

# Vitamins and the Treatment of Oral and Dental Diseases

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# Vitamins and the Treatment of Oral and Dental Diseases

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## LEARNING OBJECTIVES

After reading this article, the individual will learn:

- The current state of the medical and dental literature regarding vitamin therapies for oral and dental conditions.
- Oral and dental conditions secondary to vitamin deficiency, and toxicities related to vitamin therapies.

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## INTRODUCTION

While vitamin therapies are important in the treatment of vitamin deficiencies, at present the literature reveals only limited success of vitamin therapies in the treatment of oral and dental diseases. Furthermore, vitamin therapy has potential toxicity issues. In this article, the literature is reviewed to evaluate the relevance of vitamin therapy with regard to oral and dental conditions.



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A great deal has been written in the recent past with regard to vitamin supplementation for both medicine and dentistry. Touger-Decker<sup>1</sup> recently reported upon the increased utilization of vitamin and mineral supplements and noted that it is important for dentists to be knowledgeable concerning the scientific evidence with regard to the use and misuse of these therapeutics. As with any group of therapeutics, there is the potential to do both good and harm. Unfortunately, there have been a number of dentists advocating the importance of dentists incorporating potentially detrimental vitamin and mineral supplementation within their practices.<sup>2</sup>

Touger-Decker<sup>1</sup> reported that despite widespread utilization, there is a lack of scientific evidence to support the use of multivitamin mineral supplementation or even single vitamin or mineral supplements beyond drug reference intakes (the necessary amount of vitamins or supplements to prevent deficiencies) to prevent or treat oral diseases. Her opinion was shared within the National

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Institutes of Health (NIH) consensus document concerning vitamin supplementation.<sup>3</sup> She noted that vitamin C has been promoted as a preventative and cure for periodontal disease without adequate scientific evidence to support such. Although she noted that certain vitamin therapies for particular nutrient deficiency states with oral manifestations do have scientific supporting documentation, there is insufficient scientific evidence supporting the utilization of vitamin therapy for other dental disease concerns.

Despite the widespread utilization of consumer access to vitamins and supplements for the prevention of disease, scientific evidence regarding the efficacy of these therapeutics is lacking. Commercial enterprises purport the value of various and sundry vitamin and supplement therapies without the US Food and Drug Administration (FDA) purview available to ensure proper standards and purity.<sup>3</sup> Furthermore, the evidence does not currently support vitamin and mineral supplements for the prevention or treatment of a whole host of systemic health conditions, including many forms of cancer and cardiovascular disease (CVD).<sup>4-10</sup> It should be strongly stated that vitamin and mineral supplements have the potential for adverse health effects and that adverse effects secondary to vitamin utilization are well documented.<sup>1,3,8,11-29</sup>

Some dentists have promoted the utilization of some of these supplements with only a limited understanding of both the attributes and concerns regarding vitamins and mineral supplementation. It is important for clinicians to have an appreciation for the elucidation of both the positive and negative effects of these therapeutics within the literature.<sup>1,2,26,30-33</sup> The literature reveals when and under what context certain vitamin and mineral supplementation demonstrates efficacy and when it does not. The dental literature and the popular press have reported upon the issue of vitamin and supplement therapies and dental health. Many of these reports contain inaccurate, biased, and potentially harmful misinformation. Enwonwu and Ritchie<sup>31</sup> noted that presently, little is known concerning the role of nutrition and periodontitis and it is important for oral health scientists to study this area in the future. It is important for the dental clinician to obtain accurate, unbiased information in order to utilize therapies which may be beneficial and to avoid therapies which lack efficacy and

have the potential to do harm. Furthermore, it appears that it is important for dentists to counsel their patients regarding the importance of a healthy diet.<sup>26,28-32</sup> Hu and Willett<sup>26</sup> concluded that substantial evidence indicates that diets with nonhydrogenated unsaturated fats as the predominant form of dietary fat, whole grains as the main form of carbohydrates, adequate omega-3 fatty acids, and an abundance of fruits and vegetables offer significant protection against cardiovascular heart disease.<sup>26</sup> Therefore, the emphasis for healthcare practitioners should favor healthy diets and not vitamin supplementation. Furthermore, dentists and oral healthcare providers have a responsibility to promote a healthy diet.<sup>33</sup>

There are a number of nutritional deficiencies that manifest within the oral cavity. Therefore, the inference of nutritional deficiencies may be first discovered upon an oral examination and often by dentists.<sup>33-36</sup> Moreover, there are a number of proposed vitamin therapies for oral and dental conditions. Some of these proposed therapies appear to be efficacious, some of these therapies appear to be harmless but of questionable efficacy, and some of these therapies appear to be dangerous. The objective of this article is to educate dentists by elucidating potentially beneficial vitamin therapies, as well as the potentially detrimental vitamin therapies. The article will address: (1) water soluble vitamins, (2) fat soluble vitamins, and (3) antioxidant vitamins, related to oral tissue vitamin therapies.

### **B VITAMINS**

B vitamins including B6, B12, niacin (nicotinic acid), and folic acid tend not to be toxic as increased doses usually do not lead to overdose but rather to enhanced elimination. Touger-Decker<sup>1</sup> noted that possible toxicity issues include: (1) vitamin B6 can cause sensory neuropathy, (2) niacin can cause flushing, headache, and impaired glucose tolerance, and (3) folic acid can mask a B12 deficiency, and an untreated B12 deficiency may result in neurodegeneration. However, Schrijver and van den Berg<sup>22</sup> noted that although epidemiological research indicates that the incidence of certain disease states is decreased when the intake of vitamins is significantly higher when compared to the recommended daily allowance, targeted intervention studies presently have not provided unequivocal evidence to support

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such. Furthermore, for certain vitamins such as A, D, folic acid, B6, nicotinic acid, and beta-carotene, the epidemiologic evidence demonstrates that excessive intakes are associated with a health risk or clear toxicity. With regard to B6, nicotinic acid, and folic acid, the risk is mainly limited to the use of high-dose supplementation.<sup>22</sup>

### **B-Complex**

Neiva, et al<sup>37</sup> reported that vitamin B complex supplementation (thiamine, riboflavin, niacinamide, pantothenate, pyridoxine, d-biotin, and cyanocobalamin) significantly improved periodontal wound healing when compared to placebo with regard to enhanced clinical attachment levels. However, they noted no improvement with regard to bleeding on probing, plaque index, or gingival index. Interestingly, Muñoz, et al<sup>38</sup> reported significant efficacy with regard to gingival index, bleeding index, and periodontal pocket depth but not for attachment level. The Muñoz, et al study<sup>38</sup> was similar in design to the Neiva, et al study<sup>37</sup> but utilized folic acid, cyanocobalamin, ascorbic acid, echinacea angustifolia, vitis vinifera, coenzyme Q10, and piper nigrum. The differing outcomes in comparing these 2 studies are interesting. Neiva, et al<sup>37</sup> reported efficacy with regard to clinical attachment levels while Muñoz, et al<sup>38</sup> did not. Muñoz, et al<sup>38</sup> reported efficacy with regard to gingival bleeding index and periodontal pocket depth while Neiva, et al<sup>37</sup> did not.

### **Folic Acid**

Pack<sup>39,40</sup> reported beneficial results utilizing folic acid in the treatment of gingivitis, and Thomson and Pack<sup>41</sup> reported benefits of folic acid with regard to pregnancy gingivitis. Drew, et al<sup>42</sup> reported significant results regarding the treatment of drug-induced gingival overgrowth with a topical folate solution, while Brown, et al<sup>43</sup> and Poppell, et al<sup>44</sup> reported no significant improvement with systemic folic acid. Erdemir and Bergstrom<sup>45</sup> reported that in a population of periodontal patients, the concentration of serum folic acid is lower in smokers compared to nonsmokers.

### **Vitamin B12**

Vitamin B12 (and folic acid) deficiency may result in oral burning and neuropathy. Furthermore, patients with high

methyl malonic acid levels (a breakdown product of B12) may also demonstrate symptomatology consistent with glossodynia. Therapy with B12 (and folic acid) supplementation is often successful in reversing these symptoms. Vitamin B12 and folic acid work as cofactors and both are required nutritional supplements. B12 (and folate) deficiency may provoke the appearance of a “bald tongue” appearance due to the absence of filiform papillae. In B12 deficiency, supplementation with folate may reverse the finding of the bald tongue but the neuropathy condition will not be reversed unless B12 supplementation is initiated in a timely fashion. Injection therapy is necessary for some patients with vitamin B12 absorption issues.<sup>34,46-51</sup>

### **VITAMIN C**

Vitamin C deficiency is associated with scurvy and resulting gingival bleeding and tooth loss; however, the relationship between vitamin C supplementation and dental and oral diseases appears to be more complicated. Touger-Decker<sup>1</sup> noted that excess doses of vitamin C can result in such negative effects as nausea, osmotic diarrhea, and nephrolithiasis. She also noted that chewable vitamin C tablets may cause tooth enamel erosion. Furthermore, she noted that vitamin C has possible interactions with indinavir and iron in that it may result in reduced plasma concentrations.

Leggott, et al<sup>52</sup> studied the relationship between varying ascorbate intake, periodontal status, and subgingival microflora in a study population of young men. They reported no significant changes in plaque, probing pocket depth, or attachment level, but they noted that gingival bleeding increased significantly after ascorbic acid depletion and returned to baseline after ascorbic acid repletion. However, no relationship was determined between either the presence or proportion of periodontal microorganisms and measures of bleeding or ascorbate levels. Franceschi, et al<sup>53</sup> noted that ascorbic acid is necessary for the expression of osteoblast phenotype and examined Na<sup>+</sup> dependent transport required for MC3T3-E1 preosteoblast cells to respond to vitamin C. They determined that Na<sup>+</sup> dependent ascorbic acid transport is required in order to achieve intracellular vitamin C concentrations necessary for expression of the osteoblast phenotype. Pussinen, et al<sup>54</sup> evaluated vitamin

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C concentrations in plasma with regard to periodontitis serology in Finnish and Russian men. They reported that antibody levels to *Porphyromonas gingivalis* correlated negatively with the vitamin C concentrations. They concluded that *P. gingivalis* infection is associated with low concentrations of vitamin C in plasma. Amarasena, et al<sup>55</sup> also noted an inverse relationship between serum vitamin C and periodontitis in an elderly Japanese population. Amaliya, et al<sup>56</sup> reported an association between vitamin C plasma levels and periodontal attachment loss. However, Pussinen, et al<sup>54</sup> noted that the majority of epidemiological and biochemical studies have failed to demonstrate an association between vitamin C deficiency and the prevalence or severity of periodontitis, or that patients suffering from periodontal disease benefit from vitamin C supplementation.

Maserejian, et al<sup>15</sup> reported the positive effects of vitamin C-rich fruits and vegetables in decreasing the risk of oral premalignant lesions. The risk of oral premalignant lesions was significantly reduced with higher consumption of fruits, particularly citrus fruits and juices.

### VITAMIN D

Vitamin D is necessary for healthy bone growth. A number of studies document the importance of vitamin D and calcium, and note that deficiencies result in bone loss and inflammation which are both recognized symptoms of periodontal disease. Recently, some studies have suggested that calcium and vitamin D may benefit periodontal health. But presently, clinical efficacy trials have yet to be published.<sup>57,58</sup> Furthermore, osteoporosis is a relatively prevalent condition among the aging population and the importance of vitamin D with respect to bone maintenance is underscored. But presently, it is necessary to produce well-controlled clinical trials to determine the inter-relationship between systemic and oral bone loss and to assess the role for dentists with regard to vitamin D and other aspects of osteoporosis and systemic bone health.<sup>58</sup> With regard to excessive doses, Giunta<sup>59</sup> reported a case of vitamin D hypervitaminosis and noted such findings as enamel hypoplasia and focal pulp calcification. Also, Touger-Decker<sup>1</sup> noted a possible drug interaction of vitamin D with digoxin, which has the potential to cause an arrhythmia.

### ANTIOXIDANTS

Vitamin E has the potential to decrease the effect of anticoagulant medications. Furthermore, vitamin E and beta-carotene are associated with a number of negative health consequences, including an increased incidence of cancer and an increased mortality rate.<sup>1,4,60</sup>

Lippman, et al<sup>61</sup> reported some success with the utilization of 13-cisretinoic acid in the treatment of head and neck cancer. However, due to problematic side effects and patient toleration difficulties, this treatment has not become an accepted therapeutic regimen in the treatment of premalignant and malignant oral lesions.<sup>62,63</sup> Furthermore, Schwartz and Shklar<sup>60</sup> reported that under certain carcinogenic environments, carotenoids may enhance tumor growth.

Schwartz<sup>64</sup> added that the use of chemopreventive agents without considering their pharmacologic, oxygen-responsive characteristics may produce unwanted iatrogenic side effects.

In regard to a study assessing the effect of alpha-tocopherol and beta-carotene supplementation on the prevalence of oral mucosal lesions in smokers, Liede, et al<sup>65</sup> reported that their study did not support the concept that such supplementation plays an essential role in preventing oral mucosal changes in smokers. Further, they reported an increased tendency towards gingival bleeding with regard to alpha-tocopherol supplementation of acetylsalicylic acid. Chandra, et al<sup>66</sup> evaluated the efficacy of lycopene in the treatment of gingivitis in a randomized, placebo-controlled clinical study and reported that lycopene therapy resulted in decreased gingival and bleeding indices. Chapple, et al<sup>67</sup> reported that inflammatory periodontitis was negatively associated with serum vitamin C, bilirubin, and antioxidant concentrations. Hanioka, et al<sup>68</sup> reported that coenzyme Q improved adult periodontitis both as a sole treatment and in combination with traditional nonsurgical therapy. However, Watts<sup>69</sup> reported that a review of the available literature does not support positive claims for the efficacy of coenzyme Q10 in the treatment of periodontal treatment and that it was his opinion that coenzyme Q10 has no place in periodontal therapy.

Alpha lipoic acid is an antioxidant and a naturally synthesized chemical. It is found in very small amounts in

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foods such as peas, spinach, broccoli, brussel sprouts, rice bran, and organ meats. There are a number of studies which demonstrate the efficacy of alpha lipoic acid in the treatment of glossodynia/burning mouth syndrome and other peripheral neuropathies.<sup>70-72</sup> However, 2 recent studies by different research groups (from the one which performed the previous studies) failed to demonstrate the efficacy of alpha lipoic acid in the treatment of glossodynia.<sup>73,74</sup> In another positive report of an antioxidant efficacy study, Terezhalmay, et al<sup>75</sup> reported the efficacy of a water-soluble bioflavonoids-ascorbic acid complex in the treatment of recurrent herpes labialis.

### DISCUSSION

Any utilization of a pharmacotherapeutic must begin with a risk-benefit analysis. Do the benefits outweigh the risks or the risks outweigh the benefits? Are either the risks or benefits substantial? It is incumbent upon the clinician to make this determination. If the risk/benefit appraisal is within a grey area, it is then necessary for the clinician to educate the patient and allow the patient to be part of the discussion and decision. This process is referred to as informed consent.<sup>76</sup>

Water soluble vitamins are less toxic compared to fat soluble vitamins. Because water soluble vitamins such as B vitamins and vitamin C are readily excreted, they tend not to be toxic, although extremely high dosages of some (B6, nicotinic acid, and folic acid) can be problematic.<sup>22</sup> Even so, Huang, et al<sup>17</sup> reported that multivitamin/mineral supplements conferred no benefit in preventing CVD or cataracts, and may prevent advanced age-related macular degeneration only in high-risk individuals. The overall quality and quantity of the literature on the safety of multivitamin/mineral supplements is limited. However, there are several studies which demonstrate potential oral and dental benefits utilizing water soluble vitamin therapies.<sup>37-42</sup> Therefore, it is established that several water soluble vitamins have relatively low toxicity levels and at least a premise for successful therapy. However, fat soluble vitamins are noted to have toxicity issues and provide little in the way of efficacy.

Recently, a number of cardiac health and cancer studies have evaluated antioxidants, and these studies have been exceedingly negative. Bjelakovic, et al<sup>11</sup>

reported that they could not find convincing evidence that antioxidant supplements prevent gastrointestinal cancers and that to the contrary, antioxidant supplements of vitamins A and E seem to increase overall mortality. Liede, et al<sup>65</sup> concluded that their study did not support the hypothesis that alphatocopherol or beta-carotene supplementation plays an essential role in preventing oral mucosal changes in smokers. A cancer prevention study group concluded that they found no reduction in the incidence of lung cancer among male smokers after 5 to 8 years of dietary supplementation with alpha-tocopherol or beta-carotene, and in fact determined that these supplements may actually have harmful as well as beneficial effects.<sup>77</sup> Schwartz and Shklar<sup>60</sup> noted that carotenoids may enhance tumor growth under the appropriate carcinogenic environment.

Asplund<sup>4</sup> concluded that antioxidant vitamins as food supplements cannot be recommended in the primary or secondary prevention against CVD. Cook, et al<sup>5</sup> concluded that there were no overall effects of ascorbic acid, vitamin E, or beta-carotene on cardiovascular events among women at high risk for CVD. Sesso, et al<sup>6</sup> concluded that in their large, long-term trial of male physicians, neither vitamin E nor vitamin C supplementation reduced the risk of major cardiovascular events. Their data provided no support for the use of these supplements for the prevention of CVD in middle-aged and older men. Dagenais, et al<sup>10</sup> reported that currently, there are no data to support the use of vitamin C, beta-carotene, and vitamin E to reduce the risk of cardiovascular events. Neuhouser, et al<sup>78</sup> concluded that after a median follow-up of approximately 8 years in the clinical trial and observational study cohorts, respectively, the Women's Health Initiative study provided convincing evidence that multivitamin use has little or no influence on the risk of common cancers, CVD, or total mortality in postmenopausal women. These many studies and reviews as quoted above appear to demonstrate that vitamins and antioxidants pose potential risks without relevant benefits as opposed to antioxidants within the diet.

Ye and Song<sup>79</sup> concluded that dietary intake of antioxidant vitamins has encouraging prospects for possible cardiovascular heart disease prevention. Fletcher, et al<sup>80</sup> reported that low blood vitamin C concentrations in

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an older British population are strongly predictive of mortality. A number of studies have reported the positive implications of a diet rich in vegetables and fruits in the prevention of CVD and cancer.<sup>81-84</sup> Certainly, there are a number of studies which do not demonstrate that diet improves mortality in many forms of cancer, but many studies support that a healthy diet rich in vegetables and fruits appears to aid in protection against CVD and several forms of cancer.<sup>26,29,33,82-84</sup> At the same time, it appears that vitamin supplements do not offer the same protection offered by obtaining these same vitamins through a healthy diet. Palacios, et al<sup>33</sup> reported that dentists are in the position to play a critical role in motivating and enabling healthy food choices.

Presently, the technology exists to measure the amount of antioxidants within the skin of patients. Presumably, this measurement allows for an assessment of the patient's serum concentration and is predictive of protection against CVD and several forms of cancer.<sup>85</sup> However, the concept of utilizing such a technological measuring device to evaluate patients' antioxidant levels and prescribe supplements is problematic and potentially fraudulent, particularly so within a dental office environment.<sup>30</sup> Firstly, there is a lack of evidence with regard to the efficacy of beta-carotene supplementation therapy for oral and dental diseases, and secondly, there is the potential to cause great harm with regard to the toxicity issues of antioxidants, such as an increased rate of cancer and increased mortality. In these authors' opinion, allowing dentists to utilize an assay which promotes a patient's fear regarding a vitamin deficiency and then selling these same patients an unproven supplement in order to enhance the dentist's economic gain is unconscionable.

Unfortunately, the FDA does not regulate vitamins and vitamin supplements. These pharmacotherapeutics are available to consumers with little oversight regarding purity and concentration or efficacy. Therefore, patients/consumers cannot be assured that what they believe they are buying is in reality what is being sold and that it will necessarily have any positive effect even if it is what they believe it to be.

### CONCLUSION

There is promise but at present no documentation that future studies will demonstrate value in the utilization of some water soluble vitamin therapies in the treatment of oral and dental diseases, but presently, fat soluble vitamin supplementation tends to demonstrate many problematic risks with negligible benefits. Furthermore, dentists have an important role in emphasizing the importance of a healthy diet. It is important to continue to utilize double-blind randomized studies in the future to evaluate the safety and efficacy of vitamin therapies within the treatment of oral and dental diseases.

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### POST EXAMINATION QUESTIONS

1. Which of the following statements is the MOST CORRECT statement?
  - a. Vitamins do not have any relevant toxicity.
  - b. Vitamins have proven therapeutic efficacy regarding many oral and dental conditions.
  - c. Vitamins have the potential to do both good and harm.
  - d. Vitamins have proven to be effective in the treatment of dental disease.
2. Scientific evidence currently supports that \_\_\_\_\_.
  - a. Vitamin supplements are efficacious for the prevention or treatment of many forms of cancer.
  - b. Vitamin supplements are efficacious for the prevention or treatment of cardiovascular disease (CVD).
  - c. Both A and B.
  - d. Vitamin supplements have not proven efficacious for the prevention or treatment of CVD or many forms of cancer.
3. Vitamin B6 is known in some situations to \_\_\_\_\_.
  - a. Cause flushing and headache.
  - b. Cause sensory neuropathy.
  - c. Mask untreated B12 deficiency.
  - d. Cause "bald tongue."
4. Folic acid is known in some situations to \_\_\_\_\_.
  - a. Cause flushing and headache.
  - b. Cause sensory neuropathy.
  - c. Mask untreated B12 deficiency.
  - d. Cause "bald tongue."
5. Neiva, et al reported that after vitamin B complex therapy, their results demonstrated efficacy with respect to:
  - a. Bleeding on probing.
  - b. Attachment levels.
  - c. Plaque index.
  - d. Gingival index.
6. Muñoz, et al reported that after vitamin B complex therapy, their results demonstrated efficacy with respect to:
  - a. Bleeding on probing.
  - b. Attachment levels.
  - c. Plaque index.
  - d. Gingival index.
7. Vitamin B12 deficiency can lead to which of the following?
  - a. Neurodegeneration.
  - b. Stomatitis.
  - c. Increase in episodes of herpes labialis.
  - d. Bone fragility.

## Vitamins and the Treatment of Oral and Dental Diseases

8. Vitamin C deficiency is associated with \_\_\_\_\_.
- Scurvy.
  - Stomatitis.
  - "Bald tongue."
  - Neurodegeneration.
9. Currently, with regard to calcium and vitamin D:
- Studies demonstrate that calcium and vitamin D decrease periodontal disease.
  - Presently, there are no published clinical efficacy trials which report the success of calcium and vitamin D in the treatment of oral conditions.
  - Studies demonstrate that calcium and vitamin D decrease gingivitis.
  - Studies demonstrate that calcium and vitamin D are beneficial in the treatment of aphthous stomatitis.
10. With regard to the utilization of vitamin A therapies, which of the statements below is the MOST CORRECT?
- Vitamin A therapy has NOT demonstrated any success in the treatment of oral cancer.
  - Vitamin A therapy has demonstrated great success in the treatment of oral cancer.
  - Vitamin A therapy has demonstrated some success in the treatment of oral cancer, but such therapy has been problematic due to side effects.
  - Vitamin A anticancer therapy usually results in increased oral cancer lesions.
11. In one randomized study it was determined that lycopene was efficacious for the treatment of \_\_\_\_\_.
- Aphthous stomatitis.
  - Periodontitis.
  - Gingivitis.
  - Herpes labialis.
12. Which of the following statements related to the efficacy of alpha lipoic acid in the treatment of glossodynia/burning mouth syndrome is the MOST CORRECT?
- All the reported studies demonstrated the efficacy of alpha lipoic acid in the treatment of glossodynia.
  - All of the reported studies demonstrated that alpha lipoic acid did NOT demonstrate efficacy in the treatment of glossodynia.
  - All of the studies evaluating the efficacy of alpha lipoic acid in the treatment of glossodynia were poorly designed.
  - Some of the studies evaluating alpha lipoic acid in the treatment of glossodynia demonstrated efficacy and some did not.
13. Which of the below is the MOST CORRECT statement?
- Water soluble vitamins such as vitamins B and C have relatively low toxicity.
  - Fat soluble vitamins such as vitamins A, D, and E have relatively low toxicity.
  - Water soluble vitamins such as vitamins B and C have toxic issues.
  - Fat soluble vitamins such as vitamins A, D, and E are less toxic compared to water soluble vitamins such as vitamins B and C.
14. The antioxidant beta-carotene is associated with \_\_\_\_\_.
- Heart health.
  - Increased incidence of cancer and decreased longevity.
  - Decreased incidence and severity of cancer.
  - Skin health.
15. Which of the following statements is the MOST CORRECT?
- Antioxidant supplements are completely safe and offer no risks.
  - Eating a healthy diet rich in antioxidants is healthful.
  - Antioxidant supplements have been shown to be efficacious in treating many forms of cancer.
  - Antioxidant supplements have been shown to be efficacious in the treatment of heart disease.
16. According to the authors, the major responsibility of dentists is to \_\_\_\_\_.
- Provide vitamin therapy for dental patients.
  - Provide testing to determine vitamin deficiency determinations for dental patients.
  - Counsel patients on the importance of good nutrition.
  - Utilize vitamin therapies for the treatment of periodontal disease.

## Vitamins and the Treatment of Oral and Dental Diseases

### PROGRAM COMPLETION INFORMATION

If you wish to purchase and complete this activity traditionally (mail or fax) rather than online, you must provide the information requested below. Please be sure to select your answers carefully and complete the evaluation information. To receive credit you must answer at least 12 of the 16 questions correctly.

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### ANSWER FORM: COURSE #: 132

Please check the correct box for each question below.

- |                                                                                                                |                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 1. <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d | 9. <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d  |
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### PROGRAM EVALUATION FORM

Please complete the following activity evaluation questions.

Rating Scale: Excellent = 5 and Poor = 0

Course objectives were achieved. \_\_\_\_\_

Content was useful and benefited your clinical practice. \_\_\_\_\_

Review questions were clear and relevant to the editorial. \_\_\_\_\_

Illustrations and photographs were clear and relevant. \_\_\_\_\_

Written presentation was informative and concise. \_\_\_\_\_

How much time did you spend reading the activity and completing the test? \_\_\_\_\_