SIMPLY TEST®

CAP ACCREDITED
COLLEGE of AMERICAN PATHOLOGISTS

Oral Microbiome Dysbiosis &

# PERIODONTAL DISEASE

Date of Issue: Jan 2026

MKTG-DOC-060 V1.0

2026

# White Paper

SIMPLY TEST®

## Executive Summary

Periodontal disease is a chronic condition driven by dysbiosis of the oral microbiome accompanied by localized inflammation which can, when left untreated, contribute to persistent systemic inflammation. This systemic inflammatory burden is associated with increased risk and progression of multiple systemic diseases, including cardiovascular disease, metabolic disorders, autoimmune conditions, certain malignancies, and adverse pregnancy outcomes. Increasing recognition of the oral–systemic connection underscores the importance of periodontal health as part of comprehensive preventive and integrative medical care. Periodontal disease should be considered a modifiable inflammatory condition that contributes to increased risk for multiple significant systemic diseases.

## Background and Pathophysiology

Periodontal disease is a result of dysbiosis of the oral microbiome. The oral microbiome is a community of microorganisms which live in harmony with the host. When that harmony is disrupted, dysbiosis occurs and a pathogenic community evolves which elicits a chronic inflammatory response. This response is characterized by:

- Local production of pro-inflammatory cytokines and proteolytic enzymes
- Progressive destruction of periodontal tissues
- Chronic inflammation characterized by sustained activation of local and systemic immune responses
- Gingival epithelial barrier disruption allowing oral bacteria, bacterial components, and inflammatory mediators, to enter the systemic circulation
- Recurrent bacteremia and sustained cytokine release contributing to chronic low-grade systemic inflammation

## Pathway to Elevated Systemic Disease Risk

Multiple biologically plausible mechanisms connect periodontal inflammation to systemic disease processes, including:

- Elevated circulating inflammatory mediators (e.g., C-reactive protein, interleukin-6, tumor necrosis factor–alpha)
- Endothelial dysfunction and impaired vascular homeostasis
- Immune dysregulation and altered host response
- Metabolic effects influencing insulin resistance and lipid metabolism

Collectively, these mechanisms provide a framework by which periodontal disease may contribute to disease initiation, progression, or exacerbation in susceptible individuals.

## Systemic Conditions Associated with Periodontal Disease

Robust associations have been reported between periodontal disease and increased risk of

- Cardiovascular disease (Heart Attack)
- Cerebrovascular events (Stroke)
- Metabolic (Type 2 Diabetes Mellitus, Metabolic Syndrome, Liver and Kidney Disease)
- Autoimmune and Neurological (Rheumatoid Arthritis, Multiple Sclerosis, Alzheimer Disease)
- Adverse Pregnancy Outcomes (Preterm and Low Birth Weight)
- Malignancy (notably Colorectal, Esophageal, Pancreatic)

These associations are supported by large observational studies and meta-analyses across diverse populations.

## Impact of Periodontal Treatment

Interventional studies demonstrate that effective periodontal therapy can reduce systemic inflammatory markers and improve surrogate measures of vascular and metabolic health. While such findings do not establish direct causality for all systemic disease outcomes, they support the concept that periodontal inflammation contributes meaningfully to overall inflammatory burden.

## Prevention of Elevated Systemic Disease Risk

Management, the diagnosis of, and prevention and treatment of, asymptomatic and symptomatic periodontal disease, are the cornerstones of reducing associated systemic disease risk by improving oral health and reducing chronic inflammation. From a clinical and preventive perspective, periodontal disease should be recognized as:

- A chronic inflammatory condition with elevated systemic disease risk
- A modifiable contributor to systemic inflammation

## Conclusion

Periodontal disease represents more than an oral health concern; it is a chronic inflammatory condition with far-reaching systemic effects. Recognition of its role as a contributor to systemic inflammation supports its inclusion in comprehensive, preventive, and integrative approaches to healthcare. Addressing periodontal inflammation may help reduce downstream disease risk and improve overall health. Despite growing evidence linking oral and systemic health, medicine and dentistry remain largely siloed. Many physicians receive limited training in recognizing oral conditions that contribute to systemic disease; while many dental professionals lack formal education on the broader medical implications of oral pathology. Oral health is fundamentally interconnected with overall health, and emerging data suggest that enhanced collaboration between medical and dental providers can meaningfully improve patient outcomes. (The Medical-Dental Divide is Harming Your Patients. Medscape October 08, 2025) The availability of the SimplyTest Oral Health saliva-based assessment—useful in both symptomatic and asymptomatic individuals—supports an evidence-based approach to the identification and management of periodontal disease, enabling earlier intervention and mitigation of associated systemic health risks.

## SimplyTest Oral Health

The SimplyTest Oral-Systemic panel is a comprehensive, saliva-based test that features multi-organism detection and quantification for 17 periodontal and systemic oral health pathogens. Organisms are amplified and detected using fluorescence-based technology during PCR amplification to measure DNA or RNA targets in real time. The platforms combine precise thermal cycling, high-resolution optical detection, and advanced software algorithms to enable accurate quantification. The SimplyTest "PERIO oral—Systemic" is more than an oral health test. It's a clinical tool for deeper insight into chronic disease drivers, microbial burden, and inflammation that often begins in the mouth, but doesn't stay there.

These data are provided in the systemic health report which identifies elevated oral pathogen levels that peer-reviewed research associates with systemic health risks.

## Systemic Disease Risk

- Identifies patient-specific oral pathogens that peer-reviewed studies associate with systemic health risks
  - This risk is reported as the Periodontal Pathogen Load Index which quantifies a patient's pathogen burden relative to the reference population
  - Raw patient specific pathogen copy numbers are converted into standardized risk scores (0-100) that indicate whether a patient's bacterial load is low, average, or high compared to the reference population
- Health risk scores (0–100) reflect relative oral pathogen burden compared to our reference population
- Risk scores are not diagnostic or predictive of disease, but indicate increased risk associated with elevated periodontal pathogens
- Results should be interpreted by a qualified healthcare provider in the context of the patient's overall clinical and systemic health profile
  - These data are provided in the systemic health report
  - The systemic health report identifies elevated oral pathogen levels that peer-reviewed research associates with systemic health risks. The report shows:
    - All potentially contributing pathogens (as button icons) for each systemic risk score
    - Shows pathogens that DID contribute to elevate the patient's unique profile as brightly colored icons
    - Show pathogens that DID NOT contribute to elevate the patient's unique profile as dim/greyed out icons
- Health risk scores are not disease predictions, but identify patients at risk for developing systemic diseases associated with high levels of periodontal pathogens
- Patients are encouraged to work with their dentist to lower oral pathogen levels and reduce the periodontal component of systemic health risk, and with their physician to evaluate the patient's complete systemic health risk profile
- Organisms shown in the report reflect the patient's own unique profile
- Emphasis is placed on the fact that this test reflects risk, does not imply disease
- The utility of this information is to manage patients early in the course of disease particularly when the disease is "silent"
- According to a recent scientific statement from the American Heart Association the association between periodontitis and atherosclerotic cardiovascular disease is stronger than previously recognized and that treatment of periodontal disease can reduce inflammatory factors and improve intermediate risk markers associated with heart disease (Treating Gum Disease Improves Markers Associated With Heart Disease Risk. Statement Suggests_Medscape—December 30, 2025)

## Association Versus Causality

Current evidence supports a strong association between periodontal disease and multiple systemic diseases, mediated in part by chronic systemic inflammation, immune dysregulation, and microbial translocation. While periodontal disease should not be considered a sole causal factor, it is widely recognized as a contributing and exacerbating risk factor within multifactorial disease pathways. Reductions in systemic inflammatory markers following periodontal treatment further support a biologically plausible mechanistic link.

**References:**

**Oral Microbiome Dysbiosis and Periodontal Disease: The Pathway to Chronic Inflammation and Elevated Systemic Disease Risk**


1. Lockhart PB, Bolger AF, Papapanou PN, et al. Periodontal disease and atherosclerotic vascular disease: does the evidence support an independent association? A scientific statement from the American Heart Association. Circulation. 2012;125(20):2520-2544.
2. Sanz M, Marco Del Castillo A, Jepsen S, et al. Periodontitis and cardiovascular diseases: consensus report. J Clin Periodontol. 2020;47(3):268-288.
3. Armitage GC, et al. Periodontal disease and cardiovascular disease: an umbrella review. J Clin Periodontol. 2024.
4. Yan Y, Zhan Y, Wang X, et al. Periodontitis and risk of heart failure: a population-based cohort study. Front Cardiovasc Med. 2022;9:936308.
5. Meng X, Chen X. Periodontitis and stroke risk: a systematic review and meta-analysis. J Clin Periodontol. 2025.
6. Demmer RT, Jacobs DR Jr, Desvarieux M. Periodontal disease and incident type 2 diabetes. Diabetes Care. 2008;31(7):1373-1379.
7. Winning L, et al. Periodontitis and incident type 2 diabetes: a prospective cohort study. J Clin Periodontol. 2017;44(3):266-274.
8. Borgnakke WS. Does treatment of periodontal disease influence systemic disease? Periodontol 2000. 2020;83(1):277-291.
9. López-Valverde N, et al. Periodontal treatment and glycemic control in diabetes: overview of systematic reviews. Healthcare (Basel). 2024;12(3):312.
10. Chambrone L, et al. Periodontitis and chronic kidney disease: a systematic review and meta-analysis. J Periodontol. 2013;84(10):1368-1379.
11. Yang F, et al. Association between chronic periodontitis and chronic kidney disease: meta-analysis. BMC Oral Health. 2024;24:112.
12. He T, et al. Periodontal disease and prognosis of chronic kidney disease: systematic review and meta-analysis. Clin Oral Investig. 2025.
13. Xu F, et al. Periodontitis and non-alcoholic fatty liver disease: systematic review and meta-analysis. Oral Dis. 2023.
14. Lyu Z, et al. Chronic periodontitis and NAFLD: mechanisms and clinical evidence. Front Med. 2025.
15. Kaur S, White S, Bartold PM. Periodontal disease and rheumatoid arthritis: a systematic review. J Dent Res. 2013;92(5):399-408.
16. Dolcezza S, et al. Relationship between rheumatoid arthritis and periodontal disease: meta-analysis. Clin Oral Investig. 2024.
17. Mustufvi Z, et al. Effect of periodontal treatment on rheumatoid arthritis disease activity: systematic review. Rheumatol Adv Pract. 2022;6(1):rkac015.
18. Tsimpiris A, et al. Chronic periodontitis and multiple sclerosis: systematic review and meta-analysis. Mult Scler Relat Disord. 2023;72:104593.
19. García-Ríos P, et al. Oral manifestations in multiple sclerosis: systematic review. J Oral Pathol Med. 2025.
20. Momen-Heravi F, et al. Periodontal disease, tooth loss, and colorectal cancer risk. Int J Cancer. 2017;140(3):646-652.
21. Espejo-Carrera RE, et al. Periodontitis as a risk factor for colorectal cancer: meta-analysis. Cancers (Basel). 2025;17(2):215.
22. Brennan CA, Garrett WS. Fusobacterium nucleatum—symbiont, opportunist, and oncobacterium. Nat Rev Microbiol. 2019;17(3):156-166.
23. Chen QL, et al. Tooth loss and risk of esophageal cancer: dose-response meta-analysis. Sci Rep. 2016;6:18900.
24. Michaud DS, et al. A prospective study of periodontal disease and pancreatic cancer risk. J Natl Cancer Inst. 2007;99(2):171-175.
25. Yu J, et al. Dental health and pancreatic cancer risk: a nationwide cohort study. Br J Cancer. 2022;127(4):729-737.
26. Fan X, Alekseyenko AV, et al. Human oral microbiome and pancreatic cancer. Gut. 2018;67(1):120-127.
27. Daalderop LA, Wieland BV, et al. Periodontal disease and pregnancy outcomes: overview. J Clin Periodontol. 2018;45(1):4-17.
28. Wu J, et al. Periodontal interventions and adverse pregnancy outcomes: systematic review. BMC Pregnancy Childbirth. 2024;24:88.
29. Le QA, et al. Periodontitis and preeclampsia: meta-analysis. J Periodontol. 2022;93(2):234-245.
30. Offenbacher S, et al. Effects of periodontal therapy on preterm birth. Obstet Gynecol. 2009;114(3):551-559.
31. Tonetti MS, Van Dyke TE; Working Group 1 of the Joint EFP/AAP Workshop. Periodontitis and atherosclerotic cardiovascular disease: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. J Periodontol. 2013;84(4 Suppl):S24-S29. doi:10.1902/jop.2013.134001.
32. Hajishengallis G. Periodontitis: from microbial immune subversion to systemic inflammation. Nat Rev Immunol. 2015;15(1):30-44. doi:10.1038/nri3785.
33. Kebschull M, Demmer RT, Papapanou PN. "Gum bug, leave my heart alone!"—epidemiologic and mechanistic evidence linking periodontal infections and atherosclerosis. J Dent Res. 2010;89(9):879-902. doi:10.1177/0022034510375281.
34. Preshaw PM, Alba AL, Herrera D, et al. Periodontitis and diabetes: a two-way relationship. Diabetologia. 2012;55(1):21-31. doi:10.1007/s00125-011-2342-y.
35. 35. Kinane DF, Stathopoulou PG, Papapanou PN. Periodontal diseases. Nat Rev Dis Primers. 2017;3:17038. doi:10.1038/nrdp.2017.38.
36. Lamont RJ, Koo H, Hajishengallis G.The oral microbiota: dynamic communities and host interactions. Nat Rev Microbiol. 2018;16(12):745-759. doi:10.1038/s41579-018-0089-y.
37. Teles R, Teles F, Frias-Lopez J, Paster B, Haffajee A. Lessons learned and unlearned in periodontal microbiology. Periodontol 2000. 2013;62(1):95-162.doi:10.1111/prd.12010.
38. Hajishengallis G, Lamont RJ. Polymicrobial communities in periodontal disease: their quasi-organismal nature and dysbiotic host responses. Trends Microbiol. 2012;20(12):558-565.doi:10.1016/j.tim.2012.09.003.