Friday, 21 September 2018 11:45

Researchers Explore How Changes in Diet Alter Microbiome in Artificial Intestine

Written by **ASM Communications**
Published in **Press Releases**

Washington, DC - September 21, 2018 - Using an artificial intestine they created, researchers showed that the microbiome could quickly adapt to a switch from the medium resembling a 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 could 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, PhD, 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.”

“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. “For example, 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, one aspect rarely considered in the above debate is how macronutrient composition of a diet affects the environment of the colon and the gut microbiota residing in that region,” said Dr. Paliy. Previous studies suggest 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,” said Dr. Paliy. But in the study, when these carbohydrates were removed from the diet of the microbiome, production of short chain fatty acids dropped—along with antioxidants, which are also healthy for the host. “That might potentially have negative health consequences on the host,” said Dr. Paliy.

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.

Genera that increased in abundance on the fatty diet included *Alistipes, Bilophila*, and several genera of the class Gammaproteobacteria. In contrast, abundances declined among well-known carbohydrate and protein degrading genera, including *Bacteroides, Clostridium*, and *Roseburia*. That knowledge 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.