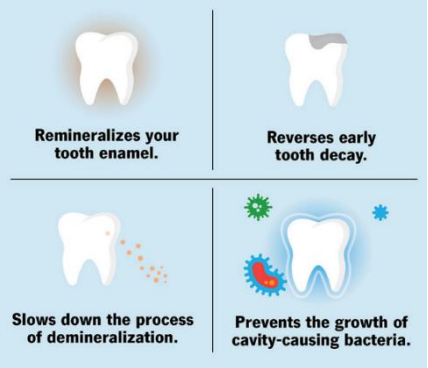
Fluoride: What you Need to Know

Fluoride is the highest contributor to the reduction of dental decay among children in the United States. The mechanisms of fluoride application are both topical and systemic, but the topical effect is the most important, especially over the lifespan of the tooth. Fluoride is available from many sources and is divided into three major categories: professionally applied, tap water (and foods and beverages processed with fluoridated water), and home-administered.[1]



Topical Fluoride Mechanisms of Action

- Promotes enamel remineralization
- Reduces enamel demineralization
- Inhibits bacterial metabolism and acid production

Systemic Fluoride Mechanism of Action

- Reduces enamel solubility through incorporation into its structure during tooth development

Public Fluoridated Water

Communities can decide to add or remove fluoride from their town's public water source. Addition of fluoride to public water is closely regulated and the Drinking Water Standards are set by the U.S. Public Health Service. The current optimal water fluoride concentration to prevent dental caries is 0.7mg/L. According to the Centers for Disease Control and Prevention approximately 200 million people in the United States are served by water systems that add fluoride to their public drinking water.[2]

Dietary Fluoride Supplementation

The use of fluoride supplements has been strongly associated with the reduction of dental decay in children. Primary care providers should assess the child's source of drinking water and prescribe fluoride supplements for children who are at high risk for dental decay and whose primary source of drinking water has suboptimal levels of fluoride.

If the child lives in a home that has public water supply, check the list of Maine Communities with Fluoridated Water Supply and Year Started or the Maine Center for Disease Control and Prevention's website for an up-to-date list. If the family is on well water, ask the family whether they have had their well water tested and whether they know the results. If the well water has not been tested or the results are unknown, recommend that the family test water using a kit that can be ordered from the Maine Center for Disease Control and Prevention's Health and Environmental Testing Lab (HETL). If the family's water supply does not have optimal levels of fluoride, dietary fluoride supplements are recommended.

Dose Chart[3] (Dosages are in milligrams fluoride/day)

Child's Age	Water Fluoride Concentration		
	<0.3 ppm	0.3–0.6 ppm	>6 ppm
Birth-6 months	None	None	None
6 months–3 years	0.25 mg	None	None
3–6 years	0.50 mg	0.25 mg	None
>6 years	1.00 mg	1.50 mg	None

[1] Weyant RJ, Tracy SL, Anselmo TT et al. Topical fluoride for caries prevention: executive summary of the updated clinical recommendations and supporting systematic review. American Dental Association Council on Scientific Affairs Expert Panel on Topical Fluoride Caries Preventive Agents. J Am Dent Assoc. 2013. 144(11):1279–91.

[2] U.S. Public Health Service recommendation for fluoride concentration in drinking water for the prevention of dental caries. (2015). *Public Health Reports®*, *130*(4), 318–331. https://doi.org/10.1177/003335491513000408

[3] American Dental Association (2023). Fluoride: Topical and Systemic Supplements. Retrieved from https://www.ada.org/resources/ada-library/oral-health-topics/fluoride-topical-and-systemic-supplements

Fluoride Varnish

Evidence supports the efficacy of high-concentration fluoride varnish in preventing dental decay in children. The application of fluoride varnish reduces early childhood decay by protecting teeth, remineralizing tooth enamel, and arresting the progression of early decay. Fluoride varnish can be safely applied to children as early as the eruption of the first tooth. Since applying fluoride varnish is a quick and easy procedure, it can be easily integrated into well-child visits and delegated to clinical support staff.

Fluoride varnish is a resin or synthetic base that contains a high concentration of fluoride. Fluoride varnish sets quickly on contact with teeth in the presence of saliva. Some fluoride remains on the enamel as a temporary layer of calcium fluoride-like material. The fluoride in the material releases when the pH level of the mouth drops in response to acid production. It then becomes available to remineralize enamel. This layer slowly disappears over the following months. Applications of fluoride varnish must be repeated to maintain effectiveness as a primary prevention strategy. Fluoride varnish application helps remineralize enamel even when there are early carious lesions.[4]

Periodicity of Fluoride Varnish Applications

Multiple applications of fluoride varnish on the primary teeth maintain the preventive benefit, as the effectiveness diminishes over time. This is especially important with high-risk children. Most guidelines recommend at least three professional applications of topical fluoride per year at intervals of three to four months for high-risk children. Research also shows that a threshold effect of at least four applications is required to obtain a detectable preventive benefit.[5]

How to Apply Fluoride Varnish

Assessing the child's risk and performing an oral health evaluation will determine the need for fluoride varnish.

Materials

- 2" x 2" gauze square
- Gloves
- Disposable mouth mirror (optional)
- 0.25 ml dose of 5% sodium fluoride varnish (applicator brush is included within the packaging of this product)

Positioning

- Establish a knee-to-knee position between the medical provider and the parent/caregiver.
- Have the child's head in the medical provider's lap.
- Allow the parent/caregiver to place the child's legs around his/her waist.
- Parent/caregiver may further assist by holding the child's hand.

Photos: Mark Deutchman, MD |Smiles for Life, a national oral health curriculum

Application

[4] American Academy of Pediatric Dentistry. Fluoride therapy. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2024:351-7.

[5] Association of State and Territorial Dental Directors (2015). Fluoride Varnish Policy Statement. Retrieved from https://www.astdd.org/docs/fluoride-varnish.pdf .

- Remove the applicator brush from the holder.
- Stir the varnish to assure proper mixture.
- Using gentle finger pressure, open the child's mouth.
- Use the gauze square to wipe the child's teeth dry and remove obvious food particles that may be present.
- Using the gauze square, isolate the teeth.
- Using the applicator brush, apply the fluoride varnish to the teeth.
- Apply a thin layer of the varnish to all surfaces of the teeth; it is not necessary to apply varnish to open areas of decay.
- Once the varnish comes into contact with the saliva, the varnish will set.

Post-Application Instructions

- Consult the fluoride varnish manufacturer's instructions for recommendations on when to start teeth brushing after application.
- Remind the parent/caregiver to feed the child a soft diet for the remainder of the day; this will allow the fluoride varnish to stay in place for the optimal length of time.

Silver Diamine Fluoride

Silver Diamine Fluoride (SDF) is a topical medicament cleared by the FDA as a Class II medical device to treat tooth hypersensitivity. Commonly, SDF (38% solution) has been used off-label to stabilize dental caries in children and adults. SDF is a brush-on liquid or gel that prevents dental decay from progressing and spreading to other teeth. Unlike traditional treatments such as drilling and filling a cavity, SDF is quick, painless, and does not require local anesthesia or sedation.

The American Medical Association (AMA) approved a new category III CPT code for the application of SDF by medical teams to arrest dental decay without a dental filling. The addition of this code is a milestone in improving access to dental care and, ultimately, helping more people achieve better oral health. [6]

Indications and usage:

The following scenarios may be well-suited for the use SDF:

- High caries-risk patients with anterior or posterior active cavitated lesions.
- Cavitated caries lesions in individuals presenting with behavioral or medical management challenges.
- Patients with multiple cavitated caries lesions that may not all be treated in one visit.
- Difficult to treat cavitated dental caries lesions.
- Patients without access to or with difficulty accessing dental care.
- Active cavitated caries lesions with no clinical signs of pulp involvement.

After SDF is applied, medical providers should place a referral to a dental provider. Dental providers will further assess tooth structure and potential loss of function. Additionally, SDF will permanently stain the tooth black, dental providers can apply restorative dental materials such as a glass ionomer to lessen the dark staining. To learn more about SDF please refer to the FTFT SDF toolkit found on the FTFT website.

Fluorosis

[6] Silver Diamine Fluoride (SDF) Application in the Pediatric Medical Setting. https://www.aap.org/en/patient-care/silver-diamine-fluoride-application-in-the-pediatric-medical-setting/

The only scientifically proven risk of fluoride use is the development of fluorosis. Fluorosis of permanent teeth occurs when an excessive amount of fluoride is ingested over a long enough period of time while the tooth is developing underneath the gums. The risk of fluorosis exists in children younger than 8 years, and the most susceptible period is between 15 and 30 months of age. The risk of fluorosis is influenced by both the dose and frequency of exposure to fluoride during tooth development.[22]

Clinical Appearance

- Usually consists of white mottling

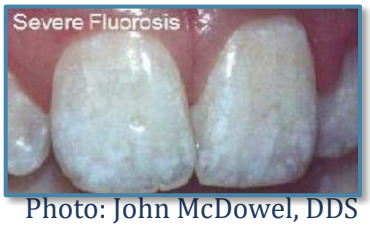


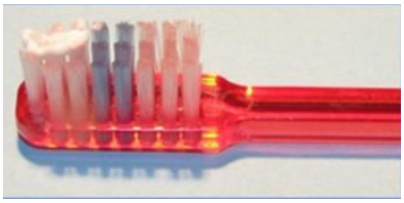
Photo: John McDowel, DDS

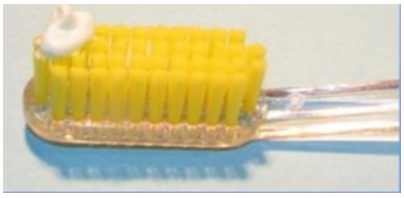
Prevalence and Risk Factors[7]

- Risk of developing fluorosis is greatest when a ratio of more than 0.06 milligrams per kilogram of body weight per day is ingested.
- Fluoride varnish is not a risk factor for fluorosis, as it is an irregular source of fluoride when applied at the recommended interval of two to four times per year between 6 months and 5 years of age when indicated.

Risk Reduction of Fluorosis[8]

- Avoid duplication of fluoride prescriptions.
- Advise patients/caregivers regarding the appropriate amount of fluoride toothpaste use by age, and recommend supervised brushing to reduce the incidence of children swallowing toothpaste (see below image for an appropriate amount for children).
- Keep fluoride-containing products out of the reach of small children.
- Determine fluoride content of current drinking water prior to recommending or prescribing dietary fluoride supplementation.


Less than 3 years of age


All children age 3 and older

[7] Skotowski MC, Hunt RJ, Levy SM. Risk factors for dental fluorosis in pediatric dental patients. J Public Health Dent. 1995. Summer;55(3):154–9.
[8] Wright JT, Hanson N, Ristic H et al. Fluoride toothpaste efficacy and safety in children younger than 6 years: A systematic review. JADA. 2014. 145(2): 182–189.