Feasibility Evaluation of the ASTar System for Rapid Antimicrobial Susceptibility Testing Using Cultured Gram-Negative Isolates.

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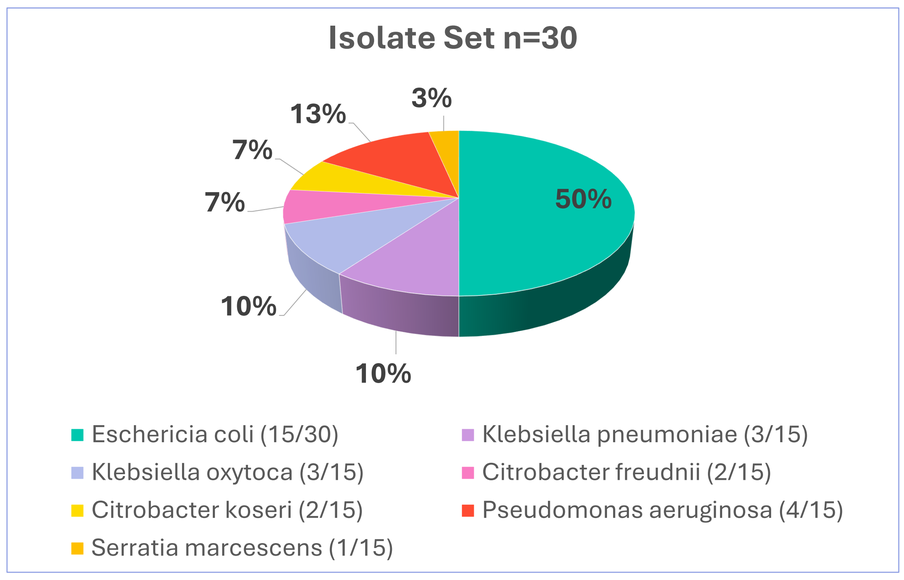
Introduction

- Rapid antimicrobial susceptibility testing (RAST) is necessary for providing optimal and timely treatment of invasive bacterial infections, especially inpatient populations.
- Prolonged suboptimal empirical treatment is costly to both patients and patient outcomes. The ASTar RAST system should mitigate these issues since MIC/AST results are available approximately 6 hours from instrument start.
- The ASTar RAST system has only been validated for FDA cleared for use on gram negative positive blood cultures.
- This study will be insightful to determining the effectiveness of the ASTar RAST system on isolated cultures.

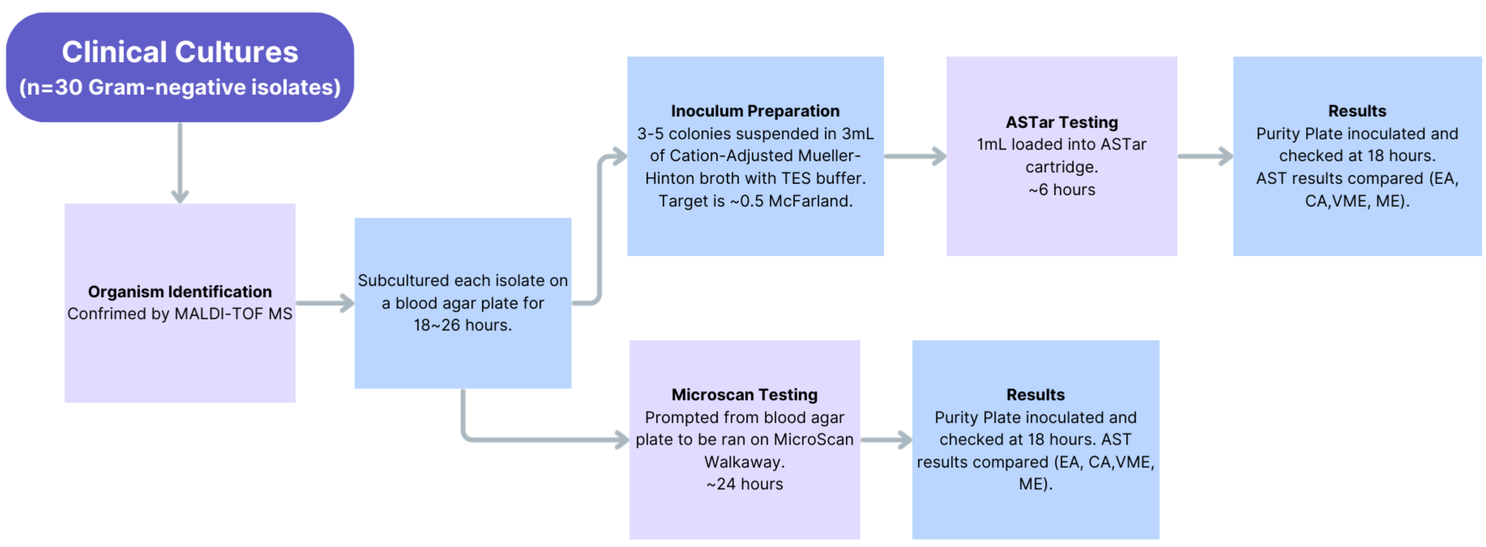
Methods

- Thirty Gram-negative isolates from various non-blood cultures were included in this study.
- Organism identification confirmed via MALDI-TOF MS and subcultures on blood agar and tested within 26 hours of plating.
- ASTar testing in an investigational research setting utilized 3-5 colonies that were probed and suspended in 3mL of cation-adjusted Mueller-Hinton broth with TES buffer, targeting an approximate turbidity of 0.5 McFarland per suspension.
- 1mL of suspension placed into the ASTar cartridge, with a parallel AST testing performed on the Microscan WalkAway system as a standard-of-care device.
- Interpretation of results were done using FDA-recognized STIC breakpoints. Performance metrics included Essential Agreement (EA), Categorical Agreement (CA), Very Major Errors (VME), and Major Errors (ME) across all 611 organism-antimicrobial combinations.

Results



Study Workflow



Antimicrobial Performance

Antimicrobial	N	EA (n)	EA (%)	CA N	CA (n)	CA (%)	S	I	R	VME (n)	VME (%)	ME (n)	ME (%)
Amikacin	31	31	100.0%	3	3	100.0%	3	0	0	0	0.0%	0	0.0%
Ampicillin	15	15	100.0%	15	15	100.0%	6	0	9	0	0.0%	0	0.0%
Ampicillin-sulbactam	24	22	91.7%	24	19	79.2%	13	4	7	1	14.3%	0	0.0%
Aztreonam	31	30	96.8%	31	30	96.8%	28	1	2	0	0.0%	0	0.0%
Cefazolin	24	24	100.0%	24	16	66.7%	17	2	5	0	0.0%	0	0.0%
Cefepime	31	31	100.0%	31	31	100.0%	30	0	1	0	0.0%	0	0.0%
Cefotaxime	28	28	100.0%	1	1	100.0%	0	0	1	0	0.0%	0	0.0%
Ceftazidime	30	30	100.0%	30	29	96.7%	30	0	1	0	0.0%	0	0.0%
Ceftazidime-avibactam	27	27	100.0%	27	27	100.0%	27	0	0	0	0.0%	0	0.0%
Ceftolozane-tazobactam	25	24	96.0%	25	24	96.0%	25	0	0	0	0.0%	1	4.0%
Ceftriaxone	28	27	96.4%	28	27	96.4%	26	0	2	0	0.0%	1	3.8%
Cefuroxime	25	25	100.0%	25	24	96.0%	22	0	3	0	0.0%	1	4.5%
Ciprofloxacin	31	31	100.0%	31	30	96.8%	25	0	6	0	0.0%	0	0.0%
Ertapenem	28	28	100.0%	28	28	100.0%	28	0	0	0	0.0%	0	0.0%
Gentamicin	31	28	90.3%	28	25	89.3%	24	1	3	1	33.3%	1	4.2%
Levofloxacin	31	30	96.8%	31	29	93.5%	26	1	4	0	0.0%	0	0.0%
Meropenem	31	31	100.0%	31	31	100.0%	31	0	0	0	0.0%	0	0.0%
Meropenem-vaborbactam	23	23	100.0%	23	23	100.0%	23	0	0	0	0.0%	0	0.0%
Piperacillin-tazobactam	31	30	96.8%	31	30	96.8%	30	0	1	0	0.0%	1	3.3%
Tigecycline	28	28	100.0%	28	28	100.0%	28	0	0	0	0.0%	0	0.0%
Tobramycin	31	29	93.5%	28	21	75.0%	23	3	2	0	0.0%	1	4.3%
Trimethoprim-sulfamethoxazole	27	25	92.6%	27	25	92.6%	25	0	2	0	0.0%	2	8.0%
Grand Total	**611**	**597**	**97.7%**	**550**	**516**	**93.8%**	**490**	**12**	**49**	**2**	**4.1%**	**8**	**1.6%**

- Across 611 total bug/drug combinations:
  - Total Categorical agreement was 93.8%.
  - Total Essential Agreement was 97.7%.
- Performance data came from clinical samples.
- Interpretations were calculated using the 34th edition of M100 Breakpoints.

Amikacin: The updated breakpoints are not cover by MicroScan reportable range, so results cannot be interpreted.
Cefotaxime: MicroScan reports an MIC of ≤2, which corresponds to either susceptible or intermediate. A definitive S/I/R category cannot be assigned.

Conclusion

- This study demonstrates high overall agreement between ASTar and standard-of-care AST when applied to gram-negative non-blood isolates.
- Findings suggest that the ASTar RAST system may feasibly support rapid AST from cultured isolates beyond gram-negative positive blood cultures.
- A larger method comparison study is suggested to verify whether the promising results here can be clinically applied.
- The process described can deliver phenotypic results in approximately 6 hours of test initiation and potentially within 24 hours of specimen plating.
- Interpretation is limited by small sample size and restricted resistance diversity.

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