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FORMULATION OF CHLORHEXIDINE GLUCONATE DENTAL GELS AND ITS ANTIBACTERIAL ACTIVITY

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Short Profile

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ABSTRACT:
Chlorhexidine has bacteriocidal and bacteriostatic properties also it is used to reduce oral bacteria and dental plaque. Chlorhexidine gluconate present in gel formulations possesses antibacterial activity towards the organisms present in the dental plaque. Hence, it is a new alternative and cheaper formulation for the treatment of Periodontitis.

KEYWORDS
Chlorhexidine Gluconate, Gels, Antibacterial activity.

INTRODUCTION :

Chlorhexidine Gluconate (CHG) is a class of bisbiguanide disinfectant and antiseptic which is effective against wide range of fungi, bacteria and some viruses [1]. Also it is used in prevention of plaque and gingivitis. In market, it is there in the form of oral rinse (Hexidine, Peridex) which shows antibacterial activity [2]. There is reduction in counts of certain assayed anaerobic and aerobic bacteria (54 to 97%) for continuous using for six months. Pharmacokinetics studies showed 30% of the drug is retained in the oral cavity when evaluated with the oral rinse. In oral fluids CHG released slowly [3, 4].

In the recent years, topical drug delivery shows better patient compliance [5]. Eradicating microorganisms from the periodontal pocket is a crucial task in treating periodontitis. To treat periodontal diseases, a targeting for anti-infective agent for the infection sites having effective levels for a enough time while concurrently evoking very less or no side effects is expected. For maximum benefit a novel therapeutic agents are modified as a local drug delivery system [6].

Hence, there is a need to develop oral mucoadhesive formulation using chlorhexidine gluconate as a gold standard, for the treatment of periodontal diseases and achieve oral health care standards in India.

In mouthwash chlorhexidine used as an active ingrediant, which reduce oral bacteria and dental plaque. It has bactericidal and bacteriostatic properties.[7] Also it has longer effect then any other drug when used in the mouthwashes, hence used for the treatment of the gingivitis [8] and to treat periodontal pockets equal or greater than 5 mm, chlorhexidine is also available in high concentration (36%) in a gelatin chip.

The formulated gels of Chlorhexidine gluconate using polymers which are safe physiologically were capable for sustained release properties. Hence, this leds to reduce the intake dose, minimize the blood level oscillations, adverse effects related to dose and improve the patient compliance.

MATERIALS AND METHODS

Materials

Chlorhexidine Gluconate(Loba Chemicals), Mueller-Hinton agar (Beef infusion, Casein Hydrolysate, Starch and Agar), propyl cellulose, Sodium carboxy methyl cellulose, Methyl cellulose, Propylene glycol, Methyl paraben, Propyl paraben and Chitosan all materials were purchased from Loba Chemicals, Robin Chemicals, Rolex Laboratory, Sisco Research Lab, Spectrochem, and Himedia.

Table 1: Composition of Chlorhexidine Gluconate medicated dental gels (%w/w)

Sr. No.	Ingredients	Formulation Code									
		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
1	CHX	1	1	1	1	1	1	1	1	1	1
2	Carbopol 934	1	2	-	-	0.5	-	-	-	-	-
3	Carbopol 940	-	-	1	2	-	0.5	-	0.5	-	-
4	Sodium CMC	-	-	-	-	2	2	-	-	-	-
5	HPMC	-	0.5	-	0.5	-	-	2	2	-	-
6	Chitosan	-	-	-	-	-	-	-	-	2	3
7	Mannitol	1	1	1	1	1	1	1	1	1	1
8	Menthol	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
9	Methyl Paraben	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
10	Propyl Paraben	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
11	Triethanolamine	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
12	Purified Water	Qs100ml	Qs	Qs	Qs	Qs	Qs	Qs	Qs	Qs	Qs

Methods

General procedure for formulation of gels:

Different concentrations of polymer in water were agitated over a period of 2 hours. Then chlorhexiine gluconate solution in propylene glycol was added dropwise under continuous stirring using magnetic stirrer till homogeneous gel obtained. With the help of vacuum oven the entrapped air bubbles was removed.

SL.No.	Formulation code	Zone of Inhibition(mm) *Staphylococci aureus*	Zone of Inhibition(mm) *Escherichia coli*	Zone of Inhibition(mm) *Candida albicans*
1	F1	10.50	10.65	10.45
2	F2	10.54	10.70	10.50
3	F3	10.45	10.54	10.42
4	F4	10.46	10.64	10.46
5	F5	10.24	10.42	10.12
6	F6	10.35	10.46	10.22
7	F7	10.23	10.65	10.35
8	F8	10.22	10.45	10.24
9	F9	10.42	10.12	10.10
10	F10	10.44	10.34	10.23

Table 2: Antibacterial activity of Chlorhexidine Gluconate dental gel.

General procedure for formulation of gels:

Different concentrations of polymer in water were agitated over a period of 2 hours. Then chlorhexiine gluconate solution in propylene glycol was added dropwise under continuous stirring using magnetic stirrer till homogeneous gel obtained. With the help of vacuum oven the entrapped air bubbles was removed.

Disk Diffusion Method: Required amount of starch was emulsified in a small amount of cold water, and then poured into the beef infusion followed by the addition of casein hydrolysate and agar. Volume was made upto to 1 liter with distilled water. All other ingredients were added and dissolved by heating gently with agitation. Finally, the medium was dispersed in screw- capped bottles and sterilized by autoclaving at 121°C for 20 min then poured into plates for carrying antibacterial activity [9].

Evaluation of Chlorhexidine Gluconate dental gels:

In vitro Antibacterial activity:

The antibacterial activity of all the prepared formulations was carried out using Staphylococci aureus (ATCC 25923), Escherichia coli (ATCC 8739) and Candida albicans (ATCC MYA-2876).

The results are shown in Table 2. Hence, the result shows that chlorhexidine gluconate present in gel formulations possesses antibacterial activity.

CONCLUSION

Hence, a novel oral gel formulation was successfully prepared, and from the above results we can conclude that the chlorhexidine gluconate present in gel formulations possesses antibacterial activity towards the organisms present in the dental plaque. Hence, chlorhexidne gluconate gel is a new alternative and cheaper formulation for the treatment of periodontitis.

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