

What happens in the mouth ... doesn't stay in the mouth

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We know that what happens in the mouth doesn't stay in the mouth—but the oral cavity's connection to the rest of the body goes way beyond chewing, swallowing and digestion.

The healthy human oral microbiome consists of not just clean teeth and firm gums, but also energy-efficient [bacteria](#) living in an environment rich in blood vessels that enables the organisms' constant communication with immune-system cells and proteins.

A growing [body](#) of evidence has shown that this system that seems so separate from the rest of our bodies is actually highly influential on, and influenced by, our overall health, said Purnima Kumar, professor of periodontology at The Ohio State University, speaking at a science conference this week.

For example, type 2 diabetes has long been known to increase the risk for [gum disease](#). Recent studies showing how diabetes affects the bacteria in the mouth help explain how periodontitis

treatment that changes [oral bacteria](#) also reduces the severity of the diabetes itself.

Connections have also been found between oral microbes and rheumatoid arthritis, cognitive abilities, pregnancy outcomes and [heart disease](#), supporting the notion that an unhealthy mouth can go hand-in-hand with an unhealthy body.

"What happens in your body impacts your mouth, and that in turn impacts your body. It's truly a cycle of life," Kumar said.

When the American Association for the Advancement of Science (AAAS) themed this year's annual meeting around dynamic ecosystems, Kumar saw an opportunity to put the mouth on the map, so to speak, as a vibrant microbial community that can tell us a lot about ourselves.

"What is more dynamic than the gateway to your body—the mouth? It's so ignored when you think about it, and it's the most forward-facing part of your body that interfaces with the environment, and it's connected to this entire tubing system," she said. "And yet we study everything but the mouth."

Kumar organized a session at the AAAS meeting today (Feb. 8, 2021) that she titled "Killer Smile: The Link Between the Oral Microbiome and Systemic Diseases."

The oral microbiome refers to the collection of bacteria—some helpful to humans and some not—that live inside our mouths.

Kumar has led and collaborated on recent research further explaining the link between oral health and type 2 diabetes, which was first described in the 1990s. She was the lead author of a 2020 study that compared the oral microbiomes of people with and without type 2 diabetes and how they responded to nonsurgical treatment of chronic

periodontitis.

The team found that periodontitis allows bacteria—rather than the human host—to take the reins in determining the mix of microbes and inflammatory molecules in the mouth. Treating the gum disease led to eventual restoration of a normal host-microbiome relationship, but it happened more slowly in people with diabetes.

"Our studies have led up to the conclusion that people with diabetes have a different microbiome from people who are not diabetic," Kumar said. "We know that changing the bacteria in your mouth and restoring them back to what your body knows as healthy and friendly bacteria actually improves your glycemic control."

Though there remains a lot to learn, the basics of these relationship between the oral microbiome and systemic disease have become clear.

Oral bacteria use oxygen to breathe and break down simple molecules of carbohydrates and proteins to stay alive. Something as simple as not brushing your teeth for a few days can set off a cascade of changes, choking off the oxygen supply and causing microbes to shift to a fermentative state.

"That creates a septic tank, which produces byproducts and toxins that stimulate the immune system," Kumar said. An acute inflammatory response follows, producing signaling proteins that bacteria see as food.

"Then this community—it's an ecosystem—shifts. Organisms that can break down protein start growing more, and organisms that can breathe in an oxygen-starved environment grow. The bacterial profile and, more importantly, the function of the immune system changes," she said.

The inflammation opens pores between cells that line the mouth and [blood vessels](#) get leaky, allowing what have become unhealthy bacteria to enter circulation throughout the body.

"The body is producing inflammation in response to these bacteria, and those inflammatory products

are also moving to the bloodstream, so now you're getting hammered twice. Your body is trying to protect you and turning against itself," Kumar said. "And these pathogens are having a field day, crossing boundaries they were never supposed to cross."

The exact mechanisms of the links between the oral microbiome and specific diseases are complex and still being investigated, but the secret to a healthy mouth is no secret at all: Prevention of oral disease is as simple as brushing and flossing, and visiting the dentist twice a year for a professional cleaning, Kumar said.

The Office of the U.S. Surgeon General announced in 2018 that it had commissioned an update to its 2000 report on oral health, which was the first to be published on the topic.

Kumar said the national emphasis on oral health as an integral element of overall well-being bolsters her argument that the mouth should be an "equal opportunity player" in determinants of health.

"Putting the [mouth](#) back into the body—that's my goal here," she said.

More information: P.S. Kumar et al. Subgingival Host-Microbial Interactions in Hyperglycemic Individuals, *Journal of Dental Research* (2020). [DOI: 10.1177/0022034520906842](https://doi.org/10.1177/0022034520906842)

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