Study shows role of fathers in seeding microbiota of newborns, confirms benefits of maternal fecal microbiota transfer

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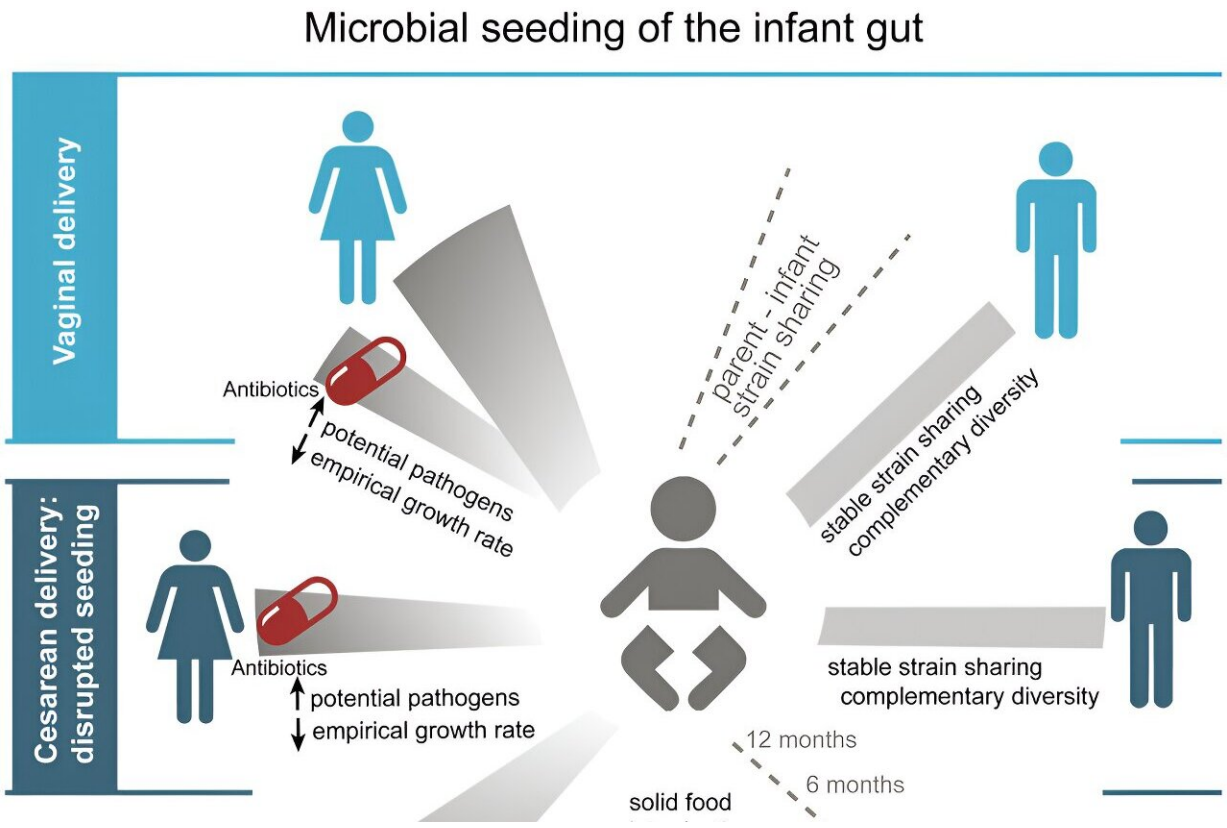

Paternal and induced gut microbiota seeding complement mother-to-infant transmission. Credit: Cell Host & Microbe/Dubois and Valles-Colomer et al.

A mother's contribution to the makeup of a newborn baby's microbiota has been well documented. Now a paper published June 12 in *Cell Host & Microbe* shows the important contributions that fathers make to the composition of microorganisms colonizing a baby's gut as well.

Furthermore, the study confirmed that maternal fecal microbiota transfer (FMT) in babies born by cesarean section can help to correct the microbiota disturbances often observed in babies who are not born vaginally.

Fetuses have sterile gastrointestinal tracts, and babies' bodies are colonized during and shortly after birth. About half of the strains found in infants' bodies can be traced to the maternal gut. This led the researchers to hypothesize that other people who have close contact with the infant could contribute to the rest, providing a stable source of microbial strains associated with good health.

"This study provides significant insight into how a newborn is colonized," says lead author Willem M. de Vos, of Wageningen University and the University of Helsinki. "The role of the father may be small, but it is not to be neglected. It is likely that the same holds for others who have close contact with the newborn."

"We are very happy to have found this connection," says co-author Nicola Segata of the University of Trento in Italy. "This highlights the importance of studying other microbial contributions as well, such as those from siblings and from daycare peers." Segata's group provided computational analysis, while de Vos's group designed the study.

Inspired by his own experiences as a parent, for many years de Vos has studied the microbiota of infants and how babies' gastrointestinal tracts

become colonized after birth.

In October 2020, he and colleagues published a proof-of-concept study in *Cell* that confirmed exposing cesarean-born newborns to their mother's microbiota just after birth was both safe and effective at giving the babies a microbial makeup that looks more similar to babies born vaginally. The babies were fed a small amount of their mothers' fecal microbiota shortly after birth.

This new paper provides follow-up data on that study as well as new research looking at the contributions of fathers to infants' microbial compositions. The authors say that because cesarean births now account for about one-quarter of births worldwide, there should be an increased focus on creating a healthy balance of gut microbiota in these infants.

The investigators performed metagenomic analysis of fecal samples from newborns and their parents. They looked for the presence of a wide range of bacterial strains over time. For the babies who were part of the earlier study, they confirmed through follow-up analysis that maternal FMT reduced the levels of potential pathogenetic bacterial strains significantly for up to a year.

For the newer study, they compared the fecal microbiomes of 73 infants; 21 were born by cesarean section and 52 were born vaginally. They longitudinally collected samples for over a year and compared the microbiota of the babies to those of both their mothers and fathers.

The researchers discovered that many of the strains found in the babies at three weeks, three months, and 12 months originated in the father, not in the mother. These include Bifidobacterium longum strains, which are known to utilize mother's milk oligosaccharides but counterintuitively may originate from the father rather than the mother.

"Knowing that the father substantially contributes to a baby's developing microbiome underlies the important role of physical and social interactions between the newborn and their father, as well as with other family members," Segata says. "We hope this study will help to create awareness of those important contributions."

The investigators in Helsinki have completed another maternal FMT trial, this one a double-blind placebo-controlled trial in babies born by cesarean (trial NCT04173208). They are now conducting long-term follow-up with those infants, studying not only the microbiome but many other health and immune functions.

Another study also published June 12 in *Cell Host & Microbe* by some of the same authors shows that where an infant is born—whether at home or at a hospital—affects transmission of gut microbiota as well. Birth location affects the timing of transmission, except for Bifidobacterium longum, which are transmitted consistently regardless of the setting.

More information: Paternal and induced gut microbiota seeding complement mother-to-infant transmission, *Cell Host & Microbe* (2024). DOI: 10.1016/j.chom.2024.05.004. www.cell.com/cell-host-microbe … 1931-3128(24)00176-8

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