inoculum. However, depending on the combinations of bacteria and antimicrobials the inoculum will affect the MIC (4).

Blood culture, urine and isolates were tested with gram-positive and gram-negative bacteria as well as bacteria requiring fastidious media. For all three tested matrices, the resulting five-hour MIC values compared well to reference Sensititre BMD (Figure 3).

Conclusions

- The automated AST workflow generates five-hour MIC results from blood culture, urine and isolates that correlate well with Sensititre BMD reference.
- Isolates can be run with either the automated or the semi-automated workflow.
- Biomass from a 100-fold lower inoculum than the EUCAST recommendation can be measured by the system.

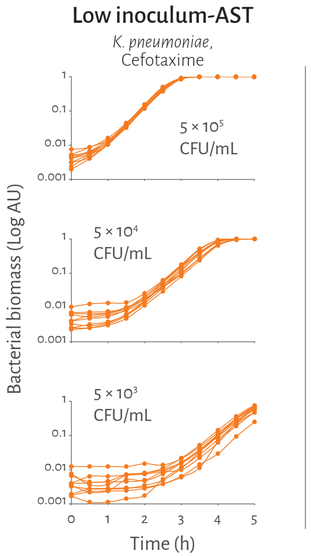

Fig 2. Inoculum between $5 \times 10^3 - 5 \times 10^5$ CFU/mL can be measured.

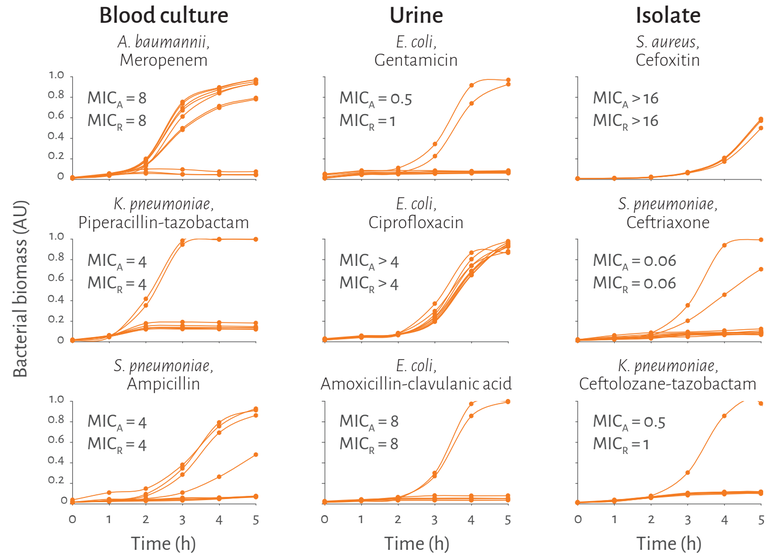

Fig 3. Biomass plotted over time for different specimen types and for a selected number of bacteria and antimicrobials combinations, each curve representing one concentration (mg/L). For each AST, ASTar-MIC (MIC_A) and reference BMD MIC (MIC_R) are noted.

References 1: Poster P1801, ECCMID 2018; 2: Poster O0400, ECCMID 2018; 3: Bonkat, G. and Pickard, R. *et al.* EAU Guidelines on Urological Infections. 2018, ISBN 978-94-92671-01-1; 4: Smith, K.P. and Kirby J.E. *Antimicrob Agents Chemother.* 2018, 62 (8), e00433-18.