

Diet lacking soluble fiber promotes weight gain, mouse study suggests

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Eating too much high-fat, high-calorie food is considered the primary cause of obesity and obesity-related disease, including diabetes. While the excess calories consumed are a direct cause of the fat accumulation, scientists suspect that low-grade inflammation due to an altered gut microbiome may also be involved. A new study in the *American Journal of Physiology—Gastrointestinal and Liver Physiology* finds in mice that a diet missing soluble fiber promotes inflammation in the intestines and poor gut health, leading to weight gain. Moreover, incorporating soluble fiber back into the diet can restore gut health.

The [gut](#) microbiota is a community of bacteria and other microorganisms that live in the intestines. Microbiota also exists elsewhere on the body, including the skin and mouth. The gut microbiota has an important role in maintaining intestinal health and function, including helping the body digest food, producing vitamins and fighting foreign microorganisms. Changes to the gut microbiota have been linked to development of gastrointestinal diseases, including inflammatory bowel disease, and metabolic diseases, including type 2 diabetes and obesity.

A research team at Georgia State University examined the effects of diets varying in amounts of soluble and insoluble fibers, protein and fat on the structure of the intestines, [fat accumulation](#) and weight gain in mice. Key observations from this study are:

- Mice on a [diet](#) lacking soluble fiber gained weight and had more fat compared with mice on a diet that included soluble fiber. The intestines of mice on the soluble fiber-deficient diet were also shorter and had thinner walls. These structural changes were observed as soon as two days after starting the diet.
- Introducing soluble fiber into the diet restored gut structure. Supplementing with soluble fiber inulin restored the intestinal structure in mice on the soluble fiber-deficient diet. Mice that received cellulose, an insoluble fiber, however, did not show improvements. Moreover, in mice fed a high-fat diet, switching the type of fiber from insoluble to soluble protected the mice from the fat accumulation and intestinal wasting that occurs with excess fat consumption. The data suggest a difference in health benefits between soluble and insoluble dietary fibers, the researchers stated.
- Improvements in gut structure with soluble fiber were due to changes in the gut microbiota and the gut microbiota's production of molecules called short chain fatty acids, which are used as fuel by intestinal cells and have anti-inflammatory properties. Mice consuming a soluble fiber-deficient diet had lower levels of short chain fatty acids, and introducing soluble fiber into their diet boosted their levels. Supplementing the soluble fiber-deficient diet with short chain fatty acids had similar effects as inulin supplementation, although not to the same extent. Inulin supplementation increased the size of the intestines in normal mice but not in [mice](#) with no gut microbiota, supporting that the gut microbiota is involved in the intestinal health effects of soluble fiber. According to the researchers, the data support that soluble fiber promotes gut health by encouraging the [gut microbiota](#) to produce short chain fatty acids.

"If our observations were to prove applicable to humans, it would

suggest that encouraging consumption of foods with high [soluble fiber](#) content may be a means to combat the epidemic of metabolic disease. Moreover, addition of inulin and perhaps other soluble fibers to processed foods, including calorically rich obesogenic foods, may be a means to ameliorate their detrimental effects," the researchers stated.

More information: Benoit Chassaing et al. Lack of soluble fiber drives diet-induced adiposity in mice, *American Journal of Physiology - Gastrointestinal and Liver Physiology* (2015). [DOI: 10.1152/ajpgi.00172.2015](#)

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