The Use and Efficacy of Professional Topical Fluorides

A Peer-Reviewed Publication
Written by N. Sue Seale, DDS, MSD and Diane M. Daubert, RDH, MS

Publication date: 9/2010
Expiry date: 8/31/2013

PennWell designates this activity for 2 Continuing Educational Credits.

Go Green, Go Online to take your course

This course has been made possible through an unrestricted educational grant. The cost of this CE course is $49.00 for 2 CE credits.

Cancellation/Refund Policy: Any participant who is not 100% satisfied with this course can request a full refund by contacting PennWell in writing.
**Educational Objectives**

The overall goal of this article is to provide the reader with information on the use, efficacy and safety of professional topical fluorides. In addition, current recommendations based on caries risk level are addressed. Upon completion of this course, the reader will be able to do the following:

1. List the types of professional topical fluorides that are available in the US and Canada
2. List and describe the ADA recommendations on the use of professional topical fluorides
3. List and describe the evidence on efficacy and safety for sodium fluoride varnishes
4. List and describe the methods by which different professional topical fluorides can be applied

**Abstract**

Following the discovery that fluoride plays a role in the prevention of dental caries, professional topical fluorides were developed. Traditionally, fluoride gels and, later, fluoride foams were used in the US and Canada. More recently, fluoride varnishes were introduced first in Canada, and then in the US where they are cleared for use as desensitizing agents. The use of fluoride varnishes for caries prevention is 'off-label' in the US. A recent publication by the ADA Council on Scientific Affairs recommends the use of fluoride varnish or fluoride gel for professional topical fluoride treatments, with the choice depending on patient age and risk category. Due to insufficient evidence, foams are not recommended for professional topical fluoride treatment and there is no evidence to support rinses. Fluoride gel and varnish have both proven to be effective, with only varnish recommended in the under-6 age group. Evidence-based treatment requires that the clinician assess a patient’s risk level prior to treatment, which can be done with formal risk assessment tools such as the Caries Assessment by Risk Assessment (CAMBRA) and the Caries Assessment Tool (CAT).

**Introduction**

Fluoride has maintained an important role in the field of preventive dentistry since the 1940s. The discovery of high levels of fluoride in the water in the 1930s led to the formation of the Dental Hygiene Unit at the National Institutes headed by H. Trendly Dean, who noticed an inverse relationship between caries prevalence and fluoride concentration that leveled off above 1 ppm. A large-scale prospective study that evaluated 30,000 children over a period of 15 years resulted in the conclusion that fluoridated water resulted in a significant reduction in caries for the fluoridated cities. The Centers for Disease Control and Prevention (CDC) reported in 2006 that 69.2% of US citizens served by public water supplies were receiving fluoridated water. Recognition of the role of fluoridated water in caries reduction led to the development of other modes of fluoride delivery, including the addition of fluoride to toothpastes, mouth rinses, gels and tablets. It also led to the development of methods of professional fluoride application for caries prevention, including gels, foams, rinses and varnishes. Specific fluoride products are also used to treat dentinal hypersensitivity, including fluoride varnish and other in-office desensitizers as well as home-use products.

**Professional Topical Fluorides**

Professional topical fluorides include fluoride gels, foams, rinses and varnishes. Traditionally, professional fluoride treatment in the US and Canada involved the use of fluoride gels in trays. This was followed by the introduction of fluoride foams used in trays, which are generally considered easier to use than gels and have less risk of ingestion of fluoride. Less total fluoride is applied with foam, and a lower volume of product is used. These factors reduce the risk of the patient gagging and swallowing fluoride and also the amount of fluoride that could be ingested as a result. Fluoride varnish has been in use in Europe for more than 30 years as a method of professional application of topical fluoride. In North America, sodium fluoride varnish was introduced first in Canada, and later in the US when it was cleared by the Food and Drug Administration (FDA) for use as a desensitizing agent and cavity liner. As such, its use for caries prevention in the US is “off-label” (i.e., it is being used for a purpose that has not received FDA approval or clearance). Since its introduction in the United States in the 1990s, its use for the prevention of caries has increased among the dental community.

**Mechanisms of Action**

Professional topical fluorides inhibit demineralization and promote remineralization. Available fluoride helps to prevent the loss of minerals during acid attacks and helps to replenish demineralized areas. Fluoride varnish utilizes a natural tree resin base that facilitates adherence of the varnish to the teeth and prolongs the contact time between fluoride and the tooth surfaces. The fluoride varnish forms calcium fluoride compound deposits that create a reservoir of fluoride ions that are slowly released when the pH of plaque drops (Figure 1). This reservoir acts as a prolonged source of fluoride ions. Numerous studies have concluded that fluoride varnishes are capable of depositing large amounts of fluoride on human enamel and it has also been concluded that the amount deposited on demineralized enamel is greater than that on sound enamel.

As desensitizing agents, fluorides work by blocking the dentinal tubules. Brannstrom’s hydrodynamic theory suggests that hypersensitivity is caused by the movement of fluid backward and forward within the dentinal tubules in response to stimuli and that it is this movement that results in the sensation of pain. Therefore, blocking the dentinal tubules blocks the movement of fluid for a period of time.
Figure 1. Release and availability of ions during acid attack

Recommendations for Professional Topical Fluorides

Treatment recommendations should be based on scientific evidence in combination with knowledge of the patient’s health history, oral condition and preferences. This means that the dental professional needs to understand the scientific and evidence-based merits of a product and also consider the patient’s caries risk when recommending fluoride treatment. In May 2006, the American Dental Association’s Council on Scientific Affairs published recommendations on the use of available professional topical fluorides by caries risk category, based on results from published clinical trials and evidence-based studies. The use of only fluoride varnish is recommended for patients less than 6 years of age. (Note that recommendations for varnish refer to 5% sodium fluoride varnish.) For patients 6 years and older, fluoride varnish or gel is recommended. The recommended frequency of use is two to four times per year for patients with a high caries risk, and twice per year for moderate risk patients. It is also stated that if a patient has low risk for caries, the person may not receive additional benefit from professional topical fluoride application. The use of foam is not recommended, due to the fact that although laboratory data supports its effectiveness there have been only two clinical trials on its anti-caries efficacy. In addition, the use of 1-minute products (gels and foams) is not endorsed.

Table 1. ADA Council on Scientific Affairs recommendations

<table>
<thead>
<tr>
<th>Age</th>
<th>High Risk</th>
<th>Moderate Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under age 6</td>
<td>Fluoride varnish; 2-4 times per year (6 month or 3 month intervals)</td>
<td>Fluoride varnish at 6 month intervals</td>
</tr>
<tr>
<td>6 - 18 years of age</td>
<td>Fluoride varnish or gel; 2 - 4 times per year (6 month or 3 month intervals)</td>
<td>Fluoride varnish or gel at 6 month intervals</td>
</tr>
<tr>
<td>Over 18 years of age</td>
<td>Fluoride varnish or gel; 2 - 4 times per year (6 month or 3 month intervals)</td>
<td>Fluoride varnish or gel at 6 month intervals</td>
</tr>
</tbody>
</table>

Low risk patients may not benefit from professional topical fluorides


Table 2. Caries risk factors

<table>
<thead>
<tr>
<th>Poor oral hygiene</th>
<th>Cariogenic diet</th>
<th>Incipient or cavitated carious lesions in the past three years</th>
<th>Xerostomia</th>
<th>Suboptimal fluoride exposure</th>
<th>Existence of many multisurface restorations</th>
<th>Exposed root surfaces</th>
<th>Drug or alcohol abuse</th>
<th>Low socioeconomic status</th>
<th>Physical or mental disability</th>
</tr>
</thead>
</table>

The patient’s caries risk, age and the scientific as well as evidence-based merits of a product must be considered when recommending fluoride treatment.

In order to provide evidence-based patient care, it is necessary to know the patient’s caries risk. A person is considered to be at low risk if she or he has had no caries, including incipient lesions, in the past three years and has no other risk factors. Caries risk factors include but are not limited to the following: one or two incipient or cavitated carious lesions in the past three years, low socioeconomic status, suboptimal fluoride exposure, xerostomia, poor oral hygiene, cariogenic diet, exposed root surfaces, drug or alcohol abuse, many existing multisurface restorations, defective restorations, orthodontic therapy, and physical or mental disability.

Table 2. Caries risk factors

<table>
<thead>
<tr>
<th>Poor oral hygiene</th>
<th>Cariogenic diet</th>
<th>Incipient or cavitated carious lesions in the past three years</th>
<th>Xerostomia</th>
<th>Suboptimal fluoride exposure</th>
<th>Existence of many multisurface restorations</th>
<th>Exposed root surfaces</th>
<th>Drug or alcohol abuse</th>
<th>Low socioeconomic status</th>
<th>Physical or mental disability</th>
</tr>
</thead>
</table>

Formal caries risk assessment tools that can be used to determine a patient’s caries risk include CAries Management By Risk Assessment (CAMBRA) and the Caries Assessment Tool (CAT). Twenty-five data points are gathered and assessed using CAMBRA, after which a protocol is developed for risk management and treatment of the child or adult patient. CAT is a separate program recommended by the American Academy of Pediatric Dentistry that is intended for use with children of all ages. Other formal risk assessment tools are also available, and the criteria and definition of low, medium and high risk vary with the program used. The ADA provided definitions of low, medium and high-risk patients by age, together with the recommendations for professional topical fluorides in the Council on Scientific Affairs publication.

Level of Evidence and Efficacy

The studies on professional topical fluorides for caries prevention have largely been conducted on medium- and high-risk children and adolescents. One meta-analysis found overall caries reductions of 38% (DMFS/dmfs) with the use of fluoride varnishes. Many systematic reviews and meta-analyses have
documented the effectiveness of fluoride varnish, as well as some for fluoride gel, in inhibiting caries in this age group.17 However, professional topical fluorides are also used in adults and geriatric patients who have additional needs. Fluoride varnish must be reapplied to maintain its caries-preventive effect, as must other topical fluorides.18,19 As discussed, recommended schedules of reapplication include two to four times a year, depending on the caries risk of the individual. An intensive treatment protocol using three applications of Duraphat in one week per year over three and four years showed caries reductions of 46% to 67% in proximal surfaces.20,21 This intensive regimen would be appropriate for highly mobile individuals who might not be available on a regular two to four times a year schedule, such as migrant families who move frequently. The level of evidence-based documentation of the efficacy of professional topical fluorides differs among age groups and by use.

**Recommended schedules of professional topical fluoride reapplication include two to four times a year, depending on caries risk.**

**Children Under 6 Years of Age**

In children younger than 6 years, there is strong evidence from systematic reviews of randomized controlled trials supporting fluoride varnish applications at six-month intervals for moderate- and high-risk patients and for applications of fluoride varnish every three months in high-risk patients. Prior to the introduction of fluoride varnish, there was no safe way to administer topical fluoride to children 0-3 years of age. Their limited ability to control swallowing and variable ability to spit effectively on command preclude the use of foams, gels and rinses. These are not recommended for this age group.

Fluoride varnish’s tenacious adherence to the tooth provides for slow release of the fluoride over time and results in only a small amount being swallowed at a time. Weintraub et al. reported that children ages 6-44 months who received no varnish were more than two times as likely to develop decay as those who received annual varnish application.22 Stearns et al. reported that children 6-44 months of age who had four or more visits where varnish was applied as a part of a preventive/referral service showed a 39% reduction in caries-related treatment in anterior teeth.23 Fluoride varnish should be part of all preventive strategies aimed at high-risk children in this age group.

Miller and Vann expanded on the ADA panel’s recommendations, which addressed recommendations for topical fluoride use in children under age 6, but not specifically ages 0-3 years; they recommended that “based on available evidence including dose reductions and efficacy justifications, we advocate that varnish should be the only topical fluoride modality used for children 0-3. Because of safety concerns we advocate further that varnish should also be the only modality used for children with special health care needs who exhibit attention span and/or cooperation problems.”24

**Children Ages 6-18 Years**

In children ages 6-18 years with moderate and high caries risk, there is evidence from systematic reviews to support the use of fluoride varnish or gel every six months as well as to support the use of fluoride varnish every three months in high-risk children. The level of evidence for the use of fluoride gel every three months in high-risk children ages 6-18 is lower. For children 6-18 years of age, a systematic review by the Cochrane Collaboration found a caries reductions of 28% for gels, and a separate review for varnish found DMFS reductions of 46% for permanent teeth and dmfs reductions of 33% for primary teeth in children up to 16 years of age.25,26

Orthodontic treatment usually begins during this age range, and it is well established that orthodontic appliances can increase the risk for enamel demineralization around brackets. Investigations have shown that fluoride varnish can reduce or minimize demineralization of enamel adjacent to brackets.27,28,29

**Figure 2. At-risk adolescent undergoing orthodontic treatment**

**Adults (All Patients Over 18 Years of Age)**

The primary uses for fluoride varnish in adults are for remineralization or control of root caries in older patients, prevention of caries in high-risk adults and treatment of dentinal sensitivity. There is some evidence supporting the use of fluoride of either modality (varnish or gel) every six months for patients over 18 years of age at moderate and high risk, and for high-risk patients at three-month intervals. The level of evidence is lower and is based on expert committee reports or opinions rather than prospective, randomized clinical trials.

Data on the effectiveness of fluoride varnish being superior to other treatment options for root caries is equivocal. Several
investigations show equivalence – no superiority of fluoride varnish over the use of chlorhexidine varnish or stannous fluoride solution (8%) or in combination with Carisolvemechanical technique. There is tentative support for three-monthly application of fluoride varnish for remineralization of root caries. There are no clinical trials providing evidence to support the use of professional topical fluoride gels or foams for the prevention and treatment of root caries. Support is definitely adequate to recommend using fluoride varnish as a part of a total preventive plan including the other agents investigated in these reported studies.

One study found 5% sodium fluoride varnish to produce sensitivity relief results that are equivalent to that of oxalate preparations. In another study 2% fluoride iontophoresis, Gluma Comfort Bond Plus Desensitizer, copal varnish and 5% sodium fluoride varnish all resulted in significant relief at 24 hours; after 7 days, results were statistically significant for 2% fluoride iontophoresis and Gluma Comfort Bond Plus Desensitizer. A recent study compared the use of 5% sodium fluoride varnish and shellac-based fluoride varnish for sensitivity relief and found both to be equally effective and to provide relief. Fluoride varnish can be effective for up to three to six months for sensitivity relief, depending on the patient, when used according to the directions for use.

Table 3. Level of evidence for professional topical fluorides - moderate and high caries risk

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Varnish</th>
<th>Gel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under age 6</td>
<td>High for every 6 months</td>
<td>Not recommended</td>
</tr>
<tr>
<td></td>
<td>High for every 6 months</td>
<td>Not recommended</td>
</tr>
<tr>
<td></td>
<td>and every 3 months</td>
<td>Not recommended</td>
</tr>
<tr>
<td>6-18 year-olds</td>
<td>High for every 6 months</td>
<td>High for every 6 months</td>
</tr>
<tr>
<td></td>
<td>High for every 6 months</td>
<td>High for every 6 months</td>
</tr>
<tr>
<td></td>
<td>and every 3 months</td>
<td>Lower for every 3 months</td>
</tr>
<tr>
<td>Over 18 years</td>
<td>Lower</td>
<td>Lower</td>
</tr>
</tbody>
</table>


Safety

Several aspects provide for the safety of sodium fluoride varnish compared to other methods of delivery of professional topical fluorides. Even though the concentration of fluoride in 5% NaF varnish (22.6 mg F/ml) is about twice as high as in APF gel (12.3 mg F/ml), the amount required for a treatment ranges from 0.1 – 0.5 ml (2.26 - 11.3 mg F) for varnish depending on age, compared with 4-8 ml (49.2-98.4 mg F) with APF gels. Additionally, the potential for ingestion is basically solved by the tenacious adherence of fluoride varnish to the teeth. Thus, any fluoride that is swallowed is minimal and ingested over longer periods of time, virtually eliminating the possibility of nausea, vomiting or other fluoride toxic reactions. In fact, there were no safe ways to administer topical fluoride to children 0-3 years of age until the introduction of fluoride varnish, and certainly the varnish provides a safer delivery system for the 3-to-6-year age group, where swallowing of gels and foams is a major concern. The risk of dental fluorosis with professional topical fluorides is minimal, since children are not frequently exposed to these, as they are to fluoride supplements and other sources of fluoride. There is a warning on package inserts to avoid sodium fluoride varnish in patients who have histories of asthma, as a result of a low but potential risk of allergic reactions to the resin base, including contact allergic dermatitis. Isaksen reported on two cases of contact allergy to sodium fluoride varnish. Miller and Vann reported no adverse outcomes with asthma at the time of their US publication. If a patient is allergic to the resin contained in the varnish base, or any other ingredient, fluoride varnish should not be used for that patient. Fluoride varnish is contraindicated if a patient has ulcerative gingivitis or stomatitis.

Fluoride vehicles and dosing

The first and most extensively studied 5% sodium fluoride varnish was Duraphat. Originally, varnishes were yellow-tinted and dispensed from a tube (Duraphat; Duraflor). A number of 5% sodium fluoride varnishes are now available, and they differ in properties such as viscosity, color (clear/white/tinted) and taste. One milliliter of the varnish contains 22.6 mg fluoride/ml. Some manufacturers provide unit-dosed packaging, which offers several advantages: each patient gets a controlled amount of fluoride, preventing over-application and minimizing any potential possibility (already minimal) of fluoride ingestion. An additional advantage of unit doses relates to sodium fluoride’s tendency to settle in the varnish due to its particulate nature, potentially affecting the amount of fluoride dispensed from multiple use containers. With unit dosing, the amount of sodium fluoride will be consistent in each application. Fluoride gels are dispensed directly into mouth trays from larger bottles, as well as being available in trays with pre-loaded and pre-dosed gel. Most manufacturers have mechanisms to help advise the proper amount of their product to dispense. For a 5% NaF varnish, in general it is advised to provide 5.65 mg F, or 0.25 ml, for the primary dentition; 9.04 mg F, or 0.40 ml, varnish for the mixed dentition; and 11.3 mg F, or 0.50 ml, varnish for the permanent dentition. For gels, the amount placed in the tray depends on the age of the patient (and thus also the size of the tray) and ranges from 49.2 - 98.4 mg fluoride.

Table 4. Treatment doses

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Varnish</th>
<th>Gel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent dentition</td>
<td>0.5 ml (11.3 mg F)</td>
<td>4 – 8 ml (49.2 – 98.4 mg F)</td>
</tr>
<tr>
<td>Mixed dentition</td>
<td>0.4 ml (9.04 mg F)</td>
<td>4 – 8 ml (49.2 – 98.4 mg F)</td>
</tr>
<tr>
<td>Primary dentition</td>
<td>0.25 ml (5.65 mg F)</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Infants</td>
<td>0.1 ml (2.26 mg F)</td>
<td>Not recommended</td>
</tr>
</tbody>
</table>
The following section shows the application in a pediatric and an adult case.

Case 1. Application of fluoride varnish for a pediatric patient
The child represented in Figure 3 is a three-year-old with high caries risk and early childhood caries. The first step in preparing to provide a fluoride varnish treatment for a pediatric patient is to determine the proper dosage for the child’s dentition, primary, mixed or full permanent. The varnish should be thoroughly mixed after it is dispensed. When only a thin layer of plaque is present, fluoride varnish can be directly applied without prior removal of the plaque. If a thick layer of plaque is present, this can be removed (prior to the application of professional topical fluoride) by toothbrushing or prophylaxis (neither is considered superior to the other).43

Moisture should be removed from the teeth with gauze or cotton rolls. It is not necessary for the teeth to be air-dried, nor is absolute moisture control necessary although excessive saliva flow over the teeth should be avoided. The varnish is then applied with a brush or cotton-tip applicator or the applicator supplied by the manufacturer, and until set will flow on the teeth, including into interproximal areas. Fluoride varnish can be rapidly applied and there is no waiting time after application. Total application time varies, depending on how many teeth need to be varnished. It will set in the presence of intraoral moisture, and no rinsing or suctioning is required following the application. The child may be able to feel the thin film of the varnish with his/her tongue. (Note: Tinted varnishes leave a yellow film over the teeth, and parents and older patients would need to be warned of this effect if a tinted varnish is used.)

Figure 3a. Missing tooth structure and carious lesion

Figure 3b. Application of varnish

Case 2. Application for an adult periodontal patient
This example involves a 68-year-old adult female with a history of periodontal surgery and regular three-monthly periodontal maintenance. The patient is at caries risk due to drug-induced xerostomia, has exposed roots and also complains of dentinal hypersensitivity. In a periodontal practice with patients who commonly have both dentin exposure and caries risk factors, it is advantageous to use one treatment that addresses two areas of concern. Part of her periodontal maintenance therapy includes fluoride varnish application, with the dual benefit that it is effective in both preventing caries and treating dentinal hypersensitivity. The application of fluoride varnish can be targeted to specific areas. In the case of periodontal patients with extensive areas of exposed roots, the varnish can easily be applied to areas that may not easily be accessed using a gel and tray. It would also be anticipated that the patient would achieve simultaneous relief from dentinal hypersensitivity. The general application technique and post-application instructions are described above.

Figure 4a. Periodontal patient at-risk for caries and with dentinal hypersensitivity
Summary

Professional topical fluoride treatments are recommended for use in patients at risk for dental caries. Based on the evidence and safety considerations, only fluoride varnish is recommended for patients under the age of 6, while for patients age 6 and older, either fluoride gel or varnish is recommended. The selection of a professional topical fluoride should be guided by the scientific evidence, age and risk level of the patient as well as specific intra-oral considerations.

References

22 Stearns SC, Rozier RG, Pahel BT, Park JY, Quinonez RB.


Author Profiles

N. Sue Seale, DDS, MSD

Dr. N. Sue Seale is Regents Professor, Department of Pediatric Dentistry, Baylor College of Dentistry, Texas A&M Health Science Center in Dallas, Texas. She received her DDS in 1970, her certificate in pediatric dentistry in 1972 and her MSD in 1979 from Baylor and has been a full-time faculty member since 1974. She was president of the Texas Academy of Pediatric Dentistry 1996-1997 and received the Distinguished Alumni Award from the Baylor College of Dentistry Alumni Association in 1997; she served on the Board of Trustees of the American Academy of Pediatric Dentistry from 1999-2002. In 2001, the American Academy of Pediatric Dentistry named her Pediatric Dentist of the Year and presented her with the Merle C. Hunter Leadership Award in 2003. She is a diplomate of the American Board of Pediatric Dentistry and received Fellowship in the American College of Dentists in 1984 and in the International College of Dentists in 2001. She was Chairman of the Department of Pediatric Dentistry at Baylor from 1986 until 2009.

Diane M. Daubert, RDH, MS

Ms. Daubert currently works as an affiliate instructor in the department of periodontics at the University of Washington and is also responsible for the management of a faculty intramural practice in the graduate periodontal clinic where she is also the coordinator for clinical research projects. Diane received the University of Washington School of Dentistry Distinguished Staff Award in 2003. She is a member of the American Dental Hygienists's Association, Washington State Dental Hygienists' Association, and the American Dental Education Association. Diane received her Bachelor of Science degree in Dental Hygiene from the University of Washington and her Master of Science in 2009. She is currently enrolled in the PhD program in Oral Biology at the University of Washington.

Acknowledgment

Figure 2 courtesy of Dr. Michael Florman. Figures 3a and 3b courtesy of Dr. Simon Lin. Cover tooth illustration © Andreas | Dreamstime.com

Disclaimer

The author(s) of this course has/have no commercial ties with the sponsors or the providers of the unrestricted educational grant for this course.

Reader Feedback

We encourage your comments on this or any PennWell course. For your convenience, an online feedback form is available at www.ineedce.com.
Questions

1. Recognition of the role of _________ in caries reduction led to the development of other modes of fluoride delivery.  
   a. topical fluoride  
   b. topical iodide  
   c. fluoridated water  
   d. all of the above

2. Sodium fluoride varnish is cleared by the Food and Drug Administration (FDA) for use as a _______.  
   a. desensitizing agent  
   b. desensitizing agent and cavity liner  
   c. desensitizing agent and caries preventive  
   d. none of the above

3. Professional topical fluorides act to _______.  
   a. inhibit remineralization and promote demineralization  
   b. inhibit demineralization and promote remineralization  
   c. promote the status quo with incipient lesions  
   d. all of the above

4. Fluoride varnish utilizes _______ that facilitates adherence of the varnish to the teeth and prolongs the contact time between fluoride and the tooth surfaces.  
   a. an agar gum base  
   b. a natural tree resin base  
   c. a colloidal base  
   d. none of the above

5. As desensitizing agents, fluorides work by _______.  
   a. blocking nerve transmission  
   b. ameliorating nerve transmission  
   c. blocking dentinal tubules  
   d. all of the above

6. The American Dental Association’s Council on Scientific Affairs published recommendations on the use of available professional topical fluorides in _______.  
   a. March 2004  
   b. May 2006  
   c. July 2008  
   d. January 2010

7. The use of _______ is recommended for patients less than 6 years of age at moderate or high risk for caries.  
   a. fluoride varnish  
   b. fluoride varnish or gel  
   c. fluoride varnish, gel or foam  
   d. none of the above

8. The use of 1-minute products (gels and foams) is _______.  
   a. strongly endorsed  
   b. ineffective  
   c. never advised  
   d. none of the above

9. Fluoride varnish or gel at 6 month intervals is recommended for children _______.  
   a. age 6 and older  
   b. under age 6  
   c. over age 13 only  
   d. a and b

10. In order to provide evidence-based patient care, it is necessary to know the patient’s _______.  
    a. caries scale  
    b. caries risk  
    c. caries future  
    d. all of the above

11. _______ is a caries risk factor.  
    a. Submicronal fluoride exposure  
    b. Suboptimal fluoride exposure  
    c. Lack of fluoride exposure  
    d. b and c

12. Incipient or cavitated carious lesions are only a risk factor if they have occurred in the last _______ years.  
    a. seven  
    b. six  
    c. five  
    d. none of the above

13. One meta-analysis found overall caries reductions of _______ with the use of fluoride varnishes.  
    a. 28%  
    b. 38%  
    c. 48%  
    d. none of the above

14. An intensive fluoride varnish regimen would be appropriate for _______ who might not be available on a regular two to four times a year schedule.  
    a. immobile individuals  
    b. highly mobile individuals  
    c. low caries risk patients  
    d. all of the above

15. Prior to the introduction of _______, there was no safe way to administer topical fluoride 
    to children 0-3 years of age.  
    a. fluoride gel  
    b. fluoride rinse  
    c. fluoride varnish  
    d. all of the above

16. Stearns et al. reported that children 6-44 months of age who had four or more visits with 
    treatment of dentinal sensitivity 
    a. 19%  
    b. 29%  
    c. 39%  
    d. 49%

17. In children ages 6-18 years with moderate and high caries risk, there is strong evidence 
    to support the use of _______.  
    a. fluoride varnish every 6 months  
    b. fluoride varnish every 4 months  
    c. fluoride varnish every 3 months in high risk children  
    d. all of the above

18. Orthodontic appliances can _______ the risk for enamel demineralization around 
    anterior teeth.  
    a. decrease  
    b. maintain  
    c. increase  
    d. none of the above

19. Data on the effectiveness of fluoride varnish being superior to other treatment options for 
    root caries is _______.  
    a. unequivocal  
    b. equivocal  
    c. overwhelming  
    d. none of the above

20. The primary use for fluoride varnish in adults is for _______.  
    a. remineralization or control of root caries in older patients  
    b. prevention of caries in high-risk adults  
    c. treatment of dental sensitivity  
    d. all of the above

21. Fluoride varnish can be effective for up to _______ for sensitivity relief.  
    a. one to two years  
    b. three years  
    c. three to six months  
    d. six to twelve months

22. Fluoride gel is recommended for patients _______ at risk for caries.  
    a. under age 6  
    b. under age 3  
    c. age 6 and over  
    d. all of the above

23. Fluoride varnish is contraindicated if a patient _______.  
    a. has ulcerative gingivitis  
    b. has stomatitis  
    c. is allergic to one of the ingredients  
    d. all of the above

24. One milliliter of the varnish contains _______.  
    a. 2.26 mg fluoride/ml  
    b. 22.6 mg fluoride/ml  
    c. 226 mg fluoride/ml  
    d. none of the above

25. Infants require _______ of fluoride varnish, _______.  
    a. 0.1 ml  
    b. 0.4 ml  
    c. 0.75 ml  
    d. none of the above

26. The dose of fluoride varnish for the mixed dentition is _______.  
    a. 0.2 ml  
    b. 0.4 ml  
    c. 0.6 ml  
    d. 0.8 ml

27. Following application of fluoride varnish, the patient _______.  
    a. should refrain from eating for at least 30-60 minutes  
    b. should refrain from drinking for at least 30-60 minutes  
    c. should refrain from eating foods containing alcohol  
    d. a and b

28. Following application of fluoride gel, the patient _______.  
    a. should refrain from eating for at least 30-60 minutes  
    b. should refrain from drinking for at least 30-60 minutes  
    c. should refrain from eating foods containing alcohol  
    d. a and b

29. When only a _______ is present, fluoride varnish can be directly applied without prior removal of the plaque.  
    a. the pellicle  
    b. a thick layer of plaque  
    c. a thin layer of plaque  
    d. all of the above

30. The selection of a professional topical fluoride should be guided by _______.  
    a. scientific evidence  
    b. age and risk level of the patient  
    c. specific intra-oral considerations  
    d. all of the above
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 2 CE credits. 6) Complete the Course Evaluation below. 7) Make check payable to PennWell Corp. For Questions Call 216.398.7822

The Use and Efficacy of Professional Topical Fluorides

Educational Objectives

1. List the types of professional topical fluorides that are available in the US and Canada
2. List and describe the ADA recommendations on the use of professional topical fluorides
3. List and describe the evidence on efficacy and safety for sodium fluoride varnishes
4. List and describe the methods by which different professional topical fluorides can be applied

Course Evaluation

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

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. Do you feel that the references were adequate?
   Yes No

9. Would you participate in a similar program on a different topic?
   Yes No

10. If any of the continuing education questions were unclear or ambiguous, please list them.

Next:

11. Was there any subject matter you found confusing? Please describe.

12. What additional continuing dental education topics would you like to see?

Please photocopy answer sheet for additional participants.

For immediate results, go to www.inedec.com to take tests online. Answer sheets can be faxed with credit card payment to (440) 845-3447, (216) 396-7922, or (216) 255-6619.

Payment of $49.00 is enclosed. (Checks and credit cards are accepted.)

If paying by credit card, please complete the following:

- Mailing Address:
- Telephone: Home ( ) Office ( )
- City: State: ZIP: Country:
- Exp. Date: Acct. Number: ____________

Charges on your statement will show up as PennWell

AGD Code 258, 430