Fetal Microbiota Development In-Utero

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Abstract

The human microbiome is a diverse collection of microorganisms residing within the human body that help produce essential vitamins, extract nutrients from food, strengthen our immune system, and carry out various other crucial processes for our health. Although the notion is that the fetus develops in a sterile environment, there is substantial evidence that challenges that consensus. The fetal microbiome begins development in-utero originating from sources such as the placenta and later gaining exposure to other microbes depending on the infant's form of diet and birth. Various studies have viewed the microbial colonization of infant meconium and the potential that the development of the human microbiome begins before birth. Cultures of meconium in healthy newborns and sampling of ASVs in infant and fetal mice exhibit the presence of microbes before birth. This could prove that the microbiome begins development in-utero rather than during birth and after feeding as previously concluded. The acknowledgement of the presence of the prenatal microbiome is key to understanding the microorganisms that reside in the human body and prevention of potential physiological issues with developing infants.

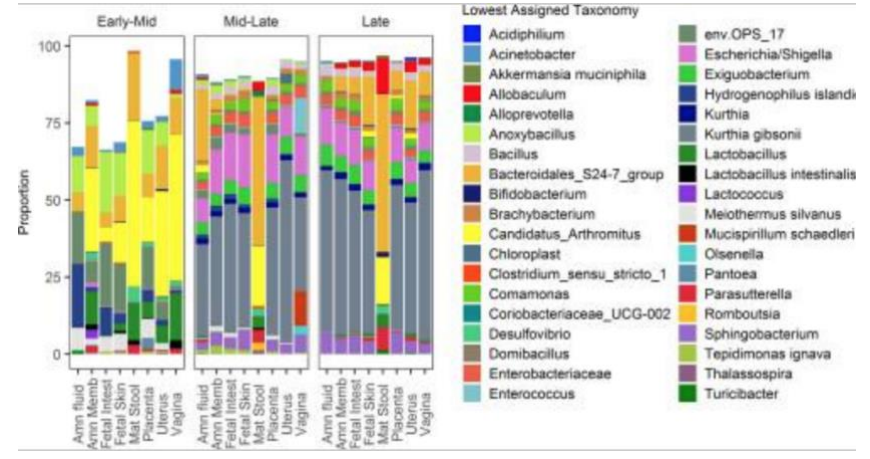

Figure 1: Study of microbial composition in fetal mice using 16S rRNA sequencing. As gestation progressed , fetal body sites contained increasingly more of the same ASVs (amplicon sequencing variants) as the maternal fecal microbiota.

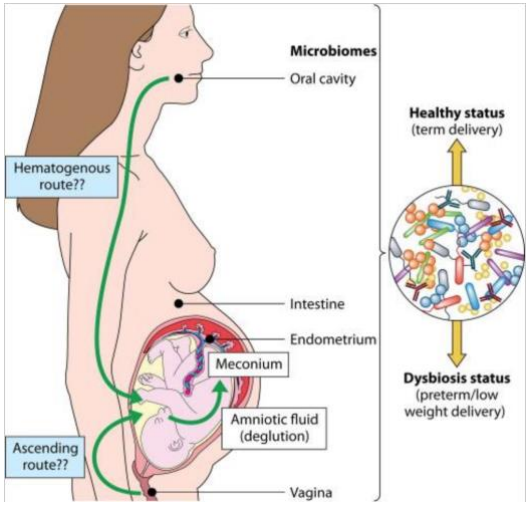

Figure 2: Potential colonization routes from maternal microbiota to fetus in-utero

Conclusions

- Enterococcus and Staphylococcus were present in meconium of healthy newborns directly after birth prior to feeding
- In-utero sources such as the placenta are the most likely origins of the development of the fetal microbiome
- Development continues and strengthens during birth (vaginal vs. cesarean) and feeding (breast vs formula)

Future Directions

- Further studies can identify a more detailed timeline on the development of the microbiome throughout gestation
- Investigating health implications of dysbiosis in fetus' and infants will help with the prevention of certain diseases

References

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