Medical Xpress

Caesarean birth, prolonged labour influence infant gut bacteria, risk of childhood obesity and allergies

October 2 2020, by Kim Wright

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Events at birth may affect the microbes living in a baby's gut during the first few months of life, leading to a higher risk of childhood obesity and

allergies, according to a new study published in the journal *Gastroenterology*.

The researchers used data from the CHILD Cohort Study (CHILD) to look at the complex relationships between birth events, a baby's gut microbiome at three and 12 months of age, and health outcomes at ages one and three.

They linked factors such as cesarean section delivery and prolonged labor to changes in the gut microbes of infants. They then determined the pathways by which these alterations may lead to an increased risk of allergies and obesity later in childhood.

Senior author Anita Kozyrskyj, a CHILD investigator and professor in the Faculty of Medicine & Dentistry at the University of Alberta, said the findings highlight the importance of identifying multiple and common pathways of the gut microbiome during infancy.

"Much of what happens to us later in life is related to the exposures we encounter in infancy and early childhood," she said. "Understanding how disruptions to the gut microbiome affect health in later childhood means we may have several options for effective interventions to prevent these chronic conditions before they become established."

The study showed that infants born by cesarean section were more likely to have a high body-mass index score at ages one and three. When the researchers examined the children's microbiome profiles at three months of age, they found that an altered ratio of two types of bacteria—Enterobacteriaceae and Bacteroidaceae—was the dominant path to overweight.

At 12 months of age, a higher Enterobacteriaceae/Bacteroidaceae (E/B) ratio and colonization with Clostridioides difficile (C. difficile) were the

main pathways leading to allergic sensitization.

"While cesarean birth was an initiating event for triggering over 100 gut microbial pathways leading to overweight and allergic sensitization, we found a higher E/B abundance ratio was the dominant compositional change," explained Kozyrskyj.

Infants born after prolonged labor associated with a first pregnancy were also found to be at higher risk for these health outcomes. The researchers found the E/B abundance ratio at three months was the most important microbiota mediator to overweight, and the E/B ratio at 12 months was the most important mediator to allergic sensitization. The abundance of Bifidobacterium, which was reduced with prolonged labor, also played a role in overweight development.

To conduct the study, Kozyrskyj's team collected stool samples from the diapers of 1,667 infants who are part of CHILD, a national birth cohort study following nearly 3,500 Canadian children from before birth to adolescence with the goal of discovering the root causes of allergies, asthma, obesity and other chronic diseases. They then analyzed the samples for gut microbes and their metabolites.

At one and three years of age, the children underwent skin prick tests to check for allergic sensitization to 10 common allergens.

The study's first author and former post-doctoral fellow, Khanh Vu, now an analyst in the U of A's Quality Management in Clinical Research unit, said he believes the central role of the infant gut microbiota involves the production of small molecules or metabolites. "Our study identified key interactions between Bifidobacterium and the metabolite, formate," he commented.

The research also highlighted the critical influence of C. difficile in all

microbiota interactions, said Kozyrskyj.

"The takeaway from our study is that exposures at birth can trigger multiple and common gut microbial pathways leading to child overweight and allergic sensitization," she noted.

"We may want to take steps to avoid unnecessary cesarean section deliveries, and possibly consider postnatal microbiota solutions that may help to prevent these two conditions."

More information: Khanh Vu et al. From birth to overweight and atopic disease: multiple and common pathways of the infant gut microbiome, *Gastroenterology* (2020). DOI: 10.1053/j.gastro.2020.08.053

Provided by University of Alberta

Citation: Caesarean birth, prolonged labour influence infant gut bacteria, risk of childhood obesity and allergies (2020, October 2) retrieved 20 September 2024 from https://medicalxpress.com/news/2020-10-caesarean-birth-prolonged-labour-infant.html

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