frontiers in Cellular and Infection Microbiology

REVIEW
published: 02 April 2019
doi: 10.3389/fcimb.2019.00085

The Preterm Gut Microbiota: An Inconspicuous Challenge in Nutritional Neonatal Care

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The nutritional requirements of preterm infants are unique and challenging to meet in neonatal care, yet crucial for their growth, development and health. Normally, the gut microbiota has distinct metabolic capacities, making their role in metabolism of dietary components indispensable. In preterm infants, variation in microbiota composition is introduced while facing a unique set of environmental conditions. However, the effect of such variation on the microbiota's metabolic capacity and on the preterm infant's growth and development remains unresolved. In this review, we will provide a holistic overview on the development of the preterm gut microbiota and the unique environmental conditions contributing to this, in addition to maturation of the gastrointestinal tract and immune system in preterm infants. The role of prematurity, as well as the role of human milk, in the developmental processes is emphasized. Current research stresses the early life gut microbiota as cornerstone for simultaneous development of the gastrointestinal tract and immune system. Besides that, literature provides clues that prematurity affects growth and development. As such, this review is concluded with our hypothesis that prematurity of the gut microbiota may be an inconspicuous clinical challenge in achieving optimal feeding besides traditional challenges, such as preterm breast milk composition, high nutritional requirements and immaturity of the gastrointestinal tract and immune system. A better understanding of the metabolic capacity of the gut microbiota and its impact on gut and immune maturation in preterm infants could complement current feeding regimens in future neonatal care and thereby facilitate growth, development and health in preterm infants.

Keywords: preterm, very low birth weight, gut microbiota, gastrointestinal tract, immune system, growth, development, health

OPEN ACCESS

Edited by:
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Specialty section:
This article was submitted to Microbiome in Health and Disease, a section of the journal Frontiers in Cellular and Infection Microbiology

Received: *18 December 2018*
Accepted: *12 March 2019*
Published: *02 April 2019*

Citation:
Henderickx JGE, Zwittink RD, van Lingen RA, Knol J and Belzer C (2019) The Preterm Gut Microbiota: An Inconspicuous Challenge in Nutritional Neonatal Care. Front. Cell. Infect. Microbiol. 9:85. doi: 10.3389/fcimb.2019.00085

BACKGROUND INFORMATION

Preterm infants, born before 37 weeks of gestation, are increasingly affected both by prematurity and by complications associated with decreasing gestational age. Complications of prematurity include impaired maturation of the gut microbiota, gastrointestinal tract, and immune system (**Figure 1**). Yet, simultaneous maturation of the gut microbiota, gastrointestinal tract, and