

Chapter 4. Measures and Programs for Preventing Dental Caries in Young Children

Chapter Description

This chapter describes measures for preventing dental caries in young children, noting the indications for use, who can provide the service, evidence for effectiveness in caries reduction, issues and controversies, costs, evaluation strategies, and selected resources and references. Some measures are included that reduce bacterial transmission by caretakers.

Chapter Overview

Measures to prevent dental caries have been available for many years, and have proven effective in reducing dental caries rates in some populations. Other population groups who either are not knowledgeable about these measures, do not use them, do not have access to them or can't afford them, still have high caries rates. Measures are valued for their ability to interfere with bacterial metabolism and adherence to teeth, to prevent demineralization of tooth enamel, and also for their role in remineralization back to healthy enamel (see Chapter 3.) A complete preventive dental program for young children includes risk assessment, anticipatory guidance, plaque removal, fluorides, other antimicrobials if needed, careful feeding practices and food choices, and regular professional checkups and care. Sealants are usually incorporated into the program when the child begins to have permanent molar teeth or if the primary molars are at high risk for decay. Mothers and other caretakers may be encouraged to receive treatment for untreated dental decay and be placed on fluoride or xylitol regimens to reduce the levels of bacteria in their own mouths.

One challenge in documenting effectiveness has been translating use of dental office-based preventive measures with individual patients to their use in community-based programs for populations or conducting community-based research. Ten characteristics of ideal public health measures are summarized in one of the major dental public health textbooks (Gluck and Morgenstein, 1998) as:

1. Medically and dentally safe
2. Proven efficacy in reducing targeted disease
3. Administered with minimum compliance on the part of the patient(s) and parents
4. Administered with maximum acceptance on the part of the patient(s) and parents
5. Uncomplicated and easily learned by utilizers
6. Readily administered by non-dental personnel
7. Inexpensive
8. Readily available and accessible to large numbers of individuals
9. Easily and efficiently implemented, utilizing a relatively small amount of materials, supplies, equipment
10. Attainable by beneficiaries regardless of socioeconomic, educational, income and occupational status.

Keep these in mind as you review this chapter.

An additional challenge is trying to document the impact of using multiple preventive measures at the same time. Another challenge in documenting effectiveness is lack of community-based research on preventive approaches in very young children or in their mothers prior to delivery. Communities that develop preventive programs should plan carefully to document baseline measures before implementing a program and track a variety of measures during the interventions. Keep in mind the following Healthy People 2010 national objectives related to preventing dental caries.

- 21.1 Reduce dental caries experience in children aged 2-4 to 11% (baseline = 18%) and in children ages 6-8 to 42% (baseline = 52%)
- 21.8 Increase sealants in first molars of 8-year-olds to 50% (Baseline = 23%)
- 21.9 Increase percentage of persons on public water supplies receiving fluoridated water to 75% (Baseline = 62%)
- 21.12 Increase preventive dental services for poor children ages 0-18 to 57% (Baseline = 20%).

Self-Assessment: Knowledge of measures for preventing dental caries

How much do you know about measures for preventing dental caries in young children? Take the [self-assessment quiz](#) before reading this chapter. The answers are found in a separate [answer sheet](#).

Community Water Fluoridation

What is it?

Fluoride can prevent or reverse the process of tooth decay by preventing the loss of minerals from tooth enamel. Trace amounts of fluoride are naturally present in all water, soil, plants and animals. These amounts are not always adequate to prevent dental decay. In communities with a public water supply, small amounts of fluoride can be added to the water supply to achieve the optimal amount-- usually 1 part per million (ppm) fluoride (1mg/L).

The Centers for Disease Control and Prevention has included community water fluoridation as one of the 10 greatest public health achievements in the 20th century.

As of July 2003, about 30% of Californians enjoy the benefits of community water fluoridation. Additional communities and cities have voted to fluoridate but may not yet have done so. See the resources section for ways to determine the fluoridation status of a particular community. The Environmental Protection Agency requires that all community water systems provide each customer an annual report on quality, which includes fluoride concentration.

Indications for use

In communities where most families receive their drinking water from individual wells on their property, or where the community is served by multiple wells, then community water fluoridation is not feasible. In general, the larger the public water system and the fewer sites where fluoride needs to be added, the more economical it is to initiate and monitor fluoridation. Water fluoridation is beneficial to everyone, not just children, and helps reduce disparities created by poverty and lack of access to services or other preventive measures.

How is it accomplished?

Decisions to fluoridate are within the purview of state and local authorities. Fluoridation can be implemented through state legislation (as of 2003 11 states, Puerto Rico and the District of Columbia had such laws), administrative regulation, or public referendum. For more details, see the resources section. Community coalitions or task forces are essential to community fluoridation efforts.

Evidence of effectiveness and safety

Fifty years of research and experience provides good evidence that fluoridation of community water supplies is safe and effective for people of all ages. Fluoridation reduces dental caries in children by 18-40%. Quantifying effectiveness in adults is difficult due to the highly variable exposure each individual may have over a lifetime, but adults (especially older adults who have exposed root surfaces) also receive benefits.

Issues and controversies

Antifluoridationists have been active for years in the US and around the world. They oppose adding "chemicals" to the water supply and report associated links to many diseases. Resources for responding to these concerns are listed in the Resources section.

Any efforts to introduce fluoridation in a community should be prepared to deal with vocal antifluoridationists at all stages. Work with experts in dental public health and community fluoridation to learn how to create a successful campaign.

Costs

Community water fluoridation has been proven to be the most cost-effective method for preventing tooth decay in population groups. Costs average about \$.50/person/year in communities larger than 20,000 people, \$1.00/person/year for communities of 10,000-20,000 people, and \$3.00/person/year in small communities (less than 5,000 people). Annual dental treatment cost savings in fluoridated communities has been estimated to be \$16 per person in small communities and \$19 per person in communities greater than 20,000 people. Every \$1 invested in community water fluoridation yields \$38 in dental treatment costs.

Resources

American Dental Association. [Community Water Fluoridation Resources](#). Includes videos, booklets, information kits, electronic presentations, and websites.

ASTHO. Community Water Fluoridation: A State Best Practice in Dental Caries Prevention. 2003. (http://www.astho.org/templates/display_pub.php?pub_id=556)

ASTDD Best Practice Approach Report. Use of Fluoride: Community Water Fluoridation. <http://www.astdd.org/bestpractices/fullListing.htm>

Average Fluoride Levels of Public Water Systems in California Implementing Water Fluoridation. <http://www.dhs.ca.gov/ps/ddwem/Fluoridation/Fluoridetable2002.htm>

CA DHS, Office of Dental Health, Fluoridation Consultant, 916-552-9947 or dnelson3@dhs.ca.gov.

CDC Division of Oral Health provides funding to some states to expand community water fluoridation (California is not one of them) and operates a national training and quality assurance program. <http://www.cdc.gov/Oralhealth/>

CDC fact sheets on fluoridation and fluorides: <http://www.cdc.gov/OralHealth/factsheets/>.

Dental Health Foundation in Oakland, CA provides technical assistance to communities considering fluoridating. Details about their services are on their website, <http://www.dentalhealthfoundation.org/topics/fluoridation/index.shtml> or contact the Project Director for Fluoridation at mstocks@pacbell.net or (510) 663-3727.

One resource available via the Centers for Disease Control and Prevention website at http://www.cdc.gov/oralhealth/data_systems is My Water's Fluoride. It provides the general public with access to some data in the Water Fluoridation Reporting System for states that participate in that system. California counties are included.

Populations Receiving Optimally Fluoridated Public Drinking Water - United States, 2000. MMWR, 51(7):144-147, February 22, 2002. <http://fluoride.oralhealth.org/papers/2002/cdcmmwr022102.htm>.

Promoting oral health: Interventions for preventing dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries: A report on the recommendations of the Task Force on Community Preventive Services. MMWR. 50(RR-21):1-13, November 30, 2001. <http://www.cdc.gov/OralHealth/guidelines.htm>.

Dietary Fluoride Supplements

What are they?

This form of fluoride is sold as tablets, lozenges or liquid drops. The liquid is usually preferred for infants and very young children who still are developing oral motor skills.

Indications for use

These supplements can only be prescribed by dentists or physicians, and dosages are based on fluoride content of the child's drinking water and the age of the child. They should not be used in

areas of optimally fluoridated water and should not be used with infants before six months of age because of the potential for dental fluorosis (see issues and controversies section). Well water has varying levels of natural fluoride. Some wells may have higher than recommended levels, while others may only have trace amounts, so it is important to determine the fluoride level in well water before prescribing fluoride supplements.

Providers or local health departments should create a list of water sources in the area and fluoride levels, including where there are private wells. Mapping these is useful to determine any pockets of low or high natural fluoride levels. Encourage families to have their well water tested for fluoride levels and document levels in dental records. The local health department or water supplier can provide information about fluoride levels and the process and cost for testing.

Bottled water usually does not list fluoride content, but some do contain fluoride. If a family primarily consumes bottled water, have them call the company where the water is bottled and ask for the fluoride content. Some reverse osmosis filters remove fluoride from the water. Be sure to ask if parents have this type of filter.

The following table displays the most recent protocol for one tablet or one dropper full of fluoride supplement per day for children at various ages.

Table III. Dietary fluoride supplement schedule			
Approved by the American Dental Association, American Academy of Pediatrics, American Academy of Pediatric Dentistry			
Age	Fluoride ion level in drinking water (ppm) *		
	Less than 0.3ppm	0.3-0.6 ppm	Greater than 0.6 ppm
Birth-6 months	None	None	None
6 months-3 years	0.25 mg/day**	None	None
3-6 years	0.50 mg/day**	0.25 mg/day	None
6-16 years	1.0 mg/day	0.50 mg/day	None

*0.1 part per million (ppm) = 1 milligram/liter (mg/L)
 **2.2 mg sodium fluoride contains 1 mg fluoride ion

To maximize the benefits of the fluoride on the teeth, tablets are intended to be chewed or sucked for 1-2 minutes before swallowing. Tablets can be provided in a group setting such as a preschool or Head Start if prescriptions are secured and the program is closely supervised and monitored. Prescriptions can be written for the entire class if appropriate.

Evidence of effectiveness and safety

Use of fluoride supplements by pregnant women does not benefit their offspring. Children who take the tablets after age 6 show decided benefits, but the benefits are mixed for younger children, probably because of less than optimal exposure time in the mouth and inconsistent compliance with giving the supplements. Safety issues for storing the tablets and drops can be a concern, especially in programs administered in group settings or when children are not well supervised at home.

Issues and controversies

Some children have shown increased evidence of dental fluorosis-white spots or pits on the teeth-caused by too much fluoride taken in early childhood. Fluorosis is primarily a cosmetic issue, but some clinicians and parents feel that the preventive benefit for dental caries outweighs the slight risk for mild enamel fluorosis. Some cases of fluorosis probably occur because children are inappropriately prescribed fluoride supplements when the child is already drinking fluoridated water or well water that contains natural fluoride, or if parents move from non-fluoridated areas to fluoridated communities and continue to use the supplements. It is, therefore, important to test well water for fluoride levels and to educate parents about appropriate fluoride use.

Costs

Fluoride tablets cost about \$37 per year for an individual child. In group programs, where tablets may be purchased in bulk and may not be in session all year, costs approximate \$3.52 per child per year. Medi-Cal covers the cost of fluoride supplements.

Resources

- CDC. Dietary fluoride supplement schedule fact sheet. <http://www.cdc.gov/oralhealth/factsheets>.
- Johnson SA and DeBiase C. Concentration levels of fluoride in bottled drinking water. J Dental Hygiene. 77:161-66, 2003.
- Leverett DH, Adair SM, Vaughan BW, Proskin HM, Moss ME. Randomized clinical trial of the effect of prenatal fluoride supplements in preventing dental caries. Caries Research, 31:174-9, 1997.
- Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States. MMWR, 50(RR-14):1-42, August 17, 2001.
- US Preventive Services Task Force Recommendations and resources. <http://www.ahrq.gov/clinic/3rduspstf/dentalchild/dentchrs.htm>.

Fluoride Varnish

What is it?

A small amount of concentrated fluoride is placed in a resin base and sold as a varnish that is brushed onto the teeth. It hardens on contact with saliva and stays in contact with the teeth for several hours or days, but is not meant to adhere permanently. See <http://www.uiowa.edu/> technical assistance section for a demonstration of the technique. Also see <http://www.brooks.af.mil/dis/DIS65/sec3.htm> for a discussion of brands and technique.

Indications for use

Currently fluoride varnishes primarily are used to prevent or arrest tooth decay in smooth surfaces in young children, especially when applied before age 3 as their teeth erupt. The taste does not appear to be offensive so is considered acceptable to young children. The technique is well accepted by parents. Varnishes should not be used in cavitated carious lesions because the caries may spread to other portions of the tooth, but can be used to remineralize white spot lesions. State practice acts differ, but in California varnishes can be applied either by dental or medical professionals in clinical or public health settings (this includes Head Start, WIC, etc.) Check the latest version of the dental practice act (<http://www.comda.ca.gov>) to determine which levels of supervision apply to which category of dental auxiliary. Because of ease of application, fluoride varnish can be applied in individual offices but is most efficiently applied in a group setting such as Early Head Start/Head Start programs, at WIC sites, Well Child clinics, or during immunization clinics. The ASTDD State Synopsis for 2002-2003 data shows 11 states conducting fluoride varnish programs, while the Indian Health Service and tribal programs are also using varnishes.

How is it accomplished?

The most common types of varnishes are Duraphat (Colgate Oral Pharmaceuticals, Inc), Duraflor (Pharmascience, Inc), Fluor Protector (Ivoclar-Vivadent), and Cavity Shield (OMNII Oral Pharmaceuticals). Fluoride varnishes are easy to apply in 1-3 minutes to all teeth by painting the varnish on the teeth using a special tiny brush. The teeth can be cleaned first with a toothbrush and then dried with a gauze square; professional tooth cleaning with a rubber cup or instruments is not indicated.



Fluoride varnish hardens on contact with saliva. Application only requires a light source such as a flashlight, gloves, something to retract the cheeks such as a tongue blade or toothbrush, 2 x 2 gauze square, applicator and the fluoride varnish product. Families should be told that their child can eat and drink afterward but they should not brush the teeth until the next day, or at least 12 hours later, as it may remove some of the varnish. Most protocols suggest two applications per year, although some recommend up to four, with the first ones occurring fairly close together or in the first 1-2 weeks.

Five common program models emerged from a recent review of models (ADHA Symposium, NOHC, 2003):

1. WIC-based: programs may want to count the varnish as a second contact and coordinate the visit with a voucher pickup.
2. Well-child appointments: varnishes are applied during scheduled well-child visits
3. Immunization visits: varnishes are applied when the child receives immunizations
4. Preschool programs: applications can be done onsite in Head Start/Early Head Start programs or other preschool settings
5. Home visits: home visiting teams (e.g., public health nurses) can apply varnishes

All of these models require training of the medical and dental professionals to apply the varnish, manage the child while doing so, and counsel the parents. This training is most effective when done with actual children and parents rather than with simulated models.

Evidence of effectiveness and safety

Fluoride varnish has been widely used in Canada and Europe since the 1970s. It is safe to ingest small amounts that might be swallowed. Fluoride varnish has been clinically proven to be the most effective professionally applied fluoride treatment available for preventing dental caries, and may also be effective against secondary caries (decay that develops around existing restorations.) Effectiveness appears to be about 46% in both primary and permanent teeth (see Cochrane analysis in the References.) Results of ongoing community-based research will no doubt be available in 1-3 years. Many communities are initiating fluoride varnish programs for infants and preschool-age children who are at risk for early initiation of tooth decay. There doesn't seem to be any association with dental fluorosis.

Issues and controversies

Some types of varnish may have a yellow appearance on the teeth that goes away when the teeth are brushed. Since the Federal Food & Drug Administration has not yet approved fluoride varnish as an "anticaries agent," using this product for dental caries prevention in the US is considered "off label" use. Clinicians can legally use products "off label" based on their clinical judgment.

Some recent reports note that fluoride varnish packaged in large tubes may separate, causing high fluoride content in the first applications and no fluoride in the later ones. This can be overcome by purchasing the varnish packaged in single use applications.

Costs

There is little cost-effectiveness data. It is unclear whether fluoride varnish is most efficiently used in programs targeting high-risk individuals/high-risk groups of children. Costs per full mouth application per child range from \$.72 to \$2.00 depending on what product is used and if labor costs are included. Fluoride varnishes may be reimbursed by dental insurance companies and Denti-Cal as topical fluoride applications. Medical providers who apply varnishes will need to determine whether the family's insurance carrier cover this procedure or the time spent with the child and parent on oral health issues.

Resources

References

ADHA Symposium on Fluoride Varnish, April 30, 2003. Access Proceedings Supplement. 2003.

Bawden JW. Fluoride varnish: A useful new tool for public health dentistry. J Public Health Dent. 58(4):266-9, 1998.

Beltran-Aguilar ED, Goldstein JW and Lockwood SA. Fluoride Varnishes: A Review of Their Clinical Mechanism, Efficacy, and Safety. J Am Dent Assn (131):589-596, 2000.

Cochrane Review on Fluoride Varnishes: <http://www.cochrane-oral.man.ac.uk>.

Donly KJ. Fluoride varnishes. CDA Journal 31(3):217-19, 2003.
<http://www.cdafoundation.org/journal/jour0303/donly.htm>.

Graham E, et al. Children's oral health in the medical curriculum: a collaborative intervention at a university-affiliated hospital. J Dental Education. 67: 338-47, 2003.

Holm AK. Effect of fluoride varnish (Duraphat) in preschool children. Community Dent Oral Epidemiol. 1979; 7: 241-5.

Populations receiving optimally fluoridated public drinking water-United States, 2000. MMWR. 51(7):144-47, Feb 22, 2002. <http://fluoride.oralhealth.org/papers/2002/cdcmmwr022102.htm>

Sippa L, Leppanen T and Hausen H. Fluoride varnish versus acidulated phosphate fluoride gel: A 3-year clinical trial. Caries Res. 1995; 29:327-30.

Weintraub JA. Fluoride varnish for caries prevention: Comparisons with other preventive agents and recommendations for a community-based protocol. Special Care in Dentistry. 23(5):180-6, 2003.

Other Resources

Into the Mouths of Babes, North Carolina Screening and Varnish Project. (Contact Kelly Haupt at 919-833-2466). They have a toolkit that includes presentation slides, guidelines and helpful hints, etc.

Iowa Dept of Public Health: <http://www.idph.state.ia.us/fch/dh.htm>, Fluoride varnish protocol, OH fact sheets, info sheet on "Why Worry about Baby Teeth?"

A number of First 5-funded programs have developed fluoride varnish programs. As one example, Lassen Oral Health Task Force has developed a community-based varnish program that includes protocols, consent forms, a fluoride "passport," carrying kits of supplies, etc. For more information, contact the Task Force at 530-257-9600, ext 12.

Online didactic course: "Dental Health Screening and Fluoride Varnish Application." <http://meded1.ahc.umn.edu/fluoridevarnish/>. This course is also available on a CD ROM by emailing deina001@umn.edu.

State of Nevada: <http://health2k.state.nv.us/oral/>. Fluoride Varnish Manual, Oral health & pregnancy information

Fluoride Toothpaste

What is it?

Fluoride is added to about 90% of the toothpaste produced in the US, Canada and other developed countries. This fluoride is absorbed directly into dental plaque and the outer layers of the tooth that are in the beginning stages of demineralizing. Brushing with fluoride toothpaste also increases the fluoride concentration in saliva.

Although brushing without toothpaste removes dental plaque and may reduce inflammation of the gum tissue, brushing without fluoride toothpaste does not prevent tooth decay. Fluoride is the active ingredient that prevents or arrests tooth decay.

Indications for use

This is an over-the-counter self-care product that can be used by anyone in any setting. Children do not need any of the extra additives that now are offered to whiten teeth and to prevent gum disease. Community-based programs need to assure that individual assistance is provided to all young children. For children at low risk for dental caries, some professionals recommend not using toothpaste with fluoride until age 2 to minimize the risk of swallowing the toothpaste.

Children need adult supervision until about age 6 to minimize ingestion and to make sure all parts of the teeth are brushed. Researchers now recommend brushing 1-2 times per day using only a pea-size amount of

toothpaste on the brush.

For decades, dental professionals have been performing a procedure called a "rubber cup prophy" using a spinning rubber cup on a handpiece and a very coarse type of toothpaste. This has been a standard until recently, when scientific studies have reported removal of the fluoride-rich outer layer of primary tooth enamel by this procedure. The American Academy of Pediatric Dentistry suggests that a "toothbrush prophy" instead of use of a rubber cup is acceptable in children who do not display stain or calculus deposits.

Evidence of effectiveness and safety

Numerous clinical trials of fluoride toothpaste of 2-3 years duration have found reductions in dental caries by about 15%-30%. Regular lifetime use probably provides benefits that approach those of fluoridated water. Some companies are considering issuing brands for children that contain lesser amounts of fluoride because of concerns about children swallowing the toothpaste and causing dental fluorosis (white or brown spots or mottling of the teeth.) In children at high risk for dental decay, the benefits of daily brushing with fluoride toothpaste generally outweigh the risks for fluorosis.

Issues and controversies

The FDA mandated labeling requirements in 1996 directing parents of children under age 2 to seek advice from a dentist or physician before using fluoride toothpaste, as a way to make sure they understand how best to brush the teeth and the possible risk of fluorosis. This should not deter parents or programs from using fluoride toothpaste with children as soon as the first tooth erupts. It does stress the importance of educating parents and caretakers on the appropriate techniques, however.

The use of abrasive prophy paste and rubber cup prophylaxis is discouraged in children with no clinical need for this procedure. Many insurance companies have interpreted a "prophy" as a rubber cup prophy, and reimbursement has been tied to this procedure. This has created a problem for implementation of preventive programs in community settings. However, the following clarification was offered on October 6, 2004 via email by the chairman of the ADA Council on Dental Benefits regarding reimbursement codes. "The code is designed to describe a procedure and not the method by which it is accomplished. In the case of a prophy it has never been the intent to dictate to the practitioner how to accomplish the procedure. Indeed a prophy is a procedure to remove plaque, stain if present and calculus if present. The code is mute on how to accomplish this and that is by intention. If the patient has only plaque, then only plaque must be removed and it is still a prophy. If stain or calculus are present, they should be removed as well. It is up to the expertise and experience of the practitioner to determine the appropriate technique to use. Intentionally the mention of scalers, cavitron type device, rubber cup or toothbrush is left out. Each case is different but indeed all are prophys. In conclusion, it is our position that there is only one prophy and it is not determined by the armamentarium used to accomplish the procedure but rather by the completion of the prescribed task--the removal of plaque, stain and calculus as needed."

Costs

The estimated annual cost per year per person without discounted pricing is \$6-\$12, but most people consider it one of the most cost-effective and accessible preventive procedures. Costs of supervised toothbrushing programs in preschool programs are not readily available as programs often try to secure donations for the products.

Resources

- AAPD. Clinical Guidelines on the Role of Dental Prophylaxis in Pediatric Dentistry. http://www.aapd.org/members/referencemanual/pdfs/02-03/G_Prophylaxis.pdf.
- Nurko C, et al. Effect of an infant oral health educational program for caries prevention. Abstract at http://iadr.confex.com/iadr/2002SanDiego/techprogram/abstract_20156.htm.
- Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States. MMWR, 50(RR-14):1-42, August 17, 2001.

Chlorhexidine

What is it?

Chlorhexidine (CHX) has been used for over 30 years outside the US in the prevention of dental caries and periodontal diseases through its antimicrobial effects, particularly against *S mutans*, a major cause of dental caries. CHX comes in various concentrations in products such as gels, gum, varnishes and rinses. In California a prescription is needed to use these products, although they don't require professional application.

Indications for use

Adults and children at high risk for dental caries can benefit. In addition, pregnant women can reduce periodontal inflammation (gingivitis) that may lead to premature or low-birthweight babies. It is used for caries control as "off label" use.

How is it accomplished?

Currently in the US, mostly rinses are available. New research with chlorhexidine varnish and gels, however, looks promising. Optimal regimens have not yet been established.

Caregivers or older children usually rinse with 10ml for 30 seconds just before bed for 1-2 weeks; this is repeated every 2-3 months. Effectiveness usually is monitored by bacterial assessments (counts of different types of bacteria, especially *S mutans*). For children who can't effectively rinse or spit, the rinse can be applied using a cotton swab twice daily.

Evidence of effectiveness and safety

In the majority of clinical trials, chlorhexidine was effective in controlling or reducing decay-causing organisms as well as reducing the incidence of dental caries in various populations. Side effects include yellow staining of the teeth and it also affects taste.

Issues and controversies

Most forms are not yet available for general use in the US; those that are can only be obtained via a prescription. Some are alcohol-based and cannot be used by children. Other forms can only be used as part of an experimental research project.

Costs

Cost and cost-effectiveness data are limited as these products have not been readily available for use with children in the US. Medi-Cal may cover this product for adults in some circumstances. Individual 16-ounce bottles cost about \$8-15.

Resources

Anderson MH. A review of the efficacy of chlorhexidine on dental caries and the caries infection. CDA Journal. 31(3):211-14, 2003. <http://www.cdafoundation.org/journal/jour0303/anderson.htm>.

Kanellis MJ. Caries risk assessment and prevention: strategies for Head Start, Early Head Start and WIC. J Public Health Dent. 60(3):210-17, discussion 218-20, 2000.

Kanellis M, et al. *S mutans* suppression in preschool children using 1% chlorhexidine gel. Abstract at http://confex.com/iadr/2004Hawaii/techprogram/abstract_39586.htm.

Dental Sealants

What are they?

Dental sealants are plastic-like coatings that are applied to the pits and fissures (biting surfaces) of teeth to prevent dental decay. The sealant material bonds to the tooth structure and may remain in

place, protecting the teeth for months or years. Material that is lost from fractures or wear can be replaced.

How is it accomplished?

Sealants are applied in 3 simple steps: 1) clean the tooth with a toothbrush, 2) rub a special etching liquid on the teeth and then rinse, 3) paint the sealant on the teeth and initiate the hardening process. Sealant materials are classified as autocure (chemical reaction) or light cured (using a hand-held visible ultraviolet light) to initiate the hardening process. This process does not involve destruction of any tooth structure.

Indications for use

Sealant programs primarily target elementary school-age children, often through school-based or school-linked programs. The permanent first and second molars that erupt from ages 5-13 are at especially high risk for dental decay because of their numerous pits and fissures that trap bacteria. In this age group 90% of dental decay occurs in these pits and fissures. Sealant retention is highly dependent on good clinical technique and maintaining a dry environment in the mouth during placement. This ideal situation and the time required to place the sealants often are difficult to achieve in young children, especially in preschool settings. They are indicated in high-risk children who are seen in a clinical setting, however. Sealants might be more widely used if consistently covered by dental insurance, if parents are knowledgeable about their effectiveness and request them for their children, and if providers recommend them on a regular basis.

Evidence of effectiveness and safety

Decades of research have documented that sealants are safe, effective, and greatly underused. Effectiveness depends on retention over time. Sealant retention is technique and age sensitive. Isolation of the teeth (keeping them dry and uncontaminated by saliva) is the key to clinical success. Sealants seem to be less effective in primary teeth than permanent teeth, partly because the pattern of carious lesions seems to affect the smooth surfaces of primary teeth before the pits and fissures, and as pits and fissures wear down, sealant material may need to be reapplied. In primary teeth, use of enamel-dentin bonding agents when moisture contamination is difficult to control gives better results than applying sealant alone, although it may increase application time. One application of dental sealants has been found to be about 80-90% effective after one year and about 55-85% effective after 8-10 years, with only a small percentage becoming carious. Sealants should be monitored over time, with reapplications as necessary. Only one adverse reaction has been reported in the literature, which was an allergy to the resin.

Issues and controversies

Contrary to early reports, application of topical fluoride prior to acid etching does not affect the ability of the acid to effectively etch the enamel prior to applying the sealant material. Applying acidulated phosphate fluoride after etching, however, did result in reduced bond strength. An etching time of 15-20 seconds has been found to be clinically satisfactory and very acceptable to children.

Studies show that well trained dental hygienists and assistants are equally proficient at applying sealants as a well-trained dentist. Practice acts in different states may limit who can place sealants and in what settings (check the previously mentioned website for the current restrictions.)

[By applying opaque \(white or tinted\) resins vs. clear resins, it is easier to track sealant retention over time. Both self-cured and visible light-cured materials provide equal clinical effectiveness if applied correctly.](#)

"There appear to be no reliable studies that show bacteria to remain viable under appropriately sealed teeth or that increased carious lesions progress under these sealants. Both bonded and sealed composite restorations placed over frank cavitated lesions arrested clinical progress of the lesions for at least 10 years" (Simonsen, 2002.) Despite these statements, concerns still exist about sealing over decay that may progress to infect the pulp if there is not regular follow up. Programs, therefore, need to make an effort to follow up with children who receive sealants to assure they are receiving appropriate care. Maine has developed a database and electronic reporting system for a statewide school-based sealant program (see references.)

Costs

Cost-effectiveness is enhanced by targeting high-risk children, using trained auxiliaries to the greatest extent possible, and using sealants in conjunction with fluoride programs to minimize development of caries on smooth surfaces of teeth as well. Methods used by programs to estimate costs per child are not standardized and not currently comparable.

Resources

Adair SM. The role of sealants in caries prevention programs. CDA Journal. 31(3):221-27, 2003.
<http://www.cdafoundation.org/journal/jour0303/adair.htm>.

ASTDD Best Practice Approach. School-based dental sealant programs.
<http://www.astdd.org/docs/BPASchoolSealantPrograms.pdf>.

CDC. Dental sealant fact sheet. <http://www.cdc.gov/oralhealth/factsheets>.

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Xylitol

What is it?

The FDA classifies xylitol as a special dietary sweetener. Xylitol in certain concentrations and consumed over a period of time reduces mutans streptococci, which shed from plaque into saliva. It is most often used in gum, mints or "candies" as a caries preventive agent.

Indications for use

One benefit is that xylitol can be used in combination with other preventive measures such as fluoride, and has an additive caries preventive effect. It is appropriate for all ages as soon as motor control is sufficient to chew gum or suck on hard small objects without swallowing or choking on them. At least one pilot study has shown excellent acceptance and compliance by preschool children in using xylitol gum 3 times per day for a 3-week period in a Head Start program. Many teachers, however, felt that it disturbed the classroom routine and it is questionable if such a program could continue on a long-term basis in the classroom setting.

How is it accomplished?

Caregivers and children use the product immediately after every meal and between meals. One or two pieces of gum should be chewed for 3-5 minutes per session, 3-5 times per day. Frequency is more important than the amount of the product.

An additional benefit of xylitol appears to be reductions up to 40% of otitis media (ear infections) in children.

M Anderson, 2003

Evidence of effectiveness and safety

Mothers who use xylitol regularly significantly reduce their chances of transmitting decay-causing bacteria (mutans streptococci) to their young children. This has been shown to still be true in children 6 years of age. It is especially effective during tooth eruption and promotes remineralization. Studies demonstrate decreases in dental caries ranging from 30-60% from using xylitol in toothpaste or chewing gum. The safety of xylitol has been extensively studied both in the US and internationally. The only side effect noted in animal studies appears to be mild diarrhea with ingestion of very large amounts. If gum cannot be used safely, other xylitol-containing products can be used. Some pacifiers or baby bottles can hold xylitol containing liquids. Xylitol lollipops can also be used.

Issues and controversies

Products should not be given to children randomly or to children who swallow them. Products should be stored in a safe place. Xylitol gum is becoming available as an over the counter product, but providers can also prescribe it. Compliance needs to be closely monitored as frequent and regular use is extremely important.

Costs

Most gum is packaged in twelve-piece paks or in 144-piece boxes. Prices vary, but the smaller retail packages go for about \$2.00 and the larger boxes for about \$24.00. These prices may be negotiable for large-scale community programs, however, and as competition increases.

Resources

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See list of xylitol products at <http://www.dentaluop.edu/resource> .

Dietary Intervention

What is it?

Good nutrition is needed for optimal oral growth, development and health, as all tissues are sensitive to nutrient imbalances. Because nutritional factors play a significant role in development and advancement of dental caries, a variety of feeding and dietary practices may reduce dental caries in children. Most strategies are aimed at 1) decreasing consumption (amount and frequency) of sweetened nursing bottle contents, beverages (e.g., soft drinks, fruit juices with a high sugar content, and other sweetened drinks), and snacks, 2) discouraging prolonged and frequent use of baby bottles and at will breastfeeding after the baby's teeth start to erupt, and 3) increasing consumption of water, milk, fruits and vegetables.

Indications for use

Feeding and dietary interventions can occur in all children, at any age, and in any setting. Prenatal counseling of families with frequent reinforcement will help them initiate good feeding practices as soon as the child is born. High sugar consumption is still the most important determinant of caries prevalence in most countries. Studies show that the more sugar people consume, the higher their threshold for sweetness. The consumption of soft drinks, including carbonated beverages, fruit juices and sports drinks in the US has increased 500% in the past 50 years and shows no sign of leveling off. Soda pop consumption begins early and increases as children age. Sugar-containing soft drinks can cause dental decay and the excess sugar can lead to obesity and type II diabetes in children. Some sodas have as much as 13 teaspoons of sugar. Acids in both regular and diet soft drinks can cause tooth erosion. Non-nutritive sweeteners in diet drinks may not contribute directly to dental decay, but the drinks still may be acidic and not of any nutritional value. High consumption of soft drinks has been shown to reduce consumption of milk and fruit juice.

How is it accomplished?

- 1) Assessment of dietary risk factors
- 2) Counseling by health providers
- 3) Parental infant feeding practices
- 4) Parental purchases and meal planning
- 5) Community-based educational programs integrating concepts into their teaching units and meal practices
- 6) Limited sales and provision of sweetened snacks and beverages in community based programs and schools.

See Chapter 10 for examples of ways to incorporate these approaches into oral health or other programs. Recently California enacted legislation banning the sale of sweetened beverages in school vending machines in elementary schools, and other states are looking at similar measures.

Evidence of effectiveness and safety

All dietary recommendations related to reduction of dental caries risk should consider safety first, such as the potential for choking or food allergies. Items that traditionally have been recommended as "good snacks" by dental professionals, such as pretzels, nuts and popcorn, are not necessarily appropriate for very young children, who can easily inhale or choke on these items.

Issues and controversies

Cultural eating practices and beliefs need to be carefully evaluated to integrate realistic recommendations that will be understood and followed. In children with medical or developmental problems that necessitate special diets, medications, or feeding adaptations, consultation with medical providers, dietitians and others is needed. Many liquid or chewable pills or vitamins are sweetened to make them more acceptable to children.

Check the labels of 1) powdered formula, 2) liquid and chewable medications, 3) cereals and other foods and 4) beverages for sugar content. Sugars are listed under Total Carbohydrates on food labels. Try to select ones with lower sugar content or with artificial sweeteners, and decrease the total amount and frequency of sugar consumption. Limit sugar intake for preschoolers to less than 30 grams per day (to convert grams to teaspoons, divide the number of grams by 4).

Many health professionals recommend transitioning from baby bottles to sippy cups before using regular cups. If sweetened beverages are used in the cups, this practice does not reduce the risk for dental decay. Children who walk around with bottles, sippy cups, or regular cups or cans and drink so that their teeth are getting frequent and prolonged exposure are especially at high risk for dental decay.

On-demand breastfeeding for a prolonged time after the teeth start erupting has been linked in some studies to increased risk for dental caries in infants, especially if the teeth are not cleaned on a regular basis.

Resources

AAP Policy Statements. Oral health risk assessment timing and establishment of the dental home. Pediatrics. 111(5):1113-16, 2003.

ADA Positions and Statements. Role of sugar-free foods and medications in maintaining good oral health: <http://www.ada.org/prof/resources/positions/statements/sugarfree.asp>

ADA literature review and policies regarding consumption of soft drinks:
http://www.ada.org/prof/resources/topics/topics_softdrinks.pdf.

Bexar County Health Collaborative/Fit City Project has produced vending guidelines for businesses and schools: <http://www.healthcollaborative.net/assets/pdf/vendingcriteria.pdf>.

Cox R. Coping with Dental Caries. New Beginnings. 14(1):10-11, 1997,
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A great learning module on sugar in foods, how to read food labels, and snack recipes is available from the Mohave County WIC program in Arizona at <http://www.co.mohave.az.us/WIC/sugar.htm>.

Tasty Treats for teeth, an educational piece and recipe book is available at http://www.kdhe.state.ks.us/ohi/download/snack_layout.pdf.

Measures Not Generally Recommended for Very Young Children in Community-Based Programs

Fluoride Mouthrinse

Fluoride mouthrinses are concentrated solutions of fluoride, intended for daily (.05% solution) or weekly (.20% solution) use by persons over age 6. The protocol is to swish the rinse in the mouth for 4 minutes and then spit the rest out. The Centers for Disease Control and Prevention (CDC) continues to support fluoride mouthrinsing for effectiveness in supervised settings for elementary school children at high risk for dental caries. Studies of 3-5 year-old children indicate that children this young swallow a substantial amount.

[Mouthrinse programs should not be used for children until about age 6, when a child's oral muscles have developed sufficient coordination to both swish for the required time and then spit without swallowing the liquid.](#)

Fluoride Gel and Foam

High concentrations of fluoride are applied directly to the teeth using foam or gel in a fabricated tray or brushed on the teeth. Applications can only be done by dental professionals, usually in an office setting. Gel and foam applications are recommended on an individual basis, usually for children and adults who are at high risk for dental caries. These products can also be prescribed for home use, but require careful supervision of children by an adult. Most studies recommend 4-minute applications, twice a year, using suction or spitting the excess to prevent ingestion. Gagging on the trays may occur, and nausea and vomiting can result from swallowing the fluoride.

Fluoride gels and foams usually are not recommended for community-based programs for very young children because 1) they require professional application for 4-minutes, 2) suction is often needed to prevent swallowing the fluoride in amounts that will make the child nauseous, and 3) the trays often cause gagging. This type of fluoride application is best done in a clinical setting on children at high-risk for dental caries.

Resources

Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States. MMWR, 50(RR-14):1-42, August 17, 2001: <http://www.cdc.gov/OralHealth/guidelines.htm>.

Summary

In this chapter you have reviewed the various preventive measures that are currently used to prevent dental caries in children and their mothers/caretakers, especially those that can be implemented in community-based settings. A self-assessment tested your knowledge of these methods. The goal of this chapter is to help communities select measures that are most appropriate and effective for young children in a variety of settings, and use the appropriate professionals to provide these services.

General References and Resources

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Early Childhood Caries: A Medical & Dental Perspective. Online CE course sponsored by Arizona DHS; \$30 for 2 CEUs: <http://www.pc.maricopa.edu/departments/dental/ecc/preview>

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Evaluation

What did you learn or accomplish as a result of reading this chapter? Did it help you to organize your thoughts about what types of community-based preventive programs would be appropriate in your community? How can you promote use of individual measures at home as well as provide access to preventive measures in other settings? Were the resources and examples helpful? Complete the [feedback form](#) and tell us what was useful or not useful for you.