Rapid test for growth and determination of antibiotic sensitivity of group B streptococcus (GBS) in antepartum women

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ABSTRACT

OBJECTIVE: We determined if a new method of rapidly growing GBS in 6 hours could also determine antibiotic sensitivities in a shorter period compared to standard cultures.

STUDY DESIGN: Women were screened between 35 to 37 weeks gestation. Vaginal-rectal swabs were collected in Stuart's transport medium. Swabs were then inoculated on a nitrocellulose membrane (NCM) that had been coated previously with polyclonal rabbit antibody against GBS in the presence or absence of clindamycin. At six hours, the NCM was removed from the sheep blood agar medium, and horseradish-peroxidase conjugate polyclonal antibody against GBS was added. An additional swab from each patient was cultured by traditional methods for 48-72 hours and those positive for GBS were then tested for resistance/sensitivity to clindamycin. A final control consisted of sending a separate swab from each patient to a commercial lab.

RESULTS: 124 patient samples were screened, of which 33 were positive for GBS by the rapid test (97.0% concordance with traditional culture). Of these 33 positive samples, 10 were resistant to clindamycin, which agreed 100% with traditional culture. Results of the both the rapid and traditional culture showed 100% concordance with sensitivity or resistance to clindamycin when compared with commercial lab results.

CONCLUSION: This new NCM assay offers a rapid and unique method for both detection and determination of antibiotic sensitivities for GBS; thus improving the targeting of antibiotic prophylaxis for GBS colonization.

INTRODUCTION

- GBS exposure during delivery may lead to significant neonatal morbidity[1]
- CDC guidelines recommend universal screening for GBS colonization between 35-37 weeks gestation[1]
- In conditions such as preterm labor, universal screening is often not performed[1]
- Routine culture requires at least 2-3 days to identify GBS, and is therefore not suitable as an intrapartum test[1]
- Resistance of GBS to clindamycin has been well documented, and patients who report a penicillin allergy are often given vancomycin when GBS status is unknown[2]
- A method is needed for the rapid determination of GBS and its sensitivity or resistance to selected antibiotics

METHODS

- As part of an ongoing clinical study, patients were enrolled for determination of GBS colonization by a novel rapid assay.
  - -A subgroup of this larger population was included for clindamycin susceptibility analysis.
- Vaginal-rectal swabs were collected from women at 35-37 weeks gestation. Three swabs were collected per patient and placed in Stuart's Transport Media™.
- Two of the three swabs were processed in our laboratory as follows:
  - -The first swab was incubated overnight in LIM broth and then cultured on colistin and naladixic acid agar with 5% sheep blood for detection of beta-hemolysis.
  - -Cultures which were positive for GBS were then sub-cultured in the presence of clindamycin, and susceptibility was determined with either the E-Test (BioMerieux, Durham, NC) method or by Kirby-Bauer disk-diffusion.

-Clindamycin breakpoints were as follows:

Etest (MIC):	Kirby-Bauer (mm):
Susceptible < 0.5 μg/ml	Susceptible ≥ 19
Intermediate = 1-2 μg/ml	Intermediate = 16-18
Resistant > 4 μg/ml	Resistant ≤ 15

- -The second swab was processed by the Nanologix QuickTest™ (rapid assay), in the presence of two different concentrations of clindamycin, with no prior incubation or enrichment phase.
- -Results for the rapid assay were obtained in six hours.

- The third swab was sent for processing at a commercial lab and results served as the gold standard (Quest Diagnostics, Madison, NJ). Discrepancies between the rapid test an in-house culture were compared with this commercial lab result.
- Processing of all samples was performed by a trained clinical microbiologist.
- The sensitivity, specificity, positive and negative predictive values determined for the rapid test results were compared with results obtained by routine culture.

RESULTS

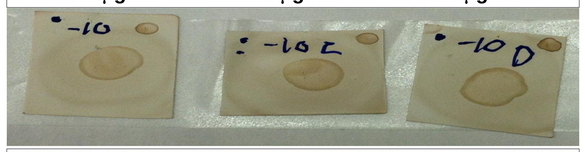
Table 1. Determination of GBS Resistance by Rapid Test vs. Culture out of 159 patients

		Culture	
		+	-
Rapid Test	+	24	12
	-	3	120

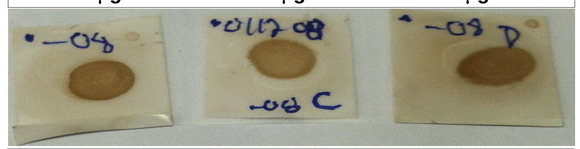
Table 2. Performance of Rapid Test vs. Culture

	Percent	95% CI
Sensitivity	88.9	69.7 – 97.1
Specificity	90.1	84.3 – 95.0
+ Predictive Value	66.7	48.9 – 80.9
- Predictive Value	97.6	92.5 – 99.4

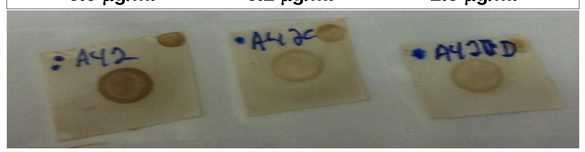
- GBS
0.0 μg/ml | 0.2 μg/ml | 2.0 μg/ml



+ GBS (Clindamycin Resistant)
0.0 μg/ml | 0.2 μg/ml | 2.0 μg/ml



+ GBS (Clindamycin Sensitive)
0.0 μg/ml | 0.2 μg/ml | 2.0 μg/ml



+ GBS (Clindamycin Resistant)
0.0 μg/ml | 0.2 μg/ml | 2.0 μg/ml

CONCLUSIONS

- This novel approach allows for identification of GBS and determination of resistance to clindamycin to be performed simultaneously, in six hours, and directly from a patient's specimen
- When compared with routine culture, this test is highly accurate.

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