Research shows a mother's fat intake can impact infant infectious disease outcomes

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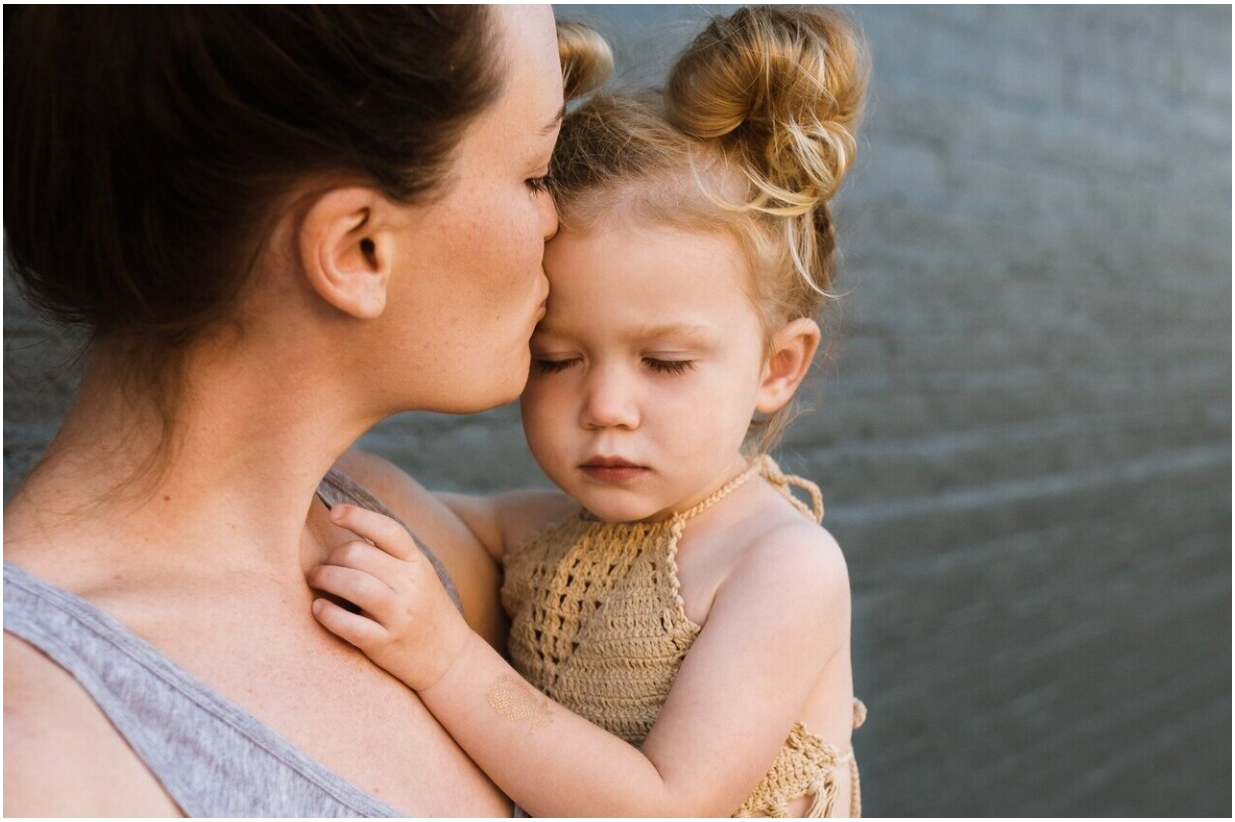

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A team of UBC Okanagan researchers has determined that the type of fats a mother consumes while breastfeeding can have long-term implications on her infant's gut health.

Dr. Deanna Gibson, a biochemistry researcher, along with Dr. Sanjoy Ghosh, who studies the biochemical aspects of dietary fats, teamed up with chemistry and molecular biology researcher Dr. Wesley Zandberg. The team, who conducts research in the Irving K. Barber Faculty of Science, explored the role of feeding dietary fat to gestating rodents to determine the generational effects of fat exposure on their offspring.

"The goal was to investigate how maternal dietary habits can impact an offspring's gut microbial communities and their associated sugar molecule patterns which can be important in immune responses to infectious disease," says Dr. Gibson, who studies gut health and immunity as well as causes of acute or chronic diseases like inflammatory bowel disease.

Their study suggests that the type of fat consumed during breastfeeding could differentially impact an infant's intestinal microbial communities, immune development and disease risk.

The three main classes of fatty acids include saturated (SFA), found in meats and dairy products, monounsaturated fats (MUFA), found in plant-based liquid oils, and polyunsaturated fatty acids (PUFAs), found in some nuts, fish and shellfish. PUFAs are further characterized as either n-3 PUFAs or n-6 PUFAs, based on the number and positions of double bonds in the acyl chain.

Previous research has determined both n-3 PUFAs and n-6 PUFAs can have a negative impact on intestinal infections such as Enteropathogenic E. coli, Clostridium difficile, salmonella and gastrointestinal illnesses from eating poorly prepared or undercooked food or drinking contaminated water. In contrast, diets rich in MUFAs and SFAs have been shown to be largely protective against these infections.

Dr. Gibson's latest research states the beneficial properties of milk fat,

or saturated fats, during the pre-and postnatal period might improve protection against infectious intestinal disease during adulthood particularly when a source of n-3 PUFAs are combined with saturated fats.

"Our findings challenge current dietary recommendations and reveal that maternal intake of fat has transgenerational impacts on their offspring's susceptibility to intestinal infection, likely enabled through microbe-immune interactions," says Dr. Gibson.

Global consumption of unsaturated fatty acids has increased significantly between 1990 and 2010, she adds, while people are consuming lower amounts of saturated fats during pregnancy because of recommendations to reduce saturated fat intake.

"Although it has been known for decades that high-fat diets can directly alter inflammatory responses, recent studies have only just begun to appreciate how fatty acid classes may have discrete effects on inflammation, and can shift host responses to an infection," says Dr. Gibson.

Dietary fatty acids can impact inflammatory processes including defensive inflammatory responses following an intestinal infection. This can affect the severity of disease, making dietary fatty acids an important consideration in predicting disease risk, Dr. Gibson explains.

Researchers believe it's a combination of dietary fat-host interactions with the intestinal bacteriome that can determine the severity of these infections. The intestinal bacteriome, Dr. Gibson explains, is established during infancy and plays a critical role in aiding immune system maturation and providing a barrier against colonization with potential pathogens.

And Dr. Ghosh notes this latest research suggests current health guidelines should be reevaluated.

"Currently, Canadian dietary guidelines recommend nursing mothers replace foods rich in SFA with dietary PUFAs, with an emphasis on consuming n-6 and n-3 PUFAs," Dr. Ghosh says. "Given that PUFAs worsened disease outcomes in postnatal diet studies, in our views, these recommendations should be reconsidered."

While breast milk protein and carbohydrate concentrations remain relatively inert, fatty acid contents vary considerably and are influenced by maternal fat intake.

"Overall, we conclude that maternal consumption of various dietary fat types alters the establishment of their child's bacteriome and can have lasting consequences on their ability to respond to infection during adulthood," says Dr. Gibson. "At the same time, we show that maternal diets rich in SFA, provide a host-microbe relationship in their offspring that protects against disease."

It's important to understand that the intestinal bacteriome is established during infancy because it plays a critical role in aiding immune system maturation which can provide a barrier to potential pathogens, explains Dr. Zandberg. He also notes a healthy bacteriome is dependent on early-life nutrition.

"Sugars decorate important proteins in the gut," says Dr. Zandberg. "Their patterns are altered in the offspring due to the dietary choices of the mother during gestation and lactation. The change in patterns is associated with changes in the ability of the infant to fight off infectious disease in our model."

More information: Candice Quin et al, Maternal Intake of Dietary Fat

Medical Xpress

Pre-Programs Offspring's Gut Ecosystem Altering Colonization Resistance and Immunity to Infectious Colitis in Mice, *Molecular Nutrition & Food Research* (2021). DOI: 10.1002/mnfr.202000635

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