

Infants introduced early to solid foods show gut bacteria changes that may portend future health risks

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Infants who were started on solid foods at or before three months of age showed changes in the levels of gut bacteria and bacterial byproducts, called short-chain fatty acids, measured in their stool samples, according to a study from researchers at Johns Hopkins Bloomberg School of Public Health.

Prior studies have linked the early introduction of solid foods to a higher chance of being overweight in childhood. The new study, published in *BMC Microbiology*, suggests that early solid [food](#) introduction may predispose infants to being overweight at least in part by altering the gut bacterial population.

"How the early introduction of solid foods would cause the later development of obesity has been unknown, but our findings suggest that disruptions to gut bacteria may be one explanation," says Noel Mueller, Ph.D., assistant professor in the Department of Epidemiology at the Bloomberg

School.

Pediatricians' associations typically recommend that infants be breastfed exclusively for the first four to six months, after which solid foods should be introduced as a supplement to breastmilk or milk formula. Past research suggests that children who start eating solid foods earlier than six months are more likely to be overweight in childhood. Prior studies also indicate that the timing of solid food introduction may affect the chances of developing eczema, food allergies, asthma, hay fever, and other allergy-related conditions.

To understand better how the timing of solid food introduction, in terms of biological mechanisms, could affect a child's metabolic and/or immune health, Mueller and his colleagues analyzed data from the Nurture study, which tracked infants in a community in Durham, North Carolina, for the first year of life and was set up principally to explore early-life factors that might predispose to obesity.

The scientists conducting the study interviewed the mothers every three months about the infants' diets and other factors and also collected [stool samples](#) from the infants. Data from 67 children were included in the new analysis, for which the researchers compared the timing of solid food introduction with the bacterial species and byproducts found in the month-3 and month-12 stool samples.

The team found that the samples from infants who had started on solid foods at or before three months, at the month-3 time point and even at the month-12 time point, contained a significantly higher diversity of bacteria, indicating a more diverse gut bacterial population or "microbiome," compared to samples from infants who had started later on solid foods. This finding is consistent with a

2018 Norwegian-led study, which linked higher gut microbiome diversity at 3 months of age to a greater chance of being overweight later in childhood.

The researchers also measured the stool-sample levels of organic bacterial byproducts called short-chain fatty acids. Prior studies have linked higher stool levels of butyric acid and other short-chain fatty acids in adults to increased risks of obesity, diabetes, and hypertension. Mueller and colleagues found in their study that infants starting on [solid foods](#) by three months had significantly higher concentrations of butyric acid, as well as total short-chain fatty acids, at 12 months—but not at 3 months, which could indicate a delayed and sustained impact of early solid-food introduction.

Mueller concludes that, on the whole, the findings are consistent with the emerging evidence that gut microbiome changes are key factors in the development of common metabolic and immune conditions, and suggest that scientists are on the right track in studying these changes. And, the authors say that further research is needed to determine if these measures of microbiome diversity and short-chain fatty acid concentration truly drive the development of obesity and other disorders.

Mueller and colleagues are continuing to conduct studies of diet and the gut microbiome in [infants](#) and children, and the associations between these factors and outcomes such as obesity and immune-related disorders.

"Timing of complementary feeding is associated with gut microbiota diversity and composition and short chain fatty [acid](#) concentrations over the first year of life" was written by Moira Differding, Sara Benjamin-Neelon, Cathrine Hoyo, Truls Østbye, and Noel Mueller.

Provided by Johns Hopkins University Bloomberg School of Public Health

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