Linking Dermatology and Dentistry
Part II: Treatment Options

A Peer-Reviewed Publication
Written by Lisa Dowst-Mayo, RDH, BSDH

Abstract
Part one of this two part course discussed commonly encountered skin lesions and conditions. Part two discusses treatment options for a variety of skin conditions including antioxidants, surgery, chelating agents, and systemic medications. Dental clinicians are in an advantageous position to identify a variety of lesions and conditions since a significant amount of time is spent working in and around the head and neck region of the body. Expanding our observations beyond the oral cavity will enhance patient care.

Educational Objectives
At the conclusion of this educational activity participants will be able to:
1. Define and discuss antioxidants and their benefits to dermatology and dentistry.
2. Discuss anti-aging and healing capabilities of antioxidants.
3. Present treatment options for a variety of common skin conditions.
4. Discuss ultraviolet radiation (UVR) and protection.

Author Profiles
Lisa Dowst-Mayo, RDH, BSDH graduated magna cum laude from Baylor College of Dentistry in 2002. She has been an active member of the American Dental Hygiene Association and has held numerous leadership positions both at the state and local levels. She is currently a full time professor at Concorde Career College in the dental hygiene department in San Antonio, TX. Lisa is a published author, enthusiastic national speaker and can be contacted through her website at www.lisamayordh.com or by email at lisa_dowst@hotmail.com.

Author Disclosure
Lisa Dowst-Mayo has no affiliations with any company who would have a gained interest in the material published in this course. There was no corporate sponsor in the making of this course and the author is not employed by a company that would stand to profit off the publication of this course. All research is presented in an unbiased manner.

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Abstract
Part one of this two part course discussed commonly encountered skin lesions and conditions. Part two discusses treatment options for a variety of skin conditions including but not limited to; antioxidants, surgery, chelating agents, and systemic medications. Dental clinicians are in an advantageous position to identify a variety of lesions and conditions since a significant amount of time is spent working in and around the head and neck region of the body. Expanding our observations beyond the oral cavity will enhance patient care.

Introduction
Dental clinicians are in a unique position to examine the head and neck for a variety of skin lesions and conditions. In addition to routine intraoral cancer screenings, clinicians should incorporate frequent examinations of the skin as well. Early identification and intervention improves the prognosis of virtually every disease entity. There are many areas of the head and neck that cannot be visualized when looking in the mirror. Patients respond favorably when areas beyond the oral cavity are examined, lesions are noted and a referral is made for intervention to a specialist such as a dermatologist. There is a confusing array of over the counter products that address a wide variety of skin conditions. Providing care beyond the oral cavity is facilitated by increasing one’s knowledge of some of the most commonly encountered skin lesions and conditions.

MILIA
Estheticians, cosmetologists or dermatologists can remove milia by extraction in adult patients, most commonly for cosmetic purposes. Extractions involve piercing the milia with a sterile lancet or scalpel, then removing the lesion with a comedone extractor. Other treatment options may include topical retinoid creams or a series of chemical peels/microdermabrasion procedures to enhance the individual’s appearance. An accurate diagnosis by a medical professional is necessary prior to treatment.

WHITEHEAD
Whiteheads are an esthetic nuisance for the patient which will usually resolve without medical intervention. There are many products to help prevent whiteheads including antioxidants or cleansing agents which remove excess sebum, dead skin cells and cosmetic residue.

BLACKHEAD/ACNE
Dermatologists commonly treat patients with blackheads and acne because dark spots and scars can permanently persist on the skin if interventions are not undertaken. Treating acne can boost a person’s self-esteem and with the wide variety of effective and safe options, there is no reason a patient has to suffer. Treatments vary based on severity of the condition as well as the root cause. Oil based cosmetics should be avoided in favor of water based products labeled as non-comedogenic. Topical medications can reduce oils and eliminate bacteria. They carry minimal risks and some are available in over the counter (OTC) preparations. Examples include benzoyl peroxide, sulfur, resorcinol and/or salicylic acid. Doctors will recommend OTC medications for mild acne signs and symptoms but to treat moderate to severe acne, prescription medications are commonly utilized.

Many prescription products utilized in acne treatment are based on a variety of Vitamin A derivatives which help promote cell turnover and prevent the clogging of hair follicles. Isotretinoin is in the retinoid drug class and is used primarily for severe cystic acne vulgaris and acne that is nonresponsive to other treatments. These medications are classified as FDA Pregnancy Category X and ADEC (Australian Drug Evaluation Committee) Category X because of the risk of birth defects, miscarriage, and inflammatory bowel disease. Alternatives include antibiotics in the case of bacterial infections and oral contraceptives if acne is caused by hormonal influences.

MOLES (NEVI)
Treatment recommendations will depend on the condition. A dermatologist may remove moles through surgery if cancer is suspected or for esthetics.

AGE SPOTS
Treatment options can include products that contain either hydroquinone (prescription bleaching cream), emblica, kojic acid, deoxyarbutin, glycolic acid or retinoids. Many of these products can lead to skin irritation so the use of a moisturizer may be necessary.

Emblica is an antioxidant derived from the fruit of a deciduous tree. It may have potential activity against certain cancers and is used clinically as an anti-inflammatory agent due to its high concentrations of L-ascorbic acid (vitamin C).

Kojic is a chelating agent produced by several species of fungi. Chelating agents are organic compounds that form soluble complex molecules with specific metal ions, inactivating the ions so they cannot normally react with other elements or ions to produce precipitates. It is used to lighten the skin and to treat diseases such as melasma, which is also commonly referred to as “the mask of pregnancy.” This condition occurs when the skin color darkens in response to pregnancy, hormone replacement therapy (HRT) or through the use of oral contraceptives. It is characterized by dark, irregular, well demarcated hyperpigmented macules to patches commonly occurring on the cheeks, nose, lips or forehead. Kojic inhibits the formation of pigments in plant and animal tissues. It
is used commercially to help prevent the oxidative browning of fruits, to preserve the pink and red color of seafood and has antibacterial and antifungal effects.

Other treatment options for age spots include; chemical peels, dermabrasion, laser resurfacing (Figure 1) or freezing (cryotherapy); all of which can involve multiple treatments and carry side effects. The best treatment is prevention, most notably avoiding sun exposure or wearing a sunscreen with zinc oxide and an SPF at least 30 but less than 50.

Figure 2 is a photo of a 56 year old white female with moderate sun exposure over a period of years. The left hand has been treated for one month with a cream containing 2% emblica and 2% kojic acid. The right hand has not received any treatment. Note the lightening of the age spots and the decreased number of hyperpigmented lesions.

ECZEMA/ATOPIK DERMATITIS/DRY SKIN
Diagnosis is made by clinical presentation and biopsy is indicated when trying to rule out other conditions. Treatment is aimed at minimizing signs and symptoms. Patients are advised to avoid scratching the skin and to use moisturizers, topical steroid creams or oral antihistamines. Patients should keep fingernails short and consider nighttime gloves to avoid scratching. All topical creams or moisturizers should be used 2-3 times per day and be free of alcohol, scents, dyes, fragrances or other chemicals. These products should be applied to the skin shortly after bathing and towel drying. A humidifier can help keep the air moist to avoid further drying of the skin. Systemic medications are generally not used unless other treatments have proven unsuccessful. Medications that suppress the immune system such as cyclosporine, methotrexate or mycophenolate have been utilized in more severe cases. Phototherapy has proven successful in some cases and antibiotics are used if an infection is co-occurring on the skin due to scratching.

ROSACEA
There is no cure for rosacea; however, there are treatments that can help with the clinical signs and symptoms. These include; laser surgery, sunscreen, chemical peels, topical products that diminish redness, vitamin A or topical antibiotics. Patients are advised to avoid triggers such as sun exposure, stress, spicy foods, alcohol, hot beverages, wind or hot baths.

ORAL LICHEN PLANUS (OLP)
There is no cure for OLP and treatment options are strictly therapeutic or palliative. Patients should be advised to improve oral hygiene and minimize local irritants. Corticosteroids are usually the first line of defense. Other treatment options include; topical immunosuppressives, systemic medications (corticosteroids, retinoids, thalidomide, levamisole, tacrolimus), use of low-level frequency lasers, antioxidants or biologics. Recent research has suggested some patients with OLP, especially the erosive form, may be at increased risk for the development of squamous cell carcinoma. If a dentist or dental hygienist identifies oral lichen planus, referral to an specialist is indicated.

PSORIASIS
Diagnosis is made based on clinical presentation and visual inspection. Biopsy is rarely needed unless it is indicated to rule out another condition. Treatments are aimed at controlling the signs and symptoms and to prevent infection. Topical agents such as; lotions, ointments, creams, shampoos, steroids, moisturizers, topical vitamin A/D or oatmeal baths are recommended to start. If these agents do not prove successful then doctors may utilize systemic medications; most commonly methotrexate, cyclosporine, retinoids or biologics. Phototherapy by exposing skin to UVA or UVB light has been successful in some clinical trials.

SEBORRHEIC DERMATITIS (SD)
Treatment options normally include the use of antifungal agents, steroids, immunomodulators and/or keratolytics.

ANGULAR CHEILITIS
Treatment is aimed at controlling the source of infection by using antifungal agents or antibiotics. If recurrent infections are an issue for the patient, a referral to rule out other underly-
ing medical problems may be necessary. Daily use of products that help keep the lips moisturized to prevent cracking or subsequent infections should be recommended to patients as well.

ACTINIC CHEILITIS (AC)
Treatment options are aimed at removing or destroying the abnormal epithelium. They can include topical application of 5-fluorouracil, chemical peels with trichloroacetic acid, cryotherapy, electrocautery, laser ablation or photodynamic therapy. Excisional biopsy (vermillionectomy) is indicated when loss of the sharp line demarcating the red color of the lip from the normal skin is seen, changes in the texture of the lip to palpitation or when there is a change in the thickness and presence of ulceration. Biopsy is the only way to allow for a histopathological review of the tissues (Figure 3).

NON-MELANOMA SKIN CANCERS:
BASEAL CELL CARCINOMA (BCC)
Early intervention is critical but unfortunately BCC treatment is commonly delayed because of misdiagnosis or lack of recognition. Differential diagnosis may include a wide variety of lesions including; scars, eczema, freckles or nevi because of BCC’s vast array of clinical features. Skin biopsy is necessary to confirm the diagnosis and will help define treatment options. Doctors may excise the lesion, perform curettage, electrodesiccation, Mohs surgery or cryosurgery, prescribe skin creams or provide photodynamic therapy. If these treatments prove unsuccessful then radiation may be necessary.

SQUAMOUS CELL CARCINOMA (SCC)
SCC is another form of non-melanoma skin cancer. A skin biopsy is used to confirm diagnosis and treatment will depend on the location and severity. Common treatments include; excision, electrodesiccation and curettage, cryosurgery, prescription medications, Mohs surgery or photodynamic therapy (Figure 4).

SOLAR DAMAGE/PROTECTION
UV-induced generation of reactive oxygen species (ROS) occurs when the skin develops oxidative stress. Reactive oxygen species are chemically reactive molecules containing oxygen. Oxidative stress is the cumulative damage to cell structures caused by ROS. When the formation of ROS exceeds the antioxidant defense capabilities of the skin cells, free radicals can potentially cause damaging changes to the skin. Free radicals indirectly cause DNA damage which can lead to malignant melanoma. Healthcare professionals and the FDA recommend sunscreen for anyone who is outdoors, especially between the hours of 10 AM-4 PM when UV light is most intense.

According to the American Cancer Foundation, the leading cause of skin cancer is UV radiation from the sun and artificial UV radiation from tanning beds. According to the CDC, individuals using tanning beds before the age of 35, have a 75% increased risk of developing skin cancer. Despite this information, many Americans are still tanning indoors. Healthcare providers should be aware of the risk factors associated with this type of intense UV radiation (UVR) exposure and be examining their patient’s skin closely.

The ozone layer of the earth does not provide protection from all forms of UVR. UV radiation is believed to be responsible for up to 90% of photo-aging. UV rays penetrate glass such as car windows. For those who spend a significant amount of time driving or commute by car, sunscreen protection of the arms is recommended. There are 3 types of UV rays, ultraviolet A, B and C. UVA is the most common on earth’s surface and penetrates beyond the top layer of human skin. UVB rays are mostly absorbed by the ozone layer and don’t reach as far into human skin; however, they are still dangerous and are responsible for most sunburns. UVC rays are extremely dangerous, are absorbed by the ozone layer and do not reach the ground.

The Skin Cancer Foundation recommends an SPF of 30 but no higher than 50 for adequate protection. Sunscreens currently on the market contain a wide array of chemicals; however, they do not all provide the same level of protection from UV radiation.
Compounds that are commonly incorporated in OTC sun-screen products include:
1. Avobenzone (Parsol 1789®)
2. Ecamsule (Mexoryl®)
3. Octinoxate
4. Octisalate
5. Octocrylene
6. Oxybenzone (Benzo-phenone-3)
7. Octyl-Dimethyl PABA
8. PABA (para-aminobenzoic acid)
9. Titanium dioxide
10. Zinc oxide

Zinc oxide is the only compound that provides protection against all three forms of UVR. (10,11) It is the preferred ingredient for protection as recommended by the American Academy of Dermatology and the EPA. Zinc oxide provides the broadest protection of all the compounds listed above. It is an FDA Category 1 skin protectant which means it is safe and effective for compromised or environmentally challenged skin which is also why it is the leading compound in baby products. When purchasing sunscreens, be sure to read the ingredients; many brands do not contain zinc oxide.

ANTIOXIDANTS
Antioxidants are natural substances comprised of vitamins and minerals. They have an ability to fight and neutralize free radicals before they can attack the body and to strengthen cells when applied directly to the skin. Studies show topical application of antioxidants can provide up to 96% reduction of sunburned skin cells and prevent the formation of thymine dimers in UV radiated skin, providing a younger and healthier appearing skin tone. (11,12,13,14) The use of the topical antioxidants discussed below can aid in prevention of oxidative stress, enhance DNA repair which can potentially decrease the risk of developing skin cancer, increase the youthfulness of skin color and contour and reverse the aging changes of the skin. (15)

A variety of factors can contribute to skin damage including: ionizing radiation, severe physical and psychological stress, alcohol intake, poor nutrition, overeating, environmental pollution, and exposure to UV radiation. The biology behind aging skin is founded in many different physiological processes. The reduction in collagen and elastin production with advancing age makes the skin thinner and more easily damaged. Many bodily processes diminish with time including the ability to fight infection and heal. Glandular activity and general blood flow also decrease with increasing age. (10) Multiple studies have demonstrated that topical antioxidants are one of the best ways to diminish the impact of certain UV rays and fight oxidative stressors noted above. (2)

A variety of factors also cause a decrease in oral antioxidants. Among them are aging, increased inflammation including the inflammatory component of periodontal disease, smoking and frequent alcohol intake. Topical oral antioxidants can address a wide variety of commonly encountered oral conditions. They can be used as an adjunct in the treatment of aphthous ulcers, xerostomia, periodontal disease, oral lichen planus, and to provide pain and sensitivity relief.

Below are descriptions of many common antioxidants that help repair damaged skin and are incorporated in many prescription and OTC products. A comprehensive discussion of antioxidants is beyond the purview of this course. More information is available from a variety of journals, textbooks and online sources.
1. Acai oil
The acai berry has an abundant supply of essential fatty acids such as Omega 3, 6 and 9. This berry also contains vitamins B1, B2, B3, vitamins E and C as well as minerals such as phosphorus, calcium, potassium, polyphenols, anthocyanins which help preserve the skin, and phytosterols. The oil derived from the berry has anti-aging effects, decreases wrinkle formation and promotes healthy, youthful skin.

2. Alpha-lipoic acid (LA)
LA is a powerful antioxidant which reacts with free radicals. According to the University of Maryland Medical Center, research suggests LA can also interact with other antioxidants including vitamins C and E and glutathione by aiding in regeneration as their quantities are depleted. It scavenges reactive oxygen species and is promoted commercially to erase fine lines, decrease wrinkles and diminish pores. It is also known as thiolic acid and is a naturally occurring compound that is synthesized in small amounts by plants and animals, including humans. Due to LA's diverse pharmacological and physiological actions in the body, research is ongoing for its use in the treatment of diabetes and periodontal disease, among others.

3. Coenzyme Q10 (CoQ10)
With advancing age, the level of CoQ10 the body produces diminishes, which may increase susceptibility to free radical damage. (16) Skin care products containing Coenzyme Q10 can aid in replenishing the CoQ10 that has been lost and slow photo-aging of the skin. A study published by Hoppe et al demonstrated, “CoQ10 penetrated into the viable layers of the epidermis and reduced the level of oxidation. Furthermore, a reduction in wrinkle depth following CoQ10 application was also shown. These results indicate that CoQ10 has the ability to prevent many of the detrimental effects of photo-aging.” (17)

Another study published by Inui demonstrated, “the use of 1% CoQ10 cream for five months reduced wrinkle score grades observed by a dermatologist and contributes to protecting dermal fiber components from degradation, leading to rejuvenation of wrinkled skin.” (18)

4. Vitamin A
This vitamin, when applied topically, has been shown to decrease hyperpigmentation and increase skin tone and color. The biologically active form, retinoic acid, binds to nuclear receptors that aid

...
in transcription and ultimately leads to its physiological effects. Retinoids include the natural and synthetic derivatives of vitamin A which are structurally related to compounds, such as retinol, retinol esters and retinoic acid.\(^1\)

When retinol is applied topically, it is converted into retinoic acid which interacts with skin cells.\(^12,14\) Skin biopsies have revealed retinol increases the production of glycosaminoglycan and procollagen which are structural components of the skin. This is the mechanism of action of the decrease in fine lines and wrinkles with the use of Vitamin A.\(^19\)

Vitamin A research dates back to the 1920s making it the most well known antioxidant on the market today. It has been proven to increase cell regeneration, exfoliation as well as dermal collagen synthesis which plumps the skin. It also lightens solar lentigines and reduces the size and number of actinic keratosis lesions (which is the precancerous growth discussed in Part One of this course). Dermatologists use retinoids for a variety of conditions including acne vulgaris, psoriasis, rosacea, lichen planus, cutaneous lupus erythematosus, disorders of keratinization, striae, ichthyosis, photo damage, enhanced wound healing and for skin cancer prevention. Retinoids do not cure skin cancer, however, through continued use, it may help prevent the formation of new lesions.\(^1\)

Vitamin A is required for the proper functioning of many important metabolic and physiologic body activities, including vision, gene transcription and immune system/skin cell differentiation. Both excessive and deficient levels of vitamin A will lead to poor functioning in the human body.\(^1\) Systemic retinoids are teratogenic and are prescribed with caution and close monitoring by medical professionals.\(^20\)

5. Vitamin C (L-ascorbic acid)
Similar to vitamin A, vitamin C increases collagen production, plumps the skin and decreases wrinkles and fine lines. Vitamin C has multiple benefits for the skin; it neutralizes reactive oxygen species, provides protection from UVB and UVA radiation, regulates vitamin E and the absorption of other antioxidants, stimulates collagen growth, prevents UV immunosuppression and also acts as an anti-inflammatory agent.\(^14\)

The active form of vitamin C, L-ascorbic acid, is a water soluble molecule. It scavenges and quenches free radicals and regenerates vitamin E from its radical form.\(^1\) By replenishing vitamin E, vitamin C indirectly inhibits lipid peroxidation which minimizes UV damage to the skin. Vitamin C aids in wound healing and is safe, even in high doses because of its water solubility.\(^1\) The optimal level for topically applied vitamin C is 20% and it appears to work best when combined with a low pH.\(^12\)

6. Vitamin E
This is a lipid or a fat-soluble antioxidant. Vitamin E is beneficial for tissue repair, to promote healing and as a natural anticoagulant. It protects against UV damage and prevents UV immunosuppression.\(^14\) It scavenges free radicals \(^1\) to reduce skin photo-aging effects, decreases wrinkling after sunburns, prevents skin cancer formation and aids in anti-inflammatory and immunostimulatory effects in the body. It can be used to treat yellow nail syndrome, discoid lupus erythematos, dystrophic epidermolysis bullosa, granuloma annulare or minor atopic dermatitis issues.\(^1\) Research indicates that vitamin E works best when combined with other antioxidants including vitamins C and/or A.

These next 3 antioxidants are plant-based botanicals and are the main ingredients in medically researched skin care products that are available by prescription or over the counter formulations.

1. Alpha-hydroxy acid (AHA)
These are naturally occurring acids that include glycolic acid, lactic acid, citric acid and/or tartaric acid. Glycolic acid is the original, the most popular, and has been proven to remove dead skin cells. AHA’s are used to exfoliate the skin, decrease fine lines, age spots, acne scars and hyperpigmentation.\(^13,14\) Estheticians and dermatologists use high concentrations (15-30%) for chemical peels which can cause deeper penetration of the acid into the skin. Home use products such as in creams and lotions come in concentrations of 5-10%. AHAs increase sensitivity to the sun and may cause drying of the skin if improper concentrations are used. Patients must use sunscreen and moisturizers when using these products for skin rejuvenation.

2. Hyaluronic acid
This is a natural acid in the human body and keeps tissues cushioned and lubricated. It is found in joint fluid, connective tissues and the skin. Smoking and an unhealthful diet will decrease the body’s production of hyaluronic acid. When applied topically, hyaluronic acid will smooth the skin. Best results are achieved when combined with vitamin C.

3. Salicylic acid
Salicylic acid is found in OTC and prescription products and is also used in dermatological chemical peels. Salicylic acid is a versatile compound with several clinical applications. It is used to treat acne because of its ability to penetrate pores. It can also decrease the incidence of blackheads and whiteheads. Salicylic acid is used for exfoliation and to decrease the signs of aging skin.\(^16\) When patients are undergoing chemical peel treatments with these products in-office or with over-the-counter preparations (lower concentrations than in-office), sunscreen must be used due to the enhanced sensitivity to UV light. This protocol also applies to many other dermatological treatments and/or product use. Minimizing exposure to the sun to avoid the skin damaging effects of free radicals is advisable for everyone.

Antioxidants deliver the required vitamins and minerals to the skin. They are inhibited by UV exposure, alcohol, analgesics, oral contraceptives, antidepressants and antiagulants.\(^21\) These agents improve the immune system response, stimulate collagen regrowth and have anti-inflammatory effects.
Antioxidant gels, rinses, toothpastes and mouthrinses are increasingly a part of the dental clinician's armamentarium. They have the ability to address a variety of oral conditions and to enhance the level of patient care.

Conclusion
We can provide a great service to our patients by identifying skin lesions, providing skin care recommendations and referrals. Combining head and neck dermatology with head and neck dentistry, promotes total body health and wellness, bridging the gap between dentistry and medicine. Expanding our profession beyond the oral cavity enables us to provide real comprehensive care for our patients.

References

Author Profile
Lisa Dowst-Mayo, RDH, BSDH graduated magna cum laude from Baylor College of Dentistry in 2002. She has been an active member of the American Dental Hygiene Association and has held numerous leadership positions both at the state and local levels. She is currently a full time professor at Concorde Career College in the dental hygiene department in San Antonio, TX. Lisa is a published author, enthusiastic national speaker and can be contacted through her website at www.lisamayordh.com or by email at lisa_dowst@hotmail.com.

Author Disclosure
Lisa Dowst-Mayo has no affiliations with any company who would have a gained interest in the material published in this course. There was no corporate sponsor in the making of this course and the author is not employed by a company that would stand to profit off the publication of this course. All research is presented in an unbiased manner.

Notes
1. Studies show topical application of antioxidants can provide up 96% reduction of sunburned skin cells and prevent the formation of which of the following in UV radiated skin?
   a. Ultraviolet dimers
   b. Thymine dimers
   c. Aging dimers
   d. Amine dimers

2. As the human body ages, which of the following decreases?
   a. Production of collagens
   b. Production of elastin
   c. Ability to fight infection
   d. All of the above

3. Which of the following antioxidants has been most thoroughly researched?
   a. Vitamin A
   b. Vitamin C
   c. Vitamin E
   d. Vitamin B

4. The biologically active form of vitamin A is:
   a. L-ascorbic acid
   b. Retinoic acid
   c. Sulfuric acid
   d. Citric acid

5. Vitamin A is required for the proper functioning of many important metabolic and physiologic body activities. Excessive amounts of vitamin A will have no adverse effects on the body.
   a. Both statements are TRUE
   b. Both statements are FALSE
   c. The first statement is TRUE, the second is FALSE
   d. The first statement is FALSE, the second is TRUE

6. Vitamin C regulates the absorption of:
   a. Vitamin E
   b. Vitamin B
   c. Vitamin D
   d. Vitamin A

7. The biologically active form of vitamin C is:
   a. L-ascorbic acid
   b. Retinoic acid
   c. Sulfuric acid
   d. Citric acid

8. When applied topically to the skin, the optimal level needed for vitamin C absorption is:
   a. 10%
   b. 15%
   c. 20%
   d. 30%

9. Vitamin C is a water soluble vitamin. Vitamin E is a fat soluble vitamin.
   a. Both statements are TRUE
   b. Both statement are FALSE
   c. The first statement is TRUE, the second is FALSE
   d. The first statement is FALSE, the second is TRUE

10. Vitamin E is best absorbed when it is combined with:
    a. Vitamins A & C
    b. Vitamins B & C
    c. Vitamins D & C
    d. Vitamins B & D

11. Which of the following is NOT a plant-based botanical?
    a. Hyaluronic acid
    b. Salicylic acid
    c. Alpha-hydroxy acid
    d. Vitamin A

12. Which group of plant-based botanicals does glycolic acid belong to?
    a. Alpha-hydroxy acid
    b. Hyaluronic acid
    c. Salicylic acid
    d. Lactic acid

13. The range of concentrations of alpha-hydroxy OTC products is:
    a. 2.5%
    b. 5-10%
    c. 20-30%
    d. 35-50%

14. The best plant-based botanical to use if a patient has easily irritated skin is:
    a. Alpha-hydroxy acid
    b. Hyaluronic acid
    c. Salicylic acid
    d. Lactic acid

15. Which of the following is found in the human body, keeps tissues cushioned and lubricated and is found in joint fluid?
    a. Alpha-hydroxy acid
    b. Hyaluronic acid
    c. Salicylic acid
    d. Lactic acid

16. Antioxidants are inhibited by:
    a. Alcohol
    b. UV Radiation
    c. Tobacco
    d. All the above

17. Which of the following treatment options are commonly used for people with acne?
    a. Water-based products labeled as non-comedogenic
    b. Benzoyl peroxide
    c. Vitamin A
    d. All of the above

18. Which of the following compounds can be used to treat age spots?
    a. Hydroquinone cream
    b. Emblica
    c. Kojic acid
    d. All the above

19. Which of the following agents is sold commercially to help prevent the oxidative browning of fruits, to preserve the pink and red color of seafood and has antibacterial and antifungal effects?
    a. Hydroquinone cream
    b. Emblica
    c. Kojic acid
    d. Glycolic acid

20. Topical creams or moisturizers indicated for the treatment of eczema should be used:
    a. 1-2 times per day
    b. 2-3 times per day
    c. 3-4 times per week
    d. 5+ times per week

21. Rosacea can be triggered by:
    a. Stress
    b. Alcohol
    c. Cold beverages
    d. Both a & b

22. There is no cure for oral lichen planus-like conditions of the skin; treatment options are strictly therapeutic or palliative. OLP may cause a patient to be at an increased risk for the development of squamous cell carcinoma.

Questions
Requirements for successful completion of the course and to obtain dental continuing education credits: 1) Read the entire course. 2) Complete all information above. 3) Complete answer sheets in either pen or pencil. 4) Mark only one answer for each question. 5) A score of 70% on this test will earn you 1 CE credit. 6) Complete the Course Evaluation below. 7) Make check payable to PennWell Corp. For Questions Call 216.398.7822

Educational Objectives
1. Define and discuss antioxidants and their benefits to dermatology and dentistry.
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3. Present treatment options for a variety of common skin conditions
4. Discuss ultraviolet radiation (UVR) and protection

Course Evaluation
1. Were the individual course objectives met?
   Objective #1: Yes No
   Objective #2: Yes No
   Objective #3: Yes No
   Objective #4: Yes No

2. To what extent were the course objectives accomplished overall? 5 4 3 2 1 0
3. Please rate your personal mastery of the course objectives. 5 4 3 2 1 0
4. How would you rate the objectives and educational methods? 5 4 3 2 1 0
5. How do you rate the author’s grasp of the topic? 5 4 3 2 1 0
6. Please rate the instructor’s effectiveness. 5 4 3 2 1 0
7. Was the overall administration of the course effective? 5 4 3 2 1 0
8. Please rate the usefulness and clinical applicability of this course. 5 4 3 2 1 0
9. Please rate the usefulness of the supplemental weblogiography. 5 4 3 2 1 0
10. Do you feel that the references were adequate? Yes No
11. Would you participate in a similar program on a different topic? Yes N
12. If any of the continuing education questions were unclear or ambiguous, please list them.
13. Was there any subject matter you found confusing? Please describe.
14. How long did it take you to complete this course?
15. What additional continuing dental education topics would you like to see?

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