

Prompting prenatal infection prevention using the mnemonic “HYGIENE”

James A McGregor^{1,2}, Marti Perhach¹, Amy Perhach¹

1. Group B Strep International 2. LA Best Babies Network

Objectives: To help parents avoid prenatal infections.

In developed countries, up to 24% of stillbirths have been attributed to infection.
U Reddy et al. Clin Obstet Gynecol 2010

Infection is estimated to contribute to nearly half of stillbirths in developing countries.
E Mclure, R Goldenberg, J Matern Fetal Neonatal Med 2009

Prenatal infection can be caused by a wide variety of microorganisms, including bacteria, viruses, and parasites.

Method:

1. Listed routes of prenatal infection.
2. Listed microorganisms that can commonly cause prenatal infection.
3. Identified behaviours that could help reduce the risk of prenatal infection.

Multiple pathways to intrauterine infection were identified. Presence of abnormal “vaginal microbiota” or “vaginal immunity” may alter each of the following pathways singly or in combination:

- a. Ascending transport of vaginal/cervical infection due to physiologic uterine activity occurring prior to or during pregnancy
- b. “Counter-current” vascular/lymphatic transport concentrating vaginal microbial products within pregnancy tissues
- c. Translocation of microbes from oral/gastrointestinal microbiome/cell constituents including lipopolysaccharides (LPS)
- d. Intrauterine inoculation of cervico-vaginal microflora by cervical manipulation or instrumentation (“membrane stripping”)
- e. Microecologic shift of predominant vaginal microflora mediated by hygienic practices, change of sexual partner(s)/practices, antimicrobial use, dietary-style microbiome shifts
- f. Hematologic transport of microbes (e.g., *Listeria* sp., enteroviruses, etc.) initiated by systemic exposure/infection

H HANDWASHING HELPS

Routine handwashing is an easy way to reduce the risk for your baby! Wash your hands with soap and water for at least 20 seconds after:

- Changing a diaper
- Feeding a young child
- Wiping a young child’s nose or drool
- Gardening or contact with soil or sand

Remember to wash under your nails!

Y YES TO PRENATAL CARE

Prenatal care is an excellent opportunity to team up with your provider to prevent infection in your baby! Having your urine cultured for bacteria at your first prenatal visit is important so you can be treated if necessary. See your provider right away if you have any vaginitis symptoms. Medications for yeast infections are not effective against bacteria although symptoms can be similar. Your provider will test you for some germs that you may not know you carry. Keep a copy of all test results with you to have ready when you arrive at the hospital to give birth. Besides brushing and flossing your teeth regularly, see your dentist for cleanings and checkups as part of your routine prenatal care. Make sure to tell your dentist you are pregnant.

G GOOD FOOD PREPARED SAFELY

Getting your recommended daily nutrition from good food prepared safely can help nourish your growing baby and prevent exposure to infection! Avoid the following:

- Unpasteurized milk
- Cheese made from unpasteurized milk
- Raw or undercooked meat or poultry
- Hot dogs and lunch or deli meats unless heated until steaming hot just before serving

Use special care in food handling:

- Peel or wash fruits and vegetables
- Store raw meat separately from other foods
- Avoid getting fluid from hot dog packages on other surfaces
- Wash cutting boards and counters after contact with raw meat, poultry, seafood, or unwashed fruits and vegetables

I IMMUNIZATIONS

Making sure your immunizations are up-to-date (ideally before becoming pregnant) is another easy way to help prevent infection in your baby! Ask your provider if you are immune to German measles (also known as rubella) and chickenpox, both causes of stillbirth and serious birth defects. These vaccines can’t be given during pregnancy so if you aren’t immune, avoid contact with anyone infected with these viruses. Make sure you get recommended flu shots. Having the flu increases the risk of your baby being born premature as well as having birth defects.

HYGIENE

Many types of prenatal infection can be prevented with healthy pregnancy behaviors. Use the word “HYGIENE” to help you make these behaviors routine!



Handwashing helps

Infections that can be prevented:

Listeria monocytogenes, Enteropathogens such as *E. coli* and *Salmonella* spp., *Toxoplasma gondii*, Enteroviruses, Influenza (flu)



Yes to prenatal care

Infections that can be prevented:

Group B strep (GBS), Cytomegalovirus (CMV), Herpes simplex virus (HSV) 1-6, Hepatitis A, B, C, Severe periodontal disease



Good food prepared safely

Infections that can be prevented:

Listeria monocytogenes, Enteropathogens, Toxigenic *E. coli*



Immunizations

Infections that can be prevented:

Influenza (flu), Tetanus, diphtheria, and pertussis also known as whooping cough (“Tdap” vaccine)



Evade others’ bodily fluids

Infections that can be prevented:

Herpes (HSV) 1 and 2, Human immunodeficiency virus (HIV), Syphilis, Chlamydia, Gonorrhea, Ebola, Cytomegalovirus (CMV), Hepatitis viruses, Influenza (flu), Fifth disease (HPV B-19)



No to unnecessary invasive procedures

Infections that can be prevented:

Vaginal/cervical infections, Chorioamnionitis



Environmental precautions

Infections that can be prevented:

Malaria, Malaria-like infections, Dengue, West Nile virus, Chikungunya virus, Zika virus, Lyme disease, Rocky Mountain spotted fever, Lymphocytic choriomeningitis virus (LCMV)

E EVADE OTHERS’ BODILY FLUIDS

Simply staying clear of germs found in saliva, urine, blood, semen, and other bodily fluids can help keep your baby safe! Keep away from anyone with infections that can be spread through coughing and sneezing. Pregnant women are most commonly exposed to CMV through the saliva and urine of young children. Use these precautions:

- Don’t share food, drinks, eating utensils, and toothbrushes with young children
- Don’t put a child’s pacifier in your mouth
- Avoid contact with saliva when kissing a child
- Clean toys and surfaces that come into contact with children’s saliva or urine

Always use safe sex practices. New partners can introduce germs even through oral sex. Be careful to not come into contact with used needles, blood, or open sores and don’t share toothbrushes and razors

N NO TO UNNECESSARY INVASIVE PROCEDURES

Avoid unnecessary, frequent, or forceful internal exams which may push germs closer to your baby. Some germs can cross intact membranes! Vaginal or perineal ultrasounds are less invasive options. Talk to your provider early in pregnancy about not stripping your membranes (a procedure often used to ineffectively induce labor). Not all providers ask before stripping membranes during a cervical exam. Even if you test negative for GBS, you may be carrying other germs that could harm your baby.

E ENVIRONMENTAL PRECAUTIONS

Enjoy your environment while making precautions routine! Some good strategies are:

- Avoid changing cat litter
- Don’t handle stray cats
- Wear gloves when gardening
- Walk in the center of trails to avoid ticks
- Remove sources of standing water around your home to avoid mosquitoes breeding

Care providers play an important role in educating their patients about the mnemonic “HYGIENE”

Patient education is a vital tool to help prevent prenatal infection. Knowledge gives women the power to advocate on behalf of their and their unborn baby’s health.

Conclusion:

We found that giving parents specific actions they can take to help avoid the risk of prenatal infection has been welcomed and useful instead of overwhelming parents with information about how to prevent each of the many types of infection.