

Gum inflammation parallels novel 'cytokine score'

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Researchers at NYU College of Dentistry have developed a single score to describe the level of cytokines in saliva, and this score is linked with the severity of clinical gum inflammation, according to a study published

in the journal *PLOS ONE*.

While more research is needed to test the "[cytokine](#) score," it could hold promise for measuring how well a patient responds to treatment for [gum disease](#), predicting gum disease recurrence, or detecting ongoing inflammation related to systemic diseases.

"Periodontal inflammation is not just apparent upon examination, but is reflected in the patient's saliva," said Angela Kamer, DMD, MS, Ph.D., associate professor of the Ashman Department of Periodontology & Implant Dentistry at NYU Dentistry and the study's senior author.

Periodontal (or gum) disease is a chronic, [inflammatory condition](#) that affects [roughly half of adults](#). Marked by inflamed gums, which can bleed and detach from the tooth, [periodontal disease](#) results from the complex interaction between an imbalance of healthy and unhealthy bacteria under the gumline and the immune system's response. This response produces high levels of cytokines—small proteins that signal the immune system—in the inflamed gums, especially [pro-inflammatory cytokines](#) such as IL-8, IL-1 β , IL-6 and TNF α .

Periodontal disease is also associated with systemic conditions including cardiovascular disease, diabetes, and Alzheimer's. Scientists believe that gum inflammation contributes to these conditions through both indirect pathways (cytokines boosting systemic inflammation) and direct pathways (cytokines traveling to a specific organ like the heart or brain), but studying this is difficult due to the challenge of measuring cytokines in the fluid found deep in the pockets in the gums.

Fortunately, cytokines are also found in the saliva, which is easier to collect. In the *PLOS ONE* study, the researchers wanted to know if clinically detected gum inflammation could predict the level of cytokines found in saliva.

"Salivary cytokines are a window into the molecular make-up of the oral environment," said Vera Tang, DDS, MS, clinical assistant professor of the Ashman Department of Periodontology & Implant Dentistry at NYU Dentistry and the study's first author.

The researchers evaluated the gums and saliva of 67 adults, ages 45 and older, who had some degree of periodontal disease but were otherwise healthy. To measure their clinical periodontal inflammation, the researchers used a formula called the Periodontal Inflamed Surface Area (PISA), which is calculated using measurements of the depth of pockets in the gums and bleeding upon probing. PISA provides a single measure of periodontal inflammation; a higher PISA score indicates worse inflammation.

Participants were also asked to spit into sterile tubes to capture saliva samples, which were then analyzed to measure a range of both pro- and anti-inflammatory cytokines: IL-1 β , IL-6, IL-8, IL-13, TNF- α , and IL-10. Led by statistician Malvin Janal, Ph.D., the researchers used two different ways (the Cytokine Component Index and Composite Inflammatory Index) to combine these cytokines into a single score.

They found that PISA scores were significantly associated with the new cytokine scores, independent of other factors including age, gender, smoking, and body mass index (BMI). The higher a cytokine score, the greater the periodontal inflammation.

"This demonstrates that a single score encompassing several salivary cytokines correlates with the severity of periodontal inflammation," said Leena Palomo, DDS, MSD, professor and chair of the Ashman Department of Periodontology & Implant Dentistry at NYU Dentistry, and a study co-author.

The researchers caution that more research is needed to validate the

cytokine score in patients with different health conditions, as well as those with all levels of periodontal disease, including healthy gums and early-stage gum disease. However, if the cytokine score is validated in larger and more diverse patient populations, it could be used to better understand periodontal disease progression and recurrence, as well as the potential connection to other systemic conditions.

"With treatment for gum disease, such as scaling and planing, we know that the PISA score goes down. It would be interesting to see if the cytokine score also drops—or, if it persists, look into what that means," added Kamer. "Is it picking up an underlying cause, like ongoing [inflammation](#) from systemic disease? Or if someone has a hyperinflammatory response, which we'd know from a high cytokine score, can it predict if periodontitis will recur or progress in the future? We hope to look into these questions in future research."

More information: Periodontal Inflamed Surface Area (PISA) Associates with Composites of Salivary Cytokines, *PLoS ONE* (2023). DOI: [10.1371/journal.pone.0280333](https://doi.org/10.1371/journal.pone.0280333)

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