Oral Systemic Link

The link between inflammation, oxidative stress and systemic disease is an important area of interest in vascular medicine. Both the New England Journal of Medicine and the Journal of the American College of Cardiology have published papers affirming that inflammation plays a key role in the development and progression of not only coronary artery disease but also of systemic atherosclerosis. Also, several inflammatory markers have been identified as risk factors in the development of heart and vascular disease. Because oral infection and periodontal disease lead to inflammation and oxidative stress, the link between oral health and cardiovascular disease is becoming increasingly clear. Several other studies have been published affirming the link between periodontal disease and vascular disease, including heart attack and stroke.

Arterial plaque development and dangers
Atherosclerosis and plaque development result from LDLs (or low-density lipoproteins, the bad cholesterol) and inflammatory cells entering the endothelial space within an artery. As plaques develop within the walls of an artery, they cause blockage. Even worse, plaque rupture leads to development of a thrombus (or blood clot) and ultimately to heart attack or, in the brain, stroke.

Arterial disease risk factors including inflammation
Physicians have known for a long time that certain risk factors are associated with arterial disease. These include high circulating levels of glucose (e.g., from diabetes), nicotine use, high cholesterol, high blood pressure, stress, chronic infections, and other factors. It appears that these factors cause damage to the endothelium, i.e., the lining of an artery, allowing the progress of plaque development.

Studies linking inflammation and vascular disease
These studies point to a link between systemic inflammation and vascular disease. In fact, several recent studies have affirmed the link.

- Inflammation plays a key role in the development and progression of not only coronary artery disease, but in systemic atherosclerosis. (New England Journal of Medicine, April 2005)
- Several inflammatory markers have been identified as risk factors in the development of heart and vascular disease. (Journal of the American College of Cardiology, May 2008)
- Inflammation is now recognized as being pivotal in the pathogenesis of atherosclerosis. (American Heart Journal, July 2005; 150 (1) 11-18)
- A landmark study known as the Jupiter Trial, followed more than 17,000 men and women who had normal cholesterol levels and no history of heart disease, but who did have high levels of C-reactive protein (CRP), a marker for systemic inflammation. Half the group were given a statin, the potent anti-inflammatory rosuvastatin (trade-named Crestor®). The other half received a placebo. The statin group reduced their LDL level by 50 percent. They also reduced their level of CRP by 37 percent. When the study looked at the occurrence of heart attack and stroke in the two groups, they found that those taking the statin had a 54 percent lower risk of heart attack and a 48 percent lower risk of stroke.

Studies linking periodontal disease, inflammation, and vascular disease
Additional studies have focused specifically on periodontal disease as a key factor in the inflammation leading to vascular disease.
• There is a statistically significant correlation between the number of periodontal pathogens present in subgingival biofilm samples and the presence of coronary heart disease. (CORODONT study, Archives of Internal Medicine, 2006; 166:554-559)

• Periodontal disease with elevated bacterial exposure is associated with CHD events and early atherogenesis (CIMT), suggesting that the level of systemic bacterial exposure from periodontitis is the biologically pertinent exposure with regard to atherosclerotic risk. (Journal of Periodontology, Dec. 2007; 78(12):2289-302)

• Subjects with advanced periodontal disease exhibit endothelial dysfunction and evidence of systemic inflammation (elevated CRP levels) possibly placing them at increased risk for cardiovascular disease. (Arteriosclerosis, Thrombosis, and Vascular Biology, 2003; 23:1245)

• CRP levels are elevated three times higher in patients with combination of periodontal disease and coronary artery disease, versus subjects with either disease alone. (Clinical and Diagnostic Laboratory Immunology, March 2002, p. 425-432, Vol. 9, No. 2)

• Periodontitis results in higher systemic levels of CRP, IL-6 and neutrophils. These elevated inflammatory factors may increase inflammatory activity in atherosclerotic lesions potentially increasing the risk for cardiac or cerebrovascular events. (Periodontology, 2000; 71:1528-1534)

• A significant association was observed between tooth loss levels and carotid artery plaque prevalence. (INVEST study, Stroke, 2003; 34:2120-2125)

• Overall periodontal bacterial burden was related to carotid IMT, a marker of carotid plaque development. This relationship was specific to causative bacterial burden and the dominance of etiologic bacteria in the observed microbiological niche. This provides evidence of a direct relationship between periodontal microbiology and subclinical atherosclerosis in the carotid artery. (Circulation, 2005; 111:576-582)

• A consensus paper on the relationship between heart disease and gum disease was published concurrently in the American Journal of Cardiology and the Journal of Periodontology. The study confirmed that inflammation is a major risk factor for heart disease, and periodontal disease may increase the inflammation level throughout the body. A number of studies show that patients with periodontal disease have an increased risk for cardiovascular disease. Current evidence indicates that management of one disease may reduce the risk for the other.

The data and published studies are accumulating to substantiate that infection and periodontitis and inflammation are closely associated with coronary heart disease. Further, infection, periodontitis and inflammation are associated with atherosclerosis in the carotid artery.

***Featured Content***

**HEALTH ECONOMICS 2010**

**The Effect of Dental Care on Cardiovascular Disease Outcomes: an Application of Instrumental Variables in the Presence of Heterogeneity and Self-Selection**

*This is an extensive epidemiologic study based on the Health and Retirement Study (HRS), a biennial longitudinal survey of individuals over 50 years old (and spouses). The data from 1996, 1998, 2000, 2002.*

**IADR 2011 POSTER 3632, BERGER T, ET. AL.**

**Association of Oral Inflammation and Symptoms of Active Rheumatoid Arthritis**

*This case report presents dental treatment of oral inflammation and subsequent reduction of symptoms of active rheumatoid Arthritis (RA).*

**THE JOURNAL OF SEXUAL MEDICINE 2009;6:1111-1116**

**Erectile dysfunction might be associated with chronic periodontal disease: two ends of the cardiovascular spectrum**

*Men in their 30s to mid-40s with chronic periodontal disease (CPD) exhibited an increase in mild and moderate to severe erectile dysfunction (ED) in this study. These preliminary findings are consistent with.*

**NEUROPSYCHIATRIC DISEASE AND TREATMENT 2008;4(5) 865-876**

**Inflammation as a potential mediator for the association between periodontal disease and Alzheimer’s disease**

*Periodontal disease (PDD) is associated with increased risk of cardiovascular disease, cerebrovascular disease, and mortality in many studies, while other studies have begun to suggest an association of PDD with Alzheimer’s disease.*
Rheumatoid arthritis and periodontal disease

The prevalence of periodontal disease has increased two-fold among patients with rheumatoid arthritis (RA) compared to the general population. This increased prevalence reflects shared pathogenic mechanisms, including an increased prevalences of the...

Peer Reviewed Scientific Articles

- **Periodontal systemic associations: review of the evidence**
  This review found that while the definitions used to identify periodontitis were fairly heterogeneous, very few studies met a stringent threshold for periodontitis. Published evidence supports modest associations between some, although not all, of the diseases and conditions reviewed: respiratory disease, chronic kidney disease, rheumatoid arthritis, cognitive impairment, obesity, metabolic syndrome and cancer. J Clin Periodontology 2013; 40 (Suppl. 14): S8-S19 doi: 10.1111/jcpe.12064

- **Infection and inflammatory mechanisms**
  This introductory article examines the potential mechanisms that may play a role in the associations between periodontitis and the systemic conditions being considered in the EFP/AAP Workshop in Segovia, Spain. Three basic mechanisms have been postulated to play a role in these interactions: metastatic infections, inflammation and inflammatory injury, and adaptive immunity. The potential role of each alone and together is considered...

- **Adverse pregnancy outcomes (APOs) and periodontal disease: pathogenic mechanisms**
  Further investigation is necessary to fully translate basic research into clinical studies and practice regarding potential biological pathways underlying the possible association between periodontal disease and adverse pregnancy outcomes. Understanding the systemic virulence potential of the individual's oral microbiome and immune response may be a distinctly different issue from categorizing the nature of the challenge using clinical signs of periodontal disease. Therefore...

- **Periodontitis and systemic diseases: a record of discussions of working group 4 of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases**
  Research into possible associations between periodontitis and various systemic diseases and conditions do not imply causality, and establishment of causality will require new studies. Precise and community-agreed case definitions of periodontal disease states must be implemented systematically to enable consistent and clearer interpretations. Studies should focus on robust disease outcomes and avoid surrogate endpoints. Read full article

- **Periodontitis and atherosclerotic cardiovascular disease: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases**
  There is consistent and strong epidemiologic evidence that periodontitis imparts increased risk for future cardiovascular disease; and while in vitro, animal and clinical studies support the interaction and biological mechanism, intervention trials to date are not adequate to draw further conclusions. Well-designed intervention trials on the impact of periodontal treatment on prevention of atherosclerotic cardiovascular disease with hard clinical outcomes are needed. Read...

- **Periodontal bacterial invasion and infection: contribution to atherosclerotic pathology**
  Despite the lack of evidence that periodontal bacteria obtained from human atheromas can cause atherosclerosis in animal models of infection, attainment of proofs 1 to 6 (out of 7) provides support that periodontal pathogens can contribute to atherosclerosis. Gathered data were categorized into 7 "proofs" of evidence that periodontal bacteria: 1) disseminate from the oral cavity and reach systemic vascular tissues; 2)...

- **Inflammatory mechanisms linking periodontal diseases to cardiovascular diseases**
  Inflammatory mechanisms may be thought to act in concert to increase systemic inflammation in periodontal disease and to promote or exacerbate atherogenesis. However, proof that the increase in systemic inflammation attributable to periodontitis impacts inflammatory responses during atheroma development, thrombotic events or myocardial infarction or stroke is lacking. J Clin Periodontology 2013; 40 (Suppl. 14): S51-S69 doi: 10.1111/jcpe.12060
• The epidemiological evidence behind the association between periodontitis and incident atherosclerotic cardiovascular disease
This review included evidence for an increased risk of atherosclerotic cardiovascular disease (ACVD) in patients with periodontitis compared to patients without; however, this may not apply to all groups of the population. There is insufficient evidence for an association between periodontitis and the incidence of secondary cardiovascular events. J Clin Periodontology 2013; 40 (Suppl. 14): S70-S84 doi: 10.1111/jcpe.12062

• Evidence that periodontal treatment improves biomarkers and CVD outcomes
Periodontal therapy triggers a short-term inflammatory response followed by (a) a progressive and consistent reduction of systemic inflammation and (b) an improvement in endothelial function. There is, however, limited evidence that these acute and chronic changes will either increase or reduce cardiovascular disease (including coronary heart disease, stroke, congestive heart failure and peripheral artery disease) burden of individuals suffering from periodontitis in...

• A review of the evidence for pathogenic mechanisms that may link periodontitis and diabetes
This review of the molecular and cellular processes that may potentially link periodontal disease and diabetes included the pathogenic roles of cytokines and metabolic molecules (e.g., glucose, lipids) and the role of periodontal bacteria. Paradigms for bidirectional relationships between periodontitis and diabetes are discussed and opportunities for elaborating these models are considered. There is a real need for longitudinal clinical studies using...

• Effect of periodontal disease on diabetes: systematic review of epidemiologic observational evidence

• Evidence that periodontal treatment improves diabetes outcomes: a systematic review and meta-analysis
Although this review found a modest reduction in Hemoglobin A1C (HbA1c) as a result of periodontal therapy in subjects with type 2 diabetes, there is limited confidence in the conclusion due to a lack of multi-center trials of sufficient sample size. J Clin Periodontology 2013; 40 (Suppl. 14): S153-S163 doi: 10.1111/jcpe.12084

• Periodontitis and adverse pregnancy outcomes: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases
Maternal periodontitis directly and/or indirectly have potential to influence the health of the fetal-maternal unit. Two major pathways have been identified, one direct, in which oral microorganisms and/or their components reach the feto-placental unit, and one indirect, in which inflammatory mediators circulate and impact the fetal-placental unit. Given the current evidence, various treatment strategies could be evaluated that consider specific target populations...

• Epidemiology of association between maternal periodontal disease and adverse pregnancy outcomes -- systemic review
There is still debate regarding potential relationships between maternal periodontitis during pregnancy and adverse pregnancy outcomes. This review concludes maternal periodontitis is modestly but independently associated with adverse pregnancy outcomes, but the findings are impacted by periodontitis case definitions. The authors suggest that future studies employ both continuous and categorical assessments of periodontal status. Additional, the authors discourage further use of the...

• The effects of periodontal treatment on pregnancy outcomes
Preterm infants are at greater risk than term infants for physical and developmental disorders. Morbidity and mortality increases as gestational age at delivery decreases. Observational studies indicate an association between poor periodontal health and risk for preterm birth or low birth weight, making periodontitis a potentially modifiable risk factor for prematurity. This study determines that non-surgical periodontal therapy, scaling and root planing, does...

• Experimental Gingivitis Induces Systemic Inflammatory Markers in Young Healthy Individuals: A Single-Subject Interventional Study
Bacterial-induced gingival low-level inflammation induced a systemic increase in inflammatory markers, which are also known as surrogate markers of atherosclerotic plaque development. Dental hygiene almost completely reversed this experimental inflammatory process, suggesting that appropriate dental prophylaxis may also limit systemic markers of inflammation with natural gingivitis. READ THE FULL ARTICLE

• No proof that gum disease causes heart disease or stroke
Despite popular belief, gum disease hasn't been proven to cause atherosclerotic heart disease or stroke, and treating gum disease hasn't been proven to prevent heart disease or stroke, according to a new scientific statement published in Circulation, an American Heart Association journal. Keeping teeth and gums healthy is important for your overall health. However, an American Heart Association expert committee -- made...
• **Chronic Oral Infection with Porphyromonas gingivalis Accelerates Atheroma Formation by Shifting the Lipid Profile**

Periodontal infection itself does not cause atherosclerosis, but it accelerates it by inducing systemic inflammation and deteriorating lipid metabolism, particularly when underlying hyperlipidemia or susceptibility to hyperlipidemia exists, and it may contribute to the development of coronary heart disease.

• **So Why Do We Call It the Oral-Systemic Health Connection?**

Should oral health and systemic health actually be considered two different entities? We propose that the associations between oral diseases and other diseases elsewhere in the body be discussed within the context of oral and overall health, much in the same way a physician would. Even if we began using the words ‘oral’ and ‘non-oral’ health, this would serve our purposes better than...

• **Oral Health Behaviors, Periodontal Disease, and Pathogens in Preeclampsia: A Case-Control Study in Korea**

Preeclampsia is a pregnancy-specific disease characterized by hypertension and proteinuria. This disease occurs in 3% of pregnant women in developing countries and remains one of the major causes of maternal and neonatal mortality and morbidity throughout the world. The study results indicate that preeclampsia could be associated with the maternal periodontal condition and interdental cleaning.

• **Prevalence of Oral HPV Infection in the United States, 2009-2010**

Human papillomavirus (HPV) infection is the principal cause of a distinct form of oropharyngeal squamous cell carcinoma that is increasing in incidence among men in the United States. Human papillomavirus–positive oropharyngeal squamous cell carcinomas (OSCCs) are associated with sexual behavior in contrast to HPV-negative OSCCs that are associated with chronic tobacco and alcohol use. At least 90% of HPV-positive OSCCs are associated with...

• **Impact of Periodontitis on the Diabetes-Related Inflammatory Status**

This review attempts to explain the immunobiological connection between periodontal diseases and type 2 diabetes mellitus, exploring the mechanisms through which periodontal infection can contribute to the low-grade general inflammation associated with diabetes (thus aggravating insulin resistance) and discussing the impact of periodontal treatment on glycemic control in people living with both diabetes and periodontal disease.

• **Minireview: The Relationship of the Oral Microbiota to Periodontal Health and Disease**

The oral microbial community represents the best-characterized consortium associated with the human host. There are strong correlations between the qualitative composition of the oral microbiota and clinically healthy or diseased states. The relationship between the highly characterized periopathogenic microbial community and chronic adult type periodontitis, the most common form of disease, remains to be determined.

• **Oral Inflammatory Burden and Preterm Birth**

The combined effects of multiple oral infections were significantly associated with preterm birth, conclude the authors of this study.

• **Systemic and follicular oxidative stress and antioxidant status in IVF patients**

Stronger antioxidant status is favorable for the achievement of clinical pregnancy. In this study, scientists describe the significance of oxidative stress and total antioxidant status in ovarian follicle, blood plasma and urine in in vitro fertilization female patients and correlate the results with the outcome of ovarian follicle stimulation, clinical pregnancy rate and etiology of infertility.[1]

• **Cataracts in Atopic Dermatitis**

Consumption of antioxidants, retinal peroxidation, and increasing production of free radicals have been proposed as pathogenic mechanisms in human cataractogenesis. These pathogenic factors have been more strongly related to age-related and cortical cataract formation, but some authors have proposed their role in atopic dermatitis (AD) patients with cataracts. There have been theories relating anterior subcapsular cataracts formation with increased inflammatory markers, such as interleukin...

• **Relationship Between Periodontal Disease, Tooth Loss, and Carotid Artery Plaque: The Oral Infections and Vascular Disease Epidemiology Study (INVEST)**

A significant association was observed between tooth loss levels and carotid artery plaque prevalence.

• **Association Between Respiratory Disease in Hospitalized Patients and Periodontal Disease: A Cross-Sectional Study**

Recent research indicated that periodontal infection may worsen systemic diseases, including pulmonary disease. Respiratory infections, such as pneumonia and the exacerbation of chronic obstructive pulmonary disease, involve the aspiration of bacteria from the oropharynx into the lower respiratory tract. Results: The comparison of study-population...
demographics on the basis of age, sex, education, and income showed no significant differences between groups. Patients with respiratory...

- **Inflammation and Periodontal Diseases: A Reappraisal - Introduction to J Perio Journal Supplement**
  Recognition of the research advances and importance of inflammatory mechanisms in essentially all of the chronic diseases of aging, including periodontal diseases, led the American Academy of Periodontology to convene a conference on January 29 and 30, 2008 in Boston titled, "Inflammation and Periodontal Diseases: A Reappraisal." This conference brought together opinion leaders in several major diseases and in the inflammatory mechanisms...

- **Gum disease can increase the time it takes to become pregnant**
  Women who are trying to become pregnant should make sure they visit their dentist and brush their teeth regularly; after preliminary research revealed that gum disease potentially can lengthen the time it takes for a woman to become pregnant by an average of an extra two months. For the first time, fertility experts have shown that, from the time that a woman

- **Moderate to Severe Adult Periodontitis Increases Risk of Rheumatoid Arthritis in Non-Smokers and Is Associated with Elevated ACPA Titers: The ARIC Study**
  Moderate to severe periodontitis may be a risk factor for the development of Rheumatoid Arthritis (RA) in non-smokers. Individuals with moderate to severe periodontitis have higher anti-citrullinated peptide antibodies (ACPA) titers than those with no or mild periodontitis. There is evidence of an interaction between smoking and periodontitis increasing the likelihood of high-titer ACPA...

- **The impact of hospitalization on oral health: a systematic review**
  Poor oral health of hospitalized patients—an increase in dental plaque accumulation and gingival inflammation and a deterioration in mucosal health—is associated with an increased risk of hospital-acquired infections and reduced life quality

- **The new periodontal disease: navigate the emerging solutions**
  Periodontitis is an oral disease that is not limited to local tissue destruction. Escalating evidence over 20 years of research suggests there are various inflammatory pathways that link periodontitis to systemic damage. These etiological mechanisms are all metastatic in nature, and include the following:• Metastatic spread of gram negative bacteria that gain access to the vasculature as a result of breach of...

- **Relationship between Oxidative Stress and Inflammatory Cytokines in Diabetic Nephropathy**
  The prevalence of diabetes has dramatically increased worldwide due to the vast increase in the obesity rate. Diabetic nephropathy is one of the major complications of type 1 and type 2 diabetes and it is currently the leading cause of end-stage renal disease. Hyperglycemia is the driving force for the development of diabetic nephropathy. It is well known that hyperglycemia increases the

- **Association Between Chronic Periodontal Disease and Obesity: A Systematic Review and Meta-Analysis**
  Study found a positive association of an obesity-periodontal disease relationship that was consistent and coherent with a biologically plausible role for obesity in the development of periodontal disease. However, with few qualify longitudinal studies, there is an inability to distinguish the temporal ordering of events, thus limiting the evidence that obesity is a risk factor for periodontal disease or that periodontitis might...]

- **Free Radicals and Cardiovascular Diseases: An Update**
  Increased production of reactive oxygen species (ROS) are involved in the development and progression of cardiovascular diseases. In a number of cardiovascular disease conditions, the delicate equilibrium between free-radical generation and antioxidant defense is altered in favor of the former, thus leading to redox imbalance i.e. escalating oxidative stress and increased tissue injury. This review focuses on the updated evidences concerning involvement...

- **Inflammation: Connecting the Mouth and Body?**
  The American Academy of Periodontology seeks to educate the public about research findings which support what dental professionals have long suspected: Infections in the mouth can play havoc elsewhere in the body. For a long time it was thought that bacteria was the factor that linked periodontal disease to other infections in the body; however, more recent research demonstrates that inflammation may...

- **Inflammation and Factors That May Regulate Inflammatory Response**
  The concept of inflammation is long established. Immune responses to injury and infection are necessary; however, they cause problems when inflammatory processes are maladaptive, leading to chronic diseases. Innovative research is needed to elucidate the intricate pathways involved in chronic inflammation. Ultimately, the question is how these can be used to better diagnose or treat the late-stage sequelae that many lines of...
• **Inflammation and coronary artery disease**
  Inflammation is now recognized as being pivotal in the pathogenesis of atherosclerosis. This review highlights key concepts in our current understanding of the role of inflammation in the initiation, progression, and complication of atherosclerosis...

• **Effect of periodontal treatment on metabolic control, systemic inflammation and cytokines in patients with type 2 diabetes**
  The clinically successful non-surgical periodontal therapy tended to reduce systemic inflammation and the concentration of some circulating cytokines for patients with type 2 diabetes mellitus (T2DM.)

• **The Collagen-Binding Protein Cnm Is Required for Streptococcus mutans Adherence to and Intracellular Invasion of Human Coronary Artery Endothelial Cells**
  Blocking the collagen-binding protein Cnm in Streptococcus mutans may prevent patients from developing infective endocarditis or coronary atherosclerosis. Streptococcus mutans, a predominantly hard tissue (tooth) colonizer, is considered the primary etiologic agent of dental caries, an infectious disease that affects 60 to 90% of the population worldwide. Streptococcus mutans was the most frequently detected bacteria in diseased heart valve tissues and athermanous...

• **The Effect of Dental Care on Cardiovascular Disease Outcomes: an Application of Instrumental Variables in the Presence of Heterogeneity and Self-Selection**
  This is an extensive epidemiologic study based on the Health and Retirement Study (HRS), a biennial longitudinal survey of individuals over 50 years old (and spouses). The data from 1996, 1998, 2000, 2002 and 2004 was included. Although there are limitations to the study, most notably lack of information on detailed dental treatment procedures, they found that women who receive dental care may...

• **Toothbrushing, inflammation, and risk of cardiovascular disease: results from Scottish Health Survey**
  Poor oral hygiene is associated with higher levels of risk of cardiovascular disease and low grade inflammation, though the causal nature of the association is yet to be determined...

• **Association of Oral Inflammation and Symptoms of Active Rheumatoid Arthritis**
  This case report presents dental treatment of oral inflammation and subsequent reduction of symptoms of active rheumatoid Arthritis (RA).

• **Erectile dysfunction might be associated with chronic periodontal disease: two ends of the cardiovascular spectrum**
  Men in their 30s to mid-40s with chronic periodontal disease (CPD) exhibited an increase in mild and moderate to severe erectile dysfunction (ED) in this study. These preliminary findings are consistent with theories that associate these conditions with systemic inflammation, endothelial dysfunction, and atherosclerosis. The study population consisted of 305 men who filled the Sexual Health Inventory for Men (SHIM) questionnaire in...

• **The American Journal of Cardiology and Journal of Periodontology Editors’ Consensus: Periodontitis and Atherosclerotic Cardiovascular Disease**
  Aim of this document is to provide health professionals, especially cardiologists and periodontists, a better understanding of the link between atherosclerotic cardiovascular disease and periodontitis. In recent years, the immune system, once believed to be only a vital defense against infection and a promoter of healing--except in the instances of a few uncommon connective tissue disorders--is now recognized as a significant active...

• **Inflammation as a potential mediator for the association between periodontal disease and Alzheimer’s disease**
  Periodontal disease (PDD) is associated with increased risk of cardiovascular disease, cerebrovascular disease, and mortality in many studies, while other studies have begun to suggest an association of PDD with Alzheimer’s disease (AD). This paper discusses how infectious pathogens and systemic infection may play a role in AD. The roles of infection and inflammation are addressed specifically with regard to known AD...

• **Impacts of Periodontitis on Nonfatal Ischemic Stroke: Comparison with Hypertension and Diabetes Mellitus**
Periodontitis is a strong independent risk factor for nonfatal ischemic stroke and its impact is almost the same as that of Hypertension (HPT) and higher than that of Diabetes Mellitus (DM) in adults in their 40s and 50s. This poster was presented at the 2011 IADR meeting as a poster.

- **Periodontal Therapy Reduces the Severity of Active Rheumatoid Arthritis in Patients Treated With or Without Tumor Necrosis Factor Inhibitors**
  Rheumatoid arthritis (RA) and periodontitis are common chronic inflammatory conditions. Recent studies showed a beneficial effect of periodontal treatment on the severity of active RA. Conclusions: Non-surgical periodontal therapy had a beneficial effect on the signs and symptoms of RA, regardless of the medications used to treat this condition.

- **Rheumatoid arthritis and periodontal disease**
  The prevalence of periodontal disease has increased two-fold among patients with rheumatoid arthritis (RA) compared to the general population. This increased prevalence reflects shared pathogenic mechanisms, including an increased prevalence’s of the shared epitope HLA-DRB1-04; exacerbated T-cell responsiveness with high tissue levels of IL-17; exaggerated B-cell responses, with plasma cells being the predominant cell type found within gingival tissue affected with periodontitis and...

- **A randomized, controlled trial on the effect of non-surgical periodontal therapy in patients with type 2 diabetes. Part 1: effect on periodontal status and glycemic control**
  This study provides evidence that non-surgical periodontal treatment contributes to improved glycemic control in type 2 diabetes mellitus patients.

- **The association between rheumatoid arthritis and periodontal disease**
  The existence of a rheumatic or other inflammatory systemic disease may promote Periodontitis (PD) in both its emergence and progress. However, there is evidence that PD maintains systemic diseases. In this review, we also discuss in detail the fact that oral bacterial infections and inflammation seem to be linked directly to the etiopathogenesis of rheumatoid arthritis (RA). There are findings that...

- **Inflammation and Alzheimer’s disease: Possible role of periodontal diseases**
  Recently, chronic periodontitis has been associated with several systemic diseases including Alzheimer's disease (AD.) In this article we review the pathogenesis of chronic periodontitis and the role of inflammation in AD. In addition, we propose several potential mechanisms through which chronic periodontitis can possibly contributes to the clinical onset and progression of AD. Because chronic periodontitis is a treatable infection, it might...

- **The effect of subantimicrobial-dose–doxycycline periodontal therapy on serum biomarkers of systemic inflammation**
  Doxycycline treatment decreased CRP and MMP9. 128 eligible postmenopausal women with chronic periodontitis assigned to a twice-daily regimen of subantimicrobial-dose–doxycycline (SDD) or placebo tablets for two years as an adjunct to periodontal maintenance therapy. In the intent-to-treat analysis across two years, SDD treatment reduced median high-sensitivity C-reactive protein (hs-CRP) by 18 percent (primary outcome; P = .02) and reduced serum matrix metalloproteinase...

- **Invasive Dental Treatment and Risk for Vascular Events**
  When performing dental treatments for patients with vascular disease, providers may wish to warn patients that vascular events increase in the first 4 weeks after invasive dental treatment. Treatment of periodontal disease may reduce cardiovascular risk in the longer term, but studies have suggested a link among dental procedures, acute inflammation, and endothelial dysfunction. However, whether such acute inflammatory effects translate into...

- **Periodontal Disease and Overall Health: A Clinician’s Guide**
  Colgate sponsored a group of respected and scholarly clinicians and scientists who, in eighteen chapters, provide a current and thoughtful perspective on the relationship of periodontal disease to systemic conditions...

- **Reducing stillbirths: prevention and management of medical disorders and infections during pregnancy.**
  Periodontal disease emerged as a clear risk factor for stillbirth but no interventions have reduced stillbirth rates.

- **Periodontal bacteria and hypertension: the oral infections and vascular disease epidemiology study**
  Chronic infections, including periodontal infections, may predispose to cardiovascular disease. We investigated the relationship between periodontal microbiota and hypertension...

- **Systemic inflammation in cardiovascular and periodontal disease: comparative study.**
  Epidemiological studies have implicated periodontal disease (PD) as a risk factor for the development of cardiovascular disease (CVD).
Periodontal Disease is Associated with Brachial Artery Endothelial Dysfunction and Systemic Inflammation
Epidemiological studies suggest that severe periodontal disease is associated with increased cardiovascular disease risk, but the mechanisms remain unknown.

Markers of systemic bacterial exposure in periodontal disease and cardiovascular disease risk: a systematic review and meta-analysis.
Recent meta-analyses reported a weak association between periodontal disease (PD) on clinical examination and cardiovascular disease (CVD). Systemic bacterial exposure from periodontitis, which correlates poorly with the clinical examination, has been proposed as the more biologically pertinent risk factor.

Periodontal infections and coronary heart disease: role of periodontal bacteria and importance of total pathogen burden in the Coronary Event and Periodontal Disease (CORODONT) study.
Chronic inflammation from any source is associated with increased cardiovascular risk. Periodontitis is a possible trigger of chronic inflammation. We investigated the possible association between periodontitis and coronary heart disease (CHD), focusing on microbiological aspects.

Ongoing Study - linking treatment of Periodontal infections to heart disease - Phase II
Epidemiological studies indicate that individuals with severe periodontal disease have significantly increased risk for cardiovascular disease. Periodontal disease, a chronic bacterial infection of the gums, is associated with recurrent bacteremia and a state of systemic inflammation that may convert endothelial cells to a pro-atherogenic phenotype with increased expression of inflammatory factors and loss of the anti-thrombotic, growth inhibitory, and vasodilator properties of...

Periodontal diseases
Periodontitis results in loss of connective tissue and bone support and is a major cause of tooth loss in adults. In addition to pathogenic microorganisms in the biofilm, genetic and environmental factors, especially tobacco use, contribute to the cause of these diseases. Common forms of periodontal disease have been associated with adverse pregnancy outcomes, cardiovascular disease, stroke, pulmonary disease, and diabetes.