



# Silver Diamine Fluoride

## Another Arrow in the Quiver to Defeat Decay

by Judy Bendit



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by Patti DiGangi



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## Abstract

The never-ending war against oral disease comes with one benefit: We're given new weapons every so often to help make a fighting difference for countless patients. One of the newest weapons that has emerged is silver diamine fluoride (SDF). SDF's unique composition has proven to be an incredibly useful medicament not only for extreme cases but in day-to-day traditional dentistry as well.

## Educational objectives

- Compare SDF to traditional fluoride.
- Understand the mechanism of action of SDF.
- Discuss indications and contraindications for use.
- Identify challenges associated with SDF.
- Review protocol for use.
- Review related CDT codes.

## Introduction

Do you know the feeling you have when you get something new and you are really excited about it and want to tell all your friends? Like when you got your first bike, car or cellphone and wanted everyone to see it?

That's how we feel about a new medicament, SDF. It's so new and exciting that even the national news has started talking about it, including *The New York Times*, the *Today* show and *Good Morning America*.

Our dental journals are also exploding with publications about it. [See *References*.] This medicament has value for all types of patients, including those in your private practice.

## An arresting development

While SDF isn't new to the world, it is a new arrow in the quiver to treat and defeat tooth decay in the U.S. You may have heard

about silver nitrate, but SDF takes that to a whole new level. Its unique composition sets it apart from other medicaments used in caries prevention: The 25 percent silver acts as an antimicrobial, the 5 percent fluoride promotes remineralization, and the 8 percent ammonia stabilizes the ingredients in the solution.

SDF is the only product to date that can arrest decay. After placing the solution on the tooth, you'll see it turn a brown decay stain black, arresting the decay within 24–48 hours. The 5 percent fluoride ion is twice the strength of the typical fluoride varnish, but the total volume of product used is so much smaller that the actual amount of fluoride available is lower. (Varnish has 11.2 milligrams of fluoride in a 0.5-milliliter dose, while SDF has 1.2mg in a single drop.) The fluoride precipitates in the mouth to help protect the rest of the dentition.

SDF will not replace fluoride varnish. Many patients will still benefit from traditional fluoride varnish. As with any treatment, patient selection is vital.

## Silver bullet science and costs

Some dentists have even referred to SDF as “the silver bullet” because it simultaneously halts the cariogenic process and prevents caries.<sup>1</sup> A January 2016 CDA article discussed the University of California San Francisco protocols for SDF use.<sup>2</sup> Another stated: “No other intervention approaches the ease of application and efficacy. Multiple randomized clinical trials—with hundreds of patients each—support its use for caries treatment, thus substantiating an intervention that addresses an unmet need in American dentistry.”<sup>3</sup>

The American Academy of Pediatric Dentistry has also embraced SDF. The FDA cleared SDF back in August 2014 as a product for sensitivity, just as fluoride varnish is FDA-cleared for desensitizing. Its



off-label use is where we'll see some exciting new opportunities. It's an easy, noninvasive and inexpensive way to stop decay. One bottle of solution has approximately 250 applications and each application can treat five surfaces. It comes out to about 52 cents per tooth to use the product.

## Indications

SDF can be used for extreme caries risk, from severe early childhood caries to severe adult root caries. Those who work with behavioral- and medical-management patients should also consider using it. We could avoid taking patients to the operating room for treatment. Consider SDF for patients with limited access to care, nursing home patients, posterior restorations and beneath restorations or to save existing restorations. Think about a restoration that's starting to leak or is compromised in some other way. SDF can protect the tooth from hidden caries. If you think a patient will not return for further treatment, SDF is your best option.

## Considerations

An important consideration is that if there is no decay, SDF won't turn the surfaces black; it changes only caries lesions. If aesthetics are an important consideration, SDF may not be your product of choice, since there isn't a restorative product that will completely mask it.

Dr. Jason Hirsch, a pediatric dentist in Royal Palm Beach, Florida, suggests using a self-curing composite instead of light-curing composite. Because of the silver component in the material, the light tends to spread the silver in the tooth and is less aesthetic.

Clinicians need to be careful when working with the material. If it touches skin, it leaves a tattoo-like mark that disappears within a few days. SDF can also stain clothes and operatory surfaces. So be careful and utilize an assistant when possible.

## Contraindications

An allergy to silver is the main contraindication. Do not use with patients who present with ulcerative gingivitis and stomatitis, because SDF can burn. Many current articles on SDF state that it cannot be used if there is pulpal involvement.

### Case 1: Jorge, age 6



- Screened in a medical and dental mission.
- Lives in a low socio-economic, nonfluoridated community.
- Drinks Coke and coffee all day long (yes, you read that correctly).
- Never had a toothbrush.
- Poor, unsupervised dietary habits.
- Extremely high risk.
- Obvious extensive cavitation.

#### Treatment plan

- SMART [see "How to use SDF" section, p. 35] because the teeth will be exfoliating soon. It was an appropriate choice to leave them with the SDF treatment.
- Patient education.
- Dietary improvements, xylitol, fluoride toothpaste.
- Bacterial testing (when available).
- Parent or caregiver interview and

instructions. (Even at age 6, this child should be supervised by an adult during daily home care.)

- Prophylaxis.
- Post-treatment fluoride varnish.
- 3- to 4-month preventive maintenance with fluoride varnish or retreatment with SDF. (Sometimes a second or third application is indicated.)

#### Post-treatment

Notice the interproximal area just 10 minutes after an application of SDF: You can see the SDF working to arrest the decay. The best part about using SDF is that you don't need anesthesia, so you avoid taking children like Jorge to the operating room and causing all kinds of fear and anxiety.



Dr. Jeremy Horst spoke about one experience he had with a patient: “He has been getting teeth treated with SDF, then extracted for orthodontic purposes and looked at in the lab,” Horst said. “It is certain that the silver makes its way down to the pulp very frequently, with no negative effects.”<sup>3</sup>

### How to use SDF

Arresting decay with SDF can be called SMART (silver material atraumatic restorative treatment). This is a modification of ART (atraumatic restorative treatment) or what the American Academy of Pediatric Dentistry calls “interim therapeutic restoration” (ITR) for deciduous teeth.

Traditional ART/ITR involves removing carious tissues via hand instruments and placing self-curing glass ionomer material, which acts as a physical barrier against biofilm or pH destruction while recharging with fluoride. However, SMART makes more sense in many circumstances. The box on the next page shows the protocols we use in practice.

### Your office

You might be thinking, “That’s interesting for mission trips, but why would I need it in my practice?” Have you read the book *Dying from Dirty Teeth* by hygienist Angie Stone? Think of the difference SDF could make.

As we age, the incidence of recession and root caries increases drastically. Think of your elderly patients in nursing homes with little or no access to care. Hygienists could place SDF in just about any setting; we don’t need an operator to do it. Use of SDF as a treatment is not an age-based modality. It should be risk- and diagnosis-based.

Consider SDF for patients with limited access to care, nursing home patients, posterior restorations and beneath restorations, or to save existing restorations.

### Accurate CDT coding

The Code Maintenance Committee (CMC) is the body that votes to accept, amend or decline coding requests. In 2012, the CMC decided to meet annually to evaluate and create codes to embrace technologies, materials and procedures that can lead to earlier arrest and prevention of oral disease, and positively influence systemic health.

Although codes are not product-specific, there are codes for all treatments. Even if nothing else seems to fit, each section in the CDT book has D1999 for “unspecified procedure, by report” code. Dental professionals are obligated to use the most accurate code available. There are codes accurate for SDF treatment.

Using the code “D1999 unspecified preventive procedure, by report” is accurate. “D1208 topical application of fluoride—excluding varnish” would also be accurate,

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#### Disclosure:

The authors declare that neither they nor any member of their families has a financial arrangement or affiliation with any corporate organization offering financial support or grant monies for this continuing dental education program.

## Judy Bendit's SDF system

(Some clinicians may do it slightly differently)

1. Standard personal protective equipment for provider and patient. Make sure patient is wearing safety glasses and plastic-lined bib.
2. One to two drops of silver diamine fluoride into a plastic dappen dish, depending on how many teeth you are treating. One drop will treat five surfaces.
3. Apply scented lip balm to patient's lips to help mask the smell of the ammonia as it is placed in the mouth.
4. Use a saliva ejector, if possible. (Not required.)
5. Isolate tongue and cheek of affected teeth with gauze or cotton rolls. Absorbent triangles work well.
6. If near the gingiva, consider applying petroleum jelly with a cotton applicator for safety. (If SDF touches any tissue, it leaves a temporary mark like a tattoo; this could help keep that from happening.)
7. Dry the affected tooth surfaces with air or a cotton swab.
8. Using plastic dappen dish and microbrush, immerse brush into solution; remove excess on side of well. (Best if done with a dental assistant to avoid spilling.)
9. Brush directly onto affected tooth surfaces.
10. Allow SDF to absorb for up to one minute if possible, then remove excess with gauze, cotton roll or cotton-tip applicator.
11. Rinse with water, or have patient spit.
12. Invert all used cotton, microbrush and dappen dish into glove, so SDF can't drip onto any surface or skin. Dispose in trash can.

as would “D2940 protective restoration,”\* which the CDT defines as “Direct placement of restorative material to protect tooth and/or tissue form. This procedure may be used to relieve pain, promote healing, or prevent further deterioration.” This code was initially for temporary fillings, but has been renamed and redefined and now has a broader meaning.

It was thought that those codes, though applicable, were not as accurate as they could be for SDF. A new code submission was brought to the CMC and was added to CDT 2016. The most accurate code is now is D1354—“interim caries-arresting medicament application.”\* Its CDT definition is “conservative treatment of an active, nonsymptomatic carious lesion by topical application of a caries-arresting or -inhibiting medicament and without mechanical removal of sound tooth structure.”

Accurate coding does not guarantee coverage. The existence of a code does not mean a patient has coverage under a policy. Yet without a code, no coverage could be offered.

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### Share the excitement

When we experience something extraordinary, like we have with SDF, we want to

## Case 2: Sylvia, age 62



- Lives in rural, nonfluoridated community with little to no dental care.
- Little to no oral hygiene.
- Poor dietary habits.

### Treatment plan

- Treated by a dental student on community outreach program.
- Based on lack of access to care and no visualization, her gingival margins (post-SDF) and the black color were not problematic.
- Placed SDF as best option.

### Post-treatment

- Notice black line at margin showing SDF delivery.



share it with someone else. The experience is so amazing that you're convinced other people will surely have the same experience that you did. Many of the patients I've seen can and do benefit by having SDF treatment. So can yours. Consider SDF as another arrow in your quiver to use in the fight against oral disease. ■

### References

1. Rosenblatt A, Stamford TCM, Niederman R. Silver diamine fluoride: A caries "silver-fluoride bullet." *J Dent Res* 2009; 88(2):116-125. doi:10.1177/0022034508329406.
2. Horst J, Ellenikiotis H, Milgrom P "UCSF Protocol for caries arrest using Silver Diamine Fluoride: Rationale, Indications and Consent" *California Dental Association Journal* Vol 44 No 1 p17-28
3. Alvear Fa, Bernadette, Jeremy Alan Horst et al, *Arresting Caries: The use of silver diamine fluoride offers many benefits in arresting caries lesions, especially among underserved and low-income populations.* *Dimensions of Dental Hygiene* July 2016

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- 1) **In the U.S., which is the newest fluoride introduced?**
  - A) Stannous fluoride
  - B) Sodium fluoride
  - C) Sodium MFP
  - D) Silver diamine fluoride
- 2) **The mechanism of action for silver diamine fluoride is as follows:**
  - A) Silver acts as an antimicrobial.
  - B) Fluoride promotes remineralization .
  - C) Ammonia stabilizes the ingredients in the solution.
  - D) All of the above.
- 3) **Which of the following would *not* be indications for use of silver diamine fluoride?**
  - A) Occlusal decay on posterior tooth (deciduous and permanent)
  - B) Gingival decay on any tooth (with consideration of how visible it is)
  - C) Patients who present with ulcerative gingivitis and stomatitis
- 4) **The FDA has given silver diamine fluoride the same clearance as fluoride varnish.**
  - A) True
  - B) False
- 5) **The indications for use include:**
  - A) Broken-down restorations
  - B) Low-risk children
  - C) Extreme high risk
  - D) A and C
- 6) **The following contraindications should be considered when using SDF:**
  - A) Peanuts
  - B) Silver
  - C) Asthma
  - D) None of the above
- 7) **SMART stands for:**
  - A) Small materials and restorative treatments
  - B) Silver material atraumatic restorative treatment
  - C) Interim therapeutic restoration
  - D) Atraumatic restorative treatment
- 8) **Codes are product-specific.**
  - A) True
  - B) False
- 9) **Dental professionals are obligated to use the most accurate:**
  - A) Fees
  - B) Forms
  - C) Codes
  - D) Coverage
- 10) **Which statement is true about coding?**
  - A) Without a code, no coverage can be offered.
  - B) Accurate codes for SDF could be D1999, D1208, D2941, D1354.
  - C) The Code Maintenance Committee votes to accept, amend or decline coding requests.
  - D) All of the above.

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