

Associations Between Rapid Weight Gain, Feeding Practices, and the Gut Microbiome During Infancy

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Objectives: Rapid weight gain (RWG) by 6 months of age has been identified as one of the earliest indicators of childhood obesity. Research suggests that exclusive breastfeeding (EBF) may protect against RWG. The makeup of the infant gut microbiome (GM) may also influence RWG as differences in feeding practices may alter the bacterial makeup of the gut, potentially impacting energy metabolism. The goal of this pilot study was to evaluate differences in GM community structure over the first 6 months of life in relation to feeding practices and RWG.

Methods: Pregnant mothers (n = 31) were recruited from Women, Infant, and Children's Supplemental Nutrition Program clinics and by word of mouth to participate in this study. Participants were followed over 6 months, completing home study visits postpartum, at 3 weeks and 6 months of infant age. RWG was defined as $>+0.67$ change in weight-for-age Z-score over the first 6 months of life. Microbial data from infant feces collected at birth, 3 weeks, and 6 months were sequenced using Illumina adapter primers for the V4 region of the 16S

rRNA gene. GM diversity metrics include α -diversity, β -diversity, and differential abundance of microbes were assessed using Kruskal-Wallis and PERMANOVA comparisons, adjusted for multiple comparisons, via QIIME2.

Results: Among this cohort, 29% (n = 9) of infants experienced RWG in the first 6 months of life, and 22.6% (n = 7) were EBF for 6 months. Results suggested a significant difference in microbial community structure (weighted UniFrac) between infants who were EBF and formula-fed (FF) from birth to 3 weeks of age (p = 0.04). An exploratory analysis of longitudinal GM changes identified the family *Prevotellaceae* as potentially volatile over the first 6 months of life; however, this model failed to reach significance for either RWG or feeding practice. No additional differences in α - or β -diversity or differential abundance of microbes were observed among RWG or feeding practice groups.

Conclusions: The present study suggested differences in microbial community structure between infants who were EBF versus FF from birth to 3 weeks of age. Future research is warranted to further explore potential connections between RWG, feeding practices, and the infant GM in a longitudinal study with a larger sample size and more frequent sampling.

Funding Sources: ASU-Mayo Clinic Partnership Obesity Solutions Seed Grant Program.