

OCTENIDINE DIHYDROCHLORIDE AS NOVEL MOUTHWASH FOR PLAQUE CONTROL -A NARRATIVE REVIEW**Dr. Anusha D.*¹, Dr. Suchetha Aghanashini², Dr. Sapna Nadiger³, Dr. Darshan Basavaraj Mundinamane⁴,
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ABSTRACT

Gingivitis is caused by plaque accumulation on the surface of the tooth or tooth supporting structures. Local and systemic factors contribute to retention of plaque and which causes progression of gingivitis ultimately leading to periodontitis. As a matter of fact, mechanical plaque control along with chemical plaque controlling agents are the primary agents which helps in maintenance of oral hygiene. Chemical plaque controlling agents with various brand names and differing in composition like chlorhexidine, triclosan, povidone iodine, essential oils are available with anti-inflammatory and antimicrobial properties, certain drawbacks of these agents like staining of the tooth and altered taste sensation and antimicrobial resistance makes it difficult to be used on daily basis. As a result, a component named octenidine dihydrochloride is at hand with limited drawbacks compared to available components with refinement in its properties for better plaque control. This narrative review provides a brief insight on octenidine in various forms in the treatment of periodontitis.

KEYWORDS: Octenidine dihydrochloride, Plaque control, Periodontitis, Cell wall.**INTRODUCTION**

In recent years there is a decreased use of systemic antibiotics due to antimicrobial resistance, as a result topical use of antiseptics has gained popularity for more effective infection prevention. Topical antiseptics such as povidone iodine, chlorhexidine, octenidine and triclosan were most popularly used both in the medical and dental fields as an antiseptic solution for skin and mucous membranes for more than 20 years.^[1] Among these antiseptics octenidine (OCT) molecule which was introduced as early in 1980 and is effectively used in European, Australian and Asian countries for a sepsis of wound and as decontamination regime in methicillin resistant patients {MRSA}.^[2] In contrast to other antiseptics OCT was particularly efficient with a short contact time at low concentrations with antimicrobial activity and remained active up to 48 h at the sites when compared to other antiseptics.^[3,4]

In the fields of dentistry maintenance of oral hygiene by brushing and use of mouth rinses, flossing and interdental aides plays an essential role for the prevention of dental plaque formation. The successful control of dental plaque by means of mechanical measures is reliant on patients' compliance. Lack of

ability to reach the sites that are inaccessible for plaque control jeopardizes the efficacy in maintenance of oral hygiene.

Extensive studies have been conducted on various mouthwashes both in-vivo and in-vitro to determine their effect on tissues of oral cavity and against microorganisms which act by reducing the formation of biofilm. Maintenance of healthy oral flora with reducing the microorganisms responsible for disease, possess a challenge to the clinicians as Use of systemic antibiotics causes antibiotic resistant strains.^[5,6,7] Numerous commercial products are available in the market which consists Chlorhexidine (CHX), Cetyl pyridinium chloride, Essential oils (Eucalyptol, menthol, thymol,) Triclosan, Polyvinylpyrrolidone (PVP), Delmopinol and octenidine, these products produce various limitations such as altered taste sensation, staining of the teeth and exhibited increased deposition of calculus.^[8]

Hence, a great need arises for the development of antibacterial and antiadhesive agents for assistance in the control of infections associated with dental plaque accumulation with limited side effects.

Among these commercially molecules, octenidine had shown promising results in reducing microbial flora and lesser side effects. According to the study conducted by Emilson et al octenidine hydrochloride has shown to be effective in the plaque control in primates when compared to chlorexidine.^[9] The clinical trial conducted by Beiswanger et al with 0.1% octenidine mouth wash was effective in patients with gingivitis and reduced bleeding sites.^[10]

This review aims to provide a brief insight on the structure, chemical composition, mechanism of action of octenidine with advantages and its limitations in the management of plaque control.

Structure

It is a synthetic antimicrobial cationic molecule which belongs bispyridines group with a chemical formula of octenidine dihydrochloride is OCT [N, N'-(1,10 decanediyl-di-1[4H]-pyridinyl-4-ylidene)-bis-(1-octanamine) dihydrochloride], the distribution of the cationic charge is attributed due to its aminopyridine structure. This molecule lacks an amide and ester

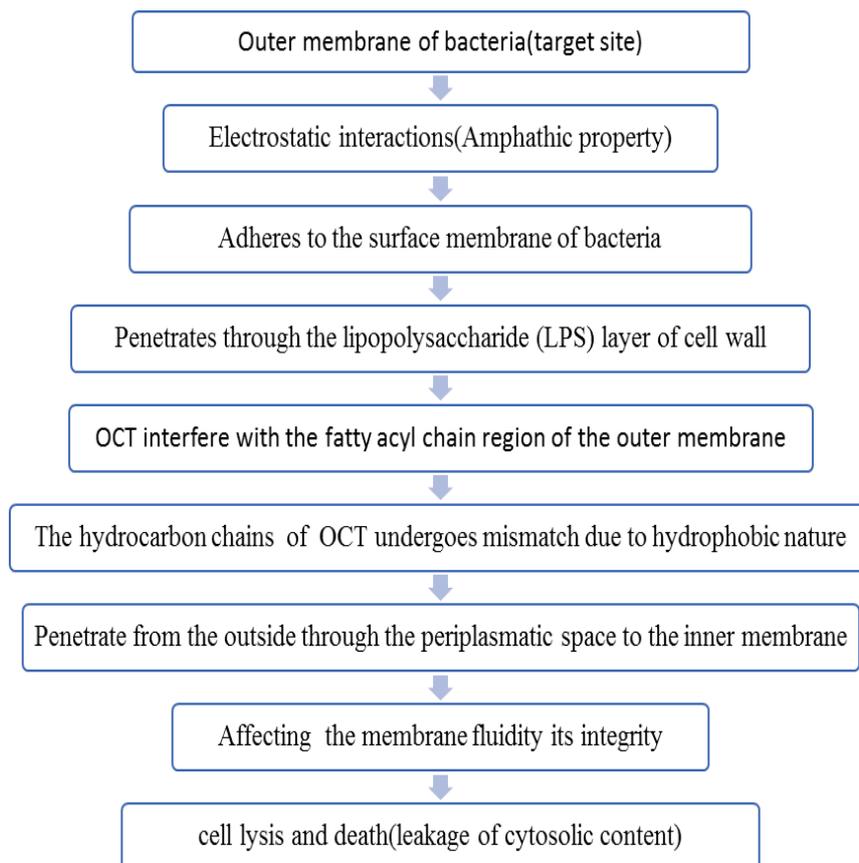
structure which differs from benzalkonium chloride and other guanidines such as chlorhexidine. The amphipathic property of the octenidine molecule is due the separation of these cationic molecules by methylene molecules. Aminopyridine has hydrophobic and hydrophilic groups, which causes breakdown of metabolites and results in lower toxicity.^[11]

Mechanism of action

Mechanism of action of octenidine dihydrochloride is attributed to its cationic molecule which has both lipophilic and hydrophilic property. Positively charged compound adheres to hard and soft tissues of oral mucosa and to the negatively charged molecules of bacterial cell wall which consists of lipopolysaccharide layer and gets ingrained in to the outer membrane and the inner membrane entering the cytosol which causes loss of cell integrity and leakage of cytosolic contents leading to lysis and cell death.^[12]

Henceforth, it is concluded that OCT acts on cell membranes where membrane contents are targets due to various electrostatic interactions.^[13]

Flow diagram of mechanism of action



Antimicrobial /antiplaque property

Octinedine shows wide range of spectrum of action on both gram positive and gram negative bacilli and cocci

and antimycotic effect on fungi and few other protozoans.

Antibacterial effect on S. aureus, MRSA and VRSA by inhibition of biofilm.^[14,15]

The ability of the antiplaque agent to adsorb on the surface of the hard and soft tissues is termed as substantivity. octenidine binds and lasts longer on the surface of tissues and shows significant inhibitory effect than chlorhexidine.^[16] Assaidian o et al conducted a study in the year 2016, and concluded that safety level is satisfactory as cutaneous application did not affect epithelial or wound tissues.^[17] commercially available 0.1 % octenidine mouthrinse (Octenidol®/OCT-MR) when compared with chlorhexidine mouthrinse was similarly effective but the bacterial was significantly low with octenidine.^[18] According to systematic review conducted by Grover et al, Octenidine inhibited plaque formation, gingivitis and staining versus placebo and was effective when compared to commercially available mouthwashes.^[19] In orthodontics and post surgical oral hygiene maintenance was one of the challenging aspects due to hinderance by appliances and inaccessibility for brush.^[20]

Effective on various organisms

Gram positive cocci

- Streptococcus mutans
- Streptococcus salivarius
- Streptococcus sanguinis
- Streptococcus aureus

Gram positive bacilli

- Lactobacilli
- Actinomyces viscosus
- Actinomyces naeslundii

Gram negative bacilli

- Fusobacterium nucleatum

Fungi

- Candida albicans
- Candida tropicalis
- Candida krusei

To summarize the advantages of octenidine in plaque control

- Substantivity
- Antibacterial and antiplaque efficacy with limited staining.
- No local or systemic toxicity (Well tolerated).
- No bacterial resistance.
- Lower cytotoxicity.
- Effective on microbial colonies by preventing coaggregation.
- Pre and post-surgical maintenance.

CONCLUSION

To conclude Octenidine meets various requisites as antiplaque and antimicrobial agent with less effects on oral tissues. But studies conducted so far are either animal studies or shortterm studies which provides less reliability to use as mouthwash as daily routine basis for long term use. Future clinical research is recommended

to meet the demands of daily of oral hygiene practice with less side effects.

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