Policy Proposal for the Use of Fluoride Varnish
in Early Head Start Programs

by

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10 April 2006

A Master's paper submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Public Health in the School of Public Health, Public Health Leadership Program.

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Abstract

Dental caries is the most common unmet health care need of children and has been termed a "silent epidemic" by the Surgeon General. Children living at ≤200% of the Federal Poverty Level statistically experience a disproportionate amount of the nation's reported caries. Disparities in oral health status as well as in access to care provide the impetus for aggressive, proactive involvement in the reduction of caries in indigent children.

Early Head Start provides an ideal venue for targeting a high caries risk population of children. Due to its existent infrastructure that supports health initiatives for children living near the poverty level, the Head Start program not only offers access to a population base composed of indigent children but also has program planning that involves health improvement interventions. Fluoride varnish is a caries preventive topical fluoride that is applied in a thin layer to teeth. It is a safe, easy to apply, cost effective, and efficacious modality for reducing caries, especially in young children. The use of fluoride varnish in Early Head Start programs provides a logical yet simple approach to reducing caries in indigent children.

A policy of administering an annual application of fluoride varnish to children, ages 0-3 years of age who are participants in a Early Head Start program will decrease the negative impact not only of Early Childhood Caries but caries in general for this high caries risk population.
Policy Paper on the Use of Fluoride Varnish
in Federally Funded Childcare Agencies

Oral health is a multi-factorial state of health and requires a holistic view of one's physical, social, demographic, and economic condition. The traditional medical/surgical model was applied to dentistry in the 1840's and dentists became known as Doctors of Dental Surgery. The concept of alleviation of discomfort via symptom treatment was the norm until the mid 1900's, despite insightful commentaries found in works such as Chirurgia Magna written in 1386 by Guy de Chaulia advocating a preventive nutritional and oral hygiene approach to oral care. In the 1940s, the establishment of fluoride as an oral health preventive agent and its inaugural use in public water supplies as a deterrent to tooth decay launched a new era of proactive oral health medicine. This era has been accentuated in the 21st century by the practice of evidence-based dentistry as well as the use of sophisticated technology and advanced information services. However, despite the shift in focus in dentistry towards prevention and a plethora of technologic improvements, oral health disparities are glaring in populations defined by low income, lack of insurance, minority ethnicity, and geographic isolationism. In a review of the oral health status of children who fall into one of these categories, the disparity is even more pronounced.

Dental caries (tooth decay) results from the demineralization of tooth structure from acid produced by oral flora. The effects of dental caries on young children can be devastating. This paper proposes the establishment of a policy advocating the annual application, with three applications occurring within seven
days, of fluoride varnish to high caries risk children, from first tooth eruption to age three, who are participants in Early Head Start programs. The policy will assist in: decreasing the risk of caries, improving the potential for a caries free oral health history, increasing the parent or caregiver's oral health literacy, and addressing the oral health disparity issue of initial access to the oral health care system. The effects of such a policy for use in these programs will isolate a key marker for high caries risk children: poverty. Low socioeconomic status of the household is a constant variable for increased risk for caries in children, according to groups such as the American Academy of Pediatric Dentistry and the Center for Disease Control [CDC] (Division of Oral Health). According to the CDC Key Findings Report of NHANES (National Health and Nutrition Examination Survey) 1999-2002 (2005), the risk of caries for indigent children is twice that of children not living near the poverty level. The resultant oral health disparity is corroborated by the fact that over 34% of indigent children, aged 2-11 years old, have untreated dental caries as compared with 13% of children living in households with incomes > 200% of Federal Poverty Levels (FPL). Not only are poor children more likely to have caries, but they are also more likely to have untreated caries. Seale and Casamassimo (2003) conducted a survey of general dentists reviewing their office protocol for appointing children for dental treatment. Even though 91% of the 4,970 dentists surveyed treated children, very few dentists offered care to children who were younger than four years of age, had Medicaid insurance, or had rampant caries.

The use of fluoride varnish is an avenue of hope in reducing this access to care disparity. Fluoride varnish offers a relatively inexpensive modality of
Fluoride varnish's effectiveness coupled with a low risk factor, even in infants, has spawned public health, the Center for Disease Control (CDC), and groups such as the Children's Dental Health Project in Washington, D.C. to advocate the use of fluoride varnishes on high caries risk children from initial tooth eruption to three years of age.\textsuperscript{5,9,10,11} Both the medical and dental health care safety net of practitioners for indigent children encourage the application of fluoride varnish on
this age group and the use of fluoride varnish is gaining momentum as a reimbursable service for medical providers.\textsuperscript{12}

Rationale for an oral health policy geared towards ages 0-3 years of age:

In 1996, in an effort to assist state oral health programs assess need and efficacy of action, the CDC and the National Institute of Dental and Craniofacial Research (NIDCR) developed the NHANES tool for the assessment and monitoring of oral health parameters. The national surveillance data collected includes the oral health status of minority and underserved populations with a key focus being to provide such data for analysis of achieving Healthy People 2000 and 2010 objectives.\textsuperscript{13} A product of that partnership was presented in a CDC report, Summary Surveillance for Dental Caries, Dental Sealants, Tooth Retention, Edentulism, and Enamel Fluorosis (2005). The summary offered an analysis of the NHANES for years 1988-1994 and 1999-2002. Despite the overall decrease in caries and severity of caries in the permanent dentition, no such trend was seen in primary dentition. Forty one percent of children ages 2-11 years had a decayed, missing, or filled primary tooth and 21% of this same population had untreated caries present. These percentages escalated when children living below the Federal Poverty Level (FPL) were carved out. The percentage of children living below the FPL who have decayed teeth was almost doubled when compared to the percentage of children with decayed teeth who live at > 200% of the FPL.\textsuperscript{14} The same escalation factor applies to the untreated caries found in children living at < 100% of the FPL: the percentage of untreated caries is 33.5% in this population as compared to 13.2% for children living at > 200% of the
The summary additionally noted that more than 91% of the adults with remaining dentition had experienced caries. This is a significant finding attributed to the communicable nature of caries. If the primary caregiver has caries, the cariogenic oral flora may be transmitted to the child. Mutans streptococci, the primary cariogenic bacteria found in the mouth, can be transmitted from caregiver to child by commonplace actions, such as licking a child's pacifier prior to placing it in the child's mouth or tasting the child's food prior to feeding the child.

It is noteworthy to consider that once a child has active caries, he is more likely to have future caries experiences. Other significant economic and epidemiologic risk factors of caries are identified in the American Academy of Pediatric Dentistry's Caries Risk Assessment Tool. (Table 1)

Caries, resulting from the demineralization of tooth enamel, is affected by various individual factors such as amount of cariogenic flora present in the mouth, the length of time the teeth are exposed to carbohydrates, frequency of exposure, type of carbohydrates ingested (refined vs. complex), consistency and rate of salivary flow (which may be altered by medications that dry out the mouth), natural buffering capacity of saliva, enamel structure (especially if defective or thin), and the presence of active decay. It is also essential to consider any inability to perform daily oral hygiene functions as a result of physical, mental, or environmental barriers (such as a lack of clean water).

The caries paradigm is also influenced by factors beyond the individual's control. Due to the communicable nature of dental disease, a history of caries
noted in the caregiver's and/or siblings' oral history also potentiates the individual's risk of caries. 19,20,21

The American Dental Association (ADA) defines Early Childhood Caries (ECC) as "the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a preschool-age child between birth and 71 months of age". 22 The State of Nevada's Oral Health Program reported that in 2004, 25% of their Head Start preschoolers had Early Childhood Caries. 23

Another critical factor in caries prevention and treatment is access to care. Weintraub's recent findings underscore the efficacy of preventive treatments in decreasing caries activity. 24 The dilemma for indigent children is getting access to these treatments. According to Oral Health in America: A Report of the Surgeon General, only 30% of the children living near the poverty level are likely to see a dentist within a year. 25 Access to care is affected by numerous barriers, including: language barriers, transportation barriers, lack of providers who accept public insurance or a sliding fee arrangement, lack of the caregiver's understanding of the importance of early preventive dental care (low oral health literacy), and fear (caregiver fear of the dentist, fear of navigating the Medicaid and public insurance system to arrange an appointment, and fear of chastisement or denigration when presenting the child for treatment).

In the Maternal and Child Oral Health Issues fact sheet (2004), one reason for lack of access was underscored by the statistic that even though 90% of general dentists will treat children, very few dentists will see children less than four years old, children with rampant caries, or children with Medicaid. 26 The lack
of access is borne out for Medicaid children with the finding that less than 20% of Medicaid children were the recipient of at least one preventive dental service annually.\textsuperscript{27} In addition, an August 2005 fact sheet from CDC noted a differential in the number of lost days from school due to dental pain or emergencies when comparing different income groups (indigent children have 12 times the rate of absences when contrasted with families living at \textgreater 200% of FPL). Chronic dental pain also contributed to dysfunctions in eating, speaking, and learning.\textsuperscript{28}

The devastation to oral health from the actual decayed dentition, the decrease in general systemic health due to the inability to properly chew food and maintain a high level of nutritional intake, and the psychological as well as physical effects of pain and decreased self esteem are strong indicators of the need of a policy to address the prevention of tooth decay early in life.

**Fluoride Modalities and Efficacy:**

In the late 1930s, puzzled by the brown mottled appearance of his patients' teeth in Colorado, Frederick McKay began a research project that resulted in one of the ten greatest public health achievements of the 20\textsuperscript{th} Century, the fluoridation of water.\textsuperscript{29} With the advent of fluoridated water in the 1940s, after World War II the decay rate in the United States decreased by 50-60\%.\textsuperscript{30}

Once the role of fluoride was confirmed in reducing tooth decay, new topical and systemic fluoride products appeared on the market. The first fluoride toothpastes were introduced in the 1950s.\textsuperscript{31} Today, some fluoride containing products are available over-the-counter, such as toothpastes and mouth rinses for home use. Other fluoride containing products are either obtained by
prescription or received at a medical or dental office. For areas where the water supply does not contain optimal levels of natural fluoride there are fluoride supplements, such as prescription drops or tablets, which provide a systemic source of fluoride. This source is beneficial for children during the development of their permanent dentition. Professional topical fluoride products include prescription strength fluoride pastes for brushing, professionally applied gels and foams, and fluoride varnishes. Fluoride is even found in some sealant and restorative products, such as glass ionomers.

Fluoride Varnish

The first fluoride varnish was developed in Germany in 1964 by Schmidt. It was a 5% NaF product in a neutral colophonium base, marketed under the name Duraphat (Woelm pharma Co., Eschwege, FRG). Approximately 10 years later, another fluoride varnish product, Fluro Protector, was introduced by Arends and Schuthof. Due to its polyurethane base, the new varnish dried in contact with air to a thin, transparent film.32 Today, all six available varnishes are still in the natural colophonium base or in the polyurethane base. The trade names, manufacturers, and description of the products are listed in Table 2.

Even though fluoride varnish has been used in Europe for more than 30 years as a topical fluoride agent, only in the last 20 years has it gained entry into the American dentists' armamentarium. In 1994, the U.S. Food and Drug Administration (FDA) first authorized use of Duraphat as a cavity liner and desensitizing agent.33 Despite the fact that fluoride varnish has not yet been approved by the FDA as a 'medical device which functions as a therapeutic
topical fluoride, it currently has widespread use by the dental community as an “off-label” topical fluoride product. This legal and common practice often occurs when a product has been proven safe within the realm of a reasonable and safe standard of care but the anticipated usage is not yet approved by the FDA. In November of 2004, the American Dental Association released the announcement of Resolution 37H, which states "the ADA supports the use of fluoride varnishes as safe and efficacious within a caries prevention program that includes caries diagnosis, risk assessment, and regular dental care." 

Fluoride varnish is an ideal topical fluoride delivery model for children due to its effective fluoride release, ease of use, relative inexpensive cost per application (the cost per uni-dose application is approximately 93 cents, only slightly higher than the average fluoride gel application), prolonged contact with the tooth, and lack of systemic ingestion resulting in adverse reactions or eventual fluorosis. The tooth surface does not have to be totally dry or professionally cleaned prior to placement of the fluoride varnish. Using a small brush applicator, a thin layer of fluoride varnish (0.3 to 0.5 milliliters) is applied directly to the teeth. Fluoride has been shown to be more effective with prolonged contact with the tooth structure. In 1985, Hellwig, Klimek, Schmidt, and Egerer also confirmed an increased fluoride uptake by enamel with increased contact time. This precept shaped the development of fluoride varnish for dental use. Due to the prolonged contact time with the tooth, more fluoride uptake by the enamel occurs in a dental varnish than in other fluoride application methods. Fluoride varnish has been shown to be a safe mode for topical fluoride application. Even though fluoride varnish has a higher concentration fluoride than
gels (gels are approximately 9-12,000 ppm fluoride while varnishes are 1,000-22,600 ppm fluoride), due to the small amount of fluoride varnish needed for a varnish application, the net exposure to fluoride is decreased. Less swallowing of the product by the young patient due to the adhesiveness of the fluoride varnish coupled with the net decrease in bioavailable fluoride has reduced the potential for fluoride varnish to contribute to fluorosis, enamel defects resulting from excess systemic fluoride intake during tooth development. One way to measure the fluorosis potential of a topical fluoride delivery system is to determine the plasma level of fluoride after application of the fluoride. According to the results of a study by Dr. Jaana Autio (University of Florida College of Dentistry) released in 2000, the blood levels of fluoride after a fluoride varnish treatment were less than other fluoride delivery systems. This was one of the first research studies focused on the primary dentition and was presented to the International Association for Dental Research Conference in Washington D.C. in April 2000. The substantiation of decreased fluoride ingestion and risk of fluorosis when fluoride varnish was applied to teeth as compared to other topical fluorides was also confirmed by Ekstrand (1987) in Pharmokinetic Aspects of Topical Fluorides. The current studies on safety of fluoride varnish and its significant benefit to high caries risk children prompted the Scottish Intercollegiate Guidelines Network (2005) to note in their guideline recommendations that "for high risk children where reliance on the home based use of fluoride toothpaste and tablets is deemed to be insufficient, professional application of a fluoride varnish may help to prevent dental caries".
Rationale for Use of Fluoride Varnish:

In 1994, Ogard, Seppa, and Rolla reviewed the cariostatic properties and remineralization process resulting from topical fluoride application that earmarks fluoride as an effective anti-caries agent. As acid contacts the enamel surface, minerals are dissolved, including calcium, phosphate, and carbonate. These minerals are trapped by dental plaque, the "sticky organic matrix of bacteria, food debris, dead mucosal cells, and salivary components that adheres to tooth enamel". Just as the dissolved minerals are trapped by dental plaque, the introduction of fluoride via a topical application as well as its presence in saliva also causes fluoride to be trapped in plaque. The cycle of demineralization and remineralization is an ongoing event throughout the time a tooth is present in the mouth. However, when fluoride is in prolonged contact with the tooth surface, the fluoride can bind to the enamel by means of remineralization. In remineralization, the fluoride replaces the carbonate in the enamel's mineral content, resulting in a fluoro-apatite crystalline structure which replaces the hydroxy-apatite crystals. The fluoride in varnish may actually alter the porosity of a carious lesion and encourage the uptake of fluoride into the enamel matrix. Interestingly, studies have also shown that a slightly demineralized enamel surface will facilitate uptake of fluoride more than sound enamel. This finding underscores the efficacy of professionally applied topical fluorides for high caries risk children, who are highly likely to have areas of demineralization as is evidenced by their increased caries rate.

In the physical act of remineralization, the altered enamel mineral content now not only yields a non-cavitated, remineralized tooth surface but also a
surface that is more resistant to acid demineralization. The cariostatic action of fluoride has been shown on a limited basis in animal models where, in the presence of fluoride acid producing bacteria are limited in their ability to produce acid.\textsuperscript{52}

In the CDC report, Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States (2001), a review of Canadian and European studies support the findings of fluoride varnish being an effective anti-caries agent.\textsuperscript{53} The evidence used by CDC fell in a Grade 1 category, where "evidence [was] obtained from one or more properly conducted randomized clinical trials (i.e., one using concurrent controls, double-blind design, placebos, valid and reliable measurements, and well-controlled study protocols).\textsuperscript{54} (Table 3) The CDC weighs their recommendations for various fluoride modalities based on a target audience's risk of dental caries, current availability and standards of practice for other fluoride sources, and the biologic risk of enamel fluorosis. Based on current studies including data published in 2001, CDC supported the use of fluoride varnish for caries management in high risk children, noting that there was substantial and proven clinical evidence proving fluoride varnish's safety and efficacy.\textsuperscript{55} (Table 4)

In a systematic review of literature by Strohmenger and Brambilla (2001), a meta-analysis of various studies is presented. Their analyses confirm the efficacy of fluoride varnish as an anti-caries agent, especially when directed toward the needs of indigent children as a high risk population. Fluoride varnish has been shown to reduce the demineralization of enamel by 53-75%, though the authors expressed concern over the design of some of the studies. Several
Fluoride varnish was studied extensively for caries prevention in the primary dentition as well as inhibiting the progression of existing caries. Fluoride varnish performed significantly well in both instances. Early Childhood Caries is a major caries event and occurs more frequently in indigent children. The review commented that one main advantage of a fluoride varnish is its ability to adhere to tooth surface and consequently deposit more significant amounts of fluoride to demineralized areas of enamel.  

In a literature review for the Agency for Healthcare Research and Quality, Bader, Rozier, Harris, and Lohr (2002) acknowledge that though the risk of fluorosis precludes recommending fluoride supplementation for low risk children, that there is benefit for high risk children. It was also noted that the American Academy of Pediatrics has adopted the CDC protocol for fluoride use. As noted earlier in this paper, the CDC has endorsed the use of fluoride varnish as a topical fluoride agent for high risk children. In 1994, an expert committee from the World Health Organization (WHO) concurs that fluoride varnish, particularly in high caries risk patients, has been shown to be an effective anti-caries agent.  

**Rationale for Use of Early Head Start Programs:**

Established in 1964 as a program to aid disadvantaged preschoolers, Head Start has developed into a comprehensive child development program according to the Department of Health and Human Services. Administered by the Head Start Bureau, Head Start and Early Head Start have an umbrella goal of school preparedness for indigent children. Programs oriented toward developing healthy children are centered on "individualized services in the areas of education and
early childhood development; medical, dental, and mental health; nutrition; and parent involvement...[which are] responsive and appropriate to each child's and family's developmental, ethnic, cultural, and linguistic heritage and experience.  

In 1995, the Head Start Bureau broadened their scope of service from aiding disadvantaged preschool children to including birth to age 5 years. With the provision of adherence to a Program Performance Standard, Head Start programs have defined goals and objectives, which must be met in order for a program to be called successful. Serving more than 62,000 children under the age of five years in Fiscal Year 2004, Head Start and Early Head Start would be an appropriate backdrop for timely intervention in breaking the high caries risk activity pattern seen in indigent children.  

Lewis, Lynch, and Richardson (2005) investigated the parameters of a successful outreach program for fluoride varnish in high caries risk populations of children. In some practices, the fluoride varnish placement by a pediatrician was the only oral health preventive service available to the children. However, the best program outcomes resulted from practices that had a community coalition of dental and other health care services. Based on Roger's Diffusion Theory, Lewis and her team identified key constructs for the successful implementation of a fluoride varnish program in the medical/dental interface. The researchers summarized the positive potential for such a model: "Fluoride varnish can be adopted successfully into medical practice given PCP [Primary Care Provider] and staff commitment and openness, training that leaves participants motivated, appropriate systems, and resources for professional dental care referral. In addition, PCP involvement with fluoride varnish provided opportunities to discuss
preventive oral health with families. Specific recommendations to encourage fluoride varnish diffusion in other settings are offered for program planners and PCP offices. Head Start programs already have in place the kind of network and infrastructure suggested in this study.

According to the Scottish Intercollegiate Guidelines Network’s (SIGN) Reference Guide on Targeted prevention of dental caries in the permanent teeth of 6-16 year olds presenting for dental care (2002), primary prevention efforts should be focused on home and office care by means of behavior modification, such as age appropriate oral hygiene instructions, and tooth protection. Secondary prevention is achieved by decreasing the effects of decay in early childhood and tertiary prevention is evidenced by treatments aimed toward remineralization of tooth enamel. It is also emphasized in the reference guide to confirm the consistency of oral health messages distributed by all partners. Head Start programs are focused on a multi-layered approach to child and family education, utilizing networked community members to reinforce the steps necessary to achieve health and well-being. The formatting is similar to that presented by SIGN for improved oral health.

The National Institute of Health released a Conference report in 2001 noting that “effective dentistry requires early identification of children at high risk for extensive caries so that they may receive early and intense preventive intervention.” This basic premise is the foundational theme for model programs. Head Start programs have links with local medical and dental practitioners who can facilitate assessment of oral health interventions and therapies. Head Start
programs are readily accessible in the community with established community networks necessary for the preventive oral health treatment of a high risk child.

Rationale for Annual Application:
In a 2001 CDC report on Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States, the topic of effective frequency of application in caries reduction is addressed. The article continues with a discussion of appropriate time intervals between applications, noting that a semi-annual fluoride varnish application offers equivalent fluoride benefits as professionally applied fluoride gels. There is also mention of an alternative application protocol of three applications within a one-week time frame. This annual routine may even prove to be more advantageous in caries management and remineralization than a tradition semi-annual application. A literature review by Strohmenger and Brambilla (2001) of studies pursued in the 1990’s substantiated the greater efficacy of an annual, three times in seven days, application of fluoride varnish as opposed to the traditional semi-annual application.

Beltran-Aguilar, Goldstein, and Lockwood reviewed variances in application interval and its effect on caries prevention and remineralization. In their assessment of the annual three times/week in a seven day period application protocol, the results indicated a caries reduction of 46 to 67 % in proximal surfaces of teeth. A confluent finding by Castillo and Milgrom (2004) noted the more concentrated uptake of fluoride and slower release of fluoride in an application of three times per week over a seven day period applied on an
annual interval as compared to a single annual application. Their commentary on the clinical ramification was insightful. They noted the positive implication for a caries risk management program for children who are members of a transient household or not likely to return for recall.69

Seppa, Tuuti, and Luoma (1984) offered a different perspective on intervals in their study of children with a high caries rate despite living in a fluoridated water supply community. Even after receiving semi-annual fluoride varnish applications for a total of three years, when re-evaluated after receiving no fluoride varnish treatments for the following two years, the “the absolute reduction in caries found during the treatment was retained, but the cariostatic effect did not continue after treatment...[suggesting] that fluoride varnish applications should not be discontinued after three years.”70 This finding supports the positioning of policy for continuity of care and the integration of community health partners for collaborative preventive oral health efforts beyond the child’s first three years of life.

The research substantiates the need for the ongoing application of a fluoride varnish, at least on an annual basis, with increased frequency of application yielding even greater benefit. An annual application with a three times/week within a seven day period would be beneficial to an indigent child population. This population would benefit from the remineralization effects of the increased frequency of application. The other advantage would be the increased likelihood of treating children who are in a mobile family. These children may not be enrolled in the Head Start program when it is time for a follow up semi-annual application of varnish. With the Early Head Start programs record keeping system...
and auditing evaluations already in place, the frequency and interval of applications can be readily tracked and recorded in a child's record.

Conclusion and Recommendations:

This paper is written for the intent of proposing policy for the application of fluoride varnish on high caries risk children, ages 0-3 years old, who are participants in Early Head Start. The U.S. Surgeon General, Richard H. Carmona, M.D., has labeled dental caries "a silent epidemic" among indigent children.71

Despite the knowledge that access to care and oral health disparities tied to socioeconomic status and minority ethnicities are common factors for indigent young children's higher caries rate, in 2004 only 18 states had submitted an oral health plan to CDC to address these issues.72 The CDC encourages the development of state plans and offers toolkits and other resources to aid in the formulation and implementation of state plans. The CDC commentary on state plans recognizes the plans as "a roadmap...that has as its goal reducing the prevalence of oral diseases [including] specific objectives related to oral health promotion, disease prevention and control, and specified risk factors."73 The framework of an oral health plan assists state public health teams and other key oral health stakeholders in effective resource management and meaningful evaluation of outcomes. According to Turnock (2004), policy development not only informs and empowers people but also weaves community assessment into an effective community health initiative.74 With a policy in place to encourage communities to mobilize resources to provide preventive oral health services to
young indigent children, state dental public health offices are provided with a stronger platform for development of oral health plans. When effective, the resultant decreased prevalence of oral disease will benefit the general health of the overall population, but most especially those at greatest risk, such as indigent children.

Since the caries rate in the indigent child population is not decreasing, innovative preventive modalities must be developed and implemented. The development of a product such as fluoride varnish, supported by research stating its efficacy and safety in treating caries in high risk populations, gives policy makers the opportunity to implement policy that will have far reaching positive health outcomes.

The policy suggested by this paper would include:

1. Program development for the placement of an annual topical fluoride varnish application, with 3 applications placed within a 7 day period, on the primary dentition of all children in Early Head Start, ages 0-3 years of age, pending parental consent. The fluoride varnish will be placed by a dentist, physician, or legally eligible expanded duty medical/dental personnel.

2. Program data on caries rates and frequency of fluoride varnish application will be made available to state and federal reporting agencies.

The hope of health is a powerful tool for increasing the quality of life. James Joyce, at age 25, noted in a letter to his brother “my mouth is full of decayed teeth and my soul of decayed ambitions.” This quote is prophetic of
our current understanding of the intricacies and interrelationships of good oral health, self esteem, improved school performance, and general good health. As our children begin to function free from the stigma of decayed teeth, swollen jaws, and painful distractions, their self-perception takes on a more global consciousness. This new vantage point affords them an opportunity to see the potential in their future for health and success.
Acknowledgements:

Joseph Doherty, DDS, MPH

Frank Farrington, DDS

Susan Pharr, RDH, MPH
Maternal and Early Child Oral Health Coordinator
Division of Dental Health
Virginia Department of Health
Bibliography

Fluoride Varnish


35 American Dental Association website. ADA House OKs fluoride varnishes. November 2004. Available at:
36 Sullivan Schein Dental Products. (Preventive Products) Available at:
38 Hollwig, E., Klimek, J., Schmidt, H. F., Eggerer, R. Fluoride uptake in plaque-covered enamel after treatment with the
fluoride lacquer Duraphat. J Dent Res 1985 64: 1080-1083. Available at:
http://jdr.iadrjournals.org/cgi/content/abstract/64/8/1
40 Ogard, B., Seppa, L., Rolla, G. Professional topical fluoride applications—clinical efficacy and mechanism of action. Adv
41 Center for Disease Control. Other Fluoride Products. Available at:
42 Donly, K. Fluoride Varnishes. Journal of the California Dental Association. March 2003. Available at:
43 Center for Disease Control. Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United
11, 2005.
44 Daughtry, C. Painting Teeth With Fluoride Varnish Is Effective Against Tooth Decay In Children. University of Florida
46 SIGN. Scottish Intercollegiate Guidelines Network’s Reference Guide on Targeted prevention of dental caries in the
permanent teeth of 5-16 year olds presenting for dental care (2002). Available at:
48 Center for Disease Control. Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United
3, 2006.
49 Beltran-Aguilar, Eugenio D., Goldstein, Jonathan W., Lockwood, Stuart A. Fluoride Varnishes: A Review of Their
Clinical Use, Cariostatic Mechanism, Efficacy and Safety. J Am Dent Assoc 2000 131: 589-596. Available at:
50 Beltran-Aguilar, Eugenio D., Goldstein, Jonathan W., Lockwood, Stuart A. Fluoride Varnishes: A Review of Their
Clinical Use, Cariostatic Mechanism, Efficacy and Safety. J Am Dent Assoc 2000 131: 589-596. Available at:
51 Hollwig, E., Klimek, J., Schmidt, H. F., Eggerer, R. Fluoride uptake in plaque-covered enamel after treatment with the
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52 Center for Disease Control. Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United
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<td>National Institute of Health. Diagnosis and Management of Dental</td>
<td>Caries Throughout Life, National Institutes of Health Consensus Development Conference</td>
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### Table 1. Caries Risk Assessment Tool

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<th>Caries-risk indicator</th>
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<th>( n = 10 ) mean</th>
<th>( n = 24 ) mean</th>
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<tr>
<td><strong>Clinical conditions</strong></td>
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<td>* No carious teeth in past 24 months</td>
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<td>* Carious teeth in the past 24 months</td>
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<td>* No enamel demineralization (enamel caries/white-spot lesions)</td>
<td>* 1 area of enamel demineralization (enamel caries/white-spot lesions)</td>
<td>* 2 areas of enamel demineralization (enamel caries/white-spot lesions)</td>
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<td>* No visible plaque; no gingivitis</td>
<td>* Gingivitis</td>
<td>* Moderate plaque or gingivitis</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Optimal systemic and topical fluoride exposure</td>
<td>* Suboptimal systemic fluoride exposure with optimal topical exposure</td>
<td>* Suboptimal topical fluoride exposure</td>
<td></td>
</tr>
<tr>
<td>* Consumption of simple sugars or foods strongly associated with caries initiation (e.g., &quot;high risk&quot;)</td>
<td>* Occasional (e.g., 1-2 times per day) consumption of simple sugars or foods strongly associated with caries initiation</td>
<td>* Frequent (e.g., 3 or more times per day) consumption of simple sugars or foods strongly associated with caries initiation</td>
<td></td>
</tr>
<tr>
<td>* High caregiver socioeconomic status</td>
<td>* Medically vulnerable socioeconomic status (i.e., eligible for school lunch program or SCHIP)</td>
<td>* Low-level caregiver socioeconomic status (i.e., eligible for Medicaid)</td>
<td></td>
</tr>
<tr>
<td>* Regular use of dental care in an established dental home</td>
<td>* Irregular use of dental services</td>
<td>* No usual source of dental care</td>
<td></td>
</tr>
<tr>
<td><strong>General health conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Children with special health care needs</td>
<td>* Conditions impairing saliva secretion/flow</td>
<td>* Conditions impairing saliva secretion/flow</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2. Fluoride Varnishes

<table>
<thead>
<tr>
<th>Varnish</th>
<th>Formulation</th>
<th>Manufacturer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluor-Protector</td>
<td>0.1% difluorosilane in a polyurethane base</td>
<td>Ivoclar North America-Vivadent 1-800-327-4688</td>
<td></td>
</tr>
<tr>
<td>VarnishAmerica</td>
<td>5% NaF in a natural colophonium resin</td>
<td>Medical Products Laboratories, Inc. 1-800-523-0191, Ext 326</td>
<td>Available in a unit-dose with an applicator</td>
</tr>
<tr>
<td>AllSolutions</td>
<td>5% NaF in a natural resin</td>
<td>Dentsply Professional 1-800-989-8826</td>
<td>Available in a unit-dose with an applicator</td>
</tr>
<tr>
<td>Vanish</td>
<td>5% NaF in a natural colophonium resin</td>
<td>Omni Products 1-800-445-3386</td>
<td>Available in a unit-dose with an applicator</td>
</tr>
<tr>
<td>Durafluor</td>
<td>5% NaF in a natural colophonium resin</td>
<td>Medicom 1-800-435-9267</td>
<td></td>
</tr>
<tr>
<td>Duraphat</td>
<td>5% NaF in a natural colophonium resin</td>
<td>Colgate Oral Pharmaceuticals 1-800-225-3756 1-800-2-COLGATE</td>
<td></td>
</tr>
</tbody>
</table>

Sources:
**Table 3: CDC Fluoride Grading System**

CDC Grading system used for determining the quality of evidence for a fluoride modality

Grade Criteria

I Evidence obtained from one or more properly conducted randomized clinical trials (i.e., one using concurrent controls, double-blind design, placebos, valid and reliable measurements, and well-controlled study protocols).

II-1 Evidence obtained from one or more controlled clinical trials without randomization (i.e., one using systematic subject selection, some type of concurrent controls, valid and reliable measurements, and well-controlled study protocols).

II-2 Evidence obtained from one or more well-designed cohort or case-control analytic studies, preferably from more than one center or research group.

II-3 Evidence obtained from cross-sectional comparisons between times and places; studies with historical controls; or dramatic results in uncontrolled experiments (e.g., the results of the introduction of penicillin treatment in the 1940s).

III Opinions of respected authorities on the basis of clinical experience, descriptive studies or case reports, or reports of expert committees.

Table 4. CDC Fluoride Coding System

<table>
<thead>
<tr>
<th>Coding system used to classify recommendations for use of specific fluoride modalities to control dental caries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Code Criteria</strong></td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
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<tr>
<td>D</td>
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<tr>
<td>E</td>
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</tbody>
</table>