Maximizing Neonatal Early Onset Group B Streptococcal Disease Prevention With Universal Culture Screening at 35 to 37 Weeks Gestation: A Comparison of GBS Detection Rates Between LIM Broth and CNA Culture Media

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Background and Objectives Group B streptococcal (GBS) disease is the most common cause of early onset neonatal sepsis. The Centers for Disease Control (CDC) recommends performing recto-vaginal cultures on pregnant women to detect GBS, followed by treatment of women with positive cultures. Our facility adopted selective culture screening in 1997 using a colistin-nalidixic acid (CNA) plate media instead of the more expensive LIM broth media. CNA plate cultures cost one third that of LIM broth and allow for final results in 24 hours, versus 48–72 hours with LIM broth. We hypothesized that CNA media saves time, money, and detects GBS as effectively as LIM broth. This study determined which media is superior at detecting recto-vaginal GBS.

Methods This was a case-control study involving 152 consecutive pregnant patients at 35–37 weeks from August 1 to October 1, 2001, at Naval Hospital Bremerton, Wash. We obtained two recto-vaginal swabs from each patient. One was cultured in LIM broth and the other on CNA medium. We then compared differences in the rates of positive cultures with LIM broth versus CNA medium using chi-square statistics and calculation of odds ratios (OR).

Results LIM broth detected GBS in 35 of 145 (24.1%) women versus 21 of 145 (14.5%) using CNA. CNA failed to detect GBS in 15 cases in which LIM broth succeeded (OR=1.88; 95% CI=1.03–3.4).

Conclusions LIM broth is superior at detecting maternal GBS colonization and is recommended over CNA plate to maximize prevention of early onset neonatal GBS disease.

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Group B Streptococcal disease (GBS) is the most common cause of early onset neonatal sepsis. In 1996, the Centers for Disease Control and Prevention (CDC) recommended that all health care facilities providing prenatal care and delivery employ either a culture-based or risk factor-based approach to reducing the incidence of early onset GBS (EOGBS) disease. Culture-based GBS prevention involves collecting recto-vaginal cultures on all pregnant patients between 35 and 37 weeks gestation. Intrapartum antibiotic prophylaxis is then given to patients who have cultures that are positive for GBS. In the risk factor-based approach, intrapartum antibiotics are only given to mothers who have or develop antepartum or intrapartum risk factors for development of GBS infection. With either approach, patients with GBS bacteriuria in the current pregnancy or a history of having had a GBS-infected neonate would be treated with IAP.

In August 2002, the CDC replaced its 1996 guidelines. The 2002 guidelines now recommend prenatal culture screening of all pregnant women at 35–37 weeks gestation. The new guidelines were based on the results of a large retrospective cohort study that demonstrated the superiority of the culture-based screening strategy over the risk-based approach.

The most commonly used culture medium for detection of GBS is LIM broth, a Todd-Hewitt broth supplemented with nalidixic acid, colistin, and yeast.
A recto-vaginal swab specimen is inoculated into the broth, and after 18 to 24 hours, the broth is sub-plated onto blood agar. The final results are available 24 hours later.

Our facility had already adopted universal culture screening in 1997 using colistin-nalidixic acid (CNA) culture medium. CNA culture media offers the advantage of early detection at one third the cost of LIM broth. At our institution, CNA broth cultures detected GBS at rates comparable to what had been reported in the literature and were associated with a reduction in the incidence of neonatal GBS disease.

CNA is a Columbia blood agar plate supplemented with nalidixic acid and colistin. CNA cultures involve only a single step in which swab specimens are directly applied on the plate. A two-step method can also be used, in which a swab specimen is first inoculated into a broth.

Culture performance characteristics influence the appropriateness of different media for the detection of maternal GBS colonization. It has been well established that selective methods of culture outperform non-selective methods, and broth media may increase GBS detection rates compared to non-broth methods.3

The lower cost and timely results obtained with CNA cultures would be advantageous but only if sensitivity is similar to that of LIM broth cultures. A literature review at the time we began our study in 2001 revealed no reported studies that directly compared LIM broth to CNA media for the detection of GBS recto-vaginal colonization. In our study, we sought to compare GBS detection rates with CNA and LIM cultures and hypothesized that CNA cultures would detect GBS as effectively as LIM broth.

Methods

Naval Hospital Bremerton is a medium-sized military community hospital located in Bremerton, Wash. There are approximately 800 deliveries per year. Our case-control study was performed from August 1 to October 1, 2001, on a sample of 152 consecutive pregnant patients at 35–37 weeks’ gestation.

Each patient served as her own control. We obtained two identically collected recto-vaginal swabs from each patient. One swab was inoculated into LIM broth, incubated for 18 to 24 hours, and then sub-cultured to a sheep blood agar plate. If GBS was not identified after 18 to 24 hours on the blood agar plate, it was reincubated and inspected at 48 hours for GBS presence. The other swab was directly rolled onto a CNA media plate, incubated, and inspected at 24 hours for the presence of GBS. Either the physician or the properly instructed patient performed collection. Several studies have shown that patient self-collected GBS swabs are equivalent to provider-collected samples.4,5

Confirmatory testing was performed on each isolate, and the primary outcome measure was the percentage of positive GBS cultures from LIM broth versus CNA plates. After data were grouped and patient identifiers removed to protect subject privacy, data were analyzed with the chi-square statistic and calculations of odds ratios (OR) to determine if there was a difference in the percentage of positive cultures obtained with LIM broth and CNA plate cultures.

Results

A total of 152 pregnant patients were involved in the study. Samples from seven patients were excluded when it was found that, inadvertently, only a single swab was obtained or submitted.

As shown in Table 1, LIM broth detected GBS in 35 of 145 (24.14%) subjects versus 21 of 145 (14.48%) using CNA (P < .04, OR = 1.88, 95% confidence interval [CI]=1.03–3.4). CNA failed to detect GBS presence in 15 cases in which LIM broth cultures were positive. In only one case did a CNA culture detect GBS when a LIM broth culture was negative for GBS.

Discussion

CDC estimates predict that a culture-based approach will prevent 86% of cases of EOGBS disease. Although this approach would require treatment of about one quarter of laboring patients, the overall cost would be only 43% of the cost of a “no screening” strategy because of the reduced incidence and cost of treating neonatal GBS disease associated with the culture-based approach. Further, as noted earlier, the culture-based approach yields better outcomes than a risk-based approach in terms of lower rates of neonatal GBS disease.2,6-11 Indeed, a recent CDC-sponsored multi-state study found that the screening approach was >50% more effective than the risk-based approach at preventing perinatal GBS disease.6,12

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<td><strong>LIM Broth Versus CNA: Comparison of GBS Detection</strong></td>
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* P < .04, odds ratio = 1.88, 95% confidence interval = 1.03–3.4

CNA—colistin-nalidixic acid
GBS—Group B Streptococcal disease
Clinicians using a culture-based strategy must ensure that cultures are correctly obtained, processed, and interpreted and that culture results are available for application to patients’ intrapartum care. Our study demonstrates that LIM broth is superior to CNA as a method for culture-based detection of GBS infection.

Limitations

Several limitations of our study should be noted. First, the background incidence of GBS colonization in our population was relatively high (19%–24% of patients annually have been GBS positive). The apparent superiority of LIM broth may not have been so great in a population with a low rate of GBS colonization. Second, our population also has a low incidence of EGGS disease. There have been only three cases of blood culture-proven EGGS sepsis in 2,926 deliveries (an incidence rate of 1.0/1,000 live births), which decreases the potential for recognition of a false negative culture result. Finally, having no other gold-standard GBS detection methods to which we can compare our results, we are unable to calculate the relative sensitivities of CNA and LIM culture methods.

Conclusions

This study demonstrates that LIM broth media is superior to CNA in the detection of maternal GBS colonization. Despite its greater initial cost, it can be anticipated to result in improved prevention of EGGS disease. LIM broth cultures, therefore, are recommended over CNA plate cultures.

Since our study was conducted, the new CDC guidelines, issued in 2002, recommend that recto-vaginal swab specimens be inoculated into commercially available selective broth (such as LIM or SBM broth), followed by sub-culture on blood agar—ie, the same method found superior in our study. The CDC guidelines cite several studies with results similar to ours, demonstrating better rates of GBS detection with selective broth cultures compared to plate cultures,14-17

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References


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