

# A HEALTHY ORAL MICROBIOME: THE KEY TO SYSTEMIC HEALTH

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## Is there more than one microbiome?

When we think of the human microbiome, we typically think of the gut microbiome in the lower gastrointestinal tract. However, thanks to many years of research, we have discovered many unique microbiomes throughout the body, such as the mouth, the urogenital tract, and even the skin. Each of these microbiomes exists to serve the body by providing a protective health benefit for their specific location and are considered to be well-balanced when the beneficial probiotic bacteria effectively compete with pathogenic bacteria. Additionally, our microbiomes exist to provide support to the immune system by decreasing inflammation from elevated cytokines.[1]

As science continues to explore the various microbiomes throughout the human body, the oral microbiome, in particular, has fascinated researchers. Besides being the second-largest microbiome (after the gut), the oral microbiome presents an incredibly biodiverse collection of microorganisms. With the advancement of genomic technologies, we can learn even more about the importance of this complex microbiome and its significant implications for our health.[2] Furthermore, research links an unhealthy oral microbiome to several systemic diseases,[3] including cardiovascular disease,[4][5] stroke,[6] and pneumonia.[7] Therefore, a **healthy oral microbiome is in fact a key component of our systemic health and plays a significant role in preventative medicine**. To understand how to properly support the oral microbiome, let us first examine its uniqueness in relation to the rest of the body.

## How is the oral microbiome unique?

The primary uniqueness of the oral microbiome is its diversity. This microbiome features a vast array of bacteria, viruses, yeast, archaea (species of methanogen producers), and protozoa. There are more than 1,000 species of bacteria within the oral microbiome.

Though this microbiome includes some familiar groups such as *actinobacteria*, *bacteroides*, and *firmicutes*, many species remain unidentified.[8] These groups include the commonly known *lactobacillus*, *bifidobacteria*, and *streptococcus* bacteria. These beneficial probiotic bacteria work to keep the oral biofilm healthy and balanced. The balance of the microbiome acts as a preventative measure against the many possible diseases that can affect the oral cavity.

An imbalance of beneficial bacteria and pathogenic bacteria, as well as environmental factors (such as diet and smoking) can cause dysbiosis, which leads to a broad array of dental health complications, including caries (tooth decay), periodontitis (gum disease), endodontic (root canal) infections, alveolar osteitis (dry socket), and tonsillitis.[9]

## How does an imbalanced oral microbiome contribute to dental cavities and gum disease?

Periodontal (gum) disease and dental caries are considered one of the most common diseases worldwide.[10] Because there is a delicate balance of probiotic and pathogenic microbiota within the oral cavity, even a slight change in diet can have profound health implications. One such example is the bacteria *Streptococcus mutans*. *S. mutans* is a typical inhabitant of the oral microbiome and does not necessarily pose a threat when the microbiome is healthy and balanced. However, under certain conditions and when the amount of *S. mutans* becomes excessive, it is the most common bacteria contributing to periodontal and dental caries. *S. mutans* and other bacteria form biofilms on the teeth, commonly known as dental plaque.[11] The bacteria within the biofilm metabolize sugars and produce acids that break down or demineralize tooth enamel and dentin, leading to dental caries. Therefore, a person's diet, specifically the amount of sugar in their diet, can create an environment where pathogenic bacteria thrive, causing an imbalanced microbiome and increasing the risk of developing dental caries. Furthermore, as the demineralization of the tooth continues, there is an inflammatory response to increased

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oxidative stress within the gums, leading to further damage to the tooth and the gums. This process can worsen tooth damage, pain, abscess, and lead to eventual tooth loss. [12]

## **How does oral health correlate with systemic health?**

When dysbiotic bacteria form biofilms, it can lead to more than poor dental health and gum disease. Research has found significant correlations between poor dental health and poor systemic health. Studies have shown that dental caries and periodontal disease can increase the risk of various systemic diseases, including cardiovascular disease, pulmonary disease, and autoimmune diseases such as rheumatoid arthritis. It is thought that the dysbiotic bacteria in the mouth increase the risk of these diseases either by direct invasion or possibly by causing an immune-inflammatory response that extends into the systemic circulation.[13] Treatment of periodontal disease can lead to a decrease in systemic inflammation, and thus treating or preventing the disease may decrease the risk posed by many other chronic health issues.[14]

Research indicates that both pulmonary and cardiac disease risk is increased with dental disease. Pneumonia is a leading cause of death in the United States, and dental disease can increase its risk.[15] The risk of other respiratory infections and many types of cardiovascular disease may also increase because of poor dental health. One study revealed that stroke risk was 400% higher in people with periodontitis.[16] Coronary heart disease and endocarditis risks are also elevated. In cardiovascular disease, it appears that direct bacterial invasion can increase complications, as well as an indirect activation of inflammation.<sup>13</sup>[17]

Rheumatoid arthritis is an autoimmune disease characterized by degenerative arthritis and an increased risk of cardiovascular disease. Dysbiosis in both the intestines and the mouth is associated with the development of rheumatoid arthritis.<sup>13</sup>[18] Further, the disease is associated with an autoimmune response to citrullinated proteins. Research indicates that infection with *Porphyromonas gingivalis*, a periodontopathogen, precedes the onset of autoantibodies to citrullinated protein and, therefore may be a precursor to rheumatoid arthritis.[19]

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## **Are there supplements that support the oral microbiome?**

The development of periodontitis and dental caries involves a multitude of pathological mechanisms, specifically microbial dysbiosis. Because we know that the oral microbiome impacts the health of the entire body, addressing microbial dysbiosis can help repair damage to the oral cavity and protect against further systemic health complications.

Research clearly indicates the necessity of adequately supporting the oral microbiome as a preventative measure against illness. One such method of supporting the oral microbiome is supplementation with probiotics. Research has shown an increase in protection against dental caries and a decrease in the overgrowth of *S. mutans* when supplementing with various probiotics. For example, oral tablets containing *Lactobacillus salivarius*, a thoroughly studied probiotic strain, have been shown to inhibit the growth of *S. mutans*.<sup>[20]</sup> Furthermore, when EGCG (of the form found in green tea), which is both an anti-inflammatory and an antioxidant, was administered alongside *L. salivarius*, the beneficial effect was even more substantial. Research found that this combination was also effective for inhibiting *P. gingivalis*,<sup>[21]</sup> which, in consideration of this pathogens' relationship to rheumatoid arthritis, may indicate the systemic benefit of supporting the oral microbiome. *Lactobacillus reuteri*, also a probiotic strain of bacteria, produces organic acids, hydrogen peroxide, and a bacteriocin-like compound that inhibits and reduces pathogenic bacteria.<sup>[22]</sup> As with *L. salivarius*, the use of oral tablets containing *L. reuteri*, were found to provide tangible benefits.<sup>[23]</sup> Indeed, based on this cited research, oral tablets appear to be an extremely effective way to target and support the oral microbiome.

Oxidative stress and inflammation play a role in the deterioration of tooth and gum health. To protect against these processes, supplementation with probiotics along with nutraceuticals is essential and can provide multiple benefits to support the health of the oral microbiome. Research has shown that supplementation with green tea extracts and cinnamon supports the decrease of oxidative stress and inflammation. Cinnamon is a well-known antimicrobial herb shown to benefit the oral microbiome.<sup>[24]</sup><sup>[25]</sup><sup>[26]</sup>

## **Conclusion**

Because the human body relies on beneficial bacteria in microbiomes to maintain proper health and functioning, it is evident that we must take deliberate action to support these essential organisms. In the case of the oral microbiome, while research has shown that many factors can positively or negatively impact a microbiome, it is clear that supplementation with probiotics and nutraceuticals is imperative to maintaining balance. The oral microbiome plays a crucial role in the health of the entire body, and patients, therefore, must take measures to preserve their dental health and, thus, their systemic health.

For more resources to support the oral microbiome, visit your Physician's Dashboard.

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