SILVER DIAMINE FLUORIDE (SDF) PROTOCOL

BACKGROUND:

- SDF is a product that has been used to treat dental decay (caries) by dentists in Japan and other countries for more than 45 years. In February 2017, Health Canada licensed SDF, for use in preventing and arresting dental caries.
- SDF is a non-invasive, secondary prevention option, used to prevent the progression of carious lesions, thereby avoiding the traditional use of restorative approaches in many instances.
- SDF has been shown to arrest dental caries lesions anywhere from 47% to 90% following one application, depending on the size of the cavity and the tooth location. Anterior teeth have higher rates of arrest than posterior teeth. Therefore, follow-up for evaluation of caries arrest is paramount.
- The American Dental Association recommends SDF application twice a year for carious lesions on coronal surfaces in primary and permanent teeth.
- The clinical application is simple, but the use of SDF requires precision handling as it will temporarily stain the skin if there is direct contact - which will clear in 1-2 weeks with no treatment required. SDF will also permanently stain clothes or hard surfaces if there is direct contact.
- No adverse events have been reported from any country where SDF has been used for the last many decades.
- A one-size fits all approach for SDF application is not appropriate. Distinct types of caries require different treatment considerations.
- SDF can be integrated into restorative procedures[1] and be used prior to restoration placement, and as part of caries control therapy.

GOALS OF SDF APPLICATION:

- Eliminate pain and sensitivity.
- Destroy the decay causing bacteria and thereby stopping the progression of decay.
- Maintain form and function of the tooth until more definitive treatment can be provided.
- For primary dentition, more definitive treatment might not be required as a SDF treated tooth may remain symptom free until exfoliation. Also, the treated tooth can act as a space- holder for the subsequent permanent tooth.

[1]It can also be placed on visible incipiencies on proximal surfaces of adjacent teeth when they become visible during restorative procedures.

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Adapted from U of M, Ottawa Public Health, American Association of Pediatric Dentistry, USFC, and Indian Health Services.

SAFETY CONSIDERATIONS:

- It is important to remember that SDF should not be used on clients allergic to silver.
- Sometimes, practitioners use Potassium Iodide (KI), after the application of SDF to reverse/ reduce the blackness of teeth. KI is contraindicated during pregnancy; therefore, should never be used among pregnant women.
- One drop (25µL) of the SDF liquid contains 9.5 mg SDF and is generally sufficient to treat four to five lesions. The lethal dose (LD) is 380mg/kg of body weight. With the assumption, that the youngest child treated would be around 10 Kgs, the dose used would be 9.5 mg, which is 0.95mg/Kg, offering a 400 fold safety margin, should an entire drop be used.
- For a child weighing less than 10 kgs, care should be taken to use less than a whole drop or limiting application to 3 teeth, which would use about 2.37 mg SDF.

RECOMMENDED MAXIMUM DOSAGE:

One drop (25µL) of SDF liquid/10 kg of body weight per treatment visit, irrelevant of the age of the client.

CONTRAINDICATION FOR SDF USE:

» known silver allergy;
» apthous ulcers, painful mouth sores, or ulcerative gingivitis;
» deep cavitated lesions that are possibly close to the pulp;
» clients with symptomatic carious lesions, SDF can cause further pulp irritation;
» carious lesions that are not accessible with a micro-brush;
» clients who are not manageable in a clinical situation.

ELIGIBLE CLIENTS:

- Clients with signed SDF Authorization Form and informed consent; and
- Clients with an updated and initialed medical history.

SERVICE PROVIDERS[2]:

- dental assistant
- dental hygienist
- dental therapist
- dentist

OBTAINING INFORMED CONSENT FROM CLIENT (IF ADULT) OR PARENT/GUARDIAN (IF CHILD):

Service provider must explain:

- the benefits of SDF vs. all available treatment options available in the community - such as traditional restorative options (fillings, crowns, extractions, etc.) or a referral, if needed, for a surgical approach such as sedation or general anesthetic to treat caries;
- the expected staining of treated carious lesions;

[2] depending on provincial/territorial regulations, these providers are GOC employees, GOC contractors and/or CA/grant employees.

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- the potential of staining if SDF comes in contact with skin and/or clothes;
- the need for follow-up and reapplication at regular intervals (four to six months) to sustain the arrest of caries;
- contraindications to use among those who are allergic to silver; and
- to pregnant women that Potassium Iodide (KI) will not be used after the application of SDF, as that is contraindicated during pregnancy.

CASE SELECTION:

It is important to know that SDF is not meant for all cases. Proper case selection will help maximize the achievement of desired results. SDF application can be indicated for the following conditions:

- High caries risk cases including the following:
  - children with severe early childhood caries;
  - elderly or those with xerostomia (reduced salivation); and
  - people with restricted manual dexterity
- Single or multiple active carious lesions, which do not have immediate access to traditional dental treatment and by the time the treatment is available, the decay probably progresses further.
- Multiple active carious lesions, which although have access to traditional dental treatment cannot be treated in one visit and might need multiple visits. If the provider suspects that the client might not be able to follow-up on the appointments (which can be due to various reasons) to receive care, SDF application in the first visit will help in reducing the progression of decay.
- Traditional dental treatment is difficult to attain because of behavioural or medical factors.
- Carious lesions at locations which are difficult to treat with traditional dental treatment such as crown margins, interproximal secondary decay or root caries.

TOOTH SELECTION:

- Teeth with no clinical signs of pulpal inflammation or reports of unsolicited/spontaneous pain.
- Avoid applying SDF to very deep cavitated caries lesions that are close to the pulp. If possible, radiographs should be taken to assess the depth of the caries lesion(s).
- Any surface with cavitated caries lesions can receive SDF if these lesions are accessible with the SDF application brush.
- SDF can be used as caries control therapy; applying prior to restoration placement. It can also be placed on visible incipiencies on proximal surfaces of adjacent teeth when they become accessible during restorative procedures.

REFERRAL FOR TREATMENT:

- Depending on the size and location of cavity, SDF may not be a treatment option. The tooth may need a filling, crown, root canal therapy, or extraction. A referral outside of Community Oral Health Services will be made if required.

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CLINICAL SDF APPLICATION PROCEDURE:

Setup:

- Cover any surfaces (e.g. counter tops) that may come into contact with SDF, use plastic drapes where possible;
- The client should wear a plastic-lined bib and protective eyewear;
- The provider(s) should wear standard Personal Protective Equipment (PPE);
- Dispense 38% SDF solution into a plastic well/dappen dish. SDF corrodes glass and metal so use only plastic dappen dish :
    - One (1) drop of SDF is generally sufficient to treat 4 or 5 lesions.
    - Have one drop of SDF in a separate plastic dappen dish, only if needed. Note: please do not take the extra drop at the first go. Do not administer a second drop if the client is <20 Kgs.

Note:

- **One drop of SDF** contains 25µL (0.025ml), which is the maximum dose per 10 kg of body weight per treatment visit, irrelevant of the age of the client.
- **Single unit dose ampules** contain 100 µL (0.1ml) of SDF, 4 times the maximum dose per 10kg of body weight, per treatment visit and should be used with caution to ensure not to exceed maximum dose per 10kg of body weight per treatment visit.

Mouth preparation :

- Remove excess saliva with saliva ejector.
- Isolate soft tissues including tongue and cheek with gauze.
- Apply a protective coating of petroleum jelly or cocoa butter to the lips and skin around the mouth and under the nose to prevent temporary staining that can occur if SDF comes in contact with soft tissues.
- Remove any soft/gross debris from carious lesion(s) and dry the affected tooth surfaces with gentle flow of air or with a cotton pellet, gauze or cotton roll to allow better SDF contact with the denatured dentin. The air/water syringe may not be well tolerated by very young children or those who are anxious or dental phobic, or may be contraindicated in an environment where aerosols need to be avoided.
- Utilize four handed dentistry – where possible, to isolate the lesion(s) to be treated by SDF.

Lesion(s) assessment and preparation :

- Measure, assess, with a WHO probe, and record the dental carious lesion(s) in the client's chart (these are important factors to consider for future determination that the treated lesions have actually arrested):
    - the size of the carious lesion(s) (in mm) to be treated;
    - the hardness of the lesion (e.g. soft, moderate, hard); and
    - the color of the lesion (e.g., yellow, brown, black)
- Considering regional variances among service delivery models and provider scope of practice, the excavation of decayed enamel and/or dentin prior to SDF application is not necessary. However, since excavation may reduce the proportion of the arrested caries lesions that become black, it may be considered for aesthetic purposes.

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Application:

- It is important to follow the manufacturer's instructions for application method. The instructions should be read every time a new bottle of the product is opened for the first time. *Note: Manufacturer's instructions indicate use on adults and children 3 years and older. Based on research and proven safety, this protocol recommends taking into account the weight of the client as opposed to the age.*
- Take a micro-brush (to prevent intra- and extra-oral tissue exposure), bend it, and dip into the plastic well/dappen dish containing the SDF solution. Remove excess solution by gently pressing the brush to the side of plastic dappen dish.
- Apply the SDF directly to the lesion(s) to be treated with micro-brush. Take care to ensure the brush does not touch adjacent mucosal tissue or skin.
- Allow the SDF to remain for a minimum of 1 minute on the lesion(s) to maximize absorption. *Note: The waiting time may be shorter than one minute in very young clients depending on treatment acceptability. In such cases, record it in client's chart, and monitor carefully at follow-up appointments to evaluate arrest and consider re-application if lesion is not hard and black.*
- Dry the SDF applied area with a cotton pellet or gauze to soak up and remove excess SDF. *Note: Do not rinse, to increase the contact time, which in turn will improve the efficacy. Not rinsing will also help to reduce the chance of staining the soft tissues and preventing the client from having a metallic taste from the SDF.*
- Where possible, a fluoride varnish application may then be applied to all tooth surfaces, including the SDF-treated areas.

Clean-up:

- Place gloves, gauze, cotton, micro-brush, and dappen dish into plastic waste bag. Take care to avoid contact of SDF solution with clinic surface as accidental stains will remain permanent.

Follow-up and Re-care Application(s):

- Depending on the frequency and practicality of when a provider can return to a community, follow-up care can be scheduled at 2-4 weeks after initial treatment to verify the arrest of the lesions treated.
- After the initial follow-up, the client should be followed every four to six months to re- assess the lesion(s)
- At each follow-up, ensure to reassess each treated lesion in size (in mm), hardness (e.g., soft, moderate, or hard), and color (e.g., yellow, brown, or black).

Post-treatment considerations:

- Following the SDF treatment, while a restoration may not be clinically indicated, the client should still be given the option of receiving restorative treatment of the affected tooth.
- If SDF treated teeth are restored, it is recommended to restore them with glass ionomer material.

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Documentation:

- Record of signed authorization and informed consent and reviewed medical history in client's chart.
- Record of all services provided on a specific day on the Oral Health Services Daily Record (OHSDR) form.
- Complete the client Services Record

SDF EVALUATION:

Since SDF is a new service provided through Community Oral Health Services, it is important to evaluate its effectiveness in arresting untreated decay and preventing the formation of new decay. It is just as important to capture the client's experience with this new service.

For the first year of implementation, a short term SDF Evaluation Form will need to be completed.

There are five sections to the Form:

- Section #1- Patient/client details
- Section #2- First Visit
- Section #3- First follow up at 4 weeks after first visit
- Section #4- Second follow up at 6 months after first visit
- Section #5- Feedback from parent/guardian/caregiver

Each of the sections will need to be completed at each of the specific visits when providing an SDF applications.

Section #5 can be completed at whichever visit the provider is able to interact with the parent/ guardian/ caregiver.

After every visit where SDF is applied, the SDF Evaluation Form will be completed and kept into the client chart

After the final visit, fully completed SDF Evaluation will be scanned or photocopied, with the original placed in the clients chart and the scanned or photocopied form will be sent to the COHI coordinator specific to your region.

The regional office will then send the completed SDF Evaluation forms to National Office for analysis, in a pdf format. (Email: oralhealth-santebuccodentaire@sac-isc.ca)

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DISCLAIMER :

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