ORIGINAL RESEARCH

Comparison of Antimicrobial Potential of Various Herbal Dentifrices

Sham S. Bhat[1], Sundeep Hegde K[2], Ratheesh M. S[3]

1- Professor and Head,Dept of Pedodontics and Preventive Dentistry,Yenepoya Dental College,Derlakatte, Mangalore,India.
2- Professor, Dept of Pedodontics and Preventive Dentistry, Yenepoya Dental College, Derlakatte, Mangalore, Karnataka, India.
3- Reader, Department of Pedodontics and Preventive Dentistry,Royal Dental College , Palaghat, Kerala, India.

Correspondence to:
Dr.Ratheesh M. S,
Reader, Department of Pedodontics and Preventive Dentistry, Royal Dental College, Iron Hills, Chalissery, Palaghat – 679 536, Kerala, India.

Contact Us : editor@ijdmr.com
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www.ijdmr.com

ABSTRACT

INTRODUCTION
Natural herbal products for general and oral health care have gained momentum worldwide. People who gravitate toward using herbal products often view these products as being safer than products that contain chemicals. As the popularity of these products continue to rise, the number of herbal dentifrices available in the market has increased significantly. The use of these products has also increased many folds. But their efficacy against various microorganism is vague. This invitro microbiological study has been aimed at comparing the efficacy of various over the counter natural or herbal dentifrices.

MATERIALS AND METHODS.
Seven over the counter herbal dentifrices were purchased and four different strains of microorganisms were selected. The dentifrices selected were tested at full strength using the standard diffusion test. The diameter of the inhibition zones was measured in millimetres at 24 and 48 hours.

RESULTS
The antimicrobial activity observed on the agar plates varied greatly among the seven herbal dentifrices tested. Among These dentifrices, most of the antimicrobial activity was observed at 24 hours and only a little additional inhibition at 48 hours.

CONCLUSION
The antimicrobial properties of the herbal dentifrices tested varied greatly. Some of the herbal dentifrices had no zone of inhibition against certain strains of microorganisms.

KEYWORDS: Antimicrobial Efficacy, A. viscosus, C. albicans, Herbal Dentifrices, S. mutans, S. sanguis

INTRODUCTION

The elimination of supra gingival plaque by mechanical means has been an effective method in controlling plaque accumulation and gingival inflammation[1,2]. But, the compliance and skill required for tooth brushing and flossing by a vast majority is inadequate and thus is not able to maintain the standard of gingival health. Various chemical agents has been used as an adjunct for an effective plaque control.[1,3]

One of the most widely practiced method for maintaining a good oral hygiene has been tooth brushing along with a dentifrice.[4] Dentifrices provide an ideal vehicle for chemical adjuncts which helps to reduce or eliminate the adherence of dental plaque. Also, a variety of antimicrobial agents, have been included in these dentifrices to produce a direct inhibitory effect on plaque formation.[3,5] The efficiency of various antimicrobial agents, like chlorhexidine and triclosan, has been proven.[6,7,8]

In today's world, a great majority of the population practice some form of alternative medicine, including the use of natural or herbal health care products.[9,10] Over the last decade, the use of these products as herbal dentifrices

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has increased significantly.[11] Consumers who gravitate toward using herbal products consider these products as being safer than the dentifrice that contain chemicals additives.[12] Dentifrices labelled as "natural" typically do not include ingredients such as synthetic sweeteners, artificial colours, preservatives, additives, or synthetic flavours and fragrances.[13] The term "herbal" on the label implies that most of these dentifrice's active ingredients are plant-based.

Consumers of these natural health care products typically are well-educated and have above-median incomes.[14] However, they tend to conceal their outside-the-mainstream practices from their health care professionals to avoid ridicule.[15]

As the popularity of natural medicines and dentifrices has been on the rise, dental professionals are in a position to provide information to patients about these products' safety and efficacy.[16] This can be difficult, however, owing to a lack of professional consensus on the subject. The clinical research on herbal-based mouth rinses and dentifrices is very limited, in contrast with a plethora of such research for conventional oral care products.[17-25] A lack of scientific studies on natural and herbal products in the peer-reviewed dental literature poses a conundrum for health care professionals when dealing with these products. While some of these natural products are as safe as conventional dentifrices, others may pose various risks if used incorrectly.[10,16] Since only a few studies have been published on herbal dentifrices, it is yet to be determined whether the herbal dentifrices are superior, equivalent or substandard to conventional dentifrices in reducing plaque.[20,26] Furthermore, the potency or quality of herbal ingredients used in these dental products requires further research. It is generally agreed that with the exclusion of fluoride from most natural herbal dentifrices, caries-preventive benefits may be forfeited.[27]

While many herbal dentifrices claim to have antimicrobial properties, the research conducted to substantiate these claims are limited. Therefore, an in vitro study was designed to assess the antimicrobial potential of various over-the-counter natural or herbal dentifrices available in today's market using a standard diffusion method.

MATERIALS AND METHODS

Seven over the counter herbal dentifrices were purchased from stores in Mangalore city, Karnataka, India. The seven herbal dentifrices tested were as follows:

1. K. P. Namboodiri's toothpaste (K. P. Namboodiri's Ayurvedics)
2. Colgate Herbal toothpaste (Colgate – Palmolive)
3. Dabur Babool Neem Toothpaste (Dabur India Limited)
4. Dabur Red toothpaste (Dabur India Limited)
5. Dabur Meswak tooth paste (Dabur India Limited)
6. Himalaya Dental cream (The Himalaya Drug Company),
7. Vicco Vajradanthi tooth paste (Vicco Laboratories).

Colgate Total (Colgate – Palmolive) as a positive control. Colgate Cibaca (Colgate – Palmolive) which had no antibacterial agents as the negative control. Four microorganisms that have been implicated in oral diseases were selected. They were Streptococcus mutans, Streptococcus sanguis, Actinomyces viscosus and Candida Albicans. The medium used for the culture of these microorganisms was sheep blood agar. Since Actinomyces an anaerobic

microorganism, anaerobic gas pack was used for culturing them.

The dentifrices selected were tested at full strength using the standard diffusion test. Sterile filter disks were used to place the dentifrices. These disks were prepared from filter papers using a punch then sterilised using an autoclave.

Dentifrice samples of approximately 50 milligrams were placed on the prepared sterile filter disks and positioned the disks on the surfaces of sheep blood agar that we inoculated with the test microorganisms. These agar plates with the dentifrices were then incubated at 37^{o} C. If antimicrobial activity was present on the plates, it was indicated by an inhibition zone surrounding the filter disk containing the test material. The diameter of the inhibition zones was measured in millimetres at 24 and 48 hours.

RESULTS

The antimicrobial activity observed on the agar plates varied greatly among the seven herbal dentifrices tested (Table No.1). The positive control produced significantly sized zone of inhibition for Streptococcus mutans and Streptococcus sanguis. For Actinomyces viscosus, the zone of inhibition was not very significant and for Candida albicans, the positive control did not produce any inhibition effect. The negative control did not produce any observable inhibitory effect.

Among the seven test dentifrices, most of the antimicrobial activity was observed at 24 hours and only a little additional inhibition at 48 hours. Of the seven herbal dentifrices, none of them produced zones of inhibition against Streptococcus sanguis. Only a minimal zone of inhibition was produced against Streptococcus mutans and Actinomyces viscosus. In plates with Candida albicans, Vicco toothpaste, Himalaya Dental cream and Dabur Red toothpaste produced a minimal zone of inhibition at 48 hours only.

Among the herbal dentifrices tested, none of them showed a consistent antimicrobial activity against all the four microorganisms. Against Streptococcus mutans, K. P. Namboodiri's toothpaste was found to be the most effective followed by Colgate herbal toothpaste. K. P. Namboodiri's toothpaste was also seen to be most effective against Actinomyces viscosus followed by Dabur Red toothpaste. Vicco toothpaste was the one found to be most effective against Candida albicans among the test dentifrices.

Sl. No.	**Microorganisms**	**S. mutans**		**S. Sanguis**		**A. viscosus**		**C. albicans**	
	Dentifrice	24 h	48 h	24 h	48 h	24 h	48 h	24 h	48 h
1.	Colgate Total	13	14	17	19	6.2	6.5	0	0
2.	Colgate Cibaca	7	7	5.4	5.5	6.3	6.4	0	0
3.	K.P. Namboodiri's	5.5	7	0	0	6.4	6.7	0	0
4.	Colgate Herbal	6	6.6	0	0	6.1	6.5	0	0
5.	Dabur Babool Neem	5.5	5.9	0	0	6.5	6.5	0	0
6.	Dabur Red	6	5.7	0	0	6.5	6.6	0	5.4
7.	Dabur Meswak	6.5	5.6	0	0	6.3	6.5	0	0
8.	Himalaya	5.4	5.9	0	0	6.2	6.4	0	5.4
9.	Vicco Vajradanthi	5.2	5.8	0	0	6.1	6.5	0	5.6

Table No.1: Mean Diameter of Inhibition zones induced by the test dentifrices

DISCUSSION

Streptococcus mutans, Actinomyces viscosus and Candida albicans were selected as test microorganisms for the study because they have been implicated in oral diseases. Also, Streptococcus sanguis was selected as it is considered to be an opportunistic bacterium in the oral cavity which can induce significant health risks if it enters any sites in which abscesses can develop, such as the brain and the heart. It is believed that the viridans

streptococci such as Streptococcus sanguis, which can enter the bloodstream through an oral infection wound or an extraction site, cause between 40 and 50 percent of cases of endocarditis, for which patients with damaged heart valves or other cardiac abnormalities are at risk of developing.[28] Of the Candida species, Candida albicans is the most common yeast isolated from the oral cavity, and it is associated with fungal oral infection, endocarditis and septicemia[28]. The results of this study, which measured dentifrices' ability to inhibit these microorganisms, provide significant information for dental professionals.

There were a few limitations associated with this study. Bacterial and fungal pathogenicity is a multifactorial process, involving microbial virulence and host response, along with genetic and environmental factors such as saliva buffering and diet[28]. Some researchers have looked at whether detrimental shifts in periodontopathic, cariogenic or opportunistic flora and increases in resistant strains have resulted from antibacterial ingredients in regular dentifrices.[29] It is known that a balance exists in each person's oral microbial population. If that balance is lost, opportunistic microorganisms can proliferate, enabling the initiation of disease processes.

The testing method used here also functioned as a screening method, and it may not have been able to detect the effects of a chemical that does not diffuse through the agar matrix. Also, since this test was in vitro, it cannot be assumed that the results of antimicrobial efficacy could be proportional or transferable to the oral cavity and translated into clinical effectiveness. Research has demonstrated that bacteria in biofilm forms such as plaque have decreased sensitivity to antibacterial agents. Moreover, formulations for topical antimicrobial oral use, such as mouth rinses and dentifrices, must be able to penetrate the biofilm matrix and deliver the active agents quickly because exposure times are limited under actual use conditions. Nevertheless, the in vitro method is a well-established technique that commonly is used in screening the antimicrobial efficacy of chemicals before in vivo testing.

CONCLUSION

The antimicrobial properties of the herbal dentifrices tested varied greatly. Some of the herbal dentifrices had no zone of inhibition against Streptococcus sanguis and Candida albicans. Further research efforts would be required to ensure the efficacy of the herbal dentifrices

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