Delmopinol – An antiplaque agent

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Abstract

Dental plaque is the sole reason for dental caries and periodontal disease. Few antibacterial agents might counterbalance the inadequate mechanical plaque removal. Antimicrobial agents are best indicated in secondary and tertiary prevention as the objectives are to restore health and to prevent disease recurrence. The rationale behind it is to prevent or delay subgingival recolonization by pathogenic microorganisms. Delmopinol is a chemical plaque control agent which can be used as an adjunct to mechanical plaque control. It is an antiplaque agent that aids in reduction of plaque and gingivitis while possessing the property of inhibiting the adhesion of oral microorganisms to the tooth surface. Long term use of such compound can preserve the biological environment of the oral cavity.

Keywords: Delmopinol, dental plaque, pathogenic microorganisms.

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INTRODUCTION

Dental plaque management is critical in the prevention of carious teeth as well as periodontal disease. In this case, chemical plaque treatment might be a valuable supplement to mechanical plaque management. The active medications should inhibit biofilm development while maintaining the biological equilibrium of the oral cavity. Depending on the aims of the preventative measures, several tactics may be implemented. Anti-plaque agents having properties other than bactericidal/static action may be used in primary prophylaxis. A small antiplaque action may be adequate or even advantageous in this scenario, as it decreases the active agent's negative effects. Antimicrobial medications are best indicated in prevention since the aims are to restore health and prevent sickness recurrence. The objective is to prevent or postpone the recolonization of the subgingival space by pathogenic bacteria. In vitro oral biofilm models have been a big step forward in the discovery of oral anti-plaque drugs in recent years. In these investigations, chlorhexidine, delmopinol, triclosan, amine and stannous fluoride, hexetidine, and phenolic compounds etc; were found to reduce biofilm development and maturation while also affecting bacterial metabolism.

Plaque on the teeth creates a unique habitat. It's a microbial biofilm, which consists of a varied microbial colony embedded in a matrix of bacterial and salivary polymers on the tooth surface. The biofilm consists of a thin basal layer on the substratum that is in contact with, and occasionally penetrates, the acquired enamel pellicle, as well as columnar, mushroom-shaped multibacterial extensions into the solution lumen, separated by empty or filled with extracellular polysaccharide regions ("channels"). Bacteria in a biofilm communicate with one another through chemical signals. These chemical signals cause the bacteria to produce potentially harmful proteins and enzymes. There are many plaque models and anticalculus medications available, as well as information on the location, content, morphology, and generation of dental calculus.18

Plaque can build on the supragingival and subgingival surfaces of the teeth. The creation of plaque is a three-step process. Microorganisms that cling to pellicle formation, flourish, and form colonies are known as pioneer microorganisms. The last stage is the accretion of filamentous organisms and spirochetes hooked on an interconnected biofilm. When plaque bacteria's products reach subepithelial tissue they cause inflammatory responses like the increased vascularity and leucocyte diapedesis. Plaque can solidify into calculus, a mineralized mass, on both the supragingival and subgingival levels. Bacteria can be discovered on the exterior of calculus, causing inflammatory responses to get worse. A good oral antiseptic should work against a varied spectrum of Gram positive & negative bacteria which includes streptococci and fusobacteria.19

Techniques targeted at minimizing supragingival and subgingival tooth plaque are most effective in gingivitis and periodontitis. Certain antibacterial medications may be able to compensate for poor self-performed mechanical plaque eradication. Other preventative therapies have an antibiotic effect on oral bacteria, but the new ingredient delmopinol prevents oral microorganisms from sticking to the tooth surface. Delmopinol has been found in a number of studies to minimize plaque development. It cannot be considered a chlorhexidine alternative at this time because to its low efficacy and side effects that are equivalent to chlorhexidine's. Delmopinol might be used in conjunction with mechanical plaque therapy for a long period. There have been no studies comparing the effectiveness of delmopinol to other antibacterial chemicals such amine or stannous fluoride, triclosan, copolymer or cetylpyridinium chloride.

Delmopinol hydrochloride is a surface active antimicrobial that has limited antibacterial properties (Simonsson et al, 1991). Rundegren et al (1992) and Steinberg et al (1992) found that delmopinol interacts with pellicle components and inhibits glucan synthesis in Streptococcus mutans (1992). Delmopinol has been shown to reduce plaque formation and eliminate existing plaque in vitro experiments (Simonsson et al, 1991). Delmopinol exhibited a bactericidal effect on both adherent and planktonic bacteria in another study using Streptococcus sanguinis as the target microbe, but had no effect on the overall quantity of bacterial cells sticking to glass surfaces (Burgemeister et al, 2001). The potential of Delmopinol to decrease bacterial acid generation is fascinating for prevention of dental caries (Simonsson et al, 1991). Delmopinol has been shown in both short and long-term clinical tests to have modest anti-plaque and anti-gingivitis effects (Collaert et al, 1993; Collaert et al, 1994; Claydon et al, 1996; Lang et al, 1998). When compared to chlorhexidine, delmopinol had lower stain and calculus scores.

Trade Name

Under the trademark Decapinol®, Sinclair Pharmaceutical Limited, later renamed Sinclair IS Pharma, was the first to commercialise delmopinol-containing oral hygiene products (London, United Kingdom). Decapinol® was first offered in many European Union countries, and it was approved as a medical device by the US Food and Drug Administration in 2005 for use in oral hygiene products (FDA 2005a,b). 4 Delmopinol hydrochloride is a medical device that operates by physically interfering with the formation of dental plaque and biofilms, as well as oral bacteria attachment to teeth. Clinical investigations showed that when used as instructed with prescribed right brushing and flossing techniques, an oral rinse containing 0.2 percent delmopinol can decrease gingivitis by up to 60% compared to no treatment at all. Delmopinol is amphiphilic, which means it has both polar and nonpolar ends. It acts as a surfactant, reducing the viscosity of solutions and interfering with colloidal structure (Klinge, Matsson, Attström, Edwardsson, & Sjödin, 1996; Simonsson, Arnebrant, & Petersson, 1991).

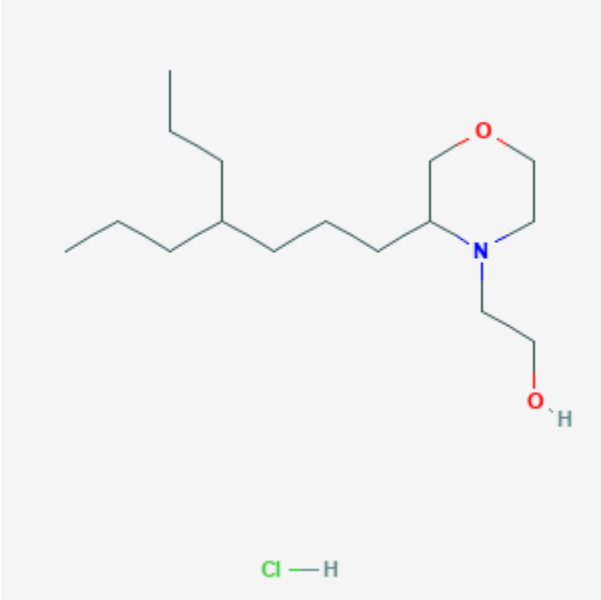
PerioShield, has shown to effectively interfere with the mechanism of plaque and biofilm adherence and to manage gingivitis which contains 0.2% delmopinol hydrochloride.

Composition of Perioshield delmopinol mouthrinse are:

1. Delmopinol hydrochloride (0.2%)
2. Water
3. Alcohol
4. Sodium saccharin
5. Sodium hydroxide
6. Flavors

Chemical Structure

Delmopinol hydrochloride ((3-(4-propylheptyl)-4-morpholinet hanol); molecular formula: C16H33NO2), molecular weight of 307.9, is an antiseptic & an oral hygiene compound that is useful as an antimicrobial agent.



C16H33NO2.ClH

Commercial mouthwashes contain molecules obtained from antiseptic, disinfection, and preservation studies. The active chemical agents (biocides) are then mixed together in multiple ways to be employed in mouthwash formulations that should, in general, have the following characteristics:

1. Effective against microorganisms that cause sickness.
2. Resistant to the local effects of disease-causing behaviours
3. Disrupts the influence of dental plaque without affecting the healthy oral flora
4. It is safe to use for both humans and the environment.
5. Adverse effects are kept to a bare minimum and are reversible.
6. Delightful flavor[20]

Moa

It generates an environment in which plaque biofilm and bacteria are unable to attach. It is effective at several phases of the process:

1. Disrupts the current plaque matrix by lowering glucan viscosity and loosening plaque cohesive characteristics, making it easier to physically remove plaque. (5,6,7)
2. Reduces the production of salivary pellicle on clean surfaces, which is necessary for bacterial adhesion to the teeth and the gingiva. (8,9)
3. Prevents pioneer bacteria from adhering to salivary pellicle on tooth and gingival surfaces. (10,11)
4. Reduces colonising bacteria's adhesion to the plaque matrix. (12)
5. Delmopinol has no antibacterial properties.

Synonyms

(R)-delmopinol hydrochloride
UNII-4YE8BQ5PWF
4YE8BQ5PWF
Q27260669
UNII-SRE423V9Z9 component JFZBMJJFVBMZNC-PKLMIRHRSA-N

Relevant Studies

Principal investigators, study centres and study durations for studies of 0.2% delmopinol.[1]

Investigator	centre	Duration (months)
N. Lang	University of Bern Switzerland	6
A. Hugoson	Institute of Postgraduate Education Jonkoping, Sweden	2
A. Bergenholtz	University of Umea Sweden	2
R. Attstrom	University of Lund Sweden	6
P. Adriaens	University of Brussels Belgium	5
N. Claffey	University of Dublin Ireland	3
M.Addy	Cardiff Dental School Wales	6
D. van Steenberge	University of Leuven Belgium	3

Properties

Delmopinol is used for various purposes, including the following:

1. It has anti-plaque characteristics and is used as a mouth rinse to prevent plaque biofilm development.

Antimicrobial characteristics are number two.

2. The ability to reduce inflammation.
3. It has antiviral characteristics.

Also, used in;

1. As a disinfectant in skincare.
2. Hospital skin dressings.

Side Effects

Users of Delmopinol mouth rinse reported paraesthesia, altered taste sensation and oral mucosa discoloration. The longest studies showed some reduction in unfavourable effects throughout the 3 to 6 month visit. In contrast, Hase and his colleagues were unable to uncover the same trend.2

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