



**Review Article**

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## Importance of Chlorhexidine in Maintaining Periodontal Health

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### Abstract

Plaque is responsible for periodontal diseases. In order to prevent occurrence and progression of periodontal disease, removal of plaque becomes important. Mechanical tooth cleaning aids such as toothbrushes, dental floss, interdental brushes are used for removal of plaque. However, in some cases, chemical agents are used as an adjunct to mechanical methods to facilitate plaque control and prevent gingivitis. Chlorhexidine (CHX) mouthwash is the most commonly used and is considered as gold standard chemical agent. In this review, mechanism of action and other properties of CHX are discussed.

**Keywords:** Plaque, Chemical agents, Chlorhexidine (CHX).

### INTRODUCTION

Dental plaque is primary etiologic factor responsible for gingivitis and periodontitis<sup>[1]</sup>. Mechanical plaque control using toothbrushes, interdental brushes, dental floss prevent occurrence of gingivitis. However, in majority of population, mechanical methods of plaque control are ineffective due to less time spent<sup>[2]</sup> for plaque removal and lack of consistency. These limitations necessitate use of chemical plaque control agents as an adjunct to mechanical plaque control.

Among various chemical agents, chlorhexidine (CHX) is considered to be a gold standard chemical agent for plaque control. Its structural formula consists of two symmetric 4-chlorophenyl rings and two biguanide groups connected by a central hexamethylene chain.

### Mechanism of action for CHX

CHX is bactericidal and is effective against gram-positive bacteria, gram-negative bacteria and yeast organisms. CHX is a base and is stable in form of salt. The most common oral preparation, CHX digluconate, is water soluble and at physiologic pH readily dissociates to produce cationic molecule. This cationic molecule binds to negatively charged cell walls of microbes and alters osmotic equilibrium within cell<sup>[3]</sup>. At low concentrations, potassium and phosphorous leaks out of cell. At high concentrations, cell death occurs due to precipitation of cytoplasmic contents<sup>[4]</sup>. CHX has substantivity due to which it is effective in reducing number of micro-organisms for prolonged periods. Substantivity is defined as the prolonged adherence of the antiseptic to the oral surfaces (teeth and mucosa) and its slow release at effective doses that guarantee the persistence of its antibacterial activity<sup>[5]</sup>.

CHX inhibits plaque formation by binding to anionic salivary glycoproteins and bacteria thereby preventing their adsorption on tooth surface<sup>[6]</sup>. Rinsing twice daily with 0.2% CHX and topical application once daily of a 2% solution of CHX prevent plaque formation. Single application of CHX has anti plaque action till 24 hours<sup>[7]</sup>. CHX has strong affinity for mucous membranes<sup>[8]</sup>. CHX prevents formation of new plaque, but is ineffective on preformed plaque<sup>[9]</sup>.

### Indications of CHX

CHX is effective in plaque control when mechanical plaque control measures are abstained after oral surgery or periodontal surgery<sup>[10]</sup>. CHX reduces plaque load during orthodontic treatment<sup>[11]</sup> and intermaxillary fixation<sup>[12]</sup>. CHX is useful in physically and mentally handicapped individuals<sup>[13]</sup>.

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CHX is effective in preventing infections such as candidal infections in medically compromised persons [14]. CHX is used in treatment of denture stomatitis<sup>[15]</sup> and minor recurrent aphthous ulcers [16]. CHX rinsing<sup>[17]</sup> and supragingival irrigation decrease occurrence of bacteremia. Single rinse with CHX reduces bacterial content in aerosols generated during use of ultrasonic scalers and air rotor hand pieces<sup>[18]</sup>.

#### Various forms of CHX

CHX is available as mouthwashes<sup>[19]</sup>, sprays<sup>[20,21]</sup>, chips<sup>[22]</sup>, gels<sup>[20,3]</sup> and varnishes [24,25]. CHX mouthwash is the most commonly used. Spray is good option in mentally or physically handicapped individuals with same efficacy as that of CHX mouthwash [20,26]. However, anti-plaque activity of 0.2% CHX mouthwash is significantly higher than 0.2% and 0.12% CHX sprays [27]. CHX chips are used as local drug delivery system as an adjunct to scaling and root planing. Bioresorbable CHX chips contains 2.5 mg CHX. No effect<sup>[28,29]</sup> to significant effect<sup>[30,31]</sup> is reported with adjunctive use of CHX chips along with SRP. Subgingival CHX gel is used as adjunct to SRP, but does not have any additional effect in treatment of chronic periodontitis patients<sup>[32]</sup>. CHX varnishes proves to be beneficial as an adjunct to SRP [24,25].

CHX mouthwash is commercially available in two concentrations i.e. 0.12% and 0.2%. Although concentration of two commercially available products is different, the total amount of CHX is same. 10 mL of 0.2% CHX contains 20 mg per volume and 15 mL of 0.12% CHX contains 18 mg per volume.

#### Side effects of CHX

Staining is the most common side effect. Other less common side effects include taste alterations especially salt and bitter<sup>[33]</sup>, erosions of mucosa. CHX promotes formation of supragingival calculus [34]. CHX causes neurosensory deafness on introduction to middle ear<sup>[35]</sup>.

#### Mechanism for CHX staining

It is postulated that release of parachloraniline due to degradation of CHX, catalysis of Maillard reaction, formation of metal sulphide<sup>[36]</sup> and precipitation of anionic dietary chromogens is responsible for staining<sup>[37]</sup>. Discoloration of tooth surfaces caused by CHX is extremely tenacious and professional tooth cleaning using abrasives is necessary to completely remove it. Staining varies between individuals and is influenced by concentration of CHX<sup>[38]</sup>.

Staining is reduced by avoiding intake of foods and beverages containing chromogens just after using CHX. CHX mouthwash is recommended at night just prior to sleeping .

In order to overcome staining, CHX mouthwash with antidiscoloration system (ADS) is available. The ADS comprises of ascorbic acid and sodium metabisulfate. One study reported less staining and similar anti-plaque and anti-gingivitis action in individuals using CHX with ADS<sup>[39]</sup>. However, study also reported reduced efficiency of CHX with ADS<sup>[40]</sup>.

#### CONCLUSION

CHX is effective antimicrobial agent with plaque inhibitory effects. It is available in various forms. It is indicated as an adjunct to mechanical methods in cases where plaque removal is not adequate. However, due to its side effects such as staining and taste alterations, patient compliance is affected. Tooth staining can be minimized with use of CHX just before sleeping. Staining is less with use of ADS, but its effect on efficacy of CHX is controversial. Further studies are required to prove effectiveness of CHX with ADS.

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