



➤ Product Review ⇐

February 2025 #391

CESAREAN SECTION: IMPROVING OUTCOMES WITH VAGINAL SEEDING

INTRODUCTION

This will be a somewhat unusual product newsletter in that it only peripherally relates to Moss Nutrition products – in this case the Moss Nutrition probiotic products **Probiotic Select®**, **Bacillospore Select™**, and **Saccharomyces boulardii**. Why do I say peripherally? Even though this is a newsletter about improving the microbiome of babies delivered by Cesarean section, it is not about giving these products to these babies. In relation to the paper I am about to review, these products would only be helpful if they were given to women either pre-pregnancy or during pregnancy. Does this seem a bit confusing? If so, it is my hope it will all start to make sense as I review a fascinating, recently published paper on improving the microbiome status of babies delivered by Cesarean section by what is being described as “vaginal seeding.”

What is vaginal seeding? As stated by Hourigan et al in their paper “Can vaginal seeding improve health outcomes of infants born by Cesarean delivery? (Hourigan SK et al. *JAMA Pediatrics*, published online February 10, 2025) it is the following:

“Exposing an infant born by cesarean delivery immediately after birth to their own mother’s vaginal fluid (and vaginal microbiome), dubbed *vaginal seeding*, is an intervention proposed to restore exposure to vaginal microbiome

colonizers that they otherwise bypass. This simple procedure involves inserting a sterile gauze into the mother’s vagina before cesarean delivery, then wiping the gauze over the newborn’s face, mouth, and body immediately after delivery, to partially replicate microbial exposures in a vaginal delivery.”

Why would such a procedure be beneficial and even necessary to maximize the health of newborns? To answer this question, I would like to go back to the beginning of the Hourigan et al paper to highlight some quotes that discuss the somewhat disturbing realities of birth by Cesarean section.

SOME DISTURBING REALITIES OF CESAREAN SECTION

Is Cesarean section delivery a risk to infant health compared to vaginal delivery? Consider the following:

“Cesarean births account for more than 30% of deliveries in the US and can be lifesaving.”

That’s the good news. Unfortunately, some of the other news is not so good:

“Evidence shows that cesarean delivery increases the risk of inflammatory and neurodevelopmental disorders in offspring, with strong evidence for obesity and atopy. The association of cesarean delivery with these disorders is thought to be mediated by its effects on offspring microbiome development.”

Why is an optimal microbiome important to newborn health?

“The microbes that first colonize a newborn play a critical role in metabolic and immune system programming, with disruption having lasting immune and metabolic consequences.”

What happens to the microbiome during Cesarean section? The authors continue:

“Cesarean delivery causes major disruption to microbial colonization, with numerous studies showing that infants born by cesarean delivery acquire different microbes than their counterparts born by vaginal delivery. Infants born by vaginal delivery characteristically acquire communities resembling maternal vaginal and perianal microbiota, whereas infants born by cesarean delivery acquire communities resembling skin and hospital environment microbiota.”

Why does this matter?

“The microbiome subsequently develops differently in infants born by vaginal delivery compared with those born by cesarean delivery. It is theorized that infants born by cesarean delivery have increased risk of chronic inflammatory conditions due to altered early-life microbiome colonization, with associated aberrant immune and metabolic development.”

RESEARCH ON THE IMPACT OF VAGINAL SEEDING

Does research support the use of this simple, cost effective effort at microbiome optimization in newborns? Consider the following:

“Beyond observational studies showing that vaginal seeding can shift the microbiome composition of infants born by cesarean delivery closer to that of infants born by vaginal delivery in early life, randomized clinical trials (RCTs) have shown that vaginal seeding compared to placebo enables maternal bacterial engraftment across multiple infant body sites and accelerates gut maturation.”

OTHER EFFORTS AT THE SEEDING OF MICROFLORA

Hourigan et al continue by discussing other approaches that have been attempted to seed microflora in newborns:

“Other approaches to maternal-child microbial seeding in infants born by cesarean delivery have been proposed. Oral administration of a mother’s vaginal fluid to her infant was not shown to change the early-life gut microbiome. However, a proof-of-concept study showed that fecal transplant from mothers to infants born by cesarean delivery could shift the gut microbiome toward that of infants born vaginally, suggesting that exposure to the mother’s gut microbiome is important.”

The next quote makes an important but under recognized point that the vaginal microbiome during pregnancy is very different compared to the nonpregnant scenario:

“Consistently, we have shown that the peripartum vaginal microbiota also contains bacteria from other maternal body sites, notably the gut, which is not seen in the nonpregnant vaginal microbiome; hence, vaginal seeding may provide microbes from different body niches required for infant colonization.”

More specifically:

“...studies consistently show increased *Bacteroides* colonization, likely from maternal stool, in infants delivered vaginally compared with infants born by cesarean delivery, which may have beneficial immunomodulatory effects.”

Unfortunately, vaginal seeding has not been demonstrated to improve *Bacteroides* colonization in the newborn:

“Vaginal seeding studies have not convincingly shown increased *Bacteroides* colonization, although fecal transplant from mother to infant has; highlighting the potential importance of transmission of maternal stool bacteria in addition to vaginal bacteria, to more completely restore the microbiome.”

THE IMPACT OF VAGINAL SEEDING ON HEALTH OUTCOMES

Does vaginal seeding, which has demonstrated the ability to bring the microbiome of the newborn delivered by Cesarean section closer to that of the vaginal delivery newborn, have an impact on the potential adverse health consequences seen with Cesarean section, as mentioned above? The authors comment:

“The first evidence of a clinical benefit of vaginal seeding was published in 2023. In a triple-blind RCT of infants born by cesarean delivery, vaginal seeding improved infant neurodevelopment compared with placebo. Importantly, this study also indicated that vaginal seeding was safe.”

The results were not so impressive in terms of inflammatory diseases:

“To date, no publications have shown that vaginal seeding improves cesarean delivery-associated inflammatory diseases, and one small RCT showed no difference in body mass index and allergy risk in early life.”

However, other suggestions of health improvement with vaginal seeding were suggested by animal studies conducted by the authors:

“...our 2024 human-to-murine model study suggests an improvement in metabolic health with vaginal seeding. We inoculated germ-free mice with early-life stool from infants born by cesarean delivery who received vaginal seeding compared with placebo. Mice who received stool from infants vaginal seeding showed decreased intra-abdominal adiposity gain, the adiposity type associated with adverse metabolic risk, in addition to gut microbiome and metabolome changes. This study provides experimental evidence suggesting that early-life gut microbiome changes from vaginal seeding may have a positive effect on metabolism.”

AUTHORS' CONCLUSIONS

Hourigan et al conclude their paper with the following thoughts:

“In conclusion, we are excited to see evidence of partial restoration of the microbiome and improvement in neurodevelopment in offspring born by cesarean delivery receiving vaginal

seeding in RCTs and suggestions of metabolic health improvement in murine models. We are optimistic we will see an improvement in cesarean delivery-associated inflammatory conditions from ongoing RCTs and that this simple, inexpensive intervention may become part of medical practice to improve the health of many.”

SOME FINAL THOUGHTS

As I suggested in the beginning of this product newsletter, it is intriguing to hypothesize that products such as **Probiotic Select®**, **Bacillospore Select™**, and **Saccharomyces boulardii** supplemented to women either pre-pregnancy or during pregnancy might further improve the outcomes of vaginal seeding with infants born via Cesarean section. It is my hope that cutting-edge researchers such as Hourigan et al will continue to think “outside the box” and see if the efficacious, cost-effective intervention of vaginal seeding could be further improved from an efficacy standpoint via the use of probiotic supplementation to the mothers before delivery.

Probiotic Select® 60 VC & 120 VC - Select 12 Strain Probiotic Blend – Providing 25+ Billion Colony Forming Units CFU's).

Bacillospore Select™ 100 VC – Providing *Bacillus coagulans* and *Bacillus subtilis* 1.5+ billion CFU's each.

Saccharomyces boulardii – 60 VC & 120 VC Providing 10+ billion CFU's.

