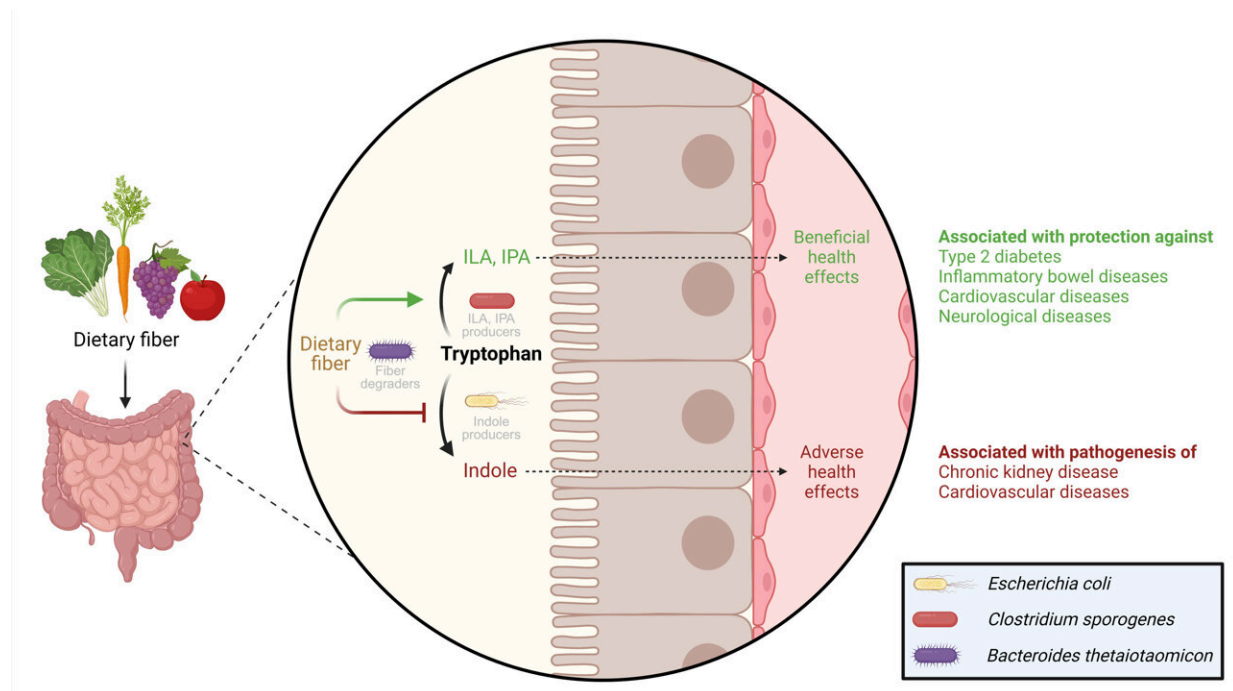


# Dietary fiber found to regulate gut bacteria's use of tryptophan, impacting health

June 25 2024



The essential amino acid tryptophan is converted in the large intestine into either beneficial or harmful substances. The research shows that tryptophan contributes to the production of the healthy substances Indole lactic acid (ILA) and Indole propionic acid (IPA) when we consume sufficient amounts of dietary fiber. However, if we do not get enough dietary fiber, tryptophan will be converted into the substance indole, which is associated with adverse health effects. The figure is created with BioRender (biorender.com) by Martin Frederik Laursen. Credit: The figure is created with BioRender (biorender.com) by Martin Frederik Laursen.

We get healthy dietary fiber from consuming fruits, vegetables, and whole grains. But why is fiber so good for us? A team of researchers has discovered that dietary fiber plays a crucial role in determining the balance between the production of healthy and harmful substances by influencing the behavior of bacteria in the colon.

Dietary fiber benefits our health, and scientists from DTU National Food Institute and the Department of Nutrition, Exercise and Sports at the University of Copenhagen have now uncovered an essential part of why this is the case. Different types of bacteria inside our colon compete to utilize an [essential amino acid](#) called tryptophan. This competition may lead to either good or bad outcomes for our health.

The research, [published](#) in the journal *Nature Microbiology*, reveals that when we eat a lot of dietary fiber, [gut bacteria](#) help turn tryptophan into healthy substances. But if we don't eat enough fiber, tryptophan can be converted into harmful compounds by our gut bacteria.

"These results emphasize that our [dietary habits](#) significantly influence the behavior of gut bacteria, creating a delicate balance between health-promoting and disease-associated activities. In the long term, the results can help us design dietary programs that prevent a range of diseases," says Tine Rask Licht, a professor at DTU National Food Institute.

## **Dietary fibers determine the battle over tryptophan**

Researchers have long known that dietary fiber is directly converted into healthy short-chain fatty acids by gut bacteria in the colon. However, the new study surprisingly shows that dietary fiber also contributes to good health by preventing the conversion of the amino acid tryptophan into [harmful substances](#) and promoting its conversion into beneficial substances in the colon.

"The gut bacterium *E. coli* can turn tryptophan into a harmful compound called indole, which is associated with the progression of chronic kidney disease. But another gut bacterium, *C. sporogenes*, turns tryptophan into healthy substances associated with protection against inflammatory bowel diseases, type 2 diabetes, cardiovascular diseases, and neurological diseases," says Anurag Kumar Sinha, a DTU National Food Institute researcher.

Through multiple experiments in bacterial cultures and mice, the researchers demonstrated that fiber-degrading gut bacteria, such as *B. thetaiotaomicron*, regulate the indole-forming activity of *E. coli*.

"*B. thetaiotaomicron* assists by breaking down fibers into simple sugars, which *E. coli* prefers over tryptophan for growth. The sugar components from the fibers prevent *E. coli* from turning tryptophan into indole, thereby allowing *C. sporogenes* to utilize tryptophan to produce healthy compounds," says Anurag Kumar Sinha.

## Understanding the behavior of gut bacteria

It is well-known that dietary fiber can alter the composition and quantities of bacteria in our gut microbiome. However, looking merely at the composition and abundance of gut microbial species will not tell us much about their impact on our health.

"The [gut microbiome](#) research field has had a strong focus on assessing effects, e.g. of diet on the quantity of potentially good or bad gut bacteria, but often neglect that diet can regulate the gut bacteria's activity without necessarily making major changes in the number of bacterial species in the colon," says an associate professor at DTU National Food Institute, Martin Frederik Laursen.

So, [dietary fiber](#) not only helps modify the types of bacteria in the gut,

leading to a healthier composition, but also influences the behavior of gut bacteria in ways that promote health.

"As a research community we need to change focus from viewing gut bacteria and their abundances strictly as either good or bad—to understand instead how we make our gut bacteria behave good or bad," says Martin Frederik Laursen.

This understanding can help scientists develop better dietary recommendations that keep our gut healthy and prevent diseases.

Essential amino acids, such as tryptophan, must be obtained through the diet since the body cannot synthesize them. Protein-rich foods serve as sources of [tryptophan](#). Examples include chicken, turkey, salmon, tuna, eggs, milk, cheese, yogurt, legumes, nuts, and seeds. Dietary fiber is present in fruits, vegetables, and whole grains.

**More information:** Dietary fibre directs microbial tryptophan metabolism via metabolic interactions in the gut microbiota, *Nature Microbiology* (2024). [DOI: 10.1038/s41564-024-01737-3](https://doi.org/10.1038/s41564-024-01737-3).  
[www.nature.com/articles/s41564-024-01737-3](https://www.nature.com/articles/s41564-024-01737-3)

Provided by Technical University of Denmark

Citation: Dietary fiber found to regulate gut bacteria's use of tryptophan, impacting health (2024, June 25) retrieved 29 June 2024 from <https://medicalxpress.com/news/2024-06-dietary-fiber-gut-bacteria-tryptophan.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--