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Group B Strep in Pregnancy: Evidence for Antibiotics and Alternatives

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What is Group B Strep?

Group B Streptococcus (GBS) is a type of bacteria that can cause illness in people of all ages. In newborns, GBS is a major cause of meningitis (infection of the lining of the brain and spinal cord), pneumonia (infection of the lungs), and sepsis (infection of the blood) (CDC 1996; CDC 2005; CDC 2009).

Group B strep lives in the intestines and migrates down to the rectum, vagina, and urinary tract. All around the world, anywhere from 10-30% of pregnant women are "colonized" with or carry GBS in their bodies (Johri et al. 2006). Using a swab of the rectum and vagina, women can test positive for GBS temporarily, on-and-off, or persistently (CDC 2010).

Being colonized with GBS does not mean that a woman will develop a GBS infection. Most women with GBS do not have any GBS infections or symptoms. However, GBS can cause urinary tract infections and GBS infections in the newborn (CDC 2010), and women who have preterm births are 1.7 times more likely to be colonized with GBS during labor than women who do not have preterm births (Valkenburg-van den Berg et al. 2009).

This article focuses on Group B Strep in pregnancy in the United States, along with some information about other countries.

You can read this article online at: *www.evidencebasedbirth.com/groupbstrep*

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Are some women more likely to carry GBS?

Researchers have looked at the risk factors for GBS in young, non-pregnant women (Feigin, Cherry et al. 2009). Women with these factors may be more likely to carry GBS:

- African-American
- Multiple sexual partners
- Male-to-female oral sex
- Frequent or recent sex
- Tampon use
- Infrequent handwashing
- Less than 20 years old

How often do newborns become infected with GBS?

There are 2 main types of GBS infection in newborns: early infection and late infection. In this article we will focus on **early infection**, which occurs in the first 7 days after birth. When a baby has an early GBS infection, symptoms usually appear within the first 12 hours, and almost all babies will have symptoms within 24-48 hours (CDC 2010). In a study of 148,000 infants born between 2000 and 2008, almost all of the 94 infants who developed early GBS infection were diagnosed within an hour after birth—suggesting that early GBS infection probably begins *before* birth (Tudela et al. 2012).

Early infection is caused by direct transfer of GBS from the mother to the baby, usually after the water breaks. The bacteria travel up from the vagina into the amniotic fluid, and the fetus may swallow some of the bacteria into the lungs—leading to an early GBS infection. Babies can also get GBS on their body (skin and mucous membranes) as they travel down the birth canal. However, most of these "colonized" infants stay healthy (CDC 2010).

In 1993-1994, the American Congress of Obstetricians and Gynecologists and the American Academy of Pediatrics recommended screening all pregnant women for GBS and treating GBS-positive women with intravenous (IV) antibiotics during labor. Since that time, we have seen a remarkable drop in early GBS infection rates in the U.S.—from 1.7 cases per 1,000 births in the early 1990's, to 0.25 cases per 1,000 births today (CDC 2012).

If a mother who carries GBS is not treated with antibiotics during labor, the baby's risk of becoming colonized with GBS is approximately 50% and the risk of developing a serious, life-threatening GBS infection is 1 to 2% (Boyer & Gotoff 1985; CDC 2010; Feigin, Cherry et al. 2009). As I noted earlier, being colonized is not the same thing as having an early GBS infection-- most colonized babies stay healthy.

On the other hand, **if a woman with GBS is treated with antibiotics during labor**, the risk of her infant developing an early GBS infection drops by 80%. So for example, her risk could drop from 1% down to to 0.2%. (Ohlsson 2013)

What is the risk of death if the baby has an early GBS infection?

Researchers have estimated that the death rate from early GBS infection is 2 to 3% for full-term infants. This means of 100 babies who have an actual early GBS infection, 2-3 will die. Death rates from GBS are much higher (20-30%) in infants who are born at less than 33 weeks gestation (CDC 2010).

Although the death rate of GBS is relatively low, infants with early GBS infections can have long, expensive stays in the intensive care unit. Researchers have also found that up to 44% of infants who survive GBS with meningitis end up with long-term health problems, including developmental disabilities, paralysis, seizure disorder, hearing loss, vision loss, and small brains. Very little is known about the long-term health risks of infants who have GBS without meningitis, but some may have long-term developmental problems (Feigin, Cherry et al. 2009; Libster et al. 2012).

Are some newborns more likely to get early GBS disease?

The primary risk factor for early GBS infection is when the mother carries GBS. However, there are some things that increase the risk of early GBS infection:

- Being African American (CDC 2012)
- **Being born at less than 37 week**s (Boyer &Gotoff 1985; Velaphi et al. 2003; Heath et al. 2009)
- **A long period between water breaking and giving birth** (Boyer &Gotoff 1985; Velaphi et al. 2003; Heath et al. 2009)
- Water broke before going into labor (premature rupture of membranes) (Adair et al. 2003)
- **High temperature during labor (> 99.5 F or 37.5 C)** (Boyer & Gotoff 1985; Adair et al. 2003; Velaphi et al. 2003; Heath et al. 2009)
- Infection of the uterus (aka “chorioamnionitis”) (Adair et al. 2003)
- Mother previously gave birth to an infant who had an early GBS infection (CDC 2010)
- Intrauterine monitoring during labor (Adair et al. 2003)

*The bolded items are the most common risk factors. However, about 60% infants who develop early GBS infection have no major risk factors, except for the fact that their mothers carry GBS (Schrag et al. 2002).

How accurate is testing for GBS?

The CDC recommends measuring GBS with a culture test at 35-37 weeks of pregnancy. This is done by swabbing the rectum and vagina with a Q-tip, and then waiting to see if GBS grows. It takes about 48 hours to get the results back. The goal is to get the results back before labor begins (CDC, 2010).

A culture test during labor is considered the "gold standard," but this method is not used in practice because it takes too long to get results back. In a recent, high-quality study, researchers did the culture test twice-- once at 35-36 weeks and once during labor. They compared the 35-36 week test to the gold standard.

Of the women who screened negative for GBS at 35-36 weeks, 91% were still GBS-negative when the gold standard test was done during labor. The other 9% became GBS positive. These 9% were "missed" GBS cases, meaning that these women had GBS, but most (41 out of 42) did not receive antibiotics.

Of the women who screened positive for GBS at 35-36 weeks, 84% were still GBS positive when the gold standard test was done during labor. However, 16% of the GBS-positive women became GBS-negative by the time they went into labor. These 16% received unnecessary antibiotics (Young et al. 2011).

Is there a faster test that could be used in labor?

It's possible that a rapid-test for GBS during labor may be a better option for some women. In the same study mentioned above, researchers compared the 35-36 week culture test and the in-labor rapid test to the gold-standard test (culture during labor).

The researchers found that the 35-36 week culture test only identified 69% of the women who actually had GBS during labor. Meanwhile, the in-labor rapid test was much more sensitive—it identified 91% of women with GBS during labor (Young et al, 2011).

In a 2012 study in France, researchers followed a hospital as it switched from prenatal testing to in-labor testing for GBS. With the in-labor rapid GBS test, more mothers with GBS were identified (17% vs. 12%), there were fewer cases of early GBS infection in newborns (0.5% vs. 0.9%), and the financial cost was the same (El Helali et al. 2012).

One drawback of rapid-testing is that it can still take up to 60 minutes to get the results back, and women would have to wait to get antibiotics until the results came in (Honest et al. 2006; Young et al. 2011). The CDC says that the ideal rapid test for GBS could be done at the bedside in less than 30 minutes (CDC, 2010).

Right now there is one rapid GBS test on the market that claims it can be done within 30 minutes. However, a researcher who used this test in a clinical study says that this same test

actually takes 50 minutes to carry out—5 minutes to prepare the sample, and 45 minutes to run the results (Personal communication, M. Hacker, April 2013). The price of this test is not listed online-- so we don't know if it's affordable. Finally, researchers have not done studies yet to find out whether the rapid test is cost-effective.

What is the evidence for antibiotics during labor to prevent early GBS infection?

To answer this question, I will walk you through **the most important studies** that led to how we most commonly try to prevent early GBS infections in the U.S. today.

GBS emerged as a widespread threat to newborns in the early 1970's. At that time, 1.7 of every 1,000 infants had early GBS infection (CDC 2010). In 1973, a researcher proposed giving pregnant women penicillin to stop early GBS infections in infants (Franciosi et al. 1973).

First, researchers tried giving penicillin to women before labor, but this didn't work. Although penicillin temporarily lowered GBS levels, by the time women went into labor the GBS levels were back up again (Gardner et al. 1979).

Next, researchers tried giving antibiotics to women with GBS during labor. In the late 1980's, three groups of researchers in the U.S., Spain, and Finland randomly assigned women with GBS to either receive IV antibiotics during labor (penicillin or ampicillin) or no antibiotics (Boyer & Gotoff 1985; Tuppurainen and Hallman 1989; Matorras et al. 1991).

In a recent Cochrane review, researchers combined the results of these 3 studies that had a total of 500 pregnant women. They found that when women with GBS had antibiotics during labor, their infants risk of catching early GBS infection dropped by 83% (Ohlsson & Shah 2013).

As the Cochrane reviewers noted, there were quite a few limitations to these 3 studies. In their summary, the reviewers said "There is no valid information from these three small, old, and biased trials to inform clinical practice." However, **an alternative perspective** would be that there is some valid information from these studies, along with some limitations to the evidence.

Was the Cochrane review correct in saying that there was no valid information from these studies to inform practice?

The Cochrane Collaboration is a highly respected organization that conducts meta-analyses on different topics related to healthcare. A meta-analysis is a type of research study when researchers pool statistics from previous studies into one large study, and look at the results.

The Cochrane Pregnancy and Childbirth Group have a policy that they only do meta-analyses on randomized, controlled trials. So it is important to understand that the Cochrane review on GBS (published in 2009 and "updated" but essentially unchanged in 2013 and 2014) only includes three small randomized, controlled trials, and does not look at other types of evidence, such as evidence from large observational studies where some women received antibiotics and others did not.

Are the results from the Cochrane review concerning?

The researchers who wrote the Cochrane review on Group B Strep came to strong conclusions against the use of antibiotics for Group B Strep. After reviewing the three existing randomized, controlled trials on Group B Strep, they stated "There is no valid information from these three small, old, and biased trials to inform clinical practice…It is remarkable that in North America the commonly implemented practice of intrapartum antibiotic prophylaxis to GBS colonized women has been so poorly studied."

It is true that these three studies had some major limitations. In fact, most studies published before 1996 suffered from less than optimal written reports of their findings.

In the mid-1990's, researchers became very concerned about the widespread quality problem with clinical trial reports. So in 1996, researchers from Canada and the U.S. came together and published the CONSORT guidelines for clinical trials.

CONSORT stands for the Consolidated Standards of Reporting Trials, and it is basically an evidence-based checklist of items that researchers must disclose in their article before they can report the results of their studies in most medical journals. Publishing of the CONSORT guidelines forced researchers to be transparent about their methods, and it greatly improved our ability to evaluate how well a clinical trial is done.

The three studies that the Cochrane reviewers critique as being "invalid" were done in 1986, 1989, and 1990, before the CONSORT guidelines were developed. So this partially explains why the written reports of these three studies are not up to today's standards.

What about their critique of the three randomized trials on antibiotics for Group B Strep?

To help you understand this issue, I would like to present two different ways that you could look at these three clinical trials: the concerns raised by the Cochrane reviewers, and an alternative point of view.

Table: Cochrane Perspective vs. Alternative Perspective

Cochrane Perspective	Alternative Perspective
None of the studies had a placebo treatment. The antibiotics were compared to no treatment.	This would not have changed the findings. The diagnosis of GBS in infants is not subjective or symptom-based, but it is based on culture (lab test) results.
Patients, care providers, and researchers were not blinded to the group assignments.	Likewise, this would not have changed the results. Blinding is much more important when the outcome of interest is subjective, like pain or quality of life.
The researchers did not do an up-front "power analysis" to determine the appropriate sample size.	It is possible that the researchers conducted a power analysis but did not report it, since power analyses were not required information for medical journals before 1996. Also, the meta-analysis did show a difference in GBS infection rates, so it appears that the studies were adequately powered to observe differences between the groups.
The sample sizes were likely too small to detect differences in early GBS infection and mortality.	But the studies did show a difference in early GBS infection rates. True, larger studies may have been better able to detect a difference in mortality rates, but it would take a very large sample, and such a study may not be practical or ethical given that the researchers found a decrease in GBS infection rates.
Only one of the three studies specifically looked at mortality.	Yes, this is a limitation, but we are interested in GBS infections, because they are a big deal. Infants are in the ICU for many weeks. This is traumatic, can have long term health effects, and also costs a lot of money.
Boyd et al. published their results and then announced that they only needed one more event in the control group to achieve statistical significance. After this one event happened, they re-published the study with the new "significant" finding. This indicates a high level of bias and possible manipulation of the study findings.	This is not ideal, but it is not uncommon for researchers to do a preliminary data analysis, find that there is a "trend" towards statistical significance, and then continue collecting more data. A trend towards significant results often indicates that the study needs only a slightly larger sample size in order to determine differences between groups.
Boyd et al. improperly tweaked their statistics (switched from a 2-tailed test to a 1-tailed test) so that the results were changed from "not	In current times, researchers would have handled this differently by doing something called a "sensitivity analysis" and appropriately

significant" to "statistically significant."	explained what they were doing.
Boyd et al. excluded all women who developed a fever from their statistics, which is incredible considering the fact that fever is a risk factor for early GBS infection.	The researchers excluded women with fever because all these women needed to receive antibiotics—they ethically could not stay in an untreated group. Therefore they were not eligible to be in this 'preventive trial'. This was an appropriate thing to do.
They were missing final results for 11% of women and infants in the study.	Yes, but it is unlikely that any of these missing individuals had GBS infections or were septic. Nowadays, there is a different type of analysis that we could have done to account for the missing data.

In summary, although these three studies had limitations (not uncommon for research published before 1996), there was also some valid information that we can use.

Although ideally we would have modern, larger, randomized, controlled trials on antibiotics for Group B Strep, such trials would be very impractical and highly unlikely to be carried out, given that antibiotics are already in routine use. Furthermore, we have newer evidence from large observational studies that we can use to look at the potential benefits and risks of antibiotics for Group B Strep.

Based on information from the 3 original randomized, controlled trials, in 1996, the CDC recommended 2 ways to prevent early GBS infections:

1. **The "universal approach."** Screen all pregnant women at 35-37 weeks and treat everyone who is positive with antibiotics during labor *(this is the method that is currently used in the U.S.)*
2. **The"risk-based approach."** Treat laboring women with antibiotics if they have one or more of these risk factors: GBS in the urine at any point in pregnancy, previously gave birth to an infant with early GBS infection, goes into labor at less than 37 weeks, has a fever during labor, or water has been broken for more than 18 hours *(this is the method that is currently used in the United Kingdom)*

In 2002, the CDC revised their guidelines to recommend the universal approach.

This decision was based on an important study published in the New England Journal of Medicine (Schrag et al. 2002). In this study, researchers used CDC lab results and chart reviews to look at 629,912 live births that took place in the U.S. between the years 1998-1999.The

researchers randomly selected 5,144 of these births to study, plus all 314 infants who were born with early GBS. They used hospital records to label women as receiving the universal approach (52%) or the risk-based approach (48%).

The results? There were 0.5 infants born with GBS per every 1,000 women. Women in both groups received antibiotics about a third of the time. But women whose care providers used the universal approach had a 54% reduction in the risk of early GBS infection compared to women whose care providers used the risk-based approach**. This means that the universal approach worked better than the risk-based approach.**

In 2002-2003, the same group of researchers looked at 819,528 births in the U.S. to see whether the revised guidelines had been put into practice. Like the previous study, the researchers picked a random sample of women and infants to analyze, along with the 254 infants who had early GBS infection. **Between 1999 and 2002, use of the universal approach rose from about 50% to 85%, and use of antibiotics during labor rose from 27% to 32%.**

This time around, there were 0.32 infants born with early GBS per every 1,000 women (down from 0.5 cases per 1,000 only four years earlier). When researchers looked at the infants born at 37 weeks or later who had early GBS, only 18.0% were born to women who were not screened. **Most of the cases of GBS in term infants (61%) happened in women who had been screened but tested negative for GBS.** The researchers concluded that universal screening and antibiotic use cannot be expected to prevent 100% of early GBS infections, and that if we want to further lower GBS infection rates, then we will need access to rapid testing and vaccines against GBS (Van Dyke et al. 2009).

What is the best time to receive antibiotics for GBS?

The CDC recommends that antibiotics be given every 4 hours, starting more than 4 hours before birth. Recent evidence supports these recommendation:

In 2013, researchers looked at 7,691 live births that took place during 2003-2004 in the U.S. (randomly selected out of >600,000 births), along with 254 infants who had early GBS infection (Fairlie et al., 2013). About 1 in 3 women had antibiotics during labor (31%), and 59% of women received antibiotics more than 4 hours before birth.

When penicillin or ampicillin was given more than 4 hours before birth, it was effective 89% of the time. In contrast, giving antibiotics 2-4 hours before birth was effective 38% of the time. Antibiotics given less than 2 hours before birth were effective 47% of the time. When Clindamycin (another antibiotic) was used in place of penicillin, it worked very poorly (only 22% effective). There was no statistical difference between the 2-4 hour window and the 2-0 hour window, so even though the percentages look different, they are not statistically significant.

In another study published in 2013, researchers reviewed the medical records of 4,756 women who received antibiotics during labor for GBS-- 1,149 received antibiotics for less than 4 hours,

and 3,633 receiving antibiotics for 4 or more hours. More infants whose mothers received less than 4 hours of antibiotics had a discharge diagnosis of sepsis when compared to infants whose mothers received 4 hours or more of antibiotics (1.4% versus 0.4%.) (Turrentine et al., 2013).

How will antibiotics during labor affect my baby's microbiome?

Unfortunately we have little-to-no evidence on this topic.

I found one small study in which researchers examined the gut microbiota of 9 newborns who were given IV ampicillin and gentamicin within 48 hours of birth. In this study, they took stool samples 4 and 8 weeks after the infants completed their antibiotics, and compared the results to 9 untreated infants. The infants who received antibiotics had much lower levels of beneficial bacteria, including *Bifidobacterium* and *Lactobacillus*. These good bacteria were replaced by members of the Proteobacteria family. Overall, the infants who received antibiotics shortly after birth had less diversity of their gut microbiobe 4 and 8 weeks after antibiotic treatment, despite the fact that some beneficial bacteria had recovered (Fouhy et al. 2012).

The information from this study may or may not apply to infants whose mothers receive IV antibiotics during labor for GBS. The most common antibiotic given for GBS during labor is penicillin, with cefazolin, clindamycin, and vancomycin being given less frequently. At this time, we do not know the short or long-term effects of this treatment on the bacteria in the infant's gut.

There is a need for researchers to study this issue, to better inform parents' decision-making about giving antibiotics for Group B Strep. There is also a need for research to examine the effects of giving probiotics (good bacteria) to help lessen the effects of antibiotic use on newborns whose mothers received antibiotics during labor.

To learn more about the gut microbiome, visit the Gut Microbiota Worldwatch website.

Also, Dr. Mark Sloan, pediatrician and blogger, has written an interesting review of the research on the link between birth and the infant gut microbiome. Although his article is specifically about Cesarean births and the gut microbiome, if you are interested in learning more about this topic it has some good information. Click here to read his article.

What are the potential benefits and harms of the universal screening and treatment approach?

Potential Benefits:

- In clinical trials, using antibiotics (penicillin or ampicillin) decreases the risk of early GBS infection by 83%, although there are limitations to the quality of this evidence (Ohlsson 2013)
- Penicillin rapidly crosses the placenta into the fetal circulation (at non-toxic levels) and can prevent GBS from growing in the fetus or newborn (CDC 2010; Barber et al. 2008).
- In large studies in the U.S., the universal approach (screening and treating all GBS-positive women with antibiotics during labor) is associated with lower rates of GBS infections than giving antibiotics based on risk factors alone (Schrag et al. 2002).
- Antibiotic resistance has not been a problem with penicillin, the drug most commonly used to prevent early GBS infection (CDC 2010).

Potential harms:

- Although rare, severe allergic reactions in mothers have been reported. The risk is estimated to be 1 in 10,000 for a severe reaction, and 1 in 100,000 for a fatal reaction. (Weiss and Adkinson 1988).
- The potential short and long-term effects on the infant's gut microbiome are unknown.
- There is an increase in the risk of maternal and newborn yeast infections. In one study, 15% of women who received antibiotics in labor had mother-baby yeast infections, compared to 7% of mothers who did not have antibiotics. (Dinsmoor et al. 2005).
- Other potential harms have to do with side effects related to the antibiotic that is used (click on the link to see a comprehensive list of potential side effects for each antibiotic, but keep in mind that most of the serious risks are rare): Penicillin, ampicillin, cefazolin, clindaymycin, and vancomycin.
- The potential medicalization of labor and birth (RCOG 2003).

What are the best antibiotics for someone who is allergic to penicillin?

Many women who have an allergy to penicllin can take **Cefazolin** instead. One advantage to Cefazolin is that (like penicillin) it crosses the placenta and reaches the fetus's bloodstream. If a woman is at high risk for anaphylaxis with penicillin (click here to find out more), then the CDC recommends several different antibiotics instead of Cefazolin. Which antibiotic a woman can take depends on the results of her GBS lab tests. Alternative antibiotics include **clindaymycin** and **vancomycin**.

Unfortunately, **clindamycin and vancomycin have never been tested in clinical trials for the prevention of early GBS infection**. Clindamycin faces high rates of drug resistance, barely reaches the fetal bloodstream, and should never be used unless a woman's GBS has been specifically tested and it is known that these antibiotics will work on her particular strain of GBS. Vancomycin can be used in someone who is highly allergic to penicillin and whose GBS is resistant to clindamycin. However, Vancomycin barely crosses the placenta to get into the fetal circulation. Finally, although some care providers may use erythromycin to prevent early GBS, the CDC states that **erythromycin should never be used** to prevent early GBS infection (CDC, 2010; Pacifici 2006).

If I have antibiotics, does this mean I will be continuously hooked up to an IV?

Not necessarily. If you use the antibiotics, you will have an IV placed, but it only takes 15-30 minutes for the antibiotics to run in. The antibiotics are only given every 4 hours until birth, which for many women is only once or twice. When the IV is running, it should not limit positioning, walking, or even laboring in water.

For the hours in between, women can ask for the IV can be "hep-locked" or "saline-locked" and detached, so that you are free from the IV pole. For more information about saline locks, please read my article about saline locks during labor here.

For low-risk, healthy women, there is no evidence supporting the routine use of IV fluids during labor, as long as women are able to drink fluids. Thus it is a very reasonable request to ask for the IV to be hep-locked or saline-locked in between antibiotic doses. For more information on IV fluids during labor, please read this article here. To learn about the evidence for eating and drinking during labor, click here.

Are there any other options?

Risk-based approach

One alternative to the universal approach is the **"risk-based approach."** This is when you receive antibiotics based on other risk factors such as having a fever or your water being broken for more than 18 hours. This alternative is no longer recommended by the CDC. The number of women who receive antibiotics is roughly the same whether you choose the universal approach or the risk-based approach—about 30%. However, as already mentioned, evidence from large multi-state studies shows that in the U.S., the universal approach is more effective than giving antibiotics based on risk factors alone.

Chlorhexadine (aka Hibiclens)

Chlorhexadine is a topical disinfectant that kills bacteria on contact. It binds easily to the skin and mucous membranes. In the vagina, the anti-GBS effects of chlorhexadine last from 3-6 hours. Chlorhexadine has been shown to be safe, is easy to administer, and only costs a few cents per use (Goldenberg et al. 2006). Hibiclens is a brand formulation that includes chlorhexadine. Most of the research studies have used chlorhexadine; however, in the U.S., many midwives can only access Hibiclens.

Although chlorhexadine reduces the risk of a newborn being colonized with GBS, it has not been shown to decrease the risk of actual GBS infections in newborns. As I said earlier in the article, there is a difference between being colonized and being infected. Colonized babies almost always stay healthy, while infected babies are very sick, and it is thought that an actual early GBS infection occurs when the fetus swallows infected amniotic fluid into the lungs. In a Cochrane review (Stade et al. 2004), researchers combined results from 5 randomized, controlled trials that compared vaginal chlorhexadine to a placebo on outcomes of 2,190 infants born to women who were GBS positive. There was a wide range in the quality of the studies, with only one study being very high quality.

Even though women who used vaginal chlorhexadine reduced their infants' risk of being colonized with GBS by 28%, there was no difference in rates of early GBS infection between women who used the chlorhexadine and those who did not. There were no cases of infant deaths from GBS in either group. The only adverse effects that were reported were stinging and irritation. The researchers called for a large clinical trial to test chlorhexadine for the prevention of early GBS.

Chlorhexadine may potentially be beneficial for women living in poor countries where access to antibiotics is limited. In their review of the literature, Goldenberg et al. (2006) found 2 studies from developing countries (Egypt and Malawi) where researchers tested chlorhexadine in the vagina every 4 hours during labor and neonatal wipes shortly after birth. This is a lower level of evidence than the studies listed above, because neither of these were randomized, controlled trials. Instead, the researchers followed hospitals over a period of months when: 1) they did not use chlorhexadine, 2) they used chlorhexadine, and 3) they stopped using chlorhexadine. In both studies, researchers found that when chlorhexadine was used, there were immediate drops in newborn hospital admissions, newborn sepsis admissions, and newborn deaths due to infections. Unfortunately, researchers did not specifically count the number of GBS infections, just the overall number of babies who had admissions for sepsis.

So is chlorhexadine effective? The bottom line is that we don't know with any certainty if it helps or not. Randomized, controlled trials show that in developed countries, chlorhexadine wipes during labor do not make any difference in early GBS infection rates. However, evidence from developing countries shows that chlorhexadine vaginal wipes PLUS newborn wipes may reduce sepsis rates in general. Chlorhexidine is likely better than nothing, but it cannot prevent the ascent of GBS in the amniotic fluid unless it is given before a woman's water breaks and

repeated before its effect wears off. Unlike IV antibiotics, there is no evidence that chlorhexadine can stop GBS from growing in the fetus before birth.

Garlic

Garlic has antibacterial properties, and some websites recommend putting garlic in the vagina to eliminate GBS before the GBS test. However, there is very little evidence to back up this treatment. One group of researchers put garlic extract and GBS in a petri dish together (Cutler et al., 2009). They found that the garlic was able to kill the GBS within about 3 hours. However, this treatment has never been tested in a scientific study with people. Also, it's important to understand that back in the 1970's when researchers tried using penicillin during pregnancy, they found that the antibacterials temporarily lower levels of GBS, but levels almost always go up again by the time women go into labor. So by temporarily using garlic, this could help you get a negative test result, but the effect may wear off very quickly.

In a letter to the editor in a medical journal, Cohain (2009) described treating 8 women with long-term GBS infections using a half clove of freshly cut garlic, inserted into the vagina at bedtime and removed in the morning for 3 to 6 weeks, with maintenance doses used every 2-4 days. However, none of these women were pregnant, and all of them had active infections.

Based on this one small case report we do not have any research evidence yet to inform this practice in pregnant women who are colonized with GBS-- meaning we have little evidence about the potential benefits and harms. For example, it is possible that long-term garlic or chlorhexidine use could potentially or theoretically have unexpected effects like premature rupture of membranes or increase other bacteria-- even GBS-- due to destruction of good bacteria, like lactobacilli. Until researchers examine the potential benefits and harms, there are a lot of unknowns related to this treatment.

Vaccines

Vaccines for GBS are under development, but are not available yet at this time (World Health Organization, 2005). There is a big push for a GBS vaccine for several reasons: 1) in-labor antibiotics do not prevent GBS infection 100% of the time (Velaphi et al., 2003), 2) in-labor antibiotics can have side effects, and 3) in-labor antibiotics do not prevent other GBS problems, such as preterm labor.

Probiotics

Taking probiotics (lactobacilli) is another remedy that people sometimes use to eliminate GBS in the vagina. In several studies, researchers have put vaginal lactobacilli (including a commercially available version) in a petri dish with different strains of GBS. They found that the lactobacilli strongly inhibited the growth of GBS by increasing the acidity of the environment. (Acikgov, 2005-- article in Turkish; Zarate, 2006).

In a small clinical trial, researchers randomly assigned healthy, fertile (but non-pregnant) women to wear panty liners that were saturated with probiotics, or to wear placebo panty liners. The results showed that it is possible to transfer probiotics to the vagina using panty liners. The researchers also found that women who had higher levels of lactobacilli in the vagina had lower levels of GBS. However, although these results are promising, large clinical trials need to be conducted in pregnant women to determine if this is an effective way to prevent early GBS infection in newborns (Rönnqvist PD, 2007).

There is at least one large clinical trial right now in which researchers are studying the effects of probiotics on Group B Strep colonization in pregnant women. The study is scheduled to finish recruiting pregnant women in 2015. To read more, click here.

Colloidal silver

A few websites mention **colloidal silver** as a remedy for preventing GBS infection. Although silver has anti-bacterial properties, no known research studies have ever been conducted on taking colloidal silver to prevent a GBS infection—and no studies have ever looked at the safety of colloidal silver in pregnancy. The potential benefits and harms of this substance are unknown. In 1997, the FDA stated that colloidal silver is not safe or effective for any condition.

Can infants acquire a GBS infection from staff handling the newborn?

Researchers are quite certain that infants catch early GBS infections before they are born—most likely from GBS in the amniotic fluid. As mentioned earlier, almost all infants with early GBS infection show symptoms within an hour after birth. However, infants can catch “later” GBS infections from the hospital (nursery, hands of hospital staff and family members) or the community. This is one reason hand-washing is so important (Kliegman et al. 2011).

If I am GBS positive, and I don't get the IV antibiotics for some reason, what kind of tests will my baby need to have?

As long as your baby appears to be doing well and you did not have any additional risk factors (<37 weeks, infection of the uterus, water broken >18 hours), then there is no need for your baby to have any special testing. There are some situations where the CDC recommends that a well-appearing infant have some blood tests. The CDC also recommends 48 hours of "observation"for infants who are born to GBS positive mothers, but there is no need to separate mom and baby for this observation period. To see a flow-chart with more details about newborn testing and observation, click here.

What do national organizations have to say?

In the United States:

The U.S. Centers for Disease Control and Prevention recommends universal screening for GBS at 35-37 weeks and in-labor antibiotics for all women who test positive.

These recommendations are supported by the:

- American Congress of Obstetricians and Gynecologists
- American Academy of Pediatrics
- American College of Nurse-Midwives
- American Academy of Family Physicians
- American Society for Microbiology

In the **United Kingdom:**

- The United Kingdom National Screening Committee states that pregnant women in the UK should not be screened for GBS. The UK follows the risk-based approach. This includes giving antibiotics in-labor to all women who have fever, prolonged rupture of membranes >18 hours, GBS in urine at any time during pregnancy, preterm labor, or a prior infant with GBS. This means that many women who are actually GBS negative receive antibiotics directed at GBS, just based on their risk factors. In the UK, the rate of early GBS infections is 0.5 per 1,000 births, which is slightly higher than the rate of 0.2 per 1,000 births in the U.S. In the UK, it is not considered cost effective to screen the whole population of pregnant women to lower the early GBS infection rate by 0.2-0.3 cases per 1,000.
- The Royal College of Obstetricians does not recommend routine screening for GBS during pregnancy. However, they do state that in-labor antibiotics could be considered if GBS was detected in passing or if women have any of the risk factors listed above. Many women are already receiving antibiotics for these reasons.
- There is controversy in the UK over the lack of access to GBS testing within the National Health Service. Group B Strep Support is a consumer-based charity that advocates for women to have access to GBS screening in the UK.

In Canada:

- The Society of Obstetricians and Gynaecologists of Canada (SOGC) recommends offering GBS screening to all pregnant women and treating those who are positive with IV antibiotics.
- The Association of Ontario Midwives recommends GBS screening and has a **great article for midwives to use in helping women make an informed choice regarding the treatment strategy.** Click here.

What is the bottom line?

- In the U.S., screening and treating all GBS-positive women with antibiotics during labor has been associated with lower rates of early GBS infections in newborns than giving antibiotics based on risk factors alone.
- There are both potential benefits and potential harms related to screening for GBS and giving antibiotics-- talk with your treating healthcare provider about the best course of action for you.
- Since two-thirds of remaining early GBS infections are now due to false negative GBS test results, in the future we may benefit from a rapid in-labor test for GBS
- While probiotics, chlorhexadine, and garlic have the potential to reduce vaginal and newborn colonization with GBS, we do not have evidence yet to show that these strategies can prevent early GBS infections, since GBS infection usually occurs when GBS gains access to the amniotic fluid and gets into the fetus' lungs during labor.

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