# How the health of your lungs is linked to the bacteria in your gut

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The trillions of bacteria living in our gut have an extraordinary effect on our health. They're in charge of digestion, breaking down the foods we eat and extracting their vitamins and minerals. A healthy, balanced microbiome also helps ward off infections and even lowers the risk of certain diseases.

The effects of the gut microbiome on our health are far-reaching—research shows that even our lungs are influenced by this community of microbes.

The interaction between the gut and the lungs is enabled by the gut-lung axis. This axis plays a crucial role in our respiratory health—including whether or not a person develops various lung diseases. By better understanding this connection, we may potentially be able to improve treatments for lung diseases and boost respiratory health.

Studies have revealed that people with respiratory conditions such as asthma, chronic obstructive pulmonary disease (COPD) and lung cancer often have an imbalanced gut microbiome—a condition known as dysbiosis.

For example, children with asthma often have lower levels of beneficial bacteria—such as *Bifidobacteria* and *Lactobacilli*, which are crucial for maintaining a healthy immune response. Similarly, patients with lung cancer may have lower levels of bacterial strains that help fight inflammation.

The reason an imbalance of gut bacteria can exacerbate lung conditions is because it increases inflammation and allows pathogens to thrive.

Respiratory infections can also alter gut microbiota, creating a vicious cycle that worsens health outcomes. For example, research in mice shows infections by respiratory syncytial virus, the influenza virus and SARS-COV-2 (the virus that causes COVID-19) can all lead to changes in the gut microbiome's composition.

COVID-19 infections may also lead to gut dysbiosis. And, this dysbiosis may still be present 30 days after being infected by the virus.

On the flip-side, research shows that when the gut microbiome is balanced, it may reduce respiratory symptoms. This is thanks to substances produced by beneficial gut bacteria, called short-chain fatty acids (such as butyrate and propionate). These substances have powerful anti-inflammatory properties.

Short-chain fatty acids have been found to travel through the bloodstream and can reduce inflammation in the lungs. This bolsters our defenses against respiratory infections and diseases.

In fact, research shows children who have higher levels of short-chain fatty acids in their gut have a lower risk of developing asthma. Short-chain fatty acids have also been linked to fewer COPD symptoms in adults.

## Targeting the gut

Given the important link between the gut and the lungs, researchers are now exploring whether treatments that target the gut microbiome can improve lung health.

One promising approach is the use of probiotics—live, beneficial bacteria that can restore balance to the gut microbiome.

Probiotics containing the bacterial species *Lactobacillus rhamnosus* and *Bifidobacterium lactis* have shown potential in reducing lung inflammation and improving respiratory health. A study involving asthmatic patients found that those who received probiotic supplements experienced significant improvements in lung function.

One reason probiotics may have this benefit is because they improve the balance of bacteria in the gut. When the bacteria are in balance, they produce short-chain fatty acids that help maintain the integrity of the lung's outer barrier, preventing pathogens from causing harm. By modulating how the immune system functions, this reduces lung inflammation and improves respiratory health.

Another approach is altering diet. High-fiber diets provide the fuel bacteria need to produce short-chain fatty acids. For instance, feeding mice a diet rich in fiber protected them against influenza by enhancing their immune responses.

Eating more fruits, vegetables and wholegrains (all great sources of fiber) can all support gut bacteria in producing short-chain fatty acids. Limiting processed foods, which often contribute to gut dysbiosis, could also play a crucial role in maintaining a healthy gut-lung axis.

Regular physical activity also promotes a diverse and healthy microbiome, further supporting respiratory health.

## Gut-lung axis

Understanding how the gut-lung axis can be manipulated could lead to groundbreaking treatments for the millions of people suffering from some sort of respiratory issue.

By focusing on the gut microbiome, we can potentially prevent and treat

lung diseases more effectively by addressing the underlying causes of the condition, reducing inflammation and modulating how the immune system functions. This would offer hope to the millions of people battling chronic lung conditions.

Emerging therapies, such as fecal microbiota transplants—where healthy microbiota from donors are transferred to patients with dysbiosis—have shown promise in early studies. While primarily used for gastrointestinal conditions, research shows it can also be effective in treating respiratory infections—including COPD, emphysema, to modulate dysbiosis in cystic fibrosis and improve lung function in amyotrophic lateral sclerosis .

There could also be potential for developing other kinds of personalized treatments—such as using probiotics that target the gut microbiome. Such approaches could not only improve respiratory health but also enhance well-being more generally.

The gut-lung connection is a powerful reminder of how interconnected our body systems truly are. By nurturing our gut microbiome, we can positively impact our respiratory health and potentially ward off lung diseases.



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