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THE ROLE OF MOUTH RINSES IN TREATMENT OF ORAL AND PERIODONTAL DISEASE, A SYSTEMATIC REVIEW ARTICLE

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ABSTRACT

Periodontal disease is a distinctive multi-factorial infectious condition that can affects humans at any age and if untreated results in destruction of dental attachment apparatus, alveolar bone break down and tooth loss. Although the etiology of periodontal diseases has focused on bacteria that can colonize around the tooth, several studies have demonstrated the additional role of environmental, behavioral, and genetic risk factors in periodontal disease progression. Since the nature of the disease is infectious, chemical agents are used for prevention and treatment of the disease. This Medline based systematic review represents the role of antiseptic chemical agents in controlling gingival and periodontal inflammations.

INTRODUCTION

Gingival and periodontal diseases have afflicted humans since the beginning of mankind. The earliest historical records that involve medical issues reveal an understanding of oral and periodontal disease and the need for treatment. The etiology of gingivitis and periodontitis are related to the presence of oral bacteria attached to the tooth and gingival tissue. These pathogens produce destructive enzymes such as collagenase, hyaluronidase, protease, chondroitin sulfatase and endotoxin that are responsible for damaging the epithelial and connective tissue cells. These microbial products activate monocytes and macrophages to produce vasoactive substances such as prostaglandin E2, interferon, tumor necrosis factor and interleukin-1. The resulting inflammatory processes are usually presented as gingival redness, bleeding, pain and enlargement [1, 2]. Table 1 shows the main periodontal pathogens and a brief explanation of their properties.

Clinically healthy gingiva in an individual with excellent oral hygiene and the lack of dental plaque and calculus who receives brushing and flossing meticulously on a regular basis is pink in color, no swelling, no inflammation, and is totally attached to the underlying bone, with no bleeding. Periodontal diseases usually start by size, color and texture alterations of the gingiva, e.g. redness and swelling, as well as an increased tendency to bleeding during brushing and flossing. In addition, the periodontal tissues may exhibit tissue recession and reduced resistance to routine masticatory pressures. Advanced stages of the disease may be associated with pain, increased tooth mobility and breath malodor. Usually at this stage patients become aware of the disease and visit the dentist or periodontologist for the treatment [3, 4].

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CHEMICAL AGENTS IN PERIODONTAL TREATMENT

The term chemotherapeutic agent generally is used to describe a chemical substance that provides clinical therapeutic properties. It does not specify or explain how the agent acts in achieving a clinical benefit. Clinical benefits can be derived through several mechanisms of actions like antimicrobial, anti-inflammatory or dental plaque removing properties of the agent. An antiseptic is a chemical antimicrobial agent that is used topically or subgingivally for destroying bacteria or inhibiting their function. They can also be applied on mucous membranes, wounds, or other intact dermal surfaces. In dentistry, several antiseptics are used as a part of oral rinses, gels, toothpaste, varnishes and dentifrices for their antiplaque

and antigingivitis properties. In periodontal treatment for reducing the number of bacteria present in the diseased periodontal tissues chemotherapeutic agents can be administered orally or locally. Systemic administration of these agents may be an effective strategy in controlling periodontal infection because bacteria can invade periodontal tissues and the physical therapy would be ineffective when used alone [5, 6]. Table 2 shows the main antiseptics that have been used in periodontal therapy.

1. Bisbiguanide antiseptics

Chlorhexidine was first manufactured in the 1940s by Imperial Chemical Industries, England, and used as an antiseptic for skin injuries and wounds in 1954. The most useful form of this agent is digluconate salt which is used in most oral formulations and products as a 12- 20% concentrate. Chlorhexidine is the most effective antiseptic for controlling dental plaque and preventing gingivitis but it should be noticed that it cannot be a replacement for mechanical oral hygiene practices. Like other antiseptics it is prescribed for a limited duration following surgical versus non-surgical treatment for controlling the periodontal status. Chlorhexidine is available in several commercial products such as mouthrinse, irrigator, spray, gel and various other topical supplements. The Plaque inhibitory effect of chlorhexidine was investigated in 1969 by Schroeder, but the original research on periodontal effect of this miracle agent was performed by Loe and Schiott in 1970. Their results showed that rinsing for 60 seconds twice per day with 10 ml of a 0.2% chlorhexidinegluconate solution in the absence of normal tooth cleaning, inhibited dental plaque formation and the development of gingivitis. Numerous studies was followed, concluded that chlorhexidine is one of the most useful compounds in dentistry for it's anti-plaque and anti-gingivitis properties. The main principle that has made chlorhexidine to be the gold standard and the first mouthwash of the choice is high substantivity (duration of activity in the mouth after rinsing) which is considered to be about 8 to 12 hours. Chlorhexidine mouthwash has some side effects such as brown discoloration of teeth, tongue and some restorative materials, taste perturbation, oral mucosal erosion, unilateral or bilateral parotid swelling and supragingival calculus formation [7- 11].

2. Quaternary ammonium compounds

Cetylpyridinium chloride is the most useful and studied agent from this group of antiseptics and is used in a wide variety of mouth rinse products, usually at a concentration of 0.05%. The substantivity of cetylpyridinium chloride is only 3-5 hours because of rapid absorption in the mouth after rinsing, so the frequency of using this agent should be four times per day. Cetylpyridinium chloride has some chemical plaque-inhibitory action but evidence for anti-gingivitis properties is not obvious. It is usually formulated as mouthwash and there is limited information on quaternary ammonium compounds in toothpastes and very few products are available [12 -15].

3. Phenols and essential oils

The most conventional antiseptic in this group is a *trichlora-2-hydroxy phenyl ether* called commercially Triclosan. It has been formulated into toothpaste and mouth rinses and and has been used for more than a 100 years. Main properties of triclosan include dental plaque inhibitory, anti-inflammatory and anti-oxidative activity that can reduce gingivitis, although it is not as efficacious as chlorhexidine. Triclosan is usually used at 0.2% concentration twice per day and has the plaque-inhibitory action and antimicrobial substantivity of around 5 hours in the mouth [16-19].

4. Fluorides

Many fluoridated supplements such as mouthrines and toothpastes are available in the oral hygiene markets nowadays. Although the caries-preventive benefits for of fluoride salts are well demonstrated but the fluoride compounds has less effect against the development of plaque and gingivitis. Among them amine fluoride and stannous fluoride has been used widely in the oral practice for both caries prevention and providing some plaque-inhibitory activity [20, 21].

5. Metal salts

The antimicrobial activity of silver, copper, zinc and tin has been appreciated for thousands of years. Persian kings used Cu and Ag for water disinfection and food preservation. Metal salts were later used by the Greeks, Romans, Egyptians and North Americans for preserving water, wine, milk and vinegar.

Formulating metal salts into oral hygiene products are difficult because the hydrolysis process that occurs in the presence of water makes the salt unstable. However stable anhydrous gel and toothpaste products are available and have demonstrated the anti- plaque and anti-gingivitis properties [22- 25].

6. Oxygenating agents

Oxygenating-agent disinfectants have been used with several purposes in dentistry, including endodontics, operative dentistry and periodontics. Hydrogen peroxide has been used for supragingival plaque control and tooth whitening in bleaching procedures. Peroxyborate and peroxycarbonate are among the most important compounds of this group that have been formulated and used as an antimicrobial and plaque-inhibitor disinfectant in several oral products. However there are little data about long-term anti-plaque activity of these agents in routine dental practice. The mechanism of action is that hydrogen peroxide (H202), is capable of diffusing across bacterial

cell membranes. Inside the bacteria, H2O2 may be further reduced to the hydroxyl radical, which can cause DNA damage [26-28].

7. Detergents

The most common ingredient in mouth rinse and toothpastes is sodium lauryl sulfate, which in addition to cleaning properties has some antimicrobial activity. Sodium laureth sulfate, or sodium lauryl ether sulfate (SLES), is ananionic detergent and surfactant found in many sanitized products such assoaps, shampoos, toothpaste, mouthwash, etc. It is also a very popular and effective foaming agent of the cleaning materials. It has moderate substantivity, measured between 5 and 7 hours, and plaque-inhibitory action similar to triclosan [29-31].

8. Natural products

Natural herb and plant extracts have been used in traditional oral medicine for treating gum diseases for many centuries. The most important herbs that have been used as an oral mouth rinse with anti-plaque and anti-inflammatory effects include *Vincarosea, Azadirachta indica, Citrullus colocynthis, Cucumis sativus, Sanguinaria Canadensis, Juniperus communis var. saxatillis, Gymnosporia spinosa, Borreria articularis, Spermacoce hispida, Salvia officinalis, Camellia sinensis, Rosa Damascena and Crocus sativus*[32-37].

Table 1. Main periodontal pathogens and their characteristics

Name of pathogen	Special pathogenic characteristics
Aggregatibacter actinomycetemcomitans	Small, short, straight or curved rod with rounded ends. It is nonmotile and gram negative. It possesses a number of virulence factors, including endotoxin, leukotoxin, collagenase, and protease.
Tannerella forsythia	Nonmotile, spindle-shaped, highly pleomorphic rod and gram-negative obligate anaerobe. It has several destroying proteolytic enzymes that are able to induce apoptotic cell death.
Porphyromonas gingivalis	A nonmotile, pleomorphic rod and gram-negative obligate anaerobe. It is an aggressive periodontal pathogen. These species produce a series of virulence factors, including fimbriae, capsule, many proteases, a hemolysin, and a collagenase.
Prevotellaintermedia and Prevotellanigrescens	Short, round-ended, nonmotile, gram-negative rods. Prevotella species are less virulent and less destructive than P.gingivalis.
Spirochetes	Spiral, motile, helical gram negative rods. Main species include Treponemadenticola, Treponemavinccentii and TreponemaSocranski. They have the ability to invade both the epithelium and the connective tissue, degrade collagen and dentin and produces proteolytic enzymes.

Table 2. Main antiseptic groups that has been used in periodontal therapy

Category	Example of Supplement	Mechanism of action
Bisbiguanide antiseptics	Chlorhexidine	Antimicrobial
Quaternary ammonium compounds	Cetylpyridinium chloride	Antimicrobial
Phenols and essential oils	Thymol Ecalyptol Triclosan	Antimicrobial Anti-inflammatory
Fluorides	Sodium fluoride Stannous fluoride	Antimicrobial
Metal salts	Tin, Zinc, Copper	Antimicrobial
Oxygenating agents	Hydrogen peroxide	Antimicrobial plaque removal
Detergents	Sodium lauryl sulfate	Antimicrobial
Natural products	Sanguinarine Salvadorapersica Green tea Saffron	Antimicrobial Anti-inflammatory

CONCLUSION

This article reviewed all antiseptic chemical agents that has been used in the past and present for supragingival plaque control in the prevention of gingivitis and thereby the occurrence of periodontal diseases. It should be noted that in treating periodontal infections due

to the extent and severity of the disease several surgical versus non-surgical strategies should be applied and the above mentioned chemical antiseptics have the adjunct treatment role.

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DECLARATION OF INTEREST

The author confirms that this article content has no conflict of interest.

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