

What we eat affects our health—and can alter how our genes function

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Fiber is well known to be an important part of a healthy diet, yet less than 10% of Americans eat the minimum recommended amount. A study from Stanford Medicine might finally convince us to fill our plates

with beans, nuts, cruciferous veggies, avocados and other fiber-rich foods.

The research, published in *Nature Metabolism* on Jan. 9 identified the direct epigenetic effects of two common byproducts of fiber digestion and found that some of the alterations in gene expression had anti-cancer actions.

When we eat fiber, the gut microbiome produces short-chain fatty acids. These compounds are more than just an energy source for us: they have long been suspected to indirectly affect gene function. The researchers traced how the two most common short-chain fatty acids in our gut, propionate and butyrate, altered [gene expression](#) in healthy human cells, in treated and untreated human colon cancer cells, and in mouse intestines.

They found direct epigenetic changes at [specific genes](#) that regulate [cell proliferation](#) and differentiation, along with apoptosis, or pre-programmed cell death processes—all of which are important for disrupting or controlling the unchecked cell growth that underlies cancer.

"We found a direct link between eating fiber and modulation of gene function that has anti-cancer effects, and we think this is likely a global mechanism because the short-chain fatty acids that result from fiber digestion can travel all over the body," said Michael Snyder, Ph.D., Stanford W. Ascherman, MD, FACS Professor in Genetics.

"It is generally the case that people's diet is very fiber poor, and that means their microbiome is not being fed properly and cannot make as many short-chain [fatty acids](#) as it should. This is not doing our health any favors."

Given the [worrying rates](#) of colon cancer in younger adults, the study

findings could also spur conversation and research about the possible synergistic effects of diet and [cancer treatment](#).

"By identifying the gene targets of these important molecules, we can understand how fiber exerts its beneficial effects and what goes wrong during cancer," Snyder added.

More information: Short-chain fatty acid metabolites propionate and butyrate are unique epigenetic regulatory elements linking diet, metabolism and gene expression, *Nature Metabolism* (2025). [DOI: 10.1038/s42255-024-01191-9](#)

Provided by Stanford University Medical Center

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