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An evaluation of an automated broth microdilution platform compared with the EUCAST disc diffusion methodology

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INTRODUCTION

The gold standard method for antimicrobial susceptibility testing (AST) is broth microdilution (BMD) ISO 20776-1:2006 standard[1]. However, BMD is not widely used in routine clinical laboratories due to the labour-intensive nature of this method & logistical challenges with frozen consumables.

University Hospital Southampton assessed their current AST methodology (disc diffusion following published EUCAST guidance[2]) against a technology closer to the gold standard. The Thermo Scientific™ Sensititre™ ARIS HiQ™ System for AST (ARIS HiQ System) is an incubation and reading platform that follows broth microdilution methodology, with the added benefit of automated plate setup and handling (Figure 1). The system has the capacity to hold up to 100 Thermo Scientific™ Sensititre™ Susceptibility Test Plates (Sensititre Plates).

OBJECTIVE

The objective of this study was to evaluate the performance and workflow of the the Sensititre ARIS HiQ System for non-fastidious Gram negative and Gram positive isolates, comparing the results to the EUCAST disc diffusion methodology[2].

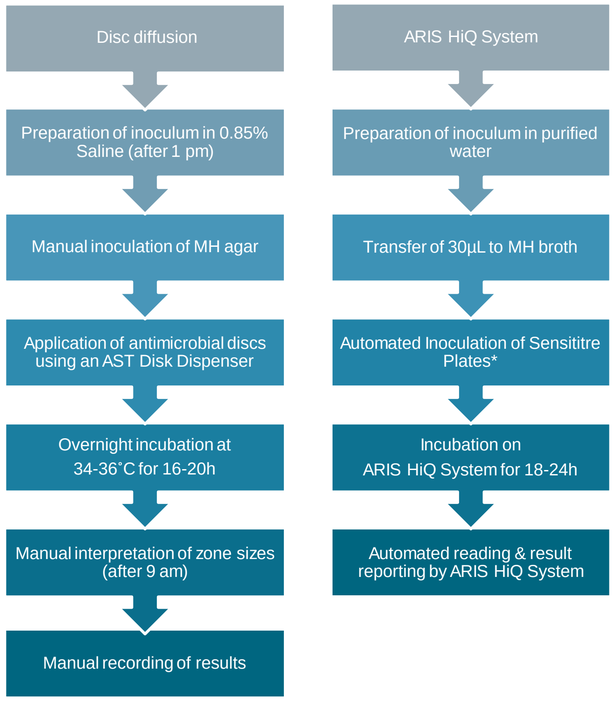
Figure 1. Sensititre ARIS HiQ System and Sensititre plates for AST testing

MATERIALS AND METHODS

AST was performed on non-fastidious Gram negative (n=160) and Gram positive (n=198) clinical isolates from University Hospital Southampton. Isolates consisted of Enterobacterales (n=86), *Pseudomonas* spp. (n=66), *Acinetobacter* spp. (n=8), *Staphylococcus* spp. (n=165) and *Enterococcus* spp. (n=33).

Disc diffusion following the EUCAST methodology[2] was performed on all isolates using antimicrobial discs and Mueller-Hinton (MH) Agar. All isolates were tested using Sensititre Plates on the Sensititre ARIS HiQ System, according to manufacturers instructions. The workflow is summarised in Figure 2.

Figure 2. Comparison of disc diffusion versus Sensititre ARIS HiQ System workflows



*Using Thermo Scientific™ Sensititre AIM™ Automated Inoculation Delivery System

RESULTS

A comparison of results was performed following the guidelines stipulated in ISO 20776-2:2007[3]; categorical agreement, total number of discrepancies and discrepancy rates are detailed in Tables 1 and 2. As the existing method in use, the disc diffusion results were reviewed as the reference method to which the Sensititre ARIS HiQ System results were compared.

Table 1. Results summary on Gram negative isolates

Total no. results		1018
Total no. discrepancies		28
Categorical agreement (%)		97.2
Discrepancy rates (%)		
Minor	Major	Very major
0.8	1.6	3.5

Table 2. Results summary on Gram positive isolates

Total no. results		1511
Total no. discrepancies		17
Categorical agreement (%)		98.9
Discrepancy rates (%)		
Minor	Major	Very major
0.1	0.9	1.6

Initial results for *Staphylococcus* spp. showed a number of discrepancies with the D-test between disc diffusion and the Sensititre ARIS HiQ System. This was found to be due to erroneous manual reading of inducible clindamycin resistance with disc diffusion. Upon re-test these discrepancies were cleared and disc diffusion results were in agreement with the Sensititre ARIS HiQ System results.

The majority of initial discrepancies were re-tested with both methods. Some of the isolates with discrepancies remaining were not available for re-testing; the original data points are included in the result evaluation.

CONCLUSIONS

Data from the ARIS HiQ System showed >97% categorical agreement to discs

- The results generated by the Sensititre ARIS HiQ System were in agreement with the disc diffusion results for >97% of all Gram negative and Gram positive isolates
- Sensititre system methodology offers quantitative MIC results equivalent to the gold standard method

Optimized workflow

- The Sensititre ARIS HiQ System offers an automated and streamlined alternative to disc diffusion, delivering quantitative MIC results coupled with access to important new antibiotics

Time efficient

- Automated reading is not bound to the sample set-up time restrictions that laboratories face with disc diffusion
- Earlier access to results for critically ill patients

Reduced risk of human error

- Expert rules and exceptional phenotypes are automatically applied or flagged by the system
- Automated result read reduces the risk of reporting incorrect results due to human error

REFERENCES

1. ISO 20776-1:2006 Clinical laboratory testing and in vitro diagnostic test Systems – Susceptibility testing of infectious agents and evaluation of performance of antimicrobial susceptibility test devices – Part 1. Reference method for testing the in vitro activity of antimicrobial agents against rapidly growing aerobic bacteria involved in infectious diseases.
2. EUCAST Disk Diffusion Method for Antimicrobial Susceptibility Testing - Version 7.0 (January 2019)
3. ISO 20776-2:2007 Clinical laboratory testing and in vitro diagnostic test Systems – Susceptibility testing of infectious agents and evaluation of performance of antimicrobial susceptibility test devices – Part 2. Evaluation of performance of antimicrobial susceptibility test devices.

TRADEMARKS/ LICENSING

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