

Characteristics, Uses and Side effects of Chlorhexidine- A Review

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Abstract:

Aim: To review about the Chlorhexidine as Mouth Wash. Also to review about the mechanism of Chlorhexidine.

Background: Chlorhexidine is one of the most commonly used antiseptic agent. It has long lasting antibacterial activity with a broad spectrum of action. It is used to reduce bleeding, gingival inflammation and plaque. CHX is available as mouthwash, gel, aerosol, spray. Chlorhexidine is antimicrobial agent. It is cationic bisbiguanide with broad antibacterial activity, low mammalian toxicity and strong for binding to skin and mucous membranes. Chlorhexidine has a wide spectrum of activity encompassing gram positive and gram negative bacteria, yeasts, dermatophytes and some lipophilic viruses. The mechanism of action of Chlorhexidine proposed by Russel & Chopra. Chlorhexidine shows different effects at different concentrations; and lower concentrations the agent is bacteriostatic, whereas at higher concentrations the agent is rapidly bactericidal. This review will talk about the Chlorhexidine molecule and its role in periodontal health and the complications it has for the same.

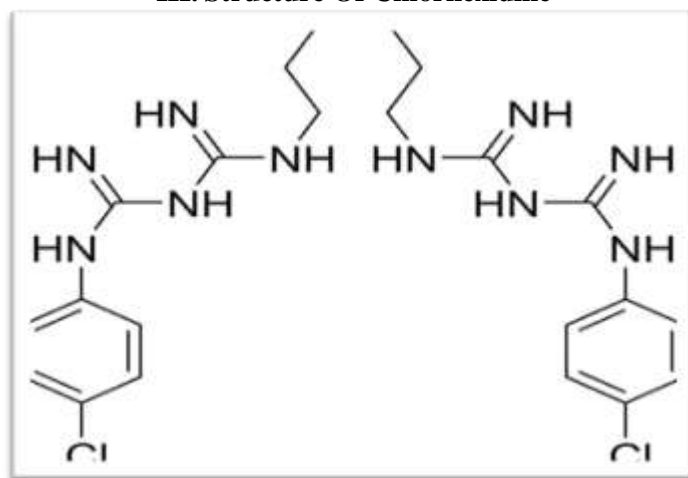
I. Introduction

Dental plaque is the major etiological agent for the initiation of gingivitis^[1]. If left untreated it can progress to periodontitis^[2]. Though Mechanical plaque control has become the corner stone of periodontal therapy, the omnipresent prevalence of gingivitis suggest at ineffective mechanical plaque debidement^[2]. Another disadvantage of mechanical plaque control is that it addresses only the non shielding surface of teeth^[3] whereas periodontal pathogens accumulate in the tissue surfaces^[4]. Hence arises the need for antimicrobial formulations for daily self care oral hygiene^[2]. Among the available mouthwashes, Chlorhexidine is found to very effective. Chlorhexidine is considered as a gold standard and has substantivity for a period of 10-12 hours^[5].

II. History Of Chlorhexidine

Chlorhexidine has been in use for almost 60 years and has been used in more than 60 pharamceuticals and medical devices. It was marketed as a general antiseptic in the year 1950. In 1954, The Imperial Chemical industries limited developed the Chlorhexidine.. In 1957, it was introduced for human use in Britain as an antiseptic for skin. Plaque inhibiting action of Chlorhexidine was first investigated by Schroeder^[6].

III. Structure Of Chlorhexidine



Chlorhexidine is a symmetrical molecule. It has four chlorophenyl rings and two bisguanide groups connected by a central hexamethylene bridge^[7].

IV. Characteristics Of Chlorhexidine

Chlorhexidine is one of the most commonly prescribed antimicrobial agents in the dental field. It has a long lasting antibacterial activity with a broad-spectrum of action and it has been shown to reduce plaque accumulation, gingival inflammation and bleeding^[8]. It is cationic bisguanide with broad antibacterial activity, low mammalian toxicity and a strong affinity for binding to skin and mucous membranes^[7]. The compound is strongly base & dicationic at pH levels above 3.5 with positive charges on either side of hexamethylene bridge. The dicationic nature of chlorhexidine attributes to its affinity with anions.

V. Mechanism Of Action Of Chlorhexidine

The Cell wall of bacteria is negatively charged and it also contains sulphates and phosphates. The Chlorhexidine which is cationic molecule positively charged is rapidly attracted towards negatively charged bacterial cell wall with specific and strong adsorption to phosphate containing compounds. The dicationic CHX molecule attaches to the pellicle by one cation, to the bacteria attempting to colonize the tooth surface with the other, This is called "Pin cushion effect". This interaction alters the integrity of the bacterial cell membrane and chlorhexidine is attracted towards inner membrane. Chlorhexidine binds to phospholipids in the inner membrane, which leads to increased permeability of inner membrane and leakage of low molecular weight compounds such as potassium ions. At this Bacteriostatic stage, the effects of chlorhexidine are reversible i.e. Removal of excess chlorhexidine by neutralizers allows bacterial cell wall to recover^[7]. There is a progressive damage to the membrane by increasing the concentration of chlorhexidine.

VI. Side Effects Of Chlorhexidine

The common side effects of Chlorhexidine as discolouration of mouth, increase of Tartar formation on the teeth, taste problems such as decreased taste or change in taste, tooth discoloration^{[9][10]}. The Brownish discolouration of teeth is known as Maillard reaction. The serious side effects of Chlorhexidine are mouth ulcer, white patches or sores inside the mouth or on the lips, swelling of salivary glands, signs of an allergic reaction which may include difficulty in breathing or swelling of face, lips, tongue and throat^[11]. Immediately after brushing using of chlorhexidine reacts with anions of the toothpaste and reduces the antimicrobial activity.

VII. Available Forms

Chlorhexidine is available in mouthrinses in form of 0.2% and 0.12%. The rinsing time is about 30-60 seconds depending on the rate of adsorption^[12]. The plaque inhibiting effect of a 0.2% chlorhexidine with rinsing time of 15, 30, 60 seconds which is followed by 72 hours of not brushing showed a great difference in plaque when compared to non use^{[13],[14]}. Chlorhexidine is also available in 1%, 0.2%, 0.12% which are delivered in trays and toothbrushes which are useful to reduce staining^[15]. Chlorhexidine is also available in the form of both pastes with 0.12% of CHX with 1 ppm (parts per million) of fluoride and also possesses similar action of Mouthwash^[5]. Other forms include sprays (0.1% and 0.2%) and varnishes^[16,17,18]. An interesting presentation form of chlorhexidine is sugar free chewing gums with 20 mg of chlorhexidine diacetate^[19].

VIII. Use In Other Branches

Chlorhexidine can be applied clinically as antimicrobial agent during all phases of root canal preparation, including the disinfection of operatory field; during enlargement of the canals orifices; removal of necrotic tissues before performing the root canal length determination; in the chemomechanical preparation prior to the foraminal patency and enlargement; as an intracanal medicament alone or combined with others for modelling the main gutta percha cone; in the removal of gutta percha cones during retreatment and in the disinfection of prosthetic spaces^{[20],[21]}. CHX has been recommended as an alternative to NaOCl, especially in cases of open apex, root resorption, foramen enlargement and root perforation, due to its biocompatibility, or in cases of allergy related to bleaching solutions^{[22],[23]}. The main feature is canals medicated with CHX do not affect negatively the ability of root fillings to prevent fluid penetration into the root canal system through the apical foramen^[24].

IX. Conclusion

Chlorhexidine's antiplaque effect is a result of the dicationic nature of chlorhexidine molecule, which affords the agent property of persistence of antimicrobial effect at the tooth surface, through both bactericidal and bacteriostatic effects^[19]. By understanding how the chemical properties of the chlorhexidine molecule can explain plethora of clinical efficacy and safety data, the use of chlorhexidine can be optimally aimed towards the patient groups who would most benefit from the superior therapeutic effect of agent. Specifically, chlorhexidine would seem to be most of value to patients in whom the ability to perform adequate oral hygiene procedures has been compromised^[25]. In these individuals the delivery of the correct dose of chlorhexidine to tooth surface can be optimized through the judicious use of the several different chlorhexidine formulations available.

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