New study finds race-based variations in gut microbiome emerge at 3 months old

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A new study finds that gut microbiome variation associated with race and ethnicity arises after three months of age and persists through childhood. The results highlight a critical developmental window when social and environmental factors drive race and ethnicity-associated microbiome variation and may contribute to adult health and health disparities. Credit: Paul Hanaoka, Unsplash (CC0, https://creativecommons.org/publicdomain/zero/1.0/)

Gut microbiome variation associated with race and ethnicity arises after three months of age and persists through childhood, according to a new study published August 17 in the open access journal *PLOS Biology* by Elizabeth K. Mallott of Washington University in St. Louis, US, Seth Bordenstein of Pennsylvania State University, US, and colleagues.

Human microbiome variation has been linked to the incidence, prevalence and mortality of many diseases and is known to associate with race and ethnicity in the United States. However, in this context race and ethnicity are considered proxies for inequitable exposure to social and environmental determinants of health due to structural racism. When these microbiome differences arise during development and how they correlate with early life experiences, including racism, has been unclear.

In the new study, researchers studied data from eight previous studies which, in total, included 2,756 gut microbiome samples from 729 children between birth and 12 years of age. In all, 17.2% of samples were from non-white individuals, and 14.3% of samples were from Hispanic individuals.

A machine learning model that analyzed the data identified variability associated with race and ethnicity at or shortly after three months of age and could distinguish participants' race and ethnicity with 87% accuracy based on their microbiomes. Some of the bacterial species most important in this prediction were also associated with breastfeeding and delivery method (vaginal vs. cesarean section).

Of the 57 types of bacteria that varied in abundance among children of differing self-identified racial categories, 19 were previously identified as differentially abundant between Black and White adult individuals.

"Notably, our findings do not support race- or ethnicity-associated

variation appearing at birth or shortly after, when mother-to-infant and other mechanisms of vertical microbial transmission are expected to be strongest," the authors say.

"Instead, external factors are most likely shaping race- and ethnicity-associated microbiome variation at or shortly after three months. Our results highlight the impetus to increase the diversity of individuals included in studies in the microbiome sciences and support the call for studies investigating how structural racism and other structural inequities affect microbiome variation and health."

Mallott says, "The differences that we see are not present at birth, or even shortly after. Only two of the 82 microbes that differ along the lines of either race or ethnicity are microbes that are maternally transmitted. The vast majority are all microbes that we acquire from the environment."

Bordenstein adds, "The analysis presented in this paper highlights that human microbiome studies have an urgent imperative to prioritize diversity and the social sciences in research from early life onward. We want to eventually translate diverse microbiome discoveries into shaping the future of health precision, policy and equity across the diversity of all of us."

More information: Human microbiome variation associated with race and ethnicity emerges as early as 3 months of age, *PLoS Biology* (2023). DOI: 10.1371/journal.pbio.3002230

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