# A toddler's gut bacteria predict whether they will be overweight at 5 years old, finds new research

May 19 2023

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The make-up and volume of gut bacteria in toddlers at 3.5 years old is predictive of body mass index (BMI) at age 5, irrespective of whether they are born prematurely or not, according to new research, being presented at this year's European Congress on Obesity (ECO) in Dublin, Ireland (17-20 May).

The findings also identified differences in the bacteria that colonize the gut seen in adults living with obesity, suggesting that changes in the gut microbiota that predispose to adult obesity begin in early childhood.

The make-up of the gut microbiota grows and changes in the first few months and years of life and disruption to its development is associated with conditions in later life including inflammatory bowel disease, type 1 diabetes, and childhood obesity.

However, the associations between gut microbiota and both change in BMI during childhood and pediatric overweight remain unclear, and information on infants born preterm is scarce.

To find out more, the study—led by Mr. Gaël Toubon from, Inserm, Université Paris Cité and Université Sorbonne Paris Nord, Paris, France—investigated how the gut microbiota of children at 3.5 years from two French nationwide birth cohorts was associated with their BMI at 5 years old and changes in their BMI between 2 and 5 years old, after adjusting for confounding factors including child age and sex, gestational age, delivery mode, ever breastfed, maternal preconception BMI, and country of birth.

Overall, 143 preterm infants (born less than 32 weeks of gestational age) were included from EPIPAGE2—a national study conducted in all maternity and neonatal units in France in 2011—and 369 full-term infants (born more than 33 weeks of gestational age) from ELFE—a national study tracking the lives of 18,000 children born in metropolitan France in 2011.

Stool samples were collected at 3.5 years. Genetic microbiota profiling revealed a positive association between BMI z-score (a measure of bodyweight based on height for each age group by sex) at 5 years and the ratio of gut bacteria Firmicutes to Bacteroidetes that are directly involved with obesity—the more Bacteroidetes (compared to Firmicutes), the leaner individuals tend to be.

"The reason these gut bacteria affect weight is because they regulate how much fat we absorb," explains Toubon. "Children with a higher ratio of Firmicutes to Bacteroidetes will absorb more calories and be more likely to gain weight."

The analysis also found that six specific types of gut bacteria were highly predictive of BMI z-score at 5 years old.

Greater abundances of three categories of bacteria—Eubacterium hallii group, Fusicatenibacter, and Eubacterium ventriosum group—were identified as a risk factor for a higher BMI z-score; and greater numbers of three types of bacteria—Eggerthella, Colidextribacter, and Ruminococcaceae CAG-352—were associated with a lower BMI z-score.

Interestingly, some types of bacteria were also associated with changes in BMI z-scores between 2 and 5 years old, indicating that some were involved in a higher speed of progression in BMI z-scores between 2 and 5 years, while others were found to be more protective against this faster

progression.

Additionally, the researchers found that both the predicted biosynthesis of steroid hormones and the biotin (a B vitamin involved in a wide range of metabolic processes) gut microbiota metabolic pathways were associated with lower 5-yrs BMI z-score.

"These findings suggests that what matters with the gut microbiota is not only a question of which bacteria are involved, but also what they are doing," explains Toubon.

Importantly, being born prematurely made no difference to later BMI.

"The gut microbiota is emerging as an important early-life factor able to influence weight gain in childhood and later life," says Toubon. "Our findings reveal how an imbalance in distinct bacterial groups may play an important role in the development of obesity. Further research is needed to drill down into the specific bacterial species that influence risk and protection and to better understand when the switch to an obesity favorable gut microbiota may take place, and therefore the right timing for possible interventions."

**More information:** Conference: eco2023.org/

Provided by European Association for the Study of Obesity