

Non Flouride Alternative in the Prevention of Dental Caries - A Narrative Review

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Abstract

Dental caries is a complex disease process that afflicts a large population of the world, regardless of gender, age and ethnicity, although it does tend to affect more with a low socioeconomic status to a greater extent. New and emerging methods have been and are in the process of being developed. These hold great promise of preventing and reversing caries, especially in the one-fifth of the population that accounts for two thirds of the caries experience. However, despite the dramatic reduction in dental caries rates over the past half century and the

concurrent increase in emphasis on preventive dentistry, caries still affects a major percentage of the population. A 1998 to 1991 survey of the U.S. population showed that 45.3 % of children and adolescents in the 5- to 17-year-old age group had carious teeth. In adults, 93.8 % had evidence of past and present coronal caries. In people with teeth 22.5 % had root caries. Not surprisingly, the incidence of root caries was found to increase dramatically with age. In the 55- to 64-year-old age group, 38.2 % of subjects had decayed or filled root surfaces. This incidence increased to 47 % in adults aged

65 to 74 years. Thus, control of caries is of major importance in dentistry and will continue to be for the foreseeable future, many potential anticaries agents other than fluoride. This review will consider these potential anticaries agents under the following 14 categories: Polyols, Dicalcium phosphate dihydrate, Alpha-tricalcium Phosphate, Calcium carbonate, CPP –ACP, Tooth mousse, Polymers Metals, miscellaneous agent, Antimicrobials, Chewing gums, Smart materials, Ozone therapy, Lasers, Herbal product.

Keywords: CPP, ACP, Polymer.

Introduction Dental caries, a complex disease prevalent among individuals with low socioeconomic status, continues to affect a significant portion of the global population. Although there have been advancements in preventing and reversing caries, a substantial percentage of people still experience its negative effects. This document explores new and emerging methods aimed at improving oral health and addressing dental caries, particularly among the population with the highest caries prevalence¹.

Prevalence of Dental Caries

Dental caries rates have shown a significant decrease over the past fifty years. However, studies conducted between 1998 and 1991 revealed alarming statistics, with 45.3% of children and adolescents exhibiting carious teeth and 93.8% experiencing coronal and root caries in adults. These findings emphasize the need for preventive dentistry and comprehensive strategies to combat dental caries effectively².

Emerging Methods to Prevent and Reverse Caries

In this section, we explore various emerging methods and agents that show promise in preventing and reversing dental caries. These methods can be categorized as follows:

Polyols

Polyols, such as xylitol, sorbitol, saccharin, and aspartame, are sugar substitutes used in products like sweets, candies, chewing gum, oral hygiene products, and pharmaceuticals to reduce the occurrence of dental caries².

Dicalcium Phosphate Dihydrate (DCPD) DCPD, an acidic calcium phosphate phase, has been proposed as a precursor to hydroxyapatite formation in teeth and other calcified structures³.

Alpha-Tricalcium Phosphate (α -TCP) Studies have shown that α -TCP-fortified acidic gum increases plaque fluid and saliva calcium and phosphate levels, aiding in the deposition of acid-labile plaque deposits⁴.

Calcium Carbonate

Calcium carbonate, used as an alkaline buffering agent and abrasive in dentifrice, has shown efficacy in inhibiting enamel demineralization⁵.

CPP-ACP

Research has indicated an inverse association between plaque calcium and inorganic phosphate levels and caries experience. CPP-ACP, a calcium phosphate compound, has shown potential in preventing and treating dental caries⁶.

Tooth Mousse

Tooth mousse, when applied before bedtime or as part of an intensive treatment, has demonstrated effectiveness in preventing and treating dental caries. It is recommended for various clinical applications, such as white spot prevention, post-orthodontic treatment, dentinal hypersensitivity, and erosion and incipient carious lesions⁷.

Polymers

Certain polymers, previously studied as thickening agents in saliva substitutes, have shown potential in their caries-protective properties, affecting the growth,

dissolution, and remineralization of hydroxyapatite crystals⁸.

Metals

Several metals have been investigated for their potential caries-preventive effects through various tests, including animal caries models, in situ studies, and epidemiological studies⁹.

Miscellaneous Agents

Various miscellaneous agents, including citrate, have demonstrated activity in animal caries studies and plaque acid clinical trials, suggesting their potential in caries prevention¹⁰.

Antimicrobials

Antimicrobial therapy, such as chlorhexidine, triclosan, classical antibiotics, cetylpyridinium, and sanguinarine extract, plays a crucial role in eliminating cariogenic bacteria and preventing dental caries¹¹.

Smart Materials

Smart materials are designed to inhibit or decrease secondary caries activity near restorations by releasing specific components. Examples of smart materials include ACP-filled methacrylate composites, CPP-ACP incorporated glass ionomer cement, and hydroxyl ion-releasing composite¹².

Lasers

Dental lasers have been studied for their effects on hard dental substrates. Ruby laser irradiation, for instance, has been shown to increase enamel acid resistance and has been used for removing carious enamel and dentin. Other types of lasers, such as carbon dioxide (CO₂) lasers, have been utilized for dental caries prevention¹³.

Ozone Therapy

Ozone therapy is a novel approach for treating caries by eliminating cariogenic bacteria. Ozone, a powerful oxidant, can destroy bacterial cell membranes and has

been investigated for its potential use in caries treatment¹⁴.

Chewing Gum Chewing gum has a long history and has been linked to dental caries due to its initial sweetened content. However, certain chewing gum properties have been claimed to have positive effects, such as removing food debris and plaque, stimulating saliva flow, raising plaque pH, promoting remineralization ion, and reducing gingivitis¹⁵.

Herbal Products

Certain herbal products have demonstrated anti-cariogenic effects. *Salvadora persica* L. (Miswak), for example, has been shown to reduce plaque formation and caries progression due to its fluoride content and saliva-stimulating properties. Additionally, various culinary herbs have shown potential in preventing dental caries, although further research is needed¹⁶.

Conclusion

While fluoride has been widely used in preventing dental caries, concerns have arisen regarding its potential adverse effects and limited efficacy on certain tooth surfaces. It has explored alternative fluoride-free methods for caries prevention, offering potential solutions for public health measures. Further research and development are necessary to enhance the effectiveness of these emerging methods and ensure improved oral health for all.

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