Painless Blood Testing
to Prevent Neonatal Sepsis

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ABSTRACT
The current US guidelines advise that all women colonized with Group B Streptococcus (GBS) at 35-37 weeks, as well as those laboring before this time and all women with GBS urinary tract infections, should be offered intrapartum antibiotic prophylaxis, usually in the form of high-dose intravenous penicillin or ampicillin, unless delivered by planned cesarean section before the onset of labor in a woman with intact membranes. In term and preterm babies born to treated women, as well as babies who are ill, the recommendation is to treat the baby with antibiotics. In certain circumstances, such as when the mother receives an intrapartum antibiotic <4 hours prior to delivery, the baby receives antibiotics even if the baby appears well.

This paper proposes a new process for testing for GBS that involves using the umbilical cord. If this process were used, babies would not need to have blood drawn and would experience less pain.

BACKGROUND
The incidence of early onset disease in the United States has fallen in association with the introduction of screening pregnant women for Group B Streptococcus (GBS) colonization.1

Colonization with Streptococcus agalactiae (GBS) is discovered via rectal and vaginal culture in 15%-40% of pregnant North American women. Similar numbers have been reported for Scandinavian, African, Middle Eastern, South American, British, and other European women.2-5

The current US guidelines advise that all women colonized with GBS at 35-37 weeks, as well as those laboring before this time and all women with GBS urinary tract infections, should be offered intrapartum antibiotic prophylaxis, usually in the form of high-dose intravenous penicillin or ampicillin, unless delivered by planned cesarean section before the onset of labor in a woman with intact membranes. In term and preterm babies born to treated women, as well as babies who are ill, are treated with antibiotics.

If an infant born of gestational age ≥35 weeks appears well and the mother receives intrapartum antibiotic >4 hours prior to delivery, the baby receives routine care (no neonatal antibiotics). In contrast, if the intrapartum antibiotic is given to the mother <4 hours prior to delivery, a blood culture and complete blood count (CBC) are done, and an I:T ratio is calculated [bands/(segs+bands+metamyelocytes)]. If the I:T ratio is >0.2, the baby receives antibiotics until the blood culture is negative for 48 hours, even if the baby appears well.6

There are benefits to a universal-screening approach, and the practice of analyzing infants' blood to decide whether or not to treat them when they appear well but present with infectious risk factors, but this also increases the medicalization of the labor-and-delivery process. There are also concerns about the risk of emergence of antibiotic resistance, the small risk of maternal allergic reactions, and the expense and work for providing intrapartum antibiotics. Since 2006, we have instituted changes to decrease the number of times babies will need to have blood drawn or receive antibiotic treatment without sacrificing the benefits of the more traditional approach.7-9

A KINDER AND GENTLER APPROACH
In our protocol we safely substitute umbilical cord blood for infant blood if the mother receives intrapartum antibiotic >4 hours prior to delivery, the baby receives routine care (no neonatal antibiotics). In contrast, if the intrapartum antibiotic is given to the mother <4 hours prior to delivery, a blood culture and complete blood count (CBC) are done, and an I:T ratio is calculated [bands/(segs+bands+metamyelocytes)]. If the I:T ratio is >0.2, the baby receives antibiotics until the blood culture is negative for 48 hours, even if the baby appears well.6

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The evidence for our approach includes 3 published studies concerning umbilical and placental cord blood cultures. The studies reveal that the sensitivity of umbilical cord blood cultures for neonatal sepsis is 100% and the specificity is 98%. In our first 130 umbilical blood
cultures, and in our subsequent surveillance, our false-positive rate was 3.8%, which is similar to that reported in the published studies. In addition, these studies do not report any false-negative umbilical cord blood cultures, nor have we had any false-negative cord blood cultures in our program. The cultures were obtained on the orders of the physician, midwife, or neonatal nurse practitioner (not a randomized or blinded study). Our program goals include the early detection of neonates with sepsis who would require antibiotic therapy and the early exclusion of infants without sepsis, thus limiting direct antibiotic exposure.

**PROCESS**

This method for umbilical cord blood studies yields the lowest false-positive rate for cord blood cultures:

1. Clamp the umbilical cord at the placental side and the infant side. Cut the cord between each pair of clamps and hand it off to the nurse.
2. Wipe the cord 3 times with 70% isopropyl alcohol using sterile technique.
3. Using a sterile 22-gauge needle and syringe, draw approximately 1.5 to 2mL of blood into the syringe from the umbilical vein or artery.
4. Replace the needle from syringe with a new sterile needle and wipe the culture bottle top with alcohol.
5. Send to the lab 1mL of blood in an aerobic culture bottle and 0.5mL for a complete blood count (CBC)/differential to calculate the I:T ratio.

We do not need a complete blood count on the baby as the substitution of umbilical cord blood I:T for baby’s blood I:T ratio does not change clinical care decisions 92% of the time.

In addition, we have selectively used umbilical cord blood high sensitive C-reactive protein, which can be useful in the case of unexplained maternal fever or to help confirm a clinical diagnosis of chorioamnionitis. The high sensitive C-reactive protein on umbilical cord blood is a reliable marker for the presence of infected amniotic fluid, neonatal sepsis, and funisitis. This is important to our patients because Centers for Disease Control and Prevention guidelines state that if chorioamnionitis is suspected in the mother, the baby should be diagnosed and treated regardless of its clinical condition at birth, its gestational age or the duration of maternal antibiotic treatment. Thus the umbilical cord high sensitive C-reactive protein can help guide clinical management of the baby.

**CONCLUSION**

We also mounted an educational campaign and instituted clinical triggers to begin intrapartum antibiotics in accordance with a Yale study. This has decreased the number of well-appearing babies who received antibiotics with a positive I:T ratio as the only indication for this treatment. If this process was used at more hospitals and birthing centers, thousands of babies in Wisconsin and throughout the US would experience less pain.

**Funding/SUPPORT:** None declared.

**FINANCIAL DISCLOSURES:** None declared.

**REFERENCES**

The mission of the Wisconsin Medical Journal is to provide a vehicle for professional communication and continuing education of Wisconsin physicians.

The Wisconsin Medical Journal (ISSN 1098-1861) is the official publication of the Wisconsin Medical Society and is devoted to the interests of the medical profession and health care in Wisconsin. The managing editor is responsible for overseeing the production, business operation and contents of Wisconsin Medical Journal. The editorial board, chaired by the medical editor, solicits and peer reviews all scientific articles; it does not screen public health, socioeconomic or organizational articles. Although letters to the editor are reviewed by the medical editor, all signed expressions of opinion belong to the author(s) for which neither the Wisconsin Medical Journal nor the Society take responsibility. The Wisconsin Medical Journal is indexed in Index Medicus, Hospital Literature Index and Cambridge Scientific Abstracts.

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