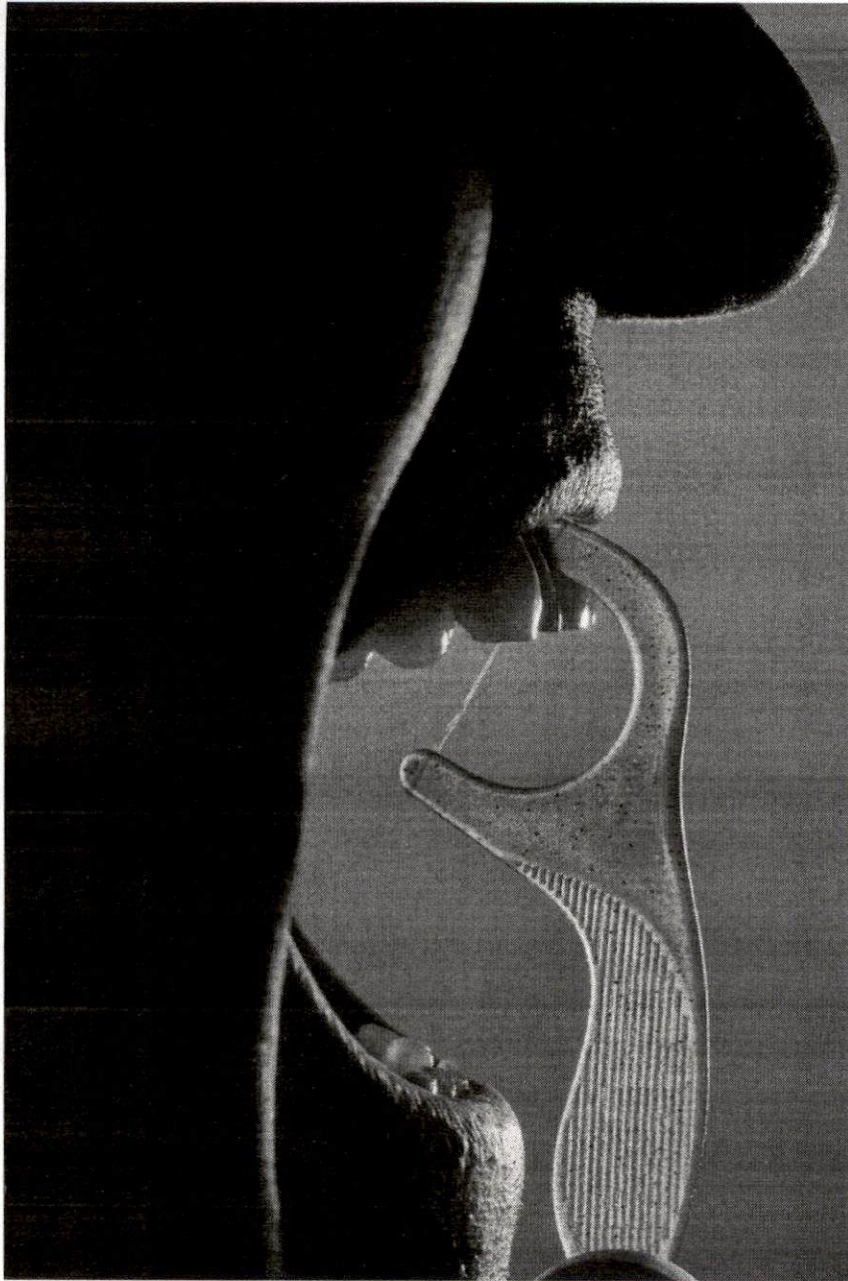


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Consistent brushing, flossing, and rinsing, are critical for preventing gum disease. Chronic gum infection sparks an ongoing war with the immune system, causing tissue damage throughout the body, even in the joints.

PHOTOGRAPH BY REBECCA HALE, NATIONAL GEOGRAPHIC

SCIENCE

Can gum infections trigger arthritis symptoms? There's growing evidence of a link.



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GIVE A GIFT

Researchers are exploring the connection between oral health and joint health—with surprising results.

BY SHARON GUYNUP



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Arthritis has plagued humanity for millennia. More than 2,000 years ago, Hippocrates, “the father of Western medicine,” weighed in on a possible cause. He recognized a connection between oral infection and joint issues. He suggested pulling teeth could cure arthritis. He was on the right track, sort of.

Infected gums release bacteria into the bloodstream where they are targeted as invaders by the immune system. And chronic gum infection sparks an ongoing war; immune cells course through the body, causing collateral damage by destroying tissue, even far from the mouth, including the joints.

“We discovered that the immune response to oral bacteria in the blood was associated with joint flare-ups,” says Camille Brewer, a Stanford University graduate student. She was lead author on recent study that provides insights into how oral disease and arthritis may be connected. With regularly scheduled blood tests for people with and without rheumatoid arthritis, her team discovered the first real-time correlation between oral pathogen levels in the blood and joint pain.

As the immune system attacks its own tissues, joints grow painful and swell; hands, wrists, and knees may become misshapen. “Within 10 years of onset, 50 percent of people with rheumatoid arthritis are disabled and unable to work,” says William Robinson, a Stanford professor of medicine.

Hundreds of studies over the past few decades have explored how severe oral disease may cause or worsen other serious diseases. “There’s increasing evidence that periodontitis (gum disease) exacerbates other inflammatory diseases,” says Thomas Van Dyke, vice president of clinical and translational research at the Massachusetts-based Forsyth Institute and professor at the Harvard School of Dental Medicine. These include heart disease, diabetes, Alzheimer’s disease, and rheumatoid arthritis (RA), which affects some one million people in the United States.

Greater understanding of the connection between oral health and joint health may yield new or improved arthritis treatment that prevents joint flare-ups.

Untangling the how and why

Scientists are still teasing out the mechanisms behind this relationship.

One clue came from a 2016 genetic analysis of dental plaque by a team

Oral Medicine at the University of Michigan School of Dentistry. It compared microbes in plaque samples from 22 RA patients with samples from 19 people without joint disease. The team discovered that simply having rheumatoid arthritis impacted the normal balance of bacteria in the mouth, even in patients who had seemingly healthy gums. “When you have periodontal disease or rheumatoid arthritis,” Kumar says, “you have dysbiosis”—a pathogen-rich environment in the mouth.

Other researchers have documented more serious periodontal disease in RA patients with advanced joint disease, including gums riddled with deep ulcerations and lost teeth. Advanced RA can also damage the heart, arteries, skin, and eyes.

Brewer's study didn't look at either the mouth or the joints: It tracked what was happening in the blood. The team took weekly blood samples from five women with rheumatoid arthritis for up to four years; two had active oral disease. For baseline data, researchers analyzed blood and joint fluid from 67 people with and without arthritis and/or gum disease.

They found that the same antibodies that recognize a particular chemical modification on several species of oral bacteria mistakenly attack proteins in the joints that display the same chemical changes. This has led to the hypothesis that antibodies multiplying in the blood to fight oral bacteria also target the joints.

However, Brewer's study was small, and it will take more research to prove that these antibodies are truly a smoking gun, Van Dyke says. Other inquiries will need to explore in greater detail exactly how these oral and joint diseases interact, and to identify the oral bacteria “driver species” that trigger or exacerbate joint problems.

Connecting the dots between the mouth and the joints

Ancient evidence of arthritis was documented in 1907, when researchers excavated Nubian skeletons—up to 4,000 years old—from Egyptian archaeological sites. They noted that “scarcely a single adult in the group had escaped osteo-arthritic changes in the bones.” There's also a long history of the struggle to maintain a healthy mouth: Egyptians treated infected gums with myrrh around the year 250.

Both remain serious health concerns today. Rheumatoid arthritis is the most common joint autoimmune disease, and former surgeon general David Satcher characterized periodontal disease as a “silent epidemic” in his landmark 2020 report on oral health. It currently affects nearly half of Americans over 30 and 70 percent by age 65.

While the dental and medical professions remain separate disciplines with little cross-consultation, the mouth is the gateway to the body. It offers a

warm, wet habitat for 700-plus species of bacteria that has been likened to a metropolis, second in size only to the gut microbiome.

This microbial community forms a sticky matrix of plaque, or biofilm, along the gumline and between teeth. It survives in a finely orchestrated dance with the immune system, Kumar says. Only a few species are pathogenic, she notes, and those are kept under control within this larger bacterial community.

Trouble starts when something tips the balance. Inflammation changes that ecosystem, triggering the rise of dysbiosis, Van Dyke says. Poor dental hygiene or medical conditions including rheumatoid arthritis impact this bacterial ecosystem in the mouth, allowing virulent species such *Porphyromonas gingivalis* and others to win turf wars.

Given the opportunity, these bad-actor microbes grow out of control, much like invasive species, infecting tissue below the gumline. This opens wounds that allow bacteria to slip into the bloodstream and travel throughout the body. In response, an army of immune cells—lymphocytes and macrophages—attack. While this immune onslaught keeps us healthy and fosters healing over the short term, ongoing inflammation wreaks havoc.

This seems to be at the heart of what is known as “the oral-systemic disease” link, Van Dyke says, often creating a double whammy. People with gum disease tend to have more severe rheumatoid arthritis. Rheumatoid arthritis sufferers develop infected gums at 20 times the rate of those without it.

Treating gum disease for whole-body health

Everybody has plaque in their mouths, but some people have a more robust inflammatory response. “There’s clearly a susceptibility factor; probably a genetic factor,” Van Dyke says.

While still early, convincing data is emerging that people with periodontitis are at greater risk of developing rheumatoid arthritis and other inflammatory illnesses. Van Dyke adds that those with both systemic disease and oral disease are potentially in the crosshairs for other health “events,” such as worsening diabetes, heart attack, or joint flare-ups.

To find out if a healthier mouth could help RA patients, Kumar and her team treated their oral disease, scaling and root-planing their teeth, a type of deep dental cleaning. They compared inflammation markers in the mouth and systemic markers in the blood measured before and after. The markers that were specific for rheumatoid arthritis dropped.

That shows that “along with treating your arthritis, you should also be

swollen gums are not normal. "If you're spitting blood into the sink when you brush, seek professional care," she advises. Simple cleaning, deep cleaning, or surgery can help build back lost tissue.

It's clear that consistent brushing, flossing, and rinsing are critical for everyone, Kumar says. "If you care about your body, you need to protect the doors to your house."

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