

TOPICAL FLUORIDE

How does Fluoride Reduce Caries?

Reduction of Enamel Solubility

Fluoride enters the enamel surface causing crystals to change from predominantly carbonated apatite and hydroxyapatite crystals to fluorapatite-like (FAP) and fluorhydroxyapatite (FHAP) crystals. The new fluoride-rich apatite crystals are much less acid soluble than the original enamel apatite.

Remineralization

Fluoride enhances the remineralization process by accelerating the growth of enamel crystals that survived demineralization. These larger crystals are more resistant to acid attack.











	Before	After
Surface zone	60nm 	100nm 
Body of the lesion	20nm 	75nm 
Dark zone	75nm 	125nm 
Translucent zone	30nm 	40nm 
Sound enamel	40nm 	40nm 

Fig. 2.1. Relative crystal diameters in a carious lesion before and after exposure to a rematerializing solution.

Interference with Plaque Microorganisms

Fluoride lodges in plaque and inhibits bacterial enzymes responsible for acid metabolism. In high concentrations fluoride is bactericidal, therefore, reducing plaque. In lower concentrations it is bacteriostatic so it controls the growth of bacteria without destroying it.

Modification in Tooth Morphology

If fluoride is ingested during tooth development, there is some evidence to suggest the formation of a more caries-resistant tooth which is slightly smaller, with shallow fissures.

Increase Rate of Post-eruptive Maturation

Newly erupted teeth have hypo mineralized areas that are prone to dental caries. Fluoride increases the rate at which these hypomineralized areas are mineralized creating an enamel surface that is more resistant to caries.

Our last newsletter discussed systemic fluoride. This newsletter will provide information on professionally and self-applied topical fluorides. We want to mention one more fact about systemic fluorides that was not discussed in our last issue. When water is boiled for cooking the fluoride does not boil out so the concentrations of fluoride increases as the volume of water being boiled decreases. We recommend that our patients who have concentration of fluoride of 1.6 or greater in their water cook only with bottled water containing optimum fluoride levels. These were listed in our last newsletter.

Topical Fluorides

Some preparations provide a high concentration of fluoride over a short time. Other preparations, such as dentifrices, provide continuous low concentrations of fluoride to the teeth. Topical fluoride treatments interact with minerals in the teeth. Most systemic fluorides have a topical effect through salivary secretions, but their primary effect is systemic.

Professional Applied Topical Fluoride

Vehicle Gel
 Aqueous Solution
 Foam

Fluoride Compound: Acidulated Phosphate Fluoride (APF)
Sodium Fluoride (NaF)
Stannous Fluoride (SNF₂)



Stannous fluoride, sodium fluoride, and acidulated phosphate fluoride appear to be of relatively equal efficiency in the prevention of dental caries. They differ in terms of application frequency, taste, cost, stability, gingival tissue acceptance and staining tendency.

APF solutions and gels are easy to apply, stable, and have an acceptable taste. They do not stain teeth or cause tissue irritation. APF gels are not recommended for patients with porcelain or composite restorations, because they may become etched.

We use a one minute topical foam, "Puff" that is placed in a tray. "Puff" is an APF that is made by PASCAL. For our patients who are not cooperative and can not tolerate a tray we use "60" a one minute APF gel that is made by PASCAL. This gel is brushed on then the mouth is held open for one minute while allowing fluoride to remain on the teeth. Remove all excess gel with a gauze; don't allow the patient to swallow the gel.

Decrease the Ingestion of Professionally Applied Fluoride.

1. Seat patient upright.
2. Use trays with absorptive liners.
3. Limit the amount of gel; no more than 2.5 ml. per tray (one-half teaspoon).



Professionally Applied Fluoride for One Minute or Four Minutes?

Research has shown that enamel fluoride uptake after four minutes is greater than after one minute. However, this difference is not clinically significant. We use the one minute fluoride for convenience and patient acceptance.

NaF applications are considered inconvenient because four treatments are required over a short period.

SNF₂ solutions may cause soft tissue irritation and staining of teeth. They may not be acceptable to the patient because of their bitter taste. Research indicates that stannous fluoride may be the most effective fluoride from a bacteriostatic standpoint.

Concentrations: 1.23% APF
 2% NaF
 8% SnF₂

Is a Prophylaxis Necessary Prior to a Topical Fluoride Application?

Dental researchers have recently challenged the theory that pellicle and plaque act as a barrier to fluoride uptake and should be removed by professional prophylaxis prior to topical application. More than a dozen laboratory and clinical studies have shown that a preliminary cleaning did not produce superior therapeutic results.

The prophylaxis should still be considered beneficial as an adjunct for the prevention and treatment of gingivitis and periodontal disease and for cosmetic purposes. However, its use should be based on the patient's gingival and oral hygiene status, not viewed as a prerequisite for optimal topical fluoride efficacy.

Are Two-Part Rinses (APF/Stannous Fluoride) as Effective as APF Gel Office Treatments?

Clinical studies have failed to demonstrate the effectiveness of two-part mouth rinse systems, and they do not have ADA endorsement.

Accidental overdose

The probable toxic dose is 5 mg F/kg body weight. First-aid treatment for acute fluoride overdose includes inducing vomiting and ingesting large amounts of fluoride binding liquids. These include milk, lime water and liquid or gel antacids containing aluminum or magnesium hydroxide. The patient should be immediately transported to the hospital.

Concerns have also been raised regarding the potential of the two-part rinses for easy ingestion. When a child uses the combined rinse as directed, about 11 times the amount of fluoride contained in a 0.2% NaF weekly rinse is taken into the mouth. If inadvertently swallowed, the amount can cause nausea, headaches and cramps. Therefore, APF gels continue to be the preferred treatment regimen.

Recent research has shown that the greatest amount of fluoride uptake by teeth takes place during the first minute of treatment. Until further research in the area is completed, however, patients should be instructed not to eat, drink or rinse for 30 minutes after a fluoride treatment.

Professionally applied topical fluoride is beneficial to children and adults. It is specifically beneficial for patients with high caries susceptibility, dental hypersensitivity, xerostomia (including that caused by drug or radiation therapy), root surface caries, orthodontic appliances, over dentures and recurrent decay at the margins of restorations.

Topical fluoride treatments provide caries reduction ranging from 30% to 40%. Studies indicate that it also has a bactericidal effect on plaque, reduces gingivitis and decreases dental hypersensitivity.

Home Fluoride Therapy

Studies have shown that multiple fluoride therapies produce superior results. The most beneficial regimen incorporates one systemic mechanism (water fluoridation or dietary supplementation) with as many topical approaches as needed to control caries. Bi-annual office topical applications provide infrequent high concentrations of fluoride. Dentifrices, mouth rinses and home fluoride gels offer frequent low concentrations of fluoride to enhance remineralization.

Prophylaxis Paste with Fluoride

Prophylaxis pastes have limited topical cariostatic effects, averaging only 10%. They should not be considered the sole means of fluoride delivery. The prophylaxis procedure removes the fluoride-rich outer layer of enamel. The fluoride in the prophylaxis paste may be taken up by the enamel, but its duration of action in the inhibition of caries is relatively brief. A topical fluoride application is required to provide meaningful caries inhibition.

Chronic or acute fluoride toxicity from fluoride prophylaxis paste has not been noted in the literature.

Fluoride Dentifrices

Fluoride dentifrices appear to have antiplaque, anticaries and desensitization properties. They provide a low but continuous level of fluoride in the mouth which enhances remineralization.

Precautions

Ingestion of an 8 ounce tube of fluoride dentifrice results in temporary stomach upset. Rapid consumption and retention of this amount, even by a small child, is unlikely to result in a lethal reaction.

Excessive and frequent ingestion of fluoride dentifrices may cause mild fluorosis, especially in children under age six. Parents should supervise younger children, and tubes of toothpaste should be kept out of children's reach. Younger children often ingest up .30 milligrams of fluoride during a single brushing with no adverse reaction. The amount tends to decrease with age and improved brushing ability.

Fluoride Mouth Rinses

Several mouth rinse concentrations have been developed. The fluoride concentrations most commonly used are 0.05% NaF and 2.0% NaF. Low potency mouth rinses (0.05% NaF) are used on a daily basis. High potency mouth rinses (0.2% NaF) are used on a weekly basis.

Daily rinses (0.05% NaF) and weekly rinses (0.2% NaF) have been shown to be equally effective. Daily rinses are available over the counter. Weekly rinses require a prescription or office dispensing.

When suggesting a fluoride mouth rinse, several factors should be considered. Some patients prefer a daily rinse, while others like a prescribed weekly rinse. Missing a single dose of a daily rinse is less critical than missing a weekly rinse. Some patients perceive a weekly rinse prescription product as being more important and follow the regimen more closely.

One dose of fluoride mouth rinse is approximately 2 teaspoons (10 milliliters). This amount delivers 2.25 milligrams fluoride for 0.05% NaF rinses and 9.0 milligrams fluoride for 0.2% NaF rinses.

Mouth rinses should be used after all tooth surfaces are brushed. The solution should be swished in the mouth for one minute and expectorated. For maximum benefit, patients should not eat or drink for 30 minutes after rinsing.

Mouth rinses are recommended for individuals in both fluoridated and non fluoridated communities. Children with mixed dentitions (over six years of age) will benefit from the use of fluoride mouth rinses. Younger children could swallow the rinse. With close parental supervision, fluoride gels can be used in younger children as long as it is not swallowed.

Mouth rinses are specifically beneficial for patients with high caries susceptibility, dentinal hypersensitivity, xerostomia root surface caries, orthodontic appliances, overdentures and recurrent decay at the margins of restorations.

The greatest benefit of fluoride mouth rinses are derived by newly erupted teeth.

Acute fluoride toxicity can occur if a child ingests 1 liter of 0.2% NaF mouth rinses. Ingestion of 1 liter or 0.05% NaF mouth rinse will probably cause nausea and vomiting.

Chronic fluoride toxicity (mild fluorosis) is possible if a child undergoing tooth development continuously swallows excessive amounts of fluoride mouth rinse.

Parents must supervise children while they use a mouth rinse and containers should be kept out of a child's reach.

An important consideration in selecting a fluoride rinse product is its alcohol content. A number of fluoride products contain ethanol. We recommend ACT fluoride mouth rinse "For Kids" since it contains no alcohol.

Home Fluoride Gels

The concentrations used for self-applied fluoride gels are 0.5% APF, 1.1% NaF and 0.4% SnF₂.

Depending on the concentration used, self application is done on a daily or weekly basis. Intensive fluoride therapy can be achieved through a series of daily applications for a few weeks.

These gels can be brushed on and floss can be used to carry the gel interproximally. Excess fluoride gel must be expectorated.

Trays can be used for self-applied fluoride gels. The tray should be kept in the mouth for four minutes. Make sure the patient uses only a small ribbon of gel in the tray. Excess fluoride gel must be expectorated.

The patient should not eat, drink, or rinse for at least 30 minutes after using the fluoride gel.

These gels are recommended for patients in fluoridated and nonfluoridated communities. These are specifically beneficial to patients with high caries susceptibility, dentinal hypersensitivity, xerostomia, root surface caries orthodontic appliances, overdentures and recurrent decay at the margins of restorations. They are contraindicated in children or any adult who can not expectorate.

Parental supervision is recommended. If we have a very young child with caries prone tooth surface that could benefit from a fluoride gel, we will instruct the parent to place a tiny amount of fluoride gel (the size of a match head) on a Q-tip and then wipe the gel on the area, then use a clean Q-tip to remove any excess.

Frequent ingestion of a fluoride gel by children under age six may cause dental fluorosis.

To avoid toxic reactions, large containers of fluoride gel should not be dispensed.

Most self-applied fluoride gels are available by prescription only. Stannous fluoride gel (0.4%) is available over the counter.

Dental Floss with Fluoride

Johnson and Johnson Reach makes a dental floss that contains fluoride. While there are no clinical studies to prove it is beneficial, how could it hurt?

Is Fluoride Equally Effective in Preventing Dental Caries on All Types of Tooth Surfaces?

Although fluoride is effective in preventing dental decay on all types of tooth surfaces it is more effective on smooth tooth surfaces than on surfaces with pits or fissures. Therefore, combining fluoride regimens with pit-and-fissure sealants is a logical combination to use for maximum caries protection.

In Our Next Issue

In our next issue we will discuss fluoride in restorative materials, Durafluor and fluoride's role in reducing dentinal sensitivity.

Retraction

In our Volume 4, Issue 4, The One Appointment Pulpotomy For Primary Molars, there is an error on page 3. We dilute the formocresol solution 5 parts glycerin and 1 part "Buckley's Formo Cresol" not 10 parts glycerin.

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