Disentangling the role of the gut microbiota and short-chain fatty acids on the growth and development of HIV-exposed and uninfected infants

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Abstract

Maternal-infant transmission of HIV remains a significant public health challenge in South Africa. Infants born to HIV-positive mothers undergoing antiretroviral treatment are HIV-exposed but uninfected (HEU) and have been reported to exhibit compromised immune systems, stunted growth and increased mortality. Gut microbiome dysbiosis resulting from imbalances in the abundance and composition of the microbiota and quantities of short chain fatty acids (SCFAs) have been implicated as likely differences between these infants and HIV unexposed and uninfected (HUU) infants. This study aims to investigate the gut microbiomes and SCFAs of HEU infants in South Africa to disentangle the factors contributing to their developmental challenges and stunted growth. Taxonomic classification and quantitative real-time PCR were used to assess the gut microbiota and quantities of acetate in HEU infants in comparison to HUU infants as well as their HIV-positive and HIV-negative mothers. The findings showed differences in alpha diversity and beta diversity between groups. Specifically, HEU infants had higher relative abundances of *Escherichia-Shigella*, *Erysipelatoclostridium*, *Enterococcus and Parabacteroides* when compared to HUU infants, who displayed a higher relative abundance of *Veillonella*, *Bifidobacterium*, *Prevotella* and *Faecalibacterium*. In addition, qPCR results showed that quantities of

ackA were lower in the gut microbiomes of HEU infants which may contribute to their compromised immune modulation and health. The findings from this study have the potential to contribute towards disentangling the role of the gut microbiome and SCFAs in shaping the growth and development of HEU infants. These insights are critical for guiding the development of targeted interventions aimed at mitigating the challenges associated with HIV exposure.

Keywords: HIV, HIV-exposed and uninfected (HEU), HIV-exposed and uninfected (HUU), maternal-infant transmission, gut microbiome, SCFAs