Poster # **D-211**

Comparison of Automated Reading and Incubation System (ARIS®)/Sensititre® to Vitek2® for Antimicrobial Susceptibility Testing

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ABSTRACT*

Background: The ARIS/Sensititre (TREK Diagnostic Systems, Cleveland, OH) has been evaluated against MicroScan (Dade Behring, West Sacramento, CA) for automated susceptibility testing. The ARIS/Sensititre has not been compared to the Vitek 2 (V2) (bioMerieux, Durham, NC).
Methods: 278 clinical isolates were tested on ARIS/Sensititre and V2, which yielded 2924 antimicrobial-organism combinations. ARIS/Sensititre results were compared to V2 results, with V2 being the initial reference. Only antimicrobial-organism combinations appropriate for routine use and reporting were included. Results were analyzed for essential agreement and categorical agreement. Essential agreement is defined as minimal inhibitory concentrations (MICs) within ±1 two-fold dilution. Categorical errors are defined as: minor (intermediate result versus either SS or RR result), major (ARIS/Sensititre, R; V2, S [falsely resistant]), or very major (ARIS/Sensititre, S; V2, R [falsely susceptible]). Only isolates with major or very major errors were repeated on both systems. Isolates with persistent major or very major errors were subjected to blind discrepant testing using the NCCLS M7 frozen reference method.
Results: After discrepant analysis, 198 gram-negative isolates (2286 antimicrobial-organism combinations), essential agreement was 94.8%. Categorical agreement showed 3.3% minor, 0% major and 0.9% very major errors. For 80 gram-positive isolates (638 antimicrobial-organism combinations), essential agreement was 93.9% with categorical errors of 3.3% minor, 0.7% major and 0% very major. Discrepant analysis favored Sensititre 2:1 over Vitek 2.
Conclusions: ARIS/Sensititre yields results generally comparable to V2. Reference testing of discrepant isolates favored Sensititre more often. ARIS/Sensititre is a viable option for automated antimicrobial susceptibility testing.

*Modified Abstract

INTRODUCTION

This study evaluated performance of Sensititre Gram-positive and Gram-negative customized prepared MIC plates read using the Automated Reading and Incubation System (ARIS®) compared to Vitek 2 (V2) for automated antimicrobial susceptibility testing of clinical isolates.

MATERIALS & METHODS

- **278 Clinical Isolates Tested (Table 1):**
  1. Gram-Positive 80
  2. Gram-Negative 198

- **Antibiotics tested (Shown in Tables 2 and 3)**

- **QC organisms were run each day of testing as per NCCLS.**
  1. ATCC 29213
  2. ATCC29212
  3. ATCC 25922
  4. ATCC 27853
  5. ATCC 35218

- **Sensititre Set-up:**
  1. Inocula were adjusted to a 0.5 McFarland standard using the Sensititre nephelometer.
  2. Plates were inoculated as per manufacturer's instructions.

- **Vitek Set-up:**
  1. Inocula were prepared as per manufacturer's instructions.
  2. Cards were inoculated as per manufacturer's instructions.

- **Data Analysis (Table 4):**
  1. Sensititre/ARIS results were compared to Vitek results and analyzed for:
     - Essential agreement: MICs ±1 two-fold dilution
     - Categorical errors:
     - Minor[1], intermediate versus sensitive or resistant
     - Major[2], falsely resistant (ARIS, R; Vitek, S)
     - Very major[2], falsely susceptible (ARIS, S; Vitek, R)

[1] Minor error's that were in essential agreement were not tallied as errors. For example: an MIC of 8 µg/ml (sensitive) compared to 16 µg/ml (intermediate) is within 1 two-fold dilution and thus was not considered to be a minor error.

[2] Isolates with Major or Very major error were subjected to repeat testing on both systems. Isolates with persistent Major or Very major errors were sent for blinded arbitration using the NCCLS M7 frozen reference method (Table 5).

Table 1: Isolates Tested

Organism	No. tested		
Gram-negative:			
Escherichia coli	36	**Gram-positive:**	
Klebsiella spp.	36	*Enterococcus faecalis*	30
Proteus spp.	29	*Staphylococcus aureus*	27
Pseudomonas spp.	24	*Enterococcus faecium*	15
Enterobacter spp.	22	Coagulase-negative staph	8
Serratia marcescens	12	**Total Gram-positive**	**80**
Citrobacter spp.	10		
Providencia spp.	10		
Acinetobacter spp.	10		
Miscellaneous*	9		
Total Gram-negative	**198**		

Total 278

* Includes 5 *Morganella*, 2 *Salmonella* and one each *Alcaligenes* and *Flavobacterium*

Table 2: Gram-Negative Antimicrobics

Amikacin
Ampicillin
Ampicillin/Sulbactam
Aztreonam
Cefazolin
Cefepime
Cefotetan
Ceftazidime
Ceftriaxone
Gentamicin
Imipenem
Levofloxacin
Nitrofurantoin
Piperacillin
Tobramycin
Trimethoprim/Sulfamethoxazole

Table 3: Gram-Positive Antimicrobics

Ampicillin
Cefazolin
Chloramphenicol
Clindamycin
Erythromycin
Gentamicin
Gentamicin 500
Levofloxacin
Nitrofurantoin
Oxacillin
Penicillin
Streptomycin
Tetracycline
Vancomycin

RESULTS

Table 4: Performance of Sensititre/ARIS compared to Vitek 2 after discrepant analysis

			Categorical Errors (%)		
Organism	No. tested	Essential agreement	Minor	Major	Very Major
Gram-negative	198	95.0%	76 (3.3%)	0 (0%)	4 (0.9%)
Gram-positive	80	93.9%	21 (3.3%)	3 (0.7%)	0 (0%)

Table 5: Results of Arbitration for Major and Very Major Errors

		MIC (µg/ml)			Resulting error	
Organism	Antimicrobial	Sensititre	Vitek 2	Reference	Sensititre	Vitek 2
CoNS	Clindamycin	>2	<0.25	0.06	Major	
CoNS	Erythromycin	>4	<0.25	>16		Very major
Enterococcus faecium	Vancomycin	>16	<1	0.5	Major	
Staphylococcus aureus	Nitrofurantoin	16	>512	16		Major
Staphylococcus aureus	Vancomycin	2	>32	1		Major
Citrobacter freundii	Cefazolin	8	>64	>32	Very major	
Enterobacter aerogenes	Ampicillin-Sulbactam	>16	8	>32		Very major
Proteus mirabilis	Ampicillin-Sulbactam	8	>32	16		Minor
Proteus vulgaris	Aztreonam	>8	>64	0.5		Major
Serratia marcescans	Ampicillin-Sulbactam	>16	8	16	No error	No error

CONCLUSIONS

- ARIS/Sensititre performed well compared to Vitek 2 for susceptibility testing of 278 clinical isolates (Table 4).
  1. 95.0% essential agreement for gram negative isolates
  2. 93.9% essential agreement for gram positive isolates.

- Essential and categorical error rates were within generally accepted limits[1], with the exception of gram-positive essential agreement.
  1. Results noted in the arbitration table agreed with Sensititre results 6 times and with Vitek 3 times (Table 5).
  2. Results for Vitek 2 were not analyzed by utilizing the expert rules.

- ARIS/Sensititre is a valid option for automated antimicrobial susceptibility testing in the clinical laboratory.

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