

Antioxidants in oral health care: making the connection

Mainstream medicine, dental hygiene and dentistry have not focused heavily on complementary and alternative medicine (CAM) or nutrition in the last decades. This includes products such as herbal remedies, techniques such as acupuncture, and schools of practice such as naturopathy. Use of CAM is widespread among the US public, with more than one-third of adults reporting that they have pursued some form of these treatments (1). This is also a worldwide trend. In 1978, the German government established an expert committee, the Commission E, to evaluate the safety and efficacy of over 300 herbs and herb combinations sold in Germany (2). There is more interest in this area of health and wellness because of the increasing incidence of obesity, diabetes, cancer and heart/cardiovascular disease. Because CAM use is becoming so widespread, a report recently stated that 'all doctors, nurses, and other health care providers should receive education about these treatments during their professional education' (1). This article will review recent reports and the oral health professional's role in this area.

The sixth edition of *Dietary Guidelines for Americans*, issued by the Departments of Health and Human Services (HHS) and Agriculture (USDA), recommends reduced calorie consumption, increased physical activity (PA), and wiser food choices. The guidelines are online at: <http://www.healthierus.gov/dietaryguidelines/>. The report is science-based advice to help Americans live healthier and longer lives, and can be extrapolated to other parts of the world. The guidelines demonstrate 'action' steps to reach achievable goals in weight control, stronger muscles and bones, and balanced nutrition to help prevent chronic diseases such as heart disease, diabetes and some cancers (3). Almost two-thirds of Americans are overweight or obese, and more than half are too sedentary, so the 2005 *Dietary Guidelines* highlight the need for calorie control and PA over and above the need for a healthy balance of nutritious foods.

Nutrient needs should be primarily met through consuming nutrient-dense foods rather than through dietary supplements that cannot replace a healthful diet (3). However, there is a place for supplements. We know that many individuals, some in special population groups such as pregnancy and older individuals do not consume enough of the proper foods to maintain

the optimal nutrient level (3). Women of childbearing age, pregnant or lactating should eat food rich in iron such as iron-rich plant foods or iron-fortified foods with vitamin C as an enhancer, and consume adequate folic acid from the diet and supplement daily with synthetic folic acid to the first trimester. In older adults, those with dark skin and exposed to inadequate UV light should consume extra vitamin D and/or take supplements, and regular PA is recommended. They should consume no more than 1300 mg of sodium daily and meet the daily 4700 mg potassium recommendation (similar for blacks and those with hypertension). Those older than 50 years should consume vitamin B12 in fortified foods or supplements (3).

In January 2005, the US Institute of Medicine at the National Academies issued a report stating that complementary and alternative therapies and conventional medical therapies should be held to same standards for demonstrating clinical effectiveness (1). It stated that revised regulation of dietary supplements is needed to ensure product quality and safety.

The committee noted the rising popularity of dietary supplements as well as the lack of consistency and quality in these products.

The report was compiled to support the National Institutes of Health in developing research methods and setting priorities for evaluating products and methods within CAM, and the report also reviews what is known about Americans' dependence on these therapies. Use of CAM is widespread among the US public, with more than one-third of adults reporting that they have pursued some form of these treatments, which include products such as herbal remedies, techniques such as acupuncture, and schools of practice such as naturopathy. Fewer than 40% of CAM users have revealed their use of such therapies to their physicians or nurse practitioner.

Dietary supplements, such as herbal products and vitamin pills, are among the most widely and increasingly used forms of CAM; use of herbal products jumped 380% between 1990 and 1997 (1). Mainstream medicine is incorporating CAM into their practice, as evidenced by the Website of the Dana Farber Cancer Institute's Zakim Center for Integrated Therapies (4). The mission statement of the centre is: 'The Leonard P. Zakim Center for Integrated Therapies provides complementary therapies to patients and their families, offers education on

complementary therapies to patients, families and staff, and advances knowledge of the effectiveness and outcomes of these therapies through peer-reviewed, evidence-based clinical research' (4). The centre feels that when patients integrate these therapies into their medical and surgical care, they are creating a more comprehensive treatment plan and helping their own bodies to regain health and vitality. They define 'Integrated Therapies' as individual treatments used in addition to, or as a complement to, traditional cancer treatment such as chemotherapy and radiation. The growing acceptance of CAM is reflected in the numbers of the centre, which opened in the fall of 2000. The Zakim Center has gone from approximately 800 patient visits during its first year of operation to more than 3000 expected visits this year.

The 1994 Dietary Supplement Health and Education Act (DSHEA) requires that supplements be regulated as foods rather than drugs, this translating to the fact that supplement manufacturers are not required to conduct safety or efficacy tests on their products (5). Due to the lack of required testing and the inability of manufacturers to patent many supplements, there is little incentive for supplement makers to invest in research on the effectiveness of these products.

The area of herbs, vitamins and *Nutraceuticals* (food or parts of food, that provide medical or health benefits, including the prevention and treatment of disease) is a new field of study in regard to oral health. We know that periodontitis is a bacterial infection, a major cause of tooth loss, and negatively impacts systemic health, as evidenced by the relation with heart disease and preterm low birth weight babies. A number of dental products manufacturers have looked at the use of herbs or supplements in toothpastes, mouth rinses and other products for control of periodontal disease. Aloe vera, star anise oil, myrrh gum, calendula extract, ammonium glycyrrhizate (from licorice root), fennel oil, melaleuca alternifolia (Tea Tree Oil), and neem extract are among the ingredients used for control of periodontal disease. The National Center for Complementary and Alternative Medicine (NCCAM) of the US National Institutes of Health (NIH) is recruiting for a study entitled *Complementary Naturopathic Medicine for Periodontitis* (6). The study intends to evaluate selected naturopathic medicines for adult periodontitis and to identify variables that influence successful outcomes when traditional and *alternative* approaches to preventing and treating periodontal diseases are combined. Because they are used to improve elements of host resistance that are known to be important in periodontal health and disease, three naturopathic medicines are potential adjuncts in preventing and treating periodontitis. Connective tissue components are enzymatically degraded in periodontitis (6). In

naturopathy, connective tissue nutrient formula (CTNF) (vitamins A, C and D, glucosamine sulphate, oligoproanthocyanidins, copper, zinc, manganese, boron, silicon, magnesium and calcium) is prescribed specifically to enhance the integrity of key connective tissue elements and improve their resistance to degradation (6). Periodontitis is initiated when permeability of the oral sulcular epithelium permits pathogenic bacterial components to invade deeper periodontal connective tissues. In naturopathy, glutamine is prescribed to reduce oral-intestinal epithelial membrane permeability (6). Chronic activation of the hypothalamic-pituitary-adrenal (HPA) axis during the stress response is a risk factor for periodontitis. Adaptogenic herbs (AH) (*Panax ginseng*, *Withania somnifera* and *Eleutherococcus senticosus*) are prescribed by naturopathic physicians to reverse the impact of bacterial and psychosocial stressors (6). Because glutamine, CTNF and AH target pathophysiological mechanisms known to underline periodontitis, they are compelling candidates in clinical and mechanistic investigations of complementary medicine approaches to the management of periodontitis. Adult periodontitis patients will serve as subjects and receive standard periodontal treatment.

In the same vein, the 'Antioxidant Therapy to Prevent Preeclampsia' study is now recruiting, and is co-sponsored by the National Institute of Dental and Craniofacial Research (NIDCR) (7). This study will test the likelihood that the joint administration of antioxidants vitamin C (1000 mg) and vitamin E (400 IU) will reduce the incidence of preeclampsia among chronically hypertensive pregnant patients and patients with a past history of preeclampsia/eclampsia.

A question that occurs is how can we know if vitamins and supplements are working? With many pharmaceuticals, many diagnostic tests are used, such as blood, saliva, radiographs and scans of various types, such as magnetic resonance imagery (MRI). A new technology, a BioPhotonic Nutrition Scanner, is a tool that scans tissue non-invasively in the palm of ones hand. It is based on an optical method known as Resonance Raman Spectroscopy (8). Skin carotenoid levels are a good indication of the carotenoid concentrations in blood and other tissues (9). While not a medical device or diagnostic test, the scanner assesses the level of carotenoid antioxidants with low intensity blue laser, which has been accomplished in the past with tissue samples and blood tests. Most of the health benefits of carotenoids are associated with their action as antioxidants, that is, they protect cells and tissues from the effects of free radicals (10).

A study involving a large population (1375 subjects) found persuasive evidence that carotenoids are a good indicator of antioxidant status or oxidative stress (11). The study showed

that people with high oxidative stress generally have low skin carotenoid levels, independent of their dietary carotenoid consumption. Smokers and those with habitually high exposure to sunlight fell into this category.

One places their hand over a laser light, which is being produced by a small tabletop device. The hand is held in place for approximately 3 min, during which time the device scans the tissue of your palm. Because this blue laser light can penetrate the skin, it has the ability to excite the molecular structure of chemical compounds in your tissue. Once these antioxidant molecules become excited by the laser, they begin to give off photons. By producing an 'Antioxidant Score', one can assess their current level of health (12). The scanner is available in the USA, Australia, many European countries, Hong Kong, Japan, Korea, Mexico, New Zealand, Taiwan and other countries. If the score is below the optimum level, one could improve their profile by using the guidelines previously mentioned. Another alternative is to view the World Health Organization guidelines regarding global health and diet recommendations: reduce sugars, processed foods, soft drinks and junk food advertising (13).

There is a study being conducted with the scanner that measures carotenoid levels of dental patients. The patient is asked a series of questions, then scanned with a biophotonic scanner. The premise is that a high antioxidant level can decrease gum disease. By improving the diet, and possibly taking a variety of supplements for 6–8 weeks, improvement of antioxidant levels is possible. Initial results show higher antioxidant levels can decrease chances of gum disease, and as a result, may reduce other health issues as periodontal infection may be a risk for life-threatening diseases like heart attack and stroke. There are 15 dental offices nationwide in the USA chosen to participate in the study in the 2-month study. If this technology proves beneficial, we may be seeing biophotonic scanners in offices throughout the world.

The potential link between low antioxidant levels and periodontal infection has been studied. Reduced plasma total antioxidant defence could result from low-grade systemic inflammation induced by the host response to periodontal bacteria, or may be an innate feature of periodontitis patients (14). Periodontal disease has been associated with reduced salivary antioxidant status and increased oxidative damage within the oral cavity. Women had significantly lower total antioxidant status than men, regardless of periodontal health (15). One study indicated that 8-OHdG (a marker that evaluates oxidative damage in a number of disorders including chronic inflammatory diseases) levels in saliva appear to reflect the status of periodontal health (16).

An improved understanding of the role antioxidants play in periodontitis, and the influence of nutrition on antioxidant status, may lead to a possible nutritional strategy for the treatment of periodontal disease (17). Further evidence will improve our comprehension in this arena. By educating our patients/clients about good dietary and exercise habits, and the potential roles of CAM, perhaps they can integrate these new therapies into their oral health, thus creating a more comprehensive treatment plan and helping their own bodies to regain health and vitality.

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M. Perno Goldie

Seminars for Women's Health,
155 Normandy Court,
San Carlos,
CA 94070,
USA

<http://www.seminarsforwomenshealth.com>

E-mail: mgoldie@sbcglobal.net