

## PREVENTIVE DENTISTRY

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### Self-applied fluorides

Self application of fluoride is usually carried out with groups of persons, usually children at one time, under only general supervision, in contrast to professionally applied fluoride treatments which are expensive because they depend upon one professionally trained person treating one person at a time, with expensive equipment or supplies.

*Requisites for self applied fluoride agents:*

1. Should be completely safe.
2. Should be effective for preventing caries.
3. Method should be suitable for use by large groups and at a reasonably low cost.
4. Should be acceptable to participants.
5. Should be easy to use to ensure compliance.
6. Should require few professional personnel.
7. Should be able to be supervised by non-dental personnel after short periods of in service training.

### Fluoride dentifrices

Investigation into effectiveness of adding fluoride to toothpaste has been carried out since 1945 and covers a wide range of active ingredients in various abrasive formulations. Fluoride compounds that have been tested for caries-inhibitory properties include sodium fluoride, acidulated phosphate fluoride, stannous fluoride, sodium monofluorophosphate and amine fluoride. Most toothpaste nowadays contain sodium fluoride or sodium monofluorophosphate or combination of both as active ingredient, usually in concentration of 1000-1500 mg F/g.

Toothpaste is probably the most readily available form of fluoride, and tooth brushing is a convenient and accepted habit in most cultures. In fact, a global survey revealed that experts addressed fluoride toothpaste as the main reason for the dramatic decline in caries during the last decades of the 20th century. More than a half a century of research suggests that regular use of fluoride toothpaste is associated with a clear reduction in caries increment. The reduction of dental caries was 24%–25% , the general functions of toothpaste are:

- 1- Physico-mechanical function:by action of the abrasive materials and toothbrush.
- 2- Chemical function:by reaction of fluoride with outer enamel surface and antimicrobial effect.

### Fluoride Concentration in Toothpaste

The results from many studies suggest that increased fluoride level give a greater reduction in the incidence of dental caries.The caries preventive effect of low-fluoride toothpastes intended for children (< 1000 ppm) is inferior compared with the adult products (which is 1500 ppm) .Consequently, the benefits of caries prevention must be balanced with the risk of fluorosis for children under 6 years old. So use only a pea-sized amount for children under six. To prevent swallowing, children under six years of age should be supervised in the use of toothpaste. High-fluoride toothpastes with 2500–5000ppm fluoride are available upon prescription in some countries and intended for caries-active individuals over 16 years of age and for patients with special needs, also the high-fluoride toothpaste may promote root caries arrest in frail elderly people and reduce progression of approximal caries in caries-active adolescents.The content of fluoride in dentifrices will decrease with increase in the time of storage 6 month or more.

### Mechanism of Action

Two possible mechanisms have been suggested. One suggests that fluoride ions is incorporated into the hydroxyapatite crystal lattice with a subsequent slower release of fluoride ion which then replaces hydroxyl groups to form fluorapatite. On the other hand it is suggested that it is fluoride ions itself which is incorporated into the apatite crystals by means of a substitution reaction with one or more of the phosphate groups.

Fluoride in toothpaste is taken up directly by demineralized enamel and it also increases the fluoride concentration in dental plaque, thus leaving a store of fluoride available for remineralization when pH drops.

### **Fluoride mouthrinses**

Frequent use of low concentration of fluoride is more cariostatic than less frequent use of higher concentration of fluoride for topical application. In areas where water fluoridation is not possible or has not been implemented, the fluoride mouthrinses have been found to be an effective tool in prevention of dental caries. Over the past few decades fluoride mouth rinsing has become one of the most widely used caries-preventive public health measure.

For reasons of lowest expense, convenience in handling as well avoidance of unpleasant taste, NaF became the most widely used of these tested products in public health programs. Mouth rinse products contain fluoride ion at a concentration of 225-900 mg/L for daily and weekly use respectively

### **Indications**

- Patients who, because of the use of medication, surgery, radiotherapy, and so on, have reduced salivation and increased caries formation.
- Patients with orthodontic appliances or removable prostheses, which act as traps for plaque accumulation.
- Patients unable to achieve acceptable oral hygiene.
- Patients with extensive oral rehabilitation and multiple restorative margins, which represent sites of high caries risk.
- Patients needing fluoride in their home care but cannot tolerate a custom-fitted tray.
- Patients with gingival recession and susceptibility to root caries.
- Patients with rampant caries, at least as long as the high caries activity persists.

Generally, *daily rinses* should be recommended rather than a weekly regimen; not only does the daily procedure appear to be slightly more effective, but, as a practical consideration, it is easier for patients to remember and comply with a daily procedure. In all these instances, it is important to remember that the rinses should *not be used in place of any of the other modalities* of fluoride use but as part of a

comprehensive, preventive program that should also comprise plaque control, frequent fluoride topical applications, the home use of a fluoride dentifrice, diet control, and testing to determine if and when the oral environment is no longer conducive to caries. For children living in nonfluoridated areas, the prescription of fluoride supplements may also be considered. In communities with fluoridated water supplies or with natural occurring optimum fluoride level in drinking water, mouth rinsing programs would give a super added benefit.

### Recommendations:

Mouth rinses designed to be 10 ml rinse and spit out, 0.2 % of NaF solutions are recommended (900 ppm F<sup>-</sup>) for *weekly fortnightly* use. while 0.05 percent (225 ppm F<sup>-</sup>) for *daily* use. Due to the risk of swallowing, fluoride rinsing is not advocated to children below 6 years of age. The caries reduction is about 26%-30%.

### Fluoride Gels for Home Use

During the last years, a number of fluoride gels have become available as additional measures that may be used to help achieve caries control. These procedures contain

- 1- 0.4% stannous fluoride (1,000 ppm fluoride)
- 2- 1.0% sodium fluoride (5,000 ppm)

and are formulated in a non aqueous gel base that does not contain an abrasive system.

### Recommendation

The usage involves toothbrushing with gel (similar to using a dentifrice), allowing the gel to remain in the oral cavity for 1 minute, and then expectorating thoroughly. They may be considered as an alternative to the use of fluoride rinses and an adjunct to the use of professional, topical fluoride applications and fluoride dentifrices as a collective means of achieving caries control in patients who are especially prone to caries formation (e.g. patient with rampant caries). Like fluoride rinses, the use of these gels is generally restricted to the period required to achieve caries control. It should be stressed that fluoride gels should not be used in place of fluoride dentifrices. Proper use of these preparations in combination with

professional topical fluoride applications and the home use of fluoride dentifrices may be expected to help achieve caries control in caries-active patients.

### **Fluoride exposure from multiple sources**

- Multiple fluoride therapy is a term that has been used to describe these fluoride combination programs. As originally developed, this program included the application of fluoride in the dental office in the form of both a fluoride-containing prophylactic paste and a topically applied fluoride solution and the home use of an approved fluoride dentifrice. In addition, some form of systemic fluoride ingestion, preferably communal-water fluoridation, was included.

- The results of these investigations indicate that the combination of topical fluoride applications and home use of a fluoride dentifrice resulted in about 59% fewer carious lesions. Nevertheless, it is important to note that the combination of stannous fluoride treatments not only reduced the incidence of caries by more than 50% in both children and young adults but did so in both the presence and absence of communal fluoridation. If one accepts a 50% caries reduction attributable to water fluoridation and another 50% reduction of the remaining caries from the use of multiple fluoride treatments, it is apparent that the use of multiple fluoride therapy, including communal fluoridation, results in an overall reduction in caries of about 75%.

### **Dental erosion**

Dental erosion develops through chronic exposure to extrinsic/intrinsic acids with a low pH. It is painless, progressive, irreversible loss of hard tooth tissue, first the enamel and denuded cementum and subsequent severe oral and occlusal erosive tooth wear. It is important to diagnose early the tooth wear process in children and adults.

#### **Appearance of Erosion**

Smooth, silky-glazed, sometimes dull enamel with the absence of perikymata and intact enamel along the gingival margin are typical signs. It has been hypothesized that the preserved enamel band along the oral and facial gingival margin may be due to some plaque remnants, which might act as a diffusion barrier

for acids. This phenomenon may also be due to an acid neutralizing effect of the sulcular fluid.

### **Recommendations for Patients at High Risk for Dental Erosion**

- Reduce acid exposure by reducing the frequency and contact time of acids (main meals only).
- Not hold or swish acidic drinks in the mouth and Avoiding sipping these drinks.
- Consider using modified acid beverages with no or reduced erosive potential.
- Avoiding toothbrushing immediately after an erosive challenge (vomiting, acidic diet). Instead, fluoride-containing mouth rinse, a sodium bicarbonate (baking soda) solution, milk or food, such as cheese or sugar-free yoghurt are used. If none of the above is possible, rinse with water.
- Using a soft toothbrush and low-abrasion fluoride-containing toothpaste. High-abrasive toothpastes may remove the pellicle.
- Patient referred to gastroenterologist and/or a psychologist when intrinsic causes of erosion are involved.
- After acid intake, stimulation of salivary flow with chewing gum or lozenges is considered.
- Using chewing gum to reduce postprandial reflux.
- **Topical fluoride application** inducing the formation of a protective layer on dental hard tissue, which is composed of  $\text{CaF}_2$  (in case of conventional fluorides like amine fluoride or sodium fluoride) or of metal-rich surface precipitates (in case of stannous fluoride), appears to be most effective on enamel. In dentin, the preventive effect of fluorides is highly dependent on the presence of the organic matrix. In situ studies have shown a higher protective potential of fluoride in enamel compared to dentin, probably as the organic matrix is affected by enzymatical and chemical degradation as well as by abrasive influences in the clinical situation. There is convincing evidence that fluoride, in general, can strengthen teeth against erosive acid damage, and high-concentration fluoride agents and/or frequent applications are considered potentially effective approaches in preventing dental erosion.