Maternal high-fat diet during pregnancy can affect baby's gut microbes

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Credit: Anna Langova/public domain

The community of microbes - the microbiome - living in a baby's gut can be influenced by the mother's diet during pregnancy. Researchers at Baylor College of Medicine found that babies born to mothers who consumed a high-fat diet during pregnancy had a gut microbiome that was distinctly different from the one in babies of mothers on a non-high-fat diet. This is important because the microbiome can affect the

development of babies' immune system and their ability to extract energy from food. The study appears in *Genome Medicine*.

"We had previously shown in non-human primates that mothers who ate a high-fat diet during pregnancy and lactation affected the microbiome of their offspring up to a year of age," said senior author Dr. Kjersti Aagaard, associate professor of obstetrics and gynecology at Baylor and Texas Children's Hospital. "We wanted to answer this question in humans."

To answer the question, the researchers studied a representative group of pregnant women in the U.S. "We asked 157 mothers to answer a detailed and previously validated rapid dietary questionnaire to identify the type of diets they consumed during pregnancy," said Aagaard.

The researchers used the information obtained in the dietary questionnaires to estimate how much sugar, fat and fiber the mothers ate during the latter part of the third trimester. The results showed that the mothers ate a diet that on average was 33 percent fat - the range was 14 to 55 percent fat. The Institute of Medicine recommends a daily intake between 20 and 35 percent. Then, the researchers divided the mothers whose fat intake was significantly different from the average into two groups: the control group and the high-fat group.

"We then examined the babies' first stool sample, or meconium, to determine the type of bacteria present at birth in the infants' gut. We used 16S rRNA sequencing to determine the types of microbes present in stools. We analyzed the stools again when the babies reached 4 to 6 weeks of age," said Aagaard.

The researchers found that the microbiome of the babies whose mothers had eaten a high-fat diet during the latter part of the third trimester was clearly different from that of babies whose mothers were in the control

group. Of note, the microbiomes of babies of high-fat diet mothers had fewer numbers of Bacteroides microbes, both at birth and several weeks after. The researchers think that having fewer Bacteroides in the gut on a consistent basis could affect energy extraction from food and the development of the immune system.

"We were surprised when we observed the association between fewer Bacteroides and a high-fat maternal diet during pregnancy," said Aagaard. "These findings open up whole new lines of research and emphasize the importance of including maternal diet questionnaires and data when studying early changes in the microbiome. However, further studies are needed to demonstrate whether changes in women's diets have a beneficial impact on their infants in the immediate and longer term. Diet is very amenable to change and women are highly motivated to make healthy changes during pregnancy. Traditionally, dietary interventions during pregnancy have focused on micronutrients, such as iron and folic acid. We speculate that there may be a sound argument to also discuss and estimate fat intake."

This type of study shows that a mother's diet is associated with the microbiome in her baby's gut. However, because other factors cannot be ruled out in this case, cause and effect cannot be established. The findings of this prospective cohort study may also be limited by its use of self-reported data.

The researchers also showed that the questionnaire used in this study, although with some limitations, adequately determined the maternal diet during the third trimester reflecting the diet in the general U.S. population.

More information: Derrick M. Chu et al. The early infant gut microbiome varies in association with a maternal high-fat diet, *Genome Medicine* (2016). DOI: 10.1186/s13073-016-0330-z

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