

The Surprising Link Between Your Gut Microbiome and Cholesterol Level

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STORY AT-A-GLANCE

- › Recent Framingham Heart Study research shows your gut microbiome significantly impacts cholesterol levels, with bacteria like *Oscillibacter* helping break down cholesterol through specific enzymes and metabolic processes
- › Scientists identified cholesterol dehydrogenase enzymes (*ismA* genes) in gut bacteria that convert cholesterol to coprostanol, a form less easily absorbed by the body
- › Specific gut bacteria directly influence non-HDL cholesterol levels: *Eubacterium rectale* helps lower it, while *Clostridium* sp CAG_299 increases
- › Cholesterol is involved in essential bodily functions, including cell membrane structure, hormone production, vitamin D synthesis and nerve signal transmission, making optimization the goal
- › A holistic approach to heart health requires maintaining oxygen-free gut conditions for beneficial bacteria, avoiding processed foods, managing stress and staying active

You might not realize it, but your gut health plays a pivotal role in your heart's well-being. Recent research from the prestigious Framingham Heart Study has shed light on how the intricate community of microbes in your digestive system influences cholesterol levels.¹

By meticulously analyzing stool samples and metabolic profiles from 1,429 participants, scientists were able to map out the complex interactions between your gut microbiome

and heart health. This comprehensive study bridges the gap between gut bacteria and blood lipid levels, revealing that the composition of your gut microbes significantly impacts your cholesterol levels, opening new avenues for personalized health strategies for optimal health.

Cholesterol-Metabolizing Bacteria Take Center Stage

Among the myriad of bacteria inhabiting your gut, a genus called *Oscillibacter* is key player in cholesterol metabolism. The study found that individuals with higher levels of *Oscillibacter* species tended to have lower cholesterol levels in both their blood and stool.² This suggests that these bacteria actively help in breaking down cholesterol, reducing its accumulation in your body.

By performing homology searches and molecular networking, researchers identified specific enzymes produced by *Oscillibacter* that facilitate cholesterol metabolism. These enzymes are involved in processes like glycosylation and dehydrogenation, which help modify cholesterol for its essential roles in your body.

This groundbreaking discovery highlights the potential of harnessing these natural allies within your gut to optimize cholesterol levels naturally. In fact, imagine having a team of microscopic guardians within your gut, tirelessly working to maintain your cholesterol balance. *Oscillibacter* species are proving to be just that.

The study not only identified their cholesterol-metabolizing capabilities but also confirmed that these traits are conserved across different *Oscillibacter* strains.³ This means that regardless of the specific *Oscillibacter* species present in your gut, they share the ability to process cholesterol in beneficial ways.

By reducing both fecal and plasma cholesterol levels, these bacteria contribute to better lipid homeostasis. Incorporating dietary strategies or probiotics that promote the growth of *Oscillibacter* could be a natural and effective method to support your cardiovascular health.

Moreover, the identification of specific microbial pathways involved in cholesterol metabolism offers targets for new therapeutic strategies. As research continues to unravel the complexities of your gut microbiome, the prospect of maintaining a healthy heart through gut health becomes increasingly attainable, empowering you to take proactive steps towards a healthier, longer life.

Unveiling the Enzymes Behind Cholesterol Breakdown

Tiny molecular machines exist in your gut that are specifically designed to break down cholesterol. Recent breakthroughs have identified such enzymes, known as cholesterol dehydrogenases, encoded by previously uncultured gut bacteria.⁴ Researchers explored the genetic blueprints of the gut microbiome, analyzing millions of genes to pinpoint those responsible for transforming cholesterol into coprostanol – a form that's poorly absorbed by your body.

These enzymes, designated as ismA genes, play an important role in this conversion process. By integrating vast metagenomic data with metabolomic profiles, scientists were able to predict and validate these cholesterol-metabolizing enzymes. They even expressed these genes in laboratory bacteria to confirm their activity, ensuring that these enzymes are indeed the ones reducing your cholesterol levels.

This meticulous discovery not only uncovers the specific tools your gut bacteria use to manage cholesterol but also highlights the sophisticated interplay between your microbiome and your body's lipid metabolism. Understanding these enzymes opens the door to targeted therapies that could enhance or mimic their activity, offering a natural way to maintain healthy cholesterol levels.

Meet Your Gut's Hidden Cholesterol Warriors

Deep within your digestive system resides a group of bacteria that wield the power to manage your cholesterol levels. These bacteria, though not yet cultured in laboratories, have been identified through advanced genetic sequencing techniques. They carry the

ismA genes, which encode the cholesterol dehydrogenase enzymes essential for converting cholesterol into coprostanol.

Remarkably prevalent across diverse populations, these bacteria are a common yet overlooked component of the human gut microbiome. Studies have shown that up to 92% of individuals in certain cohorts harbor these cholesterol-metabolizing species, making them a widespread natural ally in maintaining lipid balance.⁵

Moreover, their abundance is inversely related to inflammatory conditions like Crohn's disease, suggesting that a healthy gut environment supports their beneficial activity. By thriving in the oxygen-free conditions of your intestines, these bacteria continuously work to reduce cholesterol absorption, thereby lowering your serum cholesterol levels.⁶

Enhancing the presence of these bacteria through diet, prebiotics or probiotics could be a strategic approach to harnessing their natural cholesterol-optimizing capabilities, offering a personalized pathway to better health.

Causal Links Between Gut Bacteria and Non-HDL Cholesterol

Specific bacteria in your gut also directly influence your levels of non-high-density lipoprotein cholesterol (non-HDL-c). A recent study published in eBioMedicine uncovered that a decrease in *Eubacterium rectale* and an increase in bacteria known as *Clostridium* sp CAG_299 are causally linked to higher non-HDL-c levels in your bloodstream.⁷

This means that these bacteria don't just correlate with cholesterol levels — they actively contribute to their variation. By employing sophisticated techniques like Mendelian randomization, researchers were able to establish that these gut microbes play a direct role in regulating your cholesterol. *Eubacterium rectale* appears to lower non-HDL-c, while *Clostridium* sp CAG_299 does the opposite.

The findings suggest that adjusting your gut flora may be a simple way to naturally maintain optimized cholesterol levels. The study also revealed that the metabolic

activities of your gut bacteria are intricately linked to non-HDL-c levels. Specifically, the tricarboxylic acid (TCA) cycle, a fundamental metabolic pathway, plays a pivotal role.

When *Clostridium* sp CAG_299 is abundant, it suppresses the reductive TCA cycle, leading to decreased production of beneficial metabolites like 3-indolepropionic acid and N-methyltryptamine. These metabolites are important for maintaining healthy cholesterol levels and might be developed into postbiotics – compounds derived from beneficial bacteria that can be consumed directly to confer health benefits.

On the other hand, *Eubacterium rectale* supports the TCA cycle, fostering the production of these protective compounds. The suppression of the TCA cycle by harmful bacteria results in lower levels of these metabolites, thereby elevating non-HDL-c in your blood. This biochemical interplay showcases how your gut microbiota doesn't just passively reside in your digestive system but actively engages in metabolic processes that have far-reaching effects on your health.

Cholesterol Is Your Friend, Not a Foe

As the role your gut microbiome plays in cholesterol becomes clearer, it's important to understand that cholesterol is one of the most vital substances in your body. This waxy substance serves as a fundamental building block for cell membranes, providing structural integrity and fluidity. It acts as a precursor for various essential hormones and is vital in the production of vitamin D when your skin is exposed to sunlight, contributing to bone health and immune function.

In your digestive system, cholesterol aids in the formation of bile acids, which are necessary for the absorption of fats and fat-soluble vitamins. Further, cholesterol is integral to myelin sheath formation, enhancing nerve signal transmission throughout your body.

A **balanced amount of cholesterol** is indispensable for optimal health and plays a protective role as you age,⁸ which is why your focus should not be on lowering cholesterol as much as possible but rather optimizing your levels.

Heart disease often occurs due to damage to the endothelial wall from factors like poor diet, smoking, pollution, chemicals and stress. When damage occurs, your body sends cholesterol as part of the repair process. This is why cholesterol is often found at the site of arterial damage – it's there to help, not harm.⁹

Embracing a Holistic Approach to Heart Health

Maintaining a healthy heart extends beyond merely controlling cholesterol levels or sticking to a specific diet. Embracing a comprehensive approach that incorporates multiple essential factors is crucial. Begin by prioritizing whole, unprocessed foods over refined and packaged alternatives. Additionally, ensure you get quality sleep and effectively manage stress, as both play significant roles in your overall health and cardiovascular well-being.

While regular exercise is undoubtedly beneficial, avoiding a sedentary lifestyle is equally important. Simple activities like taking regular walks significantly enhance your health, supporting not only your heart but your entire body's functionality. Incorporating these movements helps maintain flexibility, improve circulation and reduce the risk of chronic diseases.

Further, pay attention to the condition of your gut microbiome. Anaerobic microorganisms are necessary for transforming indigestible plant matter into valuable fatty acids. These oxygen-intolerant bacteria flourish in environments devoid of oxygen, which necessitates sufficient cellular energy to sustain.

However, modern dietary choices, such as consuming excessive **seed oils** and exposure to **endocrine-disrupting chemicals (EDCs)** found in plastics, disrupt this delicate balance. These factors impair the energy production necessary for maintaining an oxygen-free gut environment, making it difficult for oxygen-intolerant bacteria to flourish.

When the oxygen-free conditions of your intestines are compromised, oxygen-tolerant bacteria begin to dominate. These microorganisms produce more potent endotoxins,

leading to **increased inflammation** and adverse reactions to certain carbohydrates. This shift not only disrupts the beneficial functions of your gut microbiome but also has an impact on your cholesterol levels.

Furthermore, endotoxemia – a condition characterized by the presence of endotoxins in your blood – leads to severe complications like septic shock, which is a leading cause of mortality.

Integrating Gut Health Into Heart Disease Prevention

To safeguard your heart health, it's imperative to focus on both **enhancing mitochondrial function** and maintaining a **balanced gut ecosystem**. Understanding the intricate relationship between your gut microbiome and cholesterol levels unveils a powerful tool in your arsenal for heart health.

By adopting a holistic approach that includes nourishing whole foods, staying active, managing stress and nurturing a healthy gut environment, you can naturally support cholesterol optimization and reduce your risk of cardiovascular diseases. This integrated strategy not only promotes a healthier heart but also enhances your overall well-being, empowering you to live a longer, healthier life without relying on **pharmaceutical interventions**.

Sources and References

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- ⁷ [eBioMedicine. 2024 May 9;104:105150](#)
- ⁸ [Front. Endocrinol., 13 June 2024, Discussion](#)
- ⁹ [YouTube, The Primal Podcast October 6, 2024, 0:21](#)