

**Iowa Department of Public Health
Silver Diamine Fluoride Protocol**

Silver Diamine Fluoride (SDF) Facts

Background

Silver diamine fluoride (SDF) is a topical treatment used in dentistry to prevent tooth decay and arrest some carious lesions. It is a mixture of 24-29 percent silver and 5-6 percent fluoride; the silver is antimicrobial and the fluoride remineralizes tooth structure.^{1,2}

SDF has been used by dentists in other countries for more than 80 years.³ In 2014, the United States Food and Drug Administration classified SDF as a fluoride, and the first product became available in April 2015. At this time, Advantage Arrest™ from Elevate Oral Care, LLC is the only commercially available SDF product in the US.³

SDF is an inexpensive, colorless liquid that, when applied to teeth, helps to control and prevent pain and infection of tooth decay. Application is a simple, noninvasive procedure.² The application of SDF to carious lesions has been shown to have an anti-caries effect on the remaining dentition, as well. The silver within SDF kills decay-causing bacteria and leaves the tooth surface less susceptible to development of bacterial plaque.^{4,5} When applied to a carious lesion, it hardens the softened dentin.⁶ The silver remains within the lesion, continuing the antibacterial effect and reducing the ability of new bacteria to form plaque. The fluoride also remains within the lesion, continuing its re-mineralization effect and preventing future decay.⁵ Although carious lesions treated with SDF will darken, with use of SDF, teeth are strengthened and some carious lesions are arrested, reducing restorative treatment needs and costs, and eliminating the need for local anesthesia.

Efficacy

Studies indicate that SDF reduces the incidence of new caries and progression of current caries by about 80 percent.⁷ Studies by Chu et al and Tan et al found that applying SDF just once a year was more effective in preventing carious lesions than applying fluoride varnish four times a year for both children and the elderly.^{8,9} SDF has also been shown to lower the risk of decay for teeth that are next to a tooth with a SDF-treated carious lesion.¹

Safety

SDF has been safely used in other countries for more than eight decades.⁵ Nine clinical trials have found SDF to be a safe and effective alternative to traditional dental treatments.³ Only a small amount of SDF is needed, approximately one drop per quadrant, to be effective at preventing tooth decay. SDF is applied with a small brush and rinsed off immediately afterward, limiting risk of ingestion or alteration of taste.²

Use of Silver Diamine Fluoride (SDF)

Personnel Required

In Iowa, silver diamine fluoride may be applied by licensed dentists, dental hygienists, and dental assistants, functioning within their scope of practice.

Indications for Use in Children and Adults⁵

The primary indications for topical treatment with silver diamine fluoride are to:

- Treat dentinal hypersensitivity;
- Stabilize uncontrolled caries for patients at high risk of experiencing new lesions;
- Treat patients with high caries risk (e.g., those experiencing xerostomia);
- Treat vulnerable tooth structure (e.g., exposed root);
- Treat difficult carious lesions (e.g., in a furcation or at the margin of a fixed bridge);
- Treat patients with cognitive disabilities (e.g., autism or dementia);
- Treat patients with limited or no access to restorative dental care; and/or
- Treat patients with limited life expectancy.

Contraindications:

Silver diamine fluoride should not be used if a patient has:

- An allergy to silver;
- Mucosal irritation, including oral ulcerations, desquamative gingivitis or mucositis; and/or
- Carious lesions that have symptoms of irreversible pulpitis.

Caution is needed regarding areas of demineralization (early caries) because the demineralized area may also darken if SDF is applied to it.

Application of Silver Diamine Fluoride:

During all procedures using silver diamine fluoride (SDF), utmost care must be taken to prevent contact of SDF with non-tooth surfaces, such as gingiva and mucosa. In addition to oral tissues, SDF will stain countertops, clothing, skin, and anything it contacts.

Materials needed: tray, plastic-lined tray cover, plastic-lined patient bib, silver diamine fluoride, disposable plastic dappen dish, applicator (micro brush), 2x2 gauze, gloves, cotton rolls, petroleum jelly

1. Place plastic-lined tray cover on the tray, as well as the dappen dish, applicator, gauze, and cotton rolls.
2. Wearing gloves, open the bottle of SDF and place one drop into the dappen dish.
3. Clean the teeth that will receive SDF application (toothbrushing is sufficient).
4. Place petroleum jelly on the lips and soft tissue near where SDF will be applied, to avoid staining.
5. Dry the teeth that will receive SDF application, and maintain a dry field the duration of application using cotton rolls and gauze.
6. Dip applicator into the SDF and hold against the dappen dish to remove any excess. Apply SDF to a lesion for 2-3 minutes. A rubbing motion is not necessary, but the lesion must be kept moist with the SDF for the entire 2-3 minutes.
7. At the end of 2-3 minutes, it is fine to rinse teeth with water, but it is not necessary.

8. If it is not possible to maintain a dry field, apply the SDF and then apply fluoride varnish over the area.
9. Instruct the patient to not eat or drink for at least 30 minutes or to brush their teeth for at least one hour following the application. Let the patient know that the treated lesion will increase in darkness over the next week and that an examination by a dentist is recommended.
10. After application of the SDF, gather all materials that were used including the dappen dish, gauze, and applicator, and hold inside one glove. Remove the other glove and wrap it around the glove holding the materials and place into the garbage.

Frequency of Application for Best Results:

Silver diamine fluoride, when applied correctly, should be effective after a single application. However, multiple applications are likely to be more effective. Silver diamine fluoride should be reapplied at six-month intervals for two years for maximum caries-arresting benefit.

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- ¹ American Dental Association. (2016, July 12). *Silver Diamine Fluoride in Caries Management*. Retrieved from ADA: <http://www.ada.org/en/science-research/science-in-the-news/silver-diamine-fluoride-in-caries-management>
 - ² Rosenblatt A., Stamford T., & Neiderman R. (2009). Silver Diamine Fluoride: A Caries "Silver-Fluoride Bullet". *Journal of Dental Research*, 116-125.
 - ³ Horst J., Ellenikiotis H., & Milgrom P. (2016). UCSF protocol for Caries Arrest Using Silver Diamine Fluoride: Rationale, Indications and Consent. *Journal of the California Dental Association*, 16-28.
 - ⁴ Knight, G., McIntyre J., Craig G., Mulyani, Zilm P., & Gully N. (2009). Inability to form a biofilm of *Streptococcus mutans* on silver fluoride- and potassium iodide-treated demineralized dentin. *Quintessence International*, 155-161.
 - ⁵ Featherstone J., & Horst J. (2015). Fresh Approach to Caries Arrest in Adults. *Journal of Multidisciplinary Care: Decisions in Dentistry*, 36-44.
 - ⁶ Mei M., Li Q., Chu C., Yiu C., & Lo E. (2012). The inhibitory effects of silver diamine fluoride at different concentrations on matrix metalloproteinases. *Dental Materials*, 903-908.
 - ⁷ Louis C. (2016, July 11). A Cavity-Fighting Liquid Lets Kids Avoid Dentists' Drills. Retrieved from *The New York Times*: <https://www.nytimes.com/2016/07/12/health/silver-diamine-fluoride-dentist-cavities.html>
 - ⁸ Chu C., Lo E., & Lin H. (2002). Effectiveness of silver diamine fluoride and sodium fluoride varnish in arresting dentin caries in Chinese pre-school children. *Journal of Dental Research*, 767-770.
 - ⁹ Tan H., Lo E., Dyson J., Luo Y., & Corbet E.P., L. E. (2010). A randomized trial on root caries prevention in elders. *Journal of Dental Research*, 1086-1090.