Lim Group B Strep Broth and Coagglutination for Rapid Identification of Group B Streptococci in Preterm Pregnant Women

DANIEL V. LIM, WALTER J. MORALES, and ANTHONY F. WALSH

Department of Biology, University of South Florida, Tampa, Florida 33620, and Department of Obstetrics and Gynecology and Department of Microbiology, Orlando Regional Medical Center, Orlando, Florida 32806

Received 18 August 1986/Accepted 21 October 1986

A total of 147 preterm pregnant women at Orlando Regional Medical Center were screened for group B streptococci by using Lim Group B Strep Broth (GIBCO Laboratories, Madison, Wis.) and the Phadebact Strep B Test (Pharmacia Diagnostics, Piscataway, N.J.). Test results were available within 20 h of culture and, in the case of heavily colonized women, within 5 h. This procedure is useful in rapid diagnosis of preterm pregnant women for group B streptococcal colonization.

Group B streptococci (GBS) are a major cause of neonatal infectious disease, particularly in preterm infants. Because the mortality rate of early-onset GBS disease (which may include sepsis and respiratory distress) may be as high as 50% in these infants, early and rapid diagnosis of infection is important in preventing neonatal GBS disease (6, 12, 13). Conventional laboratory tests for identification of GBS generally are of limited use in GBS disease prevention because they are presumptive tests (CAMP test [4a], sodium hippurate hydrolysis), require initial growth and isolation of bacteria on primary blood agar plates (coagglutination, latex agglutination), or identify antigens in body fluids of infants who may already be diseased (counterimmunoelectrophoresis, latex agglutination).

Recently we described a procedure to rapidly and selectively identify term maternity patients heavily colonized with GBS and considered to be at high risk of delivering infants with symptomatic early-onset GBS disease (7, 9-11). This procedure involves screening women late in the third trimester of pregnancy for GBS by using an enriched, selective broth (Lim Group B Strep Broth) and coagglutination (Phadebact Strep B Test). This procedure, when combined with chemoprophylaxis, has been found to effectively interrupt vertical transmission of GBS and reduce the incidence of neonatal early-onset GBS disease in a term population (11).

This paper describes the use of this procedure to rapidly identify colonized pregnant women delivering before term. The procedure was used to identify GBS colonization in 147 pregnant women delivering at 34 weeks or earlier. These women were part of the maternity population at Orlando Regional Medical Center in Orlando, Fla. At the time of admission in labor vaginal cultures were taken with sterile cotton-tipped applicators and sent to the hospital laboratory for processing. All infants delivered from these mothers were routinely screened for GBS infection by blood specimens and cerebrospinal fluid specimens by using lumbar punctures. These specimens were processed by conventional bacteriologic procedures. Infant urines also were screened for GBS antigen by latex agglutination (Wellcogen Strep B Test; Wellcome Diagnostics, Research Triangle Park, N.C.).

Maternal vaginal culture swabs were processed as previously described (11). Culture swabs were inoculated into 5 ml of Lim Group B Strep Broth (GIBCO Laboratories, Madison, Wis.), incubated at 36°C in 5% CO₂, and tested for the presence of GBS by coagglutination (Phadebact Strep B Test; Pharmacia Diagnostics, Piscataway, N.J.) after 5 and 20 h of incubation. Maternal culture broths were heated to 90°C for 10 min in a dry bath before coagglutination testing to eliminate multiple coagglutination reactions caused by blood on culture swabs (8).

Coagglutination test results were interpreted as recommended by Pharmacia Diagnostics. Tests in which coagglutination was observed with the Strep B reagent but not the control reagent were considered positive for GBS. Negative tests were those in which no coagglutination was observed with either the Strep B reagent or the control reagent. Mothers whose cultures tested GBS positive after 5 h of broth incubation were considered heavily colonized with GBS (≥10⁶ GBS per culture swab), as previously determined in quantitative studies (7, 9). Mothers whose cultures were GBS positive after 20 h of broth incubation were considered lightly colonized with GBS (<10⁶ GBS per culture swab).

Of the 147 pregnant women included in this study, 49 (33.3%) were colonized with GBS. Of the 49 GBS-positive women, 10 (20.4%) had 5-h-positive vaginal cultures and were heavily colonized with GBS; the remaining 39 women had 20-h-positive vaginal cultures and were lightly colonized. No nonspecific agglutinations were observed with any of the cultures processed.

GBS culture-positive pregnant women whose culture results were available before delivery were prophylactically treated with ampicillin as part of routine hospital procedure. Of the 49 GBS-positive pregnant women, 20 were administered 1 g of ampicillin intravenously every 6 h until delivery. The 20 treated women included 5 heavily colonized mothers and 15 lightly colonized mothers. None of the infants delivered from the treated mothers had GBS-positive blood or cerebrospinal fluid specimens, although two infants had GBS antigen-positive urines. One of these infants was delivered from a mother heavily colonized with GBS; the other infant was delivered from a mother lightly colonized with GBS.

A total of 29 GBS-positive pregnant women delivered before their culture results were available and, therefore, constituted a comparison group that was not prophylacti-
cally treated with ampicillin. The 29 women included 5 heavily colonized mothers and 24 lightly colonized mothers. Two GBS-septic infants (blood specimens positive for GBS), including one infant who died soon after birth, were delivered from the group of 5 heavily colonized, untreated mothers. One GBS-septic infant was delivered from the group of 24 lightly colonized mothers. None of the infants in the comparison group had GBS-positive cerebrospinal fluid specimens. Seven infants (including the three GBS-septic infants) had GBS antigen-positive urines. Three of these infants were delivered from mothers heavily colonized with GBS; four infants were delivered from mothers lightly colonized with GBS. The GBS antigen-positive urine results obtained from infants without any evidence of early-onset GBS disease suggest that urine GBS antigen results alone may not be indicative of a diseased state.

The results of this study indicate that preterm pregnant women can be rapidly diagnosed for GBS colonization by using selective broth enrichment (Lim Group B Strep Broth) of vaginal cultures and coagglutination (Phadebact Strep B Test). Latex agglutination GBS reagents may also be used in combination with Lim Group B Strep Broth. However, because some brands of latex agglutination reagents have been found to cross-react with the components of the broth (unpublished data), it is suggested that these reagents first be tested with un inoculated broth to determine the extent of background agglutination.

The rapid diagnosis of GBS colonization in preterm pregnant women is especially important because these women constitute a high-risk obstetric subgroup for early-onset neonatal GBS disease (1, 2, 12). A logical approach to the prevention of early-onset neonatal GBS disease is the eradication of colonization in the pregnant woman before delivery. It previously has been shown that intravenous administration of ampicillin or other antimicrobial agents immediately before delivery can significantly reduce colonization levels and mortality rates from GBS disease in newborn infants (2, 3, 5, 11, 14). Recently, Boyer and Gotoff reported that selective intrapartum prophylaxis in high-risk women with certain perinatal risk factors (premature labor, prolonged membrane rupture, or intrapartum fever) could prevent early-onset neonatal GBS disease (4).

In the past, it has not been possible to rapidly diagnose GBS colonization and initiate selective prophylaxis in pregnant women before delivery. It is now possible to do so with the commercially available and relatively inexpensive (approximately $3.00 for the broth and reagents for two coagglutination tests) broth (Lim Group B Strep Broth) and coagglutination reagent (Phadebact Strep B Test) described in this paper. Our results suggest that in the high-risk preterm obstetric subgroup, intrapartum prophylactic treatment of all GBS-positive women (heavily and lightly colonized) at least 6 h before delivery may be successful in preventing early-onset neonatal GBS disease. With the procedure described in this paper, confirmatory laboratory results are obtained within 20 h and, in some cases, in as little as 5 h. As more sensitive coagglutination and latex agglutination reagents are developed, this time for diagnosis might be further reduced.

LITERATURE CITED