



Enhancing Periodontal Outcomes Through Nutritional Support

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Introduction:

Typical non-surgical periodontal therapy involves a combination of in-office treatments targeted in removing toxins and irritants from the gingival environment, as well as home care instructions to minimize the proliferation of biofilm in the gingival sulcus. Antibiotic therapies using both systemic and local delivery have shown promise initially, but often fail to convert the chronic periodontal patient to long term health. All of the above mentioned therapies focus on the signs and symptoms the disease rather than the source of the disease. Although bacteria are often cited as the causative agent for disease, many scientists believe that systemic host response and the immune system are actually the determinants of disease.^{1,2,5} Manifestations of inflammation in the oral cavity very often correlate with systemic inflammatory processes. Dr. David Tecosky, DMD, MAGD states, "More than 90% of systemic diseases reveal signs and symptoms in the mouth. Most patients see their dentist on a regular basis more frequently than they do their physician. We are in a unique position to help our patients." We all agree that the oral-systemic connection exists, so how can we enhance the services we offer our patients to not only improve treatment outcomes, but improve their overall well being also?

About Peridontal Disease: Periodontal disease (PD) is the result of an inflammatory response resulting from the interaction between pathogenic bacteria and the host's immune response.^{3,4} As a result of stimulation by bacterial antigens, polymorph nuclear leukocytes (PMN) produce reactive oxygen species (ROS) during phagocytosis as part of the host response to infection culminating in oxidative damage to gingival tissue, periodontal ligaments and alveolar bone.^{4,5,6} These ROS contribute to tissue destruction by damaging DNA, causing lipid peroxidation and stimulating proinflammatory cytokines release. It has been postulated in the literature that the damage from ROS can be modulated by the presence of antioxidants, through the mechanism of electron transfer, thereby neutralizing the ROS.⁵ Antioxidants are defined as a molecule capable of slowing or preventing the oxidation of other molecules.⁶ Data from research collected suggests that there are mechanisms in which **nutrition**, particularly antioxidants, can influence periodontal disease onset, progression and wound healing.⁵ Since our bodies manufacture only limited antioxidants, we have to rely on our diet and supplementation to provide the necessary supply of these nutrients.

Antioxidants: The benefits of diets rich in antioxidants are widely recognized. As we age, vitamins and minerals are less efficiently absorbed and internal production declines, paving the way for increased risk of inflammatory burden and degenerative disease.⁷ Dietary antioxidants include essential vitamins and minerals as well as phytochemicals present in plant food. Antioxidants can prevent cancer-causing DNA damage, protect blood vessels against atherosclerosis, help optimize blood flow to the heart and brain, and protect brain cells against oxidative death that can lead to Alzheimer's disease, Parkinson's disease and other degenerative conditions that increase in age.^{4,5,7} In fact antioxidants can protect our cells from just about all diseases associated with inflammation and the aging process.

Rationale and Implementation: So how do we integrate antioxidant therapy and nutrition into our everyday practice? We **must** educate our patients about the importance of a diet high in fruits and vegetables. The National Institute of Health now recommends 9-12 servings of F & V per day. Data from the National Health and Nutrition Examination Survey (NHANES) reported that less than 11% of the nearly 24,000 Americans surveyed achieved USDA guidelines for both fruit and vegetable consumption; that means **9 out of 10 people do not consume the recommended servings of fruit and vegetables each day to prevent disease.** Since RDA standards do not outline the amount of nutrients needed for optimal health and because of our consumption of low-nutrient, high-calorie foods that are highly processed, hybridized, genetically modified, shipped long distances, and grown in nutrient-depleted soils, most of us are nutritionally bankrupt and our immune systems are vulnerable to the ravages of free radical induced disease.

What all this adds up to is clear. Nutritional supplementation is not optional. Based on mounting evidence and confirmed by the *Journal of the American Medical Association*⁸ and *The New England Journal of Medicine*⁹, the medical community strongly believes that we should all be taking **and** recommending basic supplements including vitamins, minerals, antioxidants and high quality omega three fish oil to **ALL** our patients. The economic impact of investing in our nutritional health through supplementation is compelling. New research from the Lewin Group has shown that spending pennies a day on a few key nutritional supplements can dramatically reduce sickness and chronic disease — and greatly decrease healthcare expenditures as a result.¹⁰

When determining which supplements to recommend a review of the literature is instructive, but burdensome as there are hundreds of thousands of scientific articles and clinical trials relevant to nutrition, particularly antioxidants, and inflammatory disease. Below are some current abstracts as they relate to specifically periodontal disease, but we must keep in mind that **ALL** diseases influenced by the inflammatory process are improved by an upgrade in nutritional status. I have highlighted the conclusion for expediency, but encourage the reader to conduct your own due diligence by searching PubMed or other evidence based search engines using key words such as “antioxidants and oral health” etc. If you click on the titles below you will be directed to the abstract on the PubMed site.

[Micronutritional approaches to periodontal therapy.](#)

[J Clin Periodontol.](#) 2011 Mar;38 Suppl 11:142-58. doi: 10.1111/j.1600-051X.2010.01663.x.

[Van der Velden U](#), [Kuzmanova D](#), [Chapple IL](#).

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Abstract

RESULTS AND CONCLUSION: Periodontitis is associated with low serum/plasma micronutrient levels, which may result from dietary and/or life-style factors as well as nutrigenetic characteristics. Early evidence suggests beneficial outcomes from nutritional interventions; supporting the contention that daily intake of certain nutrients should be at the higher end of recommended daily allowances. For prevention and treatment of periodontitis daily nutrition should include sufficient antioxidants, vitamin D, and calcium. Inadequate antioxidant levels may be managed by higher intake of vegetables, berries, and fruits (e.g. kiwi fruit), or by phytonutrient supplementation

[Bioactive antioxidant mixtures promote proliferation and migration on human oral fibroblasts.](#)

[Arch Oral Biol.](#) 2011 Mar 31. [Epub ahead of print]

[San Miguel SM](#), [Opperman LA](#), [Allen EP](#), [Zielinski J](#), [Svoboda KK](#).

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Abstract

CONCLUSIONS: High and low concentrations (10^{-3} - 10^{-5} M) of these antioxidants (RFT, PFR) may have beneficial effects on functional mechanisms regulating fibroblast migration and proliferation during gingival healing or periodontal repair.

[Role of coenzyme Q\(10\) as an antioxidant and bioenergizer in periodontal diseases.](#)

[Indian J Pharmacol.](#) 2010 Dec;42(6):334-7.

[Prakash S](#), [Sunitha J](#), [Hans M](#).

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Abstract

Periodontal disease is an inflammatory disease process resulting from the interaction of a bacterial attack and host inflammatory response. Arrays of molecules are considered to mediate the inflammatory response at one time or another, among these are free radicals and reactive oxygen species (ROS). Periodontal pathogens can induce ROS overproduction and thus may cause collagen and periodontal cell breakdown. When ROS are scavenged by antioxidants, there can be a reduction of collagen degradation. Ubiquinol (reduced form coenzyme Q(10)) serves as an endogenous antioxidant which increases the concentration of CoQ(10) in the diseased gingiva and effectively suppresses advanced periodontal inflammation.

[Oxidative stress, systemic inflammation, and severe periodontitis.](#)

D'Aiuto F, Nibali L, Parkar M, Patel K, Suvan J, Donos N.

J Dent Res. 2010 Nov;89(11):1241-6. Epub 2010 Aug 25.

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Abstract

Periodontal infections have been associated with a state of chronic inflammation. Analysis of these data suggests a positive association between severe periodontitis and oxidative stress.

[Relationship Between Intake of Green Tea and Periodontal Disease](#)

[Journal of Periodontology](#); March 2009, Vol. 80, No. 3, Pages 372-377 , DOI

10.1902/jop.2009.080510

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Abstract

Background: Green tea is a very popular beverage, and in vitro studies have shown that green tea polyphenols inhibit the growth and cellular adherence of periodontal pathogens and their production of virulence factors. We investigated the epidemiologic relationship between the intake of green tea and periodontal disease.

Conclusion: There was a modest inverse association between the intake of green tea and periodontal disease.

[Relationship between intake of vegetables, fruit, and grains and the prevalence of tooth loss in Japanese women.](#)

[J Nutr Sci Vitaminol \(Tokyo\)](#). 2007 Dec;53(6):522-8.

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Abstract

Epidemiological evidence regarding dental status and its relationship to diet and nutritional status has been limited. The present cross-sectional study examined the relationship between intake of vegetables, fruit, grains, antioxidants, and fiber and the prevalence of tooth loss. Of the 1,002 subjects, 256 women had lost 1 or more teeth. Compared with intake of vegetables other than green and yellow vegetables in the lowest quartile, consumption of the other vegetables in the highest quartile was independently associated with a decreased prevalence of tooth loss, showing a clear inverse dose-response relationship. These findings suggested that consumption of vegetables other than green and yellow vegetables and insoluble fiber may be related to a decreased prevalence of tooth loss among young Japanese women.

[Omega-3 fatty acid regulates inflammatory cytokine/mediator messenger RNA expression in Porphyromonas gingivalis-induced experimental periodontal disease.](#)

Oral Microbiol Immunol. 2007 Aug;22(4):232-9.

Kesavalu L, Bakthavatchalu V, Rahman MM, Su J, Raghu B, Dawson D, Fernandes G, Ebersole JL.

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Abstract

INTRODUCTION: Porphyromonas gingivalis is strongly implicated in the etiology of adult periodontitis by inducing inflammatory cytokines, resulting in gingival and periodontal tissue inflammation and alveolar bone resorption. This study tested the hypothesis that supplementing the diet with omega-3 fatty acid (omega-3 FA; i.e. fish oil) would exert anti-inflammatory effects in the gingival tissues of P. gingivalis-infected rats.

CONCLUSION: These findings suggest that diets enriched for omega-3 FA modulate the local gingival inflammatory milieu of the host following oral P. gingivalis infection, which impacts on alveolar bone resorption in rats.

[“Local and systemic total antioxidant capacity in periodontitis and health”](#)

Journal of Clinical Periodontology 2004; 31: p 515-521

Brock, GR, Butterworth CJ, Matthews JB, Chapple ILC,

The authors aim in this cross sectional study was to determine both local (saliva and gingival crevicular fluid) and peripheral (plasma and serum) antioxidant capacity in periodontal health and disease. The data showed that in health, antioxidant concentrations in GCF are significantly greater than those of serum and plasma indicating a local synthesis or storage within the periodontium. Interestingly, both serum and plasma total antioxidant capacity (TAOC) were reduced in periodontal subjects relative to controls. The commented, “Given the established role for reactive oxygen species in cardiovascular pathology and the established links between periodontal disease and cardiovascular disease, the reduced plasma TAOC in periodontitis subjects warrants further investigation. One may speculate that reduced plasma antioxidant defenses are a common risk factor for both diseases.”

[“Effects of specific nutrients on periodontal disease onset, progression and treatment”](#)

Journal of Clinical Periodontology, 2003; 30: 579-588

Neiva, RF, Steigenga, Jennifer, Al-Shammari, Khalaf, Wang, Hom-Lay,

The authors studied nutritional elements, (e.g. vitamin B-complex, vitamin C and dietary calcium) that have been strongly associated with the wound healing, periodontal disease status and response to treatment. Vitamin C, an important aqueous antioxidant, is essential for collagen formation and healing of wounds, and is shown to improve resistance to infection. Vitamin C deficiency also makes capillaries fragile and susceptible to rupture. Calcium, the most abundant mineral in the body, plays a structural role and is present 99% in bones and

teeth. Many clinical trials were referenced and reviewed by the authors, and they concluded, “Several studies reported various degrees of association between nutritional elements/supplement and periodontal status, and others have reported possible positive influences of nutritional supplementation on periodontal therapeutic outcomes” They further recommended, “Considering that nutrient supplementation shows minimal or no side effects, controlled clinical trials are able to demonstrate that it could be used to enhance response to therapy and may prove valuable in producing more predictable treatment outcomes.”

Summary:

It is evident after reviewing the literature that periodontal disease is regarded as “an inflammatory lesion mediated by host-parasite interactions.” Mediation of the inflammatory response has been successful in several peer reviewed clinical trials with a variety of naturally occurring, safe nutritional supplements that neutralize the reactive oxygen species produced in the presence of periodontal pathogens. Whether locally applied or systemically supported, antioxidant status appears to have a strong correlation with incidence of disease. Most medical practitioners were and still are unaware of the connection between disease and antioxidant status, although it has been rigorously studied and documented in the literature for the past 40 years by scientists such as Dr Lester Packer.¹¹ However, it is this authors hope that in light of current corroborative evidence, all health care practitioners will take a more common sense approach to wellness and therapeutic options when it comes to treatment of inflammatory disease. Until recently, only blood tests were available to detect antioxidant status in the body, and often they were too volatile to be accurate indicators of overall antioxidant status. With the arrival of the BioPhotonic Scanner by Pharmanex in the United States in 2003, a new standard is now available that will non-invasively measure antioxidant status in live tissue in 90 seconds. The BioPhotonic Scanner, at this point in time, is the only non-invasive method to obtain any reasonable approximation of total body antioxidant status reporting a “skin carotenoid score.” A review of the original patent for the BioPhotonic Scanner is instructive. Below are relevant excerpts from the United States Patent Application 6,205,354 – granted March 20, 2001, and awarded to Werner Gellermann and colleagues at the University of Utah. All quotes are directly excerpted from the patent. It should be noted that the patent was granted as specified, meaning that the US Patent Office was satisfied with the claims and the supporting documentation.

From the Abstract:

“A method and apparatus are provided for the determination of levels of carotenoids and similar chemical compounds in biological tissue such as living skin. The method and apparatus provide a noninvasive, rapid, accurate, and safe determination of carotenoid levels

which in turn can provide diagnostic information regarding cancer risk, or can be a marker for conditions where carotenoids or other antioxidant compounds may provide diagnostic information. Such early diagnostic information allows for the possibility of preventative intervention.”

The scanner uses Raman Spectroscopy discovered by C. V. Raman who was awarded the 1930 [Nobel Prize in Physics](#) for his work on the scattering of light and for the discovery of the [Raman effect](#). [Raman spectroscopy](#) is based on this phenomenon to measure the vibration of all of the double bonds of all carotenoids present in the skin, and through an array detector, correlate that energy into a skin carotenoid score (SCS). In an abstract submitted to the IADR/AADR in March 2007, researchers at the University of Pacific in a double blind study determined the effect of a proprietary nutritional supplement on gingival index score and antioxidant status using the Biophotonic Scanner. The supplement contained basic the multi-vitamins, A, C, E, B6, B12, folate, zinc, selenium and copper and several other botanically derived ingredients known to exert anti-inflammatory and antioxidant effects including green tea extract. Reported results showed that the supplement significantly decreased the gingival index score and a decrease in bleeding score compared to the placebo. The supplement also significantly increased skin carotenoid level. The researchers concluded that the supplement may be beneficial as an adjunct to therapy in the management of periodontal disease.¹²

Dr Ross Lambert, in an article he wrote for Dentistry Today states, “A better understanding of how antioxidants function in the pathogenesis of periodontitis, and the effects of diet and nutritional supplementation on antioxidant status, may lead to new strategies on the treatment of the disease. An accurate and low-cost noninvasive test to measure a patient’s antioxidant levels is commercially available and will become part of the prevention and treatment modules (Biophotonic Scanner [Pharmanex]). It is well-accepted that antioxidants play a major role in the immune system, fighting cancer and aging. Studies have shown that antioxidant levels play a role in periodontal disease and that periodontal disease significantly improves when these levels are restored to accepted levels. High quality pharmaceutical-grade nutritional supplements are now proven to make a difference, elevate antioxidants and beta carotenoids, and become part of every module in the model. The test for antioxidants provides a method to measure these levels on an ongoing basis and to confirm the effectiveness of a supplement.”¹³

With a risk assessment tool that is an innocuous and convenient to use as a blood pressure monitor, we can now confidently educate and monitor our patient’s oral and systemic risk factors for disease. Not only can we begin to prevent the onset of periodontal disease by recognizing these risk factors, but we can intervene earlier with enhanced treatment outcomes. Historically, dentist’s leadership role in prevention of disease has been a pioneering force in the medical community. Dr David A. Garber, partner of Dr Ron Goldstein from “Team Atlanta” states, “The biophotonic scanner can now evaluate the level of systemic antioxidants. Dentistry can then evolve to be more than a restorative modality and move into the realm of a more holistic domain, which is

so important with the oral systemic link now definitively acknowledged and related to a person's overall well being.”¹⁴

After reviewing the literature, it appears prudent to consider the inclusion of specifically targeted nutritional supplements to the home care regimen for patients with periodontal symptoms. Combining natural alternatives with traditional therapies appears to show promise in modifying systemic risk factors and providing safe methods to potentiate the clinical response during treatment. Lastly, the recent introduction of the Biophotonic Scanner (Pharmanex) which objectively measures patient antioxidant status non-invasively provides the practitioner with a provocative risk monitoring device. This technology appears to provide the dentist with information relevant to early diagnosis and intervention of periodontal disease, which could lead to more predictable treatment outcomes.

As oral physicians we have a responsibility to our patients to elevate the standard of care in our offices and educate our patients about the irrefutable benefits of diet, nutrition and supplementation as it influences oral health which ultimately affects overall health and well being. Combining natural alternatives with traditional therapies appears to show promise in modifying systemic risk factors and providing safe methods to potentiate the clinical response during periodontal therapy. The side benefits of improved nutritional status for our patients are longevity and extended healthspan.

To Your Health!

Jacqueline Russo, RN, DDS

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¹³ Dr Ross Lambert, "New age Periodontics: What's coming down the Pike" Dentistry Today; July 2007

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