# What Do Women Want?

# Reducing Perinatal Infection Risks from Sexually Transmissible Components of the Reproductive Tract Microbiome through Parental Behavior Changes: a CROWDSOURCED-Inspired Analysis

J McGregor[1], JI French[2], J Jones[3], M Perhach[3]
[1]University of Colorado Denver, [2]LA Best Babies Network, [3]Group B Strep International

## ABSTRACT

**Objective:** Devise biologically-based primary prevention behavioral strategies to reduce risks of potentially lethal or damaging vertical infections caused by reproductive microbiome microorganisms.

**Background:** Common and important reproductive tract infections originate from the reproductive tract microbiome (male or female). Most common vertical infections (VIs), i.e., GBS, *E. coli,* CMV, genital mycoplasmas, have not been considered STDs by pregnancy care providers or public health officials. Beginning in 1998, families with questions regarding GBS infection made internet-enabled enquiries to www.groupbstrepinternational.org focusing on general categories:

1) how did I/we get GBS or other pathogen colonization?
2) how do we prevent this from happening?
3) how do we prevent damage to our baby?

**Methods:** We agglomerated questions and answers regarding microbiologic and infectious disease (ID) into action-oriented responses.

**Results:**

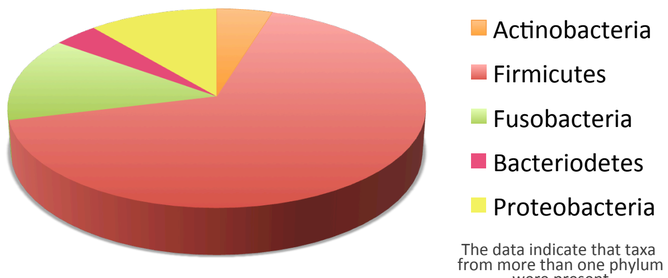
1) Enquiring parents readily comprehended (microbe-host) pathophysiological principles including necessity to "screen and treat" commonly accepted STDs (or VD) which are recommended to be screened during pregnancy by CDC, ACOG, or other bodies;
2) Parents of affected children frequently express frustration and dismay that pregnant women are not screened for recognized bacterial, viral, fungal, or pathologic vaginal microflora such as "BV" or dysbiosis;
3) Once informed, parents readily understood that various microbes (GBS, CMV, HSV) may be transmitted or inoculated during sexual contact. Parents offered behaviorally-based recommendations for future research or immediate implementation including:
   a) avoidance of new or multiple sex contacts before or during pregnancy,
   b) routine use of condoms or other barriers or abstinence to prevent microbiologic change during pregnancy,
   c) avoidance of rectal/anal contact and possibly oral-genital contact,
   d) routine screening and treatment of abnormal urogenital microflora (ASB, UTI, vaginal dysbiosis)
   e) serologic testing for common relevant viral infections (HIV, HSV, CMV) so that serodiscordant couples can be identified and modify their behaviors, and
   f) advice to avoid douching or other hygienic practices which can disrupt normal, established microbiome-host relationships, and
   g) pursue evidence-based prevention research.

## Background

Common and important reproductive tract derived vertical infections originate from the endogenous genitourinary and oral/gastrointestinal microbiome. Most pregnancy associated fetal/perinatal infections (Figure 1) are not considered sexually transmissible, and thus not considered preventable by pregnancy care providers as potentially preventable sexually transmitted infections (STIs).

Beginning in 1998, using internet "commons" or direct contact sources we heard from women/families who had suffered consequences of pregnancy associated infections, most commonly ascribed to group B *Streptococcus* (GBS).

**Figure 1. Chart of the five phyla of the intrauterine bacteria of 349 women with intra-amniotic infection who gave birth preterm**




The data indicate that taxa from more than one phylum were present in most of these women

Mendz GL, Kaakoush NO, Quinlivan JA. Bacterial aetiological agents of intra-amniotic infections and preterm birth in pregnant women. *Front Cell Infect Microbiol*. 2013; 3: 58.

## Objectives

1) Collect, record, and analyze internet crowdsourced and direct contact enquires from 1998-2014 regarding perinatal infections.
2) Secondarily, analyze suggestions offered by internet correspondents or direct contacts focusing on prevention of maternal colonization or infection with potential "perinatal pathogens," especially GBS.
3) Transpose these "commons-based" suggestions and questions into Parental Behavior changes
   a) that might reasonably be adopted by parents before and during pregnancy and postpartum, and/or
   b) which could be evaluated for efficacy in quasi or rigorous experimental designs
4) Derive a parent enquiry-based research agenda to enable perinatal infection research.

**Table 1. Parental Behaviors which May REDUCE Spread of Reproductive Tract Infections Implicated in Stillbirth**

| |
|---|
| Be selective with all personal contacts/enjoy monogamy! |
| Avoid SALIVA contacts in daycare/religious/other settings |
| Designate hygiene items (toothbrush, etc.) for personal use |
| Avoid contact with possible HERPES sores |
| Avoid rectal/anal contact and possibly oral-genital contact |
| Follow recommended strategies to help prevent infection during sexual contact, e.g., condom usage, other barriers |
| Avoid douching which can disrupt normal vaginal flora |
| Alert medical providers if you are pregnant BEFORE any transfusions (not all blood is tested for CMV) |

**Table 2. Possible candidates for "perinatal pathogen" vaccination* development/implementation strategies**

| |
|---|
| Group B *Streptococcus* (GBS) |
| *Haemophilus influenza*, unencapsulated |
| Cytomegalovirus (CMV) |
| Herpes simples virus-1 (HSV-1) |
| Herpes simplex virus-2 (HSV-2) |
| Human parvovirus B-19 (HPV-B19) |
| *Neisseria gonorrhoeae* |
| *Chlamydia trachomatis* |
| *Ureaplasma parvum* |
| Syphilis |
| Others ("BV") |

*vaccinations already developed: Hepatitis E virus (HEV), Hepatitis B virus (HBV), Human papilloma virus (HPV)

## Results

1) Corresponding parents and others, readily comprehended the need to "screen and treat" for "traditional" STIs, which are MANDATED by authoritative sources (CDC-P, ACOG, AAP, Canadian and WHO organizations.)
2) Parents and providers of GBS affected children frequently express dismay that microbial (viral, bacterial, yeast) or "microecologic shifts" (BV, intermediate vaginal microflora, dysbiosis) are NOT routinely screened for because of "cost," or operational complexity, or tradition.
3) Almost uniformly, enquiring parents wish to know how they became colonized/infected with the "perinatal pathogen."
4) Enquiring parents and providers appeared to readily understand that microorganisms such as GBS, CMV, HSV-1 and -2, and others could be "inoculated" during sexual and other intimate contacts. These parents and providers spontaneously volunteered reason-based or anecdotal recommendations to reduce risk of untoward exposure and possible infection or microbiome invasion/change (Table 1).

## Conclusions

Parents and providers and others are "ready and willing" to provide positive prevention directed suggestions, including
1) mandatory routine clinical care screening and treatment of implicated STIs or microbial alteration,
2) universal preconception and pregnancy behavior changes intended to reduce risks of potentially pathogenic oral/GI or urogenital microbiome changes, and
3) active basic and clinical research to identify and measure EVIDENCE-BASED personal and medical strategies to optimally prevent initial and repeated pregnancy infection related mortality, morbidity, costs, and liability especially identification of effective vaccinations for "perinatal pathogens" (Table 2).

## Discussion

How to best inform women to be aware that:
1) naturally-occurring microorganisms are often not considered to be STIs, but still may be sexually transmissible CAUSING INOCULATION OF NON-COLONIZED PARTNERS,
2) even if test results are negative, caution in behavior choices may still be warranted as:
   a) naturally-occurring microorganisms can be transient so status can change, and
   b) test results can show a false negative, and
3) some microorganisms can cross intact membranes and infect babies prior to possible expected treatment during labor and delivery.

## Recommendations

1) Encourage providers, parents, and perinatal organizations through the internet "commons" and personal conversations to inform women as to what they need and want to know to be able to help reduce the risk of perinatal infections, and
2) actively support evidence-based research.

For more information, please email info@gbs-intl.org or visit www.groupbstrepinternational.org.

## Bibliography

Aagaard K et al. The placenta harbors a unique microbiome. *Sci Transl Med* 21 May 2014, Vol. 6, Issue 237, p. 237ra65.

Garcia J. Chlamydia, gonorrhea linked to stillbirth or preterm birth. www.Medscape.com/view article/810588.

Spinillo A et al. The role of the placenta in feto-neonatal infections. *Early Hum Dev* 2014 Mar;90Suppl 1:S7-9.

Schrag S, Gorwitz R, Fultz-Butts K, Schuchat A. Prevention of perinatal group B streptococcal disease revised guidelines from CDC. *MMWR* August 16, 2002/51(RR11);1-22.

Smail F, Vazques JC. Antibiotics for asymptomatic bacteriuria in pregnancy. *Cochrane Database Syst Rev* 4.8.2007.

Update to CDC's *Sexually Transmitted Diseases Guideline, 2006.* MMWR. April 13, 2007/56(14);332-336.

Marrazzo M, Martin DH. Management of Cervicitis. *CID* 2007.93.9102-10.

Centers for Disease Control and Prevention, Workenski KA, Berman SM. Sexually transmitted diseases treatment guidelines, 2006. *MMWR Recomm Rep*. 2006 Aug 4;55(RR-11):1-94.