



EVALUATING ANTIMICROBIAL EFFICACY OF COMMONLY USED COMMERCIALLY AVAILABLE DENTIFRICES - AN IN-VITRO STUDY.

Dental Science

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ABSTRACT

Aim: The present study was conducted to evaluate Antimicrobial efficacy of commonly used commercially available Dentifrices against plaque microflora.

Materials and methods: 3 commercially available dentifrices: Colgate Strong Teeth (0.3% Triclosan), Colgate Ved Shakti (Azadirachta Indica) and Pepsodent G-Gum Care+ (2% Zinc citrate) were included in the study. They were collected from the local medical store in Ahmedabad, India. Each dentifrice was tested at 100% concentration; plaque was used as the sample. The collected sample was cultivated in Nutrient Agar to measure the zone of inhibition of antibacterial ingredients of these dentifrices. The sample was inoculated by Streak Method and incubated at 37°C for 24 hours.

Results: This study showed that all dentifrices selected, had antimicrobial efficacy against plaque organisms, but to varying degree. Mean Zone of inhibition for Pepsodent Gum care + was 26 mm; for Colgate Total, it was 23.5 mm and for Colgate Ved Shakti, it was 22 mm. The difference shows that Pepsodent Gum care had the most antibacterial efficacy of the three.

Conclusion: The antibacterial properties of three dentifrices were studied in vitro and concluded that almost all of the dentifrices available commercially had antimicrobial efficacy.

KEYWORDS

Dentifrices, antimicrobial efficacy, plaque.

INTRODUCTION

Since the markets are flooded with variety of dentifrices, it becomes a question of dilemma for a layman, to which one should be preferred to keep the gums healthy! Hence, the present study was aimed to evaluate the antimicrobial efficacy of most commonly used commercially available dentifrices against plaque microflora.

Dental plaque is defined clinically as, "A structured resilient, yellow grayish substance that adheres tenaciously to the intraoral hard surfaces, including removable and fixed restorations."¹ Plaque is one of the main etiologies of periodontal diseases. Hence its formation should be controlled with mechanical and chemical plaque control aids.

Dentifrices are the most commonly used chemical plaque control modality. It is defined as, "A semisolid material for removing naturally occurring deposits from teeth and is supposed to be used simultaneous with a toothbrush."² The most commonly used dentifrices for plaque control includes active ingredients like Triclosan, Chlorhexidine, Hydrogen peroxide, Baking soda, Povidone Iodine, Zinc citrate, Babool extract, Chamomile and sage, Meswak extract, neem, clove oil, Azadirachta Indica.³

Chemicals, mainly triclosan and chlorhexidine have been used in mouth rinses and dentifrices to prevent plaque formation and gingivitis. But some substances showed undesirable side effects such as dental staining and altered taste. This led to paying more attention on using natural ingredients in herbal dentifrices. Herbal ingredients have several benefits. Commonly used herbal ingredients are Akarkara (anacyclus pyrethrum), Neem (azadirachta indica), Babool (acacia arabica), Haldi (cur-cuma longa) etc. Neem have antibacterial, anti-inflammatory & anti caries properties. The antimicrobial efficacy of neem has been reported against *S. mutans* and *S. faecalis*.⁴

India is a nation in which herbal products are used maximum & at the same time, Colgate Total is a household name for toothpaste; whereas Pepsodent-G Gum care+ claims to be manufactured solely keeping in mind periodontal problems. So this present study was carried out to evaluate the claims of leading brands of dentifrices that they possess

antimicrobial properties against plaque microflora.

MATERIALS AND METHOD

The study was conducted in the Department of Periodontology and Implantology, at the College of Dental Sciences and Research Centre, Ahmedabad, Gujarat in the months of November and December 2019. Sample processing and all other laboratory procedures were done at the Department of Microbiology at the College of Dental Sciences and Research Centre, Ahmedabad, Gujarat.

1. Collection of sample

Sub-gingival plaque, collected using autoclaved scalers and area specific curettes from 10 patients suffering from Chronic Generalized Periodontitis. Place it into test-tube containing Normal Saline and cover with cotton-plug.

2. Cultivation

Cultivate the collected sample in Nutrient Agar & inoculate by Streak Method and incubate at 37°C for 24 hours.

3. Dentifrices

3 commercially available dentifrices studied: Colgate Strong Teeth (0.3% Triclosan), Colgate Ved Shakti (Azadirachta Indica) and Pepsodent G- Gum Care+ (2% Zinc citrate & 0.24% sodium fluoride). They were collected from the local medical store in Ahmedabad, India. The study was aimed at knowing the anti-microbial efficacy of the dentifrices which are most commonly used. Concentration of each dentifrice used was 100%.

4. Anti-microbial assay

The anti-microbial activity of dentifrices was determined by Agar Well Diffusion method. The agar plate surface was inoculated by spreading a volume of the microbial inoculum over the entire agar surface, with the help of a sterile spreader. A Well with a diameter of 6 to 8 mm was punched aseptically with a sterile cork borer and approximately 50mg of the dentifrice at 100% concentration was introduced into the Well. Incubated agar plates were maintained at 37°C for 24 hours in McIntosh chamber using Gas Pack. The active antimicrobial agent in

each dentifrice diffused in the agar medium and inhibited the microbial growth.

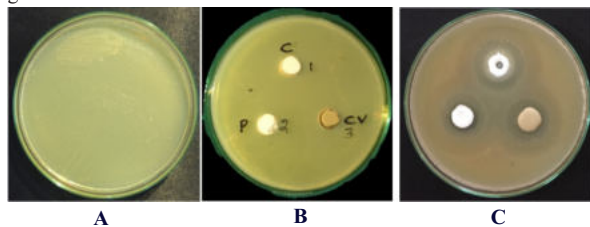


Figure 1: (A) Sub-lingual plaque cultured. (B) Wells created with dentifrices loaded C = Colgate Total, CV = Colgate Ved Shakti, P = Pepsodent-G Gum care + (C) Zone of inhibition showing antimicrobial efficacy of test dentifrices.

RESULTS

Antimicrobial efficacy was indicated by the development of clear zone (zone of inhibition) around the incubated disks after 24 hours. Of all the three dentifrices tested, the mean values obtained (Table 1) were as follows:

Table 1: Mean Values of Zone of Inhibition of Test dentifrices

Sr.No.	Test Dentifrice	Active Ingredient	Inhibition zone (Diameter in mm)
1	Colgate Total	0.3% Triclosan & 0.24% Sodium Fluoride	23.5 mm
2	Colgate Ved Shakti	Azadirachta Indica (Neem)	22 mm
3	Pepsodent G-Gum Care+	2% Zinc citrate	26 mm

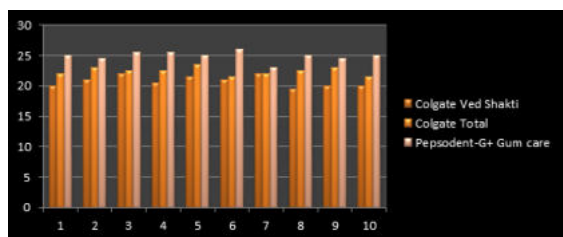


Figure 2: Bar Chart representing diameter of zone of inhibition.

Table 2: Ingredients of dentifrices

Dentifrice	Ingredients as on the Package
Colgate Total	Sodium fluoride 0.24% (0.15% w/v fluoride ion), Triclosan 0.30%, water, hydrated silica, glycerin, sorbitol, PVM/MA copolymer, sodium lauryl sulfate, flavor, cellulose gum, sodium hydroxide, propylene glycol, carrageenan, sodium saccharin, titanium dioxide
Colgate Ved Shakti	Calcium carbonate, Sorbitol, Sodium Lauryl Sulphate, Silica, Zinc oxide, Sodium silicate, Carrageenan, Sodium monofluorophosphate, Flavours, Zinc citrate trihydrate, sodium bicarbonate, benzyl alcohol, potassium nitrate, sodium saccharin, camphor, mint oil, clove oil, amla extract, neem seed oil, aloe vera extract, cinnamon leaf oil, basil oil, fennel oil, honey extract, Eugenol, d-Limonene, C177492, C177491, C174160, in aqueous base.
Pepsodent-G Gum care+	Water, Sorbitol, Hydrated Silica, Sodium Lauryl Sulfate, Peg-32, Flavour, Cellulose Gum, Trisodium Phosphate, Methylparaben, Propylparaben, Sodium Saccharin, Zinc Citrate, Triclosan, Sodium Fluoride, C177891

DISCUSSION:

Periodontitis is one of the most commonly prevalent chronic oral diseases, plaque being the most common aetiology. Therefore, many dentifrices have been developed in order to maintain oral hygiene by chemical plaque control means. Many anti-calculus agents such as Pyrophosphates, zinc citrate and zinc chloride removes the tartar formed on the teeth by stabilizing the amount of calcium in saliva and interfering with the crystalline structure of calculus.³

Triclosan: 5-Chloro-2(2,4-dichlorophenoxy)phenol, a halogenated

phenol has been used for more than 50 years, is a nonionic germicide with low toxicity and a broad spectrum of antibacterial activity, is available in dentifrices and mouth rinses. It inhibits Enzymes in Arachidonic acid pathway metabolism.⁵ It is an active component in detergents for clothings, toothpastes and mouthrinses.⁶

Zinc Citrate: The astringency of the zinc at clinically active levels precludes the use of many zinc salts. However, the selection of the citrate salt, which is sparingly soluble in water but more soluble in dentifrice formulation, permits the use of zinc at concentrations sufficient for antiplaque activity and maintains a palatable product.⁷

Azadirachta Indica (Neem): play role scavenger in free radical generation and prevents disease pathogenesis; anticancer; manages the modulation of various molecular pathways including p53, pTEN, NF- κ B, PI3K/Akt, Bcl-2, and VEGF.⁸

In the study that has been conducted,

- Pepsodent-G Gum care+ showed highest zone of inhibition of 26 mm. 2% Zinc chloride being the active ingredient.
- Colgate total showed a zone of inhibition of 23.5 mm. 0.3% Triclosan & 0.24% Sodium Fluoride being active ingredient.
- Colgate Ved Shakti showed a zone of inhibition of 22 mm. Azadirachta Indica being the active ingredient.

This study has been conducted in-vitro, but, the dentifrices may not necessarily produce the same effect in-vivo.

Moran et al. (1991)⁹, in their systematic review, concluded that herbal toothpastes had shown less anti-plaque activity than conventional pastes.

Davies et al. (2004)¹⁰ & Gunsolley et al. (2006)¹¹ in their systematic review, have concluded that formulations containing triclosan and copolymer significantly improve plaque control and periodontal health.

Williams et al. (2005)¹² have reported Colgate Total to be better dentifrice with prolonged retention and efficacy against oral microorganisms.

Manupati Prasanth (2011)¹³ carried out an invitro study on Antimicrobial Efficacy of Different Toothpastes and Mouthrinses & reported that triclosan formulations were more effective than herbal based products.

Chava VR et al. (2012)¹⁴ concluded in an invitro study testing the efficacy of neem extract on four microorganisms of streptococcus species that, Neem chewing provides the maximum benefits. Hence, the use of chewing sticks of neem can be recommended as Dried chewing sticks of neem shows maximum antibacterial activity against S.mutans.

Anushree et al. (2015)⁴ evaluated antimicrobial Efficacy of Triclosan-Containing Herbal and Homeopathy Toothpastes. They concluded that the only dentifrice containing several phytochemicals & which was significantly effective and comparable to triclosan-fluoride formulation contained Azadirachta Indica (neem).

Palekar et al. (2020)¹⁵ have showed that Colgate Vedshakti exhibited highest antimicrobial activity against P. Gingivalis.

CONCLUSION

Thus, it can be concluded from this study that Pepsodent-G Gum care+ is highly active against plaque microflora compared to the other commonly used dentifrices, and can be recommended to Periodontitis patients. But since it's an in-vitro study, further in-vivo studies are required for the conformation.

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