

# Researchers explore how changes in diet alter microbiome in artificial intestine

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Using an artificial intestine they created, researchers have shown that the microbiome can quickly adapt from the bacterial equivalent of a typical western diet to one composed exclusively of dietary fats. That adaptation

involved an increase in the populations of fatty-acid metabolizing species and a drop in those of protein and carbohydrate metabolizers. These changes led to diminished production of short chain fatty acids and antioxidants, alterations that might negatively affect human health. The research is published in *Applied and Environmental Microbiology*, a journal of the American Society for Microbiology.

"Intestinal microbes mediate many dietary effects on [human health](#)," said corresponding author Oleg Paliy, Ph.D., Associate Professor, Boonshoft School of Medicine, Wright State University, Dayton, OH. "There, most of these compounds are fermented by [gut bacteria](#). This happens because a significant proportion of dietary carbohydrates, proteins, and fats escapes digestion in the small intestine, and reaches the colon, a section of the gut housing a dense population of microbes." There, most of these compounds are fermented by gut bacteria.

In the study, the switch from a [western diet](#) to a diet of fat boosted the populations of fatty acid metabolizing bacteria from the genera *Alistipes*, and *Bilophila*, and several genera of the class, Gammaproteobacteria. Populations declined among carbohydrate and protein-degrading genera, including *Bacteroides*, *Clostridium*, and *Roseburia*.

The decline in the populations of carbohydrate metabolizing genera caused a decline in production of short chain fatty acids. Production of antioxidants also dropped. The latter are compounds that neutralize free radicals, highly reactive compounds that damage cells, DNA, and collagen.

"The relative beneficial and harmful effects of the high-carb and high-fat diets are a subject of many studies and debates," said Dr. Paliy. Several recent reports showed that low-carbohydrate diets can elicit improvement in the signs and symptoms of insulin resistance and its

secondary manifestations, such as metabolic syndrome.

However, previous studies had suggested that at least some [carbohydrate](#) is needed in the diet for optimum health. When gut microbes ferment complex carbohydrates, short chain fatty acids are produced. These have many positive effects on the host, including lowering the risk of colorectal cancer, regulating appetite, and reducing inflammation in the body.

The experimental apparatus used to conduct this study, called a human gut simulator, is designed to mimic the environment of the human colon. It is comprised of three glass vessels linked consecutively to simulate three different regions of the human colon, and was seeded with human gut microbes obtained from fecal donors. The nutrients, either characteristic of a balanced Western [diet](#), or composed entirely of [dietary fats](#), were supplied to these communities, and the researchers measured their composition and metabolites with high-throughput sequencing and high-performance liquid chromatography, respectively.

The kind of knowledge gained through this study may ultimately help researchers get a stronger handle on what kind of diets are healthiest for each person. "But there's a long way to go", said Dr. Paliy.

Provided by American Society for Microbiology

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