

# PREVENTIVE STRATEGIES

## Approaches to eliminate caries



### BACKGROUND

Caries lesions include a spectrum that stretches from the small white spot enamel demineralization of early childhood caries (ECC) to the large cavitations that extend into dentin. Although little evidence indicates that the interventions dentists currently use reduce the incidence of dental caries as a disease, these methods can reduce the incidence of new lesions and halt lesion growth. Primary prevention focuses on the etiology of the disease, whereas secondary prevention aims to stop disease progression. For primary prevention of caries, the frequency and duration of exposure to dietary sugar is essential. To be most effective, primary prevention should occur in the context of dental public health practices. For secondary prevention, early diagnosis and prompt treatment are undertaken to reduce the complications caused by lesions and the occurrence of new lesions. When lesions are allowed to grow, pain and tooth loss will result. In addition, these enlarged lesions that have gone untreated serve as a reservoir of cariogenic bacteria that can initiate new lesions. If the process continues unchecked, the patient can suffer compromised social acceptance, poor growth patterns, and reduced quality of life. A review of the preventive strategies that seek to enhance resistance to the progress of caries was offered.

### TIMING FOR PREVENTIVE EFFORTS

#### Adults

Most of the dental treatment for adults is to address failed fillings placed when they were younger. Excising lesions does not stop the initiation of new lesions or eliminate caries risk factors that led to the failed restoration. To achieve primary prevention of lesions, the treatment must change the patient's ability to resist coronal and root caries. Typically these types of interventions are aimed at the most vulnerable and those at greatest risk for additional caries. Aging is a major factor in placing a patient at increased risk for the development of caries because of the changes in the body's ability to produce appropriate quality and quantities of saliva, the exposure of roots after overbrushing and iatrogenic root surface damage, and the restoration of caries lesions that damages gingival attachment tissues and leads to root exposure.

Currently, preventive efforts for adults at the population level are rare. To be most effective, these interventions should be tied to other health care encounters so that any risk-increasing influences can also be addressed. These include drug abuse, chemotherapy, the onset of systemic disease, and polypharmacy. Senior centers, subsidized housing for elderly persons, assisted living, and skilled nursing facilities may be appropriate settings for this public health approach.

#### Children

Ideally, primary prevention efforts for children begin immediately. Once teeth have erupted, children begin to develop dental biofilm colonized by cariogenic bacteria and can suffer ECC. Efforts can include having mothers chew xylitol gum even before the child has teeth erupt to protect against the transmission of *Streptococcus mutans* and avoid caries development. These early efforts at primary prevention are essential in high-risk communities and should continue until late in the first year of life. With each new tooth, cariogenic bacteria have the opportunity to colonize. When the child has permanent teeth, lesions occur within 2 to 4 years of eruption.

Prevention efforts at the public health level are readily accomplished in a school-based delivery system. The goal is to prevent decay in permanent teeth, with nonrestorative and minimally invasive options logical for primary teeth and early erupting permanent teeth. Among the topics that should be covered are dietary guidance to avoid sugar-enriched beverages at all ages, rinsing with water after consuming any sugary drinks, and never supplementing milk and baby formula with sugar. Exposure to milk bottles should be limited to 3 to 6 meal times, depending on weight and age, to reduce the incidence of caries. Children should not have bottles with them throughout the night.

Services that are useful include making sure dental plaque doesn't accumulate by performing regular cleaning. Caregivers must be taught to clean the teeth while maintaining reasonable comfort for all involved. School-aged children can also benefit from having fluoride varnish applied to reduce the incidence of new caries lesions. Some research indicates fluoride varnish could be combined with antimicrobial agents in toddlers, but this remains in its early stages of confirmation. Although fluoride supplement tablets have proved to have preventive effects in permanent teeth, primary teeth may not respond similarly. The use of topical fluoride rinses, varnish, or toothpaste, all of which pose less risk of the child developing fluorosis, should be sufficient.

### INTERVENTIONS

#### Fluoride

Community fluoridation of water has proved itself as a preventive method against dental caries. Over 370 million people in 27 countries have been exposed to fluoridated water, proving it to be effective and safe, except for the possible side effect of fluorosis. This method is cost effective as well.

Fluoride has also been added to salt and milk. The cost of salt fluoridation is about one tenth that of water fluoridation, making it the least expensive and probably the most efficient way to

prevent caries. Milk fluoridation has the advantage of delivering the most precise fluoride dose, but the cost is about 5 times that of water fluoridation.

Fluoride toothpastes are also highly successful means for preventing caries lesions. Toothpastes are now available that deliver a lower dose of fluoride for those under age 6 years, with higher doses for older children and adults. The goal is to maintain a lower risk of fluorosis developing in young children. Training in proper tooth brushing is a valuable part of public health dental services, with supervised brushing in schools an effective approach. A program of free postal delivery of toothpaste plus advice during home visits reduces decay and the need for dental extractions in lower socioeconomic groups. Primary care providers should guide parents in selecting a fluoride-containing toothpaste, learning how to model good brushing, and learning how to brush the child's teeth until the child can do so effectively, usually around age 7 years

Other forms of fluoride delivery include rinses, foams, varnish, and sealants. Silver diamine fluoride can be used topically to not only halt the growth of caries lesions but also to prevent newly exposed, high-risk surfaces from developing new lesions. Its only known side effect is staining of the lesions, with the silver tarnishing to black. Parents and caregivers should be advised of the change in primary dentition. The application of silver diamine fluoride can be done by any dental or medical care provider even in schools or nursing homes. The cost of the material is similar to that of fluoride varnish.

### **Xylitol and Similar Agents**

Sugar substitutes such as xylitol offer antibacterial effects that inhibit caries prevalence and incidence. The greatest reduction in lesions occurs on smooth surfaces, with fissures and pits showing the least effects. Sorbitol, mannitol, erythritol, maltosyl-erythritol, and isomaltitol have also been shown to inhibit the growth of carious lesions. These agents are delivered via chewing gum and sugar-free confections and candies.

### **Antibiotics, Antiseptics, and Other Agents**

Antibiotics are not used to inhibit caries because the host can be sensitized and there is a risk of antibiotic resistance among bacteria. However, immunologic agents may still be in development.

Among the antiseptics that are used in the secondary prevention of caries are chlorhexidine, iodine, and arginine. Chlorhexidine and combinations including chlorhexidine are among the most well-known agents. These are available as mouth rinses and they kill most bacteria rapidly by disrupting their cell walls.

Other agents include extracts from natural products, such as high-molecular-weight cranberry extracts and various botanicals. Vitamin D supplementation has also been associated with benefits. Saliva produces a natural defense against caries, but salivary flow can be decreased. Muscarinic agents have been used to increase salivary flow, but have not been studied to determine if they have protective effects against caries.

### **Treatments**

Although the traditional view was to eliminate all caries lesions, it's now understood that most caries lesions can simply be sealed rather than excavated. Leaving some bacteria in a tooth with no signs of pulpal pathology is becoming the standard of care. The seal must be well-crafted, requiring either a circumferential contact with healthy enamel or complete coverage (the Hall technique).

Atraumatic restorative treatment is a simple way to manage caries. Lesions are partially removed to achieve clean margins, then a high-viscosity glass ionomer cement is placed. This method requires neither advanced equipment nor electricity and has proved both highly useful and highly successful.

### **Behavioral Interventions**

Tooth brushing of all dentate children should be done twice a day with a fluoridated toothpaste by parents for children under age 2 years, according to the American Academy of Pediatric Dentistry. Counseling by the dentist to urge the implementation of this recommendation has not been proven to be effective. Behavioral change efforts using traditional advice-based counseling has had limited success. Some alternatives that have been shown to achieve better success include the following:

- Governmental policy to control the consumption of sugar. This policy usually involves taxation of sugary beverages and snacks.
- Including parents in the identification of their needs and in overcoming barriers to action on their needs.
- Motivational interviewing, which is client-centered and directive counseling.
- Case management, which facilitates, coordinates, and monitors services that provide individuals with the ability to engage in actions that will improve their health.

### **Clinical Significance**

The war against dental caries will need to use centralized approaches, such as fluoridated water supplies and public health services for children, as well as individualized approaches, such as motivational interviewing and the use of fluoride varnishes during dental visits. Dentists can develop proficiency in techniques such as atraumatic restorative treatment and the Hall technique to provide their patients with lower cost, less invasive, and more readily delivered dental care. We have a wealth of tools at our disposal, but we need to take steps to put them to use against the public health problem of caries.

Horst JA, Tanzer JM, Milgrom PM: Fluorides and other preventive strategies for tooth decay. *Dent Clin N Am* 62:207-234, 2018

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