

Genetic makeup and diet interact with the microbiome to impact health

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A Mayo Clinic researcher, along with his collaborators, has shown that an individual's genomic makeup and diet interact to determine which microbes exist and how they act in the host intestine. The study was modeled in germ-free knockout mice to mimic a genetic condition that affects 1 in 5 humans and increases the risk for digestive diseases. The findings appear in the *Proceedings of the National Academy of Sciences*.

balance. Whether in humans or other animals, the microbial combination is unique and must function well with the individual's genome and diet for a healthy existence.

Provided by Mayo Clinic

"Our data show that factors in the differences in a host's [genetic makeup](#)—in this case genes that affect carbohydrates in the gut—interact with the type of food eaten. That combination determines the composition and function of resident microbes," says Purna Kashyap, M.B.B.S., a Mayo Clinic gastroenterologist and first author of the study. He is also a collaborator in the Microbiome Program of the Mayo Clinic Center for Individualized Medicine.

Significance of the Findings

Roughly 20 percent of humans lack the gene that encodes proteins for processing a specific carbohydrate, a sugar in the intestinal mucus called fucose. The interaction shown by the research team is valuable because many bacteria are adept at utilizing carbohydrates such as fucose, which are abundant in the gut. Confronted with diets that have little or no complex [plant sugars](#), these bacteria are forced to change their function, especially in hosts that lack fucose. This was seen with the altered metabolic gene expression of one of the key microbes in the gut—*Bacteroides thetaiotaomicron*. Changes in microbial membership or function as demonstrated in this study may, in turn, foster a "digestive landscape" that can promote inflammatory conditions such as Crohn's disease.

The microbiome represents millions of microbes in the gut and elsewhere in the body. They perform specialized functions to help keep metabolism in

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