Birthing Method and Infant Health: What You Need to Know

During pregnancy, one of the common questions we're asked is whether we are hoping for a boy or a girl. Even though there may be a slight preference toward one gender over another, all moms agree on one thing—we just want a healthy baby!

During prenatal visits, we're told to avoid things that can harm our baby's health, such as smoking and alcohol. Maybe your practitioner emphasized the importance of nutrition, taking a good-quality prenatal vitamin, managing stress, and getting enough rest. All of these are things we can either control or be mindful of.

What about lesser-known factors we can't always control, such as delivery methods, and how does that impact infants' health? Indeed, there are times when a caesarian section is indicated and can be lifesaving for the infant and mother. In these cases, we are grateful to have this procedure available! However, more and more caesarian section births are being performed due to mothers' requests instead of medical reasons. The global caesarian rates, currently at 21%, have bypassed the World Health Organization's (WHO) acceptable rate (Angolile et al. (2023).

If you're wondering how the delivery method impacts infant health, you are not alone! It is partly due to the relationship between bacteria and our baby's microbiome. The microbiome refers to the trillions of microbes, including beneficial bacteria within the gut. These bacteria work together with our body to support health (Yang et al. 2016). When babies first enter this world, they acquire tiny microbes from the environment. Whether a baby is delivered cesarean section or vaginally shapes their ability to respond to various illnesses. So, how do bacteria differ between a vaginal birth versus a cesarean delivery?

During a vaginal birth, babies acquire bacteria from the mother, known as "seeding," which has an essential role in establishing their microbiome (Mady et al. 2024). Many of these initial microbes, such as the *Bifidobacterium genus*, are the first to colonize a baby's gut, where they have positive health benefits (O'Callaghan et al. 2016). The transfer of beneficial bacteria continues as the baby is placed skin-to-skin with the mother and through breastfeeding. In an ideal world, this is the natural process that each mother and baby experience to lay the foundation for a healthy microbiome. And you thought it was all about bonding!

During a cesarean delivery, the procedural environment in the hospital influences an infant's initial contact with microbes and bacteria. The Baby Biome study found that 83.7% of babies delivered via C-section had higher *Enterococcus, Enterobacter, and Klebsiella* species, which are opportunistic pathogens within the hospital environment (Shao et al. 2019). Opportunistic pathogens are microbes that, when conditions allow, can cause unwanted effects in the body. Aside from a higher pathogen profile, these babies were also found to have lower commensal species than vaginal births. Commensal species are important types of bacteria due to their many health-protective properties (Khan et al. 2019). Let's now explore how different types of bacteria have a role in developing health conditions.

No mother wants to see their child feeling under the weather. However, exposure to viruses and bacteria within our environment is part of how children develop a robust immune system. While

we cannot prevent our child from catching every illness, we can support their immune system to respond appropriately, starting with the gut. Approximately 70-80% of immune cells reside in the gut, which heavily impacts the immune system's response (Wiertsema et al. (2021). When an infant enters this world and begins developing their microbiome through bacterial exposure, this can affect their response, positively or negatively, to future disease (Korpela et al. 2018). Specifically, beneficial bacteria, such as *Bifidobacterium longum*, can help protect the immune and respiratory systems by exerting antimicrobial benefits (Khan et al. 2019).

Asthma is important to mention specifically because it is one of the most common pediatric chronic diseases. Any mom who has a child with asthma knows how life-altering it can be. The Canadian Healthy Infant Longitudinal Development (CHILD) Study showed that infants at a higher risk of asthma had altered gut flora in the first 100 days of life (Arrieta et al. 2015). Although there can be many reasons for alterations in gut flora, two significant factors relevant to infancy include caesarian delivery and antibiotic exposure (Bokulich et al. 2016).

Eczema is another complex condition and has been a pain point for many mothers. No one wants to see their baby struggle with dry, itchy skin and the discomfort that comes with it. Although genetics and the environment can also play a role, research shows that gut health is another key factor. Anything that harms the gut barrier can affect its ability to keep toxins out of the blood circulation. An increase in the permeability of this barrier, which allows a higher toxin load, has been shown in those with eczema (Niewiem et al., 2022).

You may be familiar with some of the illnesses above, and there are many more health conditions where gut microbes can play a role. Considering this, you may be wondering how you can support your child. If a child was born via caesarian section and/or had exposure to antibiotics as an infant, there are still many things you can do to encourage a healthy microbiome!

Nutrition in babies' first year of life can play an important role in facilitating a healthier gut (Yang et al. 2016). Breastmilk is one example that can protect the gut even after a round of antibiotics. Fiber is a source of nutrition that acts as fuel for bacteria, supports healthy digestive patterns, and encourages bacterial diversity. Introducing a variety of age-appropriate fruits and vegetables is beneficial to encourage a healthy microbiome.

Probiotics are widely available but can be confusing; how do we choose the right one? Finding a probiotic for infants with *lactobacillus* and *bifidobacterium* strains can be helpful. Each infant's microbiome is unique, so an individual approach may be necessary in more complex cases. In such instances, diagnostic stool tests are available and may be recommended by your provider. Shotgun metagenomic sequencing is considered the gold standard test and can help remove the guesswork (Milani et al. 2017). These results can guide providers to make therapeutic recommendations based on your baby's unique bacterial profile. Treatment can include strain-specific probiotic therapy and targeted nutritional intervention.

Opting for a vaginal delivery when medically able is ideal for initial seeding of bacteria. However, there are times when a caesarian section is indicated for the health of the mother and baby. If this was your experience, don't worry! You can do a lot to support the development of your baby's microbiome and susceptibility to future health conditions. Understanding how the

delivery method has the potential to impact bacterial composition can better equip providers and caregivers to manage this therapeutically.

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