What’s Up With Whitening?  
An Update on Professionally Dispensed Vital Tooth Bleaching

A Peer-Reviewed Publication  
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Educational Objectives
Upon completion of this course, the clinician will be able to do the following:
1. List the different types of vital tooth bleaching systems.
2. List the esthetic conditions that can be treated with vital tooth bleaching.
3. Describe the adverse reactions that have been associated with vital tooth bleaching.
4. Describe the clinical technique for professional vital tooth bleaching using a tray system.
5. Describe how to manage bleaching relapse.

Abstract
Professionally dispensed vital tooth bleaching techniques include a variety of concentrations of hydrogen and carbamide peroxide, in-office techniques with and without light or heat enhancement, professionally dispensed whitening strips and tray bleaching. A predictable technique that does not require wearing of trays for long periods of time improves patient compliance. Tooth whitening with the latest generation of vital bleaching products is effective, safe and relatively long lasting. Bleaching can be maintained through the use of whitening toothpastes and bleaching toothpastes or with yearly touch-up bleaching using the patient’s custom fitted tray. Vital tooth bleaching is a viable, esthetic treatment for the discolored dentition.

Professionally Dispensed Vital Tooth Bleaching: An Update
Esthetic restorative dentistry includes many treatment modalities to change the appearance of teeth. Unfortunately, most techniques involve the placement of restorations, which generally requires some tooth preparation and the need to replace some of these restorations over the patient’s lifetime. With the increased knowledge and interest by patients in having the appearance of their teeth changed with esthetic dentistry, the more conservative techniques have gained wider acceptance. Changing the appearance of teeth to improve a patient’s smile may include modifying tooth contours, shapes, color and position. Where the modification of tooth shape, contours and position is necessary to achieve an improved esthetic result, orthodontics and restorations may be indicated. When there are no patient concerns about the appearance of the teeth and smile other than color, the most conservative clinical technique is vital tooth bleaching.

Professionally dispensed vital tooth bleaching refers to the materials used for vital bleaching that are dispensed in the dental office. These techniques can include a variety of concentrations of hydrogen and carbamide peroxide, in-office techniques with and without light or heat enhancement, professionally dispensed whitening strips and tray bleaching. This article will review the different systems, indications and contraindications for vital tooth bleaching, adverse effects, and describe a predictable technique for tray bleaching that does not require wearing of the tray for long periods of time. Bleaching relapse is a reality. The article will also describe ways for patients to maintain the whiter and brighter smile that was created with vital tooth bleaching.

Bleaching is usually used to lighten teeth darkened by intrinsic and/or extrinsic discoloration. In some cases normal tooth color can be lightened to a whiter smile for those patients who want to improve their esthetic appearance. However, not all tooth discolorations are amenable to successful treatment with vital tooth bleaching. Before making the decision to perform vital tooth bleaching, a thorough clinical examination and evaluation of the existing oral conditions must be made to establish a diagnosis. There will be times when radiographs are necessary to establish and verify a diagnosis.

Diagnosis and clinical evaluation of tooth discolorations
Tooth discolorations can be a result of enamel mottling, tetracycline staining, trauma, developmental hypoplasia, caries demineralization, age-related extrinsic enamel staining, thinning of enamel with subsequent dentin shine-through, and staining of teeth due to smoking, food and beverage ingestion. These types of tooth discolorations can modify the esthetics of teeth so that patients find their appearance and the appearance of their smile unacceptable.

Tooth discolorations can be classified as either intrinsic (within the enamel and dentin) or extrinsic (on the surface of the enamel). Intrinsic discolorations are deep within the tooth, usually a dentin discoloration. Examples of intrinsic tooth discolorations are tetracycline staining of the teeth and endodontic staining. Extrinsic discolorations are superficial and located in the enamel. Fluorosis and enamel hypoplasia (“white spots”) are examples of extrinsic discolorations of the enamel.

Mottled enamel, also known as enamel hypoplasia due to fluoride or fluorosis, is caused when children ingest too much fluoride during tooth development. This can be the result of a child swallowing a fluoride-containing toothpaste or a fluoride mouth rinse, or ingesting fluoride-containing vitamins when the water and other beverages being ingested have the minimal dose of fluoride necessary to provide enamel protection. Fluorosis has a varied appearance depending on the amount of fluoride ingested. Mild fluorosis usually has the appearance of white flecking or spotting of the enamel or white opaque areas on the enamel surface. When fluorosis is moderate to severe, the enamel takes on a brownish appearance (mottling) that can be combined white opaque spots or pitting defects on the enamel surfaces. In cases of severe fluorosis, the enamel has a very pitted, eroded appearance. In addition, moderate to severe dental fluorosis can contribute to the enamel being more susceptible to wear and fracture due to the pitted and thinned edges of the teeth.

A patient with teeth that appear yellow, brown-orange or blue-gray-brown, demonstrates the consequences of taking
tetracycline-based medications for the treatment of childhood infections. Tetracycline staining was first described in 1956. This intrinsic discoloration appears to be caused by the binding of the tetracycline to the calcium in the enamel matrix during mineralization. Tetracycline discoloration can also present with the clinical appearance of banded staining, with the darkest staining at the gingival third of the tooth due to the thinness of the enamel in that area and the discoloration within the underlying dentin. A differential diagnosis of tetracycline staining can be made by shining an ultraviolet light on the teeth. If the teeth fluoresce, then the diagnosis is most likely tetracycline staining.

In recent years, other medication-induced discolorations have been observed. Unlike the characteristic tetracycline staining that occurs during tooth development, these discolorations appear after the teeth are fully erupted in the mouth. The staining has a bluish-gray appearance. Minocycline has been implicated in the discoloration of the permanent dentition after eruption of the teeth.

Another cause of intrinsic discoloration of vital teeth is trauma to the tooth during enamel formation. If the primary tooth is traumatized, blood products in the soft tissue can be incorporated into the mineralization of the permanent tooth enamel matrix. These teeth have a yellow-brownish, opaque appearance. Also, permanent teeth that are fully or partially erupted when traumatized can become similarly discolored and still maintain their vitality, or upon radiographic examination reveal an obliterated (narrowed) root canal.

The most prevalent forms of tooth discoloration observed are extrinsic. Over time teeth become discolored with normal yellowing and darkening, which has been referred to as age-related discoloration. This occurs due to the fact that while enamel appears to be a highly lustrous, hard crystalline surface, it is in fact microscopically rough and permeable. These microporosities result in enamel’s permeability over time and can lead to staining due to smoking and ingested foods and beverages. In many cases, the acidity of tobacco-containing products, coffee, tea, tea with lemon, carbonated soda, energy and electrolyte replacement beverages have the ability to etch the enamel surfaces, leaving them more susceptible to staining. Also, as enamel ages in the mouth, the surface develops micro- and macrocracks and fracture lines that are vulnerable to staining. Over time the enamel crown is also at risk of physical loss of surface from the physical effects of wear created by toothpastes, toothbrush bristles and eating rough foods. Erosion, a chemical process of dissolution of tooth substance, can result from acid dissolution from ingested foods and beverages. As the enamel thins, the more yellow-colored dentin “shines through” the translucent enamel crown, leaving the tooth with a more yellowed appearance.

Caries can create both intrinsic and extrinsic disolorations of teeth through acid demineralization. Once the carious lesion has penetrated through the enamel surface into the dentin, a dark, shadowy discoloration can appear as a shine-through phenomenon in the enamel. Once the bacterial invasion responsible for the carious lesion has penetrated into the dentin, restoration is necessary.

**Bleaching, a treatment for the discolored dentition**

Tooth bleaching was reported as early as 1877, but it has only been in the last 30 years that the conservative treatment of the discolored dentition with high concentrations of heated hydrogen peroxide has been accepted. Unfortunately, this use of a heated, high-concentration hydrogen peroxide has clinical problems and adverse reactions that include the need for multiple office visits (five to seven) to attain an acceptable result, tooth hypersensitivity, soft-tissue irritation due to the high-concentration hydrogen peroxide seeping under the dental dam, and significant chair time.

Over the past 15 years, other techniques for vital tooth bleaching have been described. In 1989, a technique using an at-home mouthguard (tray) with 10% carbamide peroxide was described as successfully whitening teeth. This report was followed by the introduction of other carbamide peroxide products. Concerns about the safety, efficacy and longevity of these bleaching techniques were initially expressed by the United States Food and Drug Administration and the dental profession. A number of reports have adequately addressed these concerns and have demonstrated the safety and effectiveness of tooth whitening with peroxide products. By 1995, a survey of 8,143 dentists reported that 91% used vital tooth bleaching. Seventy-nine percent of the dentists reported success with tooth whitening. Side effects reported by the respondents included the following: 62.2% noted tooth sensitivity 10.7% of the time, 45.9% reported soft-tissue irritation 5.6% of the time, 2.1% noted systemic effects 0.2% of the time, and 18.8% reported no side effects.

Bleaching vital teeth has become an extremely well accepted and successful procedure in dental practices, with tray bleaching being the most popular. During the early introduction of tray (mouthguard) vital bleaching with carbamide and hydrogen peroxide bleaching agents, studies demonstrated the efficacy and safety of these agents. In all cases, the agents lightened the color of the teeth safely and effectively with minimal adverse reactions. In addition, when the bleaching procedure was completed, any adverse reactions that were reported during treatment were no longer present.

With the increased acceptance by the dental profession of vital tooth bleaching and tooth whitening with other products, the American Dental Association issued a report in 1994 and revised in 1998 on the guidelines safety and efficacy criteria for peroxide-containing products that include their use for tooth bleaching. Any product that meets these criteria could receive the American Dental Association Seal of Acceptance. To receive the seal, a company would have to submit safety studies and two clinical trials that demonstrate at least two value oriented shade increments of change when
the bleaching recommendations are followed. To date, all the bleaching products to obtain the seal are 10% carbamide peroxide products.

Professional vital bleaching started with custom-made trays as vehicles to hold a 10% carbamide peroxide gel and now includes a variety of different types of tray and trayless systems that provide for the delivery of either hydrogen or carbamide peroxide in a wide range of concentrations. When comparing hydrogen peroxide to carbamide peroxide, the approximate equivalent of 3% hydrogen peroxide equals 10% carbamide peroxide. In the past decade a number of different peroxide bleaching products have been introduced for professional dispensing. There have been modifications in the chemistry to make the available peroxide longer lasting for overnight tray bleaching. Also, most manufacturers have made available a range of higher concentrations of peroxides (both carbamide peroxide and hydrogen peroxide) to decrease the wear time of the tray and/or decrease the time necessary to achieve the final whitening result. Some higher-concentration hydrogen peroxides have been targeted for in-office bleaching.

Many of the earlier concerns over adverse reactions have been addressed by manufacturers. Over the last decade manufacturers have responded to clinician concerns about issues of taste with better flavors for improved patient acceptance. Tooth sensitivity during bleaching has been the highest reported adverse reaction. It has been demonstrated that tooth sensitivity is transient. To minimize tooth sensitivity, the clinician can recommend the patient decrease the time the tray is worn the first week to no more than an hour a day for carbamide peroxide products or for as little as 15 minutes a day for higher concentration hydrogen peroxides, use lower concentrations of peroxide, employ bleaching gels with desensitizing agents, have patients use a desensitizing toothpaste in a tray for 30 minutes a day during the week prior to bleaching, or use a professionally dispensed desensitizing gel for use with bleaching.

Over the years there has been controversy about what tray is best. When tray bleaching was introduced, the trays were fabricated from thin or thick, flexible vacuum-formed materials and thin rigid plastic materials. Some manufacturers created a foam-lined tray, believing it would hold the bleach on the teeth more effectively. From the current research, which has evaluated a wide variety of tray configurations and types, as well as the duration of wearing the tray, one can conclude the following:

1. Thin, flexible, vacuum-formed materials are the standard;
2. The use of spacers on the stone model to create reservoirs is not necessary, but the use of reservoirs will lead to the patient swallowing less of the bleaching gel;
3. Scalloping the tray to follow the gingival contours is not necessary when using a 10% carbamide peroxide, but should be done for higher concentrations. Over-trim-
4. Custom fitted trays provide improved bleaching gel-tooth contact;
5. Most companies provide bleaching gel for a 2 week time of application;
6. Higher concentrations of carbamide peroxide bleach worn in a tray show faster initial improvements, but over a 6 week period of time comparing 10% carbamide peroxide to higher concentrations there is no difference in the final result;
7. The concept of teeth lightening to a final certain level has been termed as the “inherent lightness potential” of a tooth and there is an endpoint to how much lighter teeth will get;
8. In most cases moderate and dark tetracycline staining can be treated with bleaching over an extended time of 3–6 months;
9. Concern over the effectiveness of the bleaching potential with overnight wearing of a tray has been addressed and while wearing a tray overnight with a bleaching gel has demonstrated a degradation in peroxide concentration over time, the bleaching agent is still effective;
10. 10% at-home carbamide peroxide bleaching gels are clinically safe when exposed to enamel, dentin, root surfaces, ceramics, cast metal and composite resins, but there is one case report of greening of amalgam during bleaching.

In recent years, manufacturers have developed novel, trayless methods of bleaching teeth. The first product introduced professionally was Crest Whitestrips (Proctor & Gamble, Cincinnati, OH) for in-office dispensing. Within a year of the introduction of Whitestrips, a lower hydrogen peroxide concentration was released as an over-the-counter product. In the past six months, the concentration of the professionally dispensed and OTC Whitestrips has been increased, and other OTC strips have become available from other manufacturers. One of the limitations of strips is the limited surface area that can be whitened. Strips only cover the anterior teeth, from canine to canine, and are difficult to apply when a patient has misaligned teeth. In response to the need for a trayless system that will both cover more teeth and not be impeded by tooth misalignment, a tray-applied, thin-membrane bleaching system, Trèswhite (Ultradent Products, South Jordan, UT) was introduced. This novel trayless system uses a 9% hydrogen peroxide and includes a gel barrier at the gingival margin that ensures improved comfort when being worn. The primary author has had a number of dental students try this system and they have reported favorably on the ease of use and whitening results. The benefits of a trayless system are numerous. It need only be worn 30 minutes twice a day; there is no tray to fill, eliminating the possibility of the patient putting too much or too little in, and the trayless
strip or membrane is disposable. Reports have shown strips to be as effective as at-home tray bleaching.68

The first bleaching treatment to change the color of teeth was an in-office procedure. Currently, the most popular systems for in-office bleaching use high-concentration hydrogen peroxides and are often referred to as “one-hour bleaching.” These high-concentration hydrogen peroxides range from 25%–35%. In-office bleaching can be provided to patients as either a one-visit one-and-a-half-hour treatment or a multiple visit procedure. One of the light enhanced bleaching techniques can be used or a paint-on bleaching gel or solution. In-office professional whitening can be a perfect complement to the at-home whitening system you are using. There are many patients that cannot find the time to apply trays or strips in their busy lives. In-office whitening offers them a chance to whiten their teeth in one or more easy dental appointments.

How effective is in-office bleaching? Studies have been done to compare in-office bleaching to at-home tray bleaching. At-home tray bleaching usually gives the best final result. The results of in-office bleaching with light enhancements are controversial. While there are studies that have demonstrated that the use of a light-activated/enhanced product provides better whitening, other studies demonstrate that there is no benefit to using an accessory light.49,50,51,52 An example of one-hour bleaching with light enhancement is Den-Mat’s Rembrandt® which uses their Sapphire® PAC light (Den-Mat, Santa Maria, CA) with whitening crystals. What differentiates this light from other bleaching lights is that it is multiuse and can be used to polymerize resin-based materials. A one-hour whitening 35% hydrogen peroxide whitening product that does not require a light is Perfection White® (Premier Dental Products, Plymouth Meeting, PA).

Patient selection for vital tooth bleaching

When planning for successful esthetic treatment for tooth discolorations it is important to select patients with conditions that have the best prognosis for success with bleaching. It has been reported that tooth discolorations with the best prognosis for whitening are as follows:
1. Yellowing of the teeth without any systemic or developmental cause (food, smoking, age staining);
2. Mild fluorosis staining;
3. Mild tooth-darkening due to trauma;
4. Mild tetracycline staining.33,34

It has been reported that moderate to severe tetracycline discoloration can be lightened in shade with overnight use of vital mouthguard bleaching over a period of 6 months.55

Many dentists are using vital tooth bleaching as an adjunct to their esthetic bonding procedures. For patients dissatisfied with tooth malposition and shape as well as with discolorations, lightening the shade of teeth first with bleaching makes masking tooth discolorations less difficult. It is important that before any bonding procedure that bleaching be discontinued for at least one week before the restorative treatment to prevent interference with bonding adhesion and material setting.56,57,58,59

Vital tray bleaching with a high-concentration hydrogen peroxide system

Vital tray bleaching has been demonstrated to be highly effective and safe. One problem frequently encountered by clinicians is patient compliance with tray bleaching. While some products require as little as an hour a day and others require overnight use, it has been shown that patient compliance is higher for a shorter, less frequent wear period. Even for Crest Whitestrips, the requirement is 30 minutes, twice a day. Recently a novel, high-concentration (14%) hydrogen peroxide, Perfecta® REVITM (Premier Dental Products, Plymouth Meeting, PA), was introduced for use in a tray. As compared to most carbamide peroxide products that require a minimum of one hour a day for two weeks to achieve an acceptable result, Perfecta REV! requires only 15 minutes a day for two weeks. In a recent report Perfecta REV! demonstrated an average shade change of 9.42%.60 This study compared Perfecta REV! to Crest Whitestrips. During the course of the study the Perfecta REV! group reported sensitivity in 14% of the subjects that resolved when the amount of gel placed in the tray was decreased, compared to 42% of the subjects using Crest Whitestrips.

Clinical technique: case studies

Patient compliance with vital tooth bleaching using trays can be a significant issue. There has been a focus in recent years on reducing wear time of trays through the use of higher-concentration bleaching gels. For this patient, compliance was a past issue. With this in mind, a 14% concentration hydrogen peroxide gel Perfecta REV! was chosen for this case.

The technique for vital bleaching with Perfecta REV! is similar to other tray bleaching products using soft, thin, flexible vinyl trays custom-fabricated to a patient’s casts made from an alginate impression. For this case, impressions were made with a double arch full tray (Alfa™ Triple Tray™, Premier Dental Products) impression with alginate. The casts were poured with a fast set dental stone to allow for pouring of both maxillary and mandibular quadrants quickly. (Figure 1)
After separation of the casts from the Alfa Tray, the casts were inspected to be certain there were no irregularities, bubbles or distortions. For tray fabrication, the stone casts were trimmed, leaving a minimal base to ensure an accurate adaptation of the thin, soft-vinyl mouthguard/tray material. A vacuum-adapted tray was fabricated with a vacuum unit. Once the tray was vacuumed on the cast, it was trimmed on the cast using a Tray Magic™ (Premier Dental Products, Plymouth Meeting, PA) electric, soft-tray trimmer to leave a scalloped tray that followed the free margin of the gingivae on both the facial and lingual surfaces. All gingival tissue was left uncovered by the tray. (Figure 2) By trimming the tray on the cast, there is less concern about distortion that occurs when trimming with scissors. Scalloping of the tray is especially important with any of the higher concentration bleaching gels.\(^{51,62}\)

![Figure 2. Scalloping and trimming the soft-vinyl bleaching tray with a Tray Magic Handpiece.](image)

With the trays fabricated (Figure 3), they were tried in the patient’s mouth. The patient was instructed on the insertion of the maxillary and mandibular trays and the cleaning of the trays. The patient was observed placing the trays on her teeth. As the wear time is only 15 minutes, the first wearing can be done in the office so that all aspects of the treatment can be demonstrated. In some cases patients will start by bleaching the maxillary arch first.

![Figure 3. Bleaching trays with scalloping fabricated.](image)

With the trays removed from the mouth, the placement of the Perfecta REV! in the tray was demonstrated. (Figure 4) A small amount of gel was applied to each tooth area in the well-adapted tray and inserted. The patient was shown how to brush away any excess bleach with a soft-bristle toothbrush. After 15 minutes, the tray was removed. A specially buffered REV!™ Finishing Rinse was used immediately after the tray was removed. The rinse is specially formulated to immediately accelerate the breakdown of the remaining hydrogen peroxide gel to boost the whitening effect. The rinsing effect also safely removes any residual gel from the teeth and soft tissues. According to the manufacturer, the rinse contains a highly stable form of Vitamin C to protect both hard and soft tissue from

![Figure 4. Application of the Perfecta REV! into the bleaching tray with small amounts of bleaching gel.](image)

![Figure 5a. Prior to bleaching.](image)

![Figure 5b. After two weeks of tray bleaching.](image)

![Figure 6a. Prior to bleaching.](image)

![Figure 6b. After two weeks of bleaching.](image)
any free radicals and to promote healthy teeth and gingival structures. The rinse also contains pentasodium triphosphate to enhance the stain-removing ability of the bleach.

Bleaching can significantly change the appearance of teeth. In order to demonstrate this improvement to patients these authors will commonly bleach the maxillary arch first. After the removal of orthodontic brackets, this teenage patient had areas of demineralization that created significant tooth discoloration.

Using tray bleaching for two weeks produced a significant whitening effect. (Figures 5a, b) In some cases, after a period of time, a crown no longer matches the color of the adjacent teeth. For these patients the use of tray bleaching for 2 weeks can restore the color harmony between a crown and the adjacent teeth. (Figures 6a, b)

Summary

From all clinical and research accounts, tooth whitening with the latest generation of vital bleaching products is effective, safe and also relatively long lasting.64–30,32,49–51,63–66 Bleaching relapse has been reported. With in-office bleaching, CRA reported relapse of 41% at 1 year.67 For tray bleaching, Haywood reported relapse of 26% at 18 months.68 Bleaching can be maintained through the use of whitening toothpastes and bleaching toothpastes (e.g., Rembrandt Plus, Oral B) or with yearly touch-up bleaching using the patient’s custom fitted tray.

Based upon the clinical results reported with professional vital tooth bleaching, it is a viable, esthetic treatment for the discolored dentition.69 Its conservative nature and little if any risks make it an important part of an esthetic dentistry treatment plan.

References


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Author Profiles

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Dr. Howard Strassler is Professor and Director of Operative Dentistry at the University of Maryland Dental School in the Department of Restorative Dentistry. He has lectured nationally and internationally on techniques and selection of dental materials in clinical use and esthetic restorative dentistry. He is a Fellow in the Academy of Dental Material and Academy of General Dentistry, a Member of the American Dental Association, Academy of Operative Dentistry and International Association of Dental Research. He is on the editorial board of numerous publications. He is a consultant and clinical evaluator to over 15 dental manufacturers. Dr. Strassler has published over 400 articles in the field of restorative dentistry and innovations in dental practice and has coauthored seven chapters in texts. He has presented over 425 programs throughout the United States, Canada, and Europe. Dr. Strassler has a general practice in Baltimore, Maryland that is limited to restorative dentistry and esthetics.

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1. Professionally dispensed vital tooth bleaching refers to tooth whitening products:
   a. bought in the pharmacy.
   b. purchased over the internet at special websites.
   c. given to the patient in the dental office.
   d. purchased from TV infomercials.

2. Esthetic conditions that can not be treated with vital tooth bleaching include the following:
   a. tooth shape
   b. tooth spacing
   c. tooth misalignment
   d. all of the above

3. Bleaching is a technique to lighten the color of teeth darkened by:
   a. intrinsic staining.
   b. extrinsic staining.
   c. forensic staining.
   d. a and b

4. All the following are examples of tooth discolorations due to intrinsic staining except:
   a. fluorosis.
   b. enamel hypoplasia.
   c. endodontic staining.
   d. ingested food and beverage staining

5. The most conservative treatment for tooth discolorations due to intrinsic staining is:
   a. porcelain veneers.
   b. composite resin veneers.
   c. bleaching.
   d. ceramic crowns

6. Vital bleaching can treat all of the following except:
   a. mild fluorosis.
   b. caries.
   c. mild tetracycline staining.
   d. discoloration due to trauma.

7. The most prevalent form of tooth discoloration is caused by:
   a. moderate to severe fluorosis.
   b. aging and food and beverage ingestion.
   c. moderate tetracycline staining.
   d. endodontic staining.

8. Tetracycline staining clinically has the appearance of:
   a. brown-orange staining.
   b. blue-gray-brown staining.
   c. banded staining.
   d. all of the above.

9. Teeth with ________ will fluoresce when exposed to ultraviolet light.
   a. fluorosis
   b. mottled enamel
   c. tetracycline staining
   d. endodontic staining

10. Fluorosis is caused by the ingestion of an:
    a. milk.
    b. excessive fluoride during tooth development.
    c. antibiotic during tooth development.
    d. stain producing beverages.

11. Tooth bleaching was reported as early as:
    a. 1877
    b. 1918
    c. 1932
    d. 1969

12. The most commonly reported adverse reaction of vital teeth bleaching is:
    a. bad taste of bleach.
    b. gingival irritation.
    c. tooth sensitivity during bleaching.
    d. that trays are difficult to insert.

13. Choices for vital tooth bleaching include:
    a. mouthguard (tray) vital bleaching.
    b. in-office bleaching.
    c. strips for bleaching.
    d. all the above

14. To receive the ADA Seal for whitening a manufacturer must submit:
    a. safety studies.
    b. two clinical trials demonstrating at least a 2-shade difference.
    c. a and b.
    d. none of the above.

15. Scalloping of bleaching trays is needed for:
    a. in-office light enhanced bleaching.
    b. at-home tray bleaching with high concentrations gels.
    c. providing the patient with a special effect of the tray.
    d. none of the above.

16. Before the fabrication of bleaching trays, the stone model must be:
    a. trimmed leaving a minimal base.
    b. inspected for bubbles.
    c. inspected for irregularities.
    d. all of the above.

17. Use of spacers on the stone model to create reservoirs:
    a. is not necessary.
    b. must be done if you want to see results.
    c. should only be done for the anterior teeth.
    d. should only be done for the posterior teeth.

18. Drawbacks to bleaching with Whitestrips are that they:
    a. only whiten the six anterior teeth.
    b. are difficult to apply on misaligned teeth.
    c. a and b.
    d. none of the above.

19. A common agent for in-office bleaching is:
    a. sodium perborate.
    b. sodium hypochlorite.
    c. calcium peroxide.
    d. hydrogen peroxide.

20. To minimize tooth sensitivity recommend that the patient:
    a. decrease time the tray is worn the first week.
    b. use lower concentration gels with a desensitizing agent.
    c. use a desensitizing toothpaste in the tray for a week before starting bleaching.
    d. all the above.

21. To increase patient compliance with wearing a bleaching tray recommend they wear it:
    a. every night for 2 weeks.
    b. twice a day for one hour.
    c. once a day for 15 minutes.
    d. twice a day for 30 minutes.

22. In-office bleaching:
    a. must be done with a light source.
    b. must be done without a light source.
    c. uses hydrogen peroxides in the 6–10% range.
    d. with or without a light source can give a whitening result.

23. Research supports a novel 14% hydrogen peroxide gel that demonstrated an average shade change of:
    a. 9.42
    b. 7.04
    c. 2.46
    d. no shade change

24. An innovative method for scalloping a vital bleaching tray is:
    a. a #12B scalpel blade.
    b. a ceramic scissor with a curved blade.
    c. an electric heated tipped soft tray trimming device.
    d. a Swiss Army knife.

25. In the technique of tray bleaching with a novel 14% hydrogen peroxide gel a patient must wear the tray:
    a. 2 times a day for an hour each for two weeks.
    b. at least 6 hours for two weeks.
    c. 15 minutes once a day for two weeks.
    d. 1 hour a day for three weeks.

26. When using the novel 14% hydrogen peroxide professional at-home system it is important to:
    a. use the buffered mouthrinse.
    b. not eat or drink for 2 hours.
    c. dip the tray in cold water.
    d. put the gel in the refrigerator.

27. Vital tooth bleaching with patients with moderate to severe tetracycline staining:
    a. has been ineffective.
    b. has been beneficial when used over long periods of time.
    c. must use a combined in-office technique.
    d. should never be discussed with a patient.

28. Vital bleaching with peroxide containing agents has been shown to:
    a. be an effective treatment to lighten discolored teeth.
    b. have sufficient research to demonstrate safety and effectiveness.
    c. have several successful techniques.
    d. all of the above.

29. Bleaching relapse has been reported to occur for both in-office and tray based bleaching.
    a. True
    b. False

30. Bleaching can be maintained through the use of:
    a. whitening toothpastes.
    b. touch-ups with in-office system.
    c. touch-up bleaching with the patient’s tray.
    d. all the above.
Educational Objectives
1. List the different types of vital tooth bleaching systems.
2. List the esthetic conditions that can be treated with vital tooth bleaching.
3. Describe the adverse reactions that have been associated with vital tooth bleaching.
4. Describe the clinical technique for professional vital tooth bleaching using a tray system.
5. Describe how to manage bleaching relapse.

Course Evaluation
Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective 1: Were the individual course objectives met?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Objective 2: To what extent were the course objectives accomplished overall?</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Objective 3: Please rate your personal mastery of the course objectives.</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Objective 4: How would you rate the objectives and educational methods?</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Objective 5: Please rate the instructor’s effectiveness.</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Objective 6: Was the overall administration of the course effective?</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Objective 7: Do you feel that the references were adequate?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Objective 8: Would you participate in a similar program on a different topic?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Objective 9: If any of the continuing education questions were unclear or ambiguous, please list them.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mail completed answer sheet to
Academy of Dental Therapeutics and Stomatology,
A Division of PennWell Corp.
P.O. Box 116, Chesterland, OH 44026
or fax to: (440) 845-3447

For IMMEDIATE results, go to www.ineedce.com and click on the button “Take Tests Online.” Answer sheets can be faxed with credit card payment to (440) 845-3447, (216) 398-7922, or (216) 255-6619.

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