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In-vitro Anti-Microbial Evaluation of Commercially Available Brands of Tooth Paste against Human Pathogenic Bacteria.

Sivakumar SM* and Aamena Jabeen.

Division of Pharmaceutical Biotechnology, College of Pharmacy, Jazan University, Jazan, Kingdom of Saudi Arabia.

ABSTRACT

The antibacterial action of five different tooth pastes namely Himalaya dental cream, Aloe dent, Dabur tooth paste, Colgate and Colgate white were evaluated against selected human pathogenic strains *Staphylococcus aureus, Streptococcus pyogenes, Bacillus subtilis* and *Escherichia coli*. All the tooth paste was exhibiting good anti-bacterial effect against screened organisms except Escherichia coli. In our study the antibacterial efficacy of Himalaya dental cream and Aloe dent is more or less same followed by Dabur, Colgate and Colgate white tooth pastes. This preliminary study suggesting that the herbal tooth pastes is better than non-herbal tooth pastes.

Keywords: Tooth pastes, anti-bacterial effect, herbal origin and non-herbal origin

*Corresponding author

INTRODUCTION

Bacterial colonization leads to various iseases of oral cavity such as plaque and periodontal disease [1]. *Streptococcus mutans*, is an important pathogen causing dental carries [2]. *Streptococcus pyogenes* is a member of the *Streptococcus mutans* family, which associates to be an etiologic agent of dental caries. Streptococcal infections of gingiva cause acute streptococcal gingivitis which has been observed very rarely [3]. *Staphylococcus aureus* is a presumed pathogen of periodontitis [4] and dental caries [5]. This study mainly focuses on the efficacy of various commercially available brands of toothpastes existing in the Kingdom. In this work we screened five different tooth paste Himalaya dental cream, Aloe dent, Dabur tooth paste, Colgate and Colgate white tooth pastes for their efficacy against *Staphylococcus aureus, Streptococcus pyogenes, Bacillus subtilis* and *Escherichia coli.*

MATERIALS AND METHODS

Collection of Materials

Commercially available 5 different brands were purchased for antimicrobial screening. All Chemicals used for this study was analytical grade.

Strains used

24 hours culture of *Staphylococcus aureus, Streptococcus pyogenes, Bacillus subtilis* and *Escherichia coli* were used in this study.

Properties of tooth pastes and antibacterial screening

The colour, texture, homogeneity and pH were evaluated on preliminary basis. All the tooth pastes were diluted in sterile water and prepare predetermined concentrations of 0.5, 1, 1.5 2, 2.5 and 3% w/v of respective paste was prepared for our study. The minimum inhibitory concentration (MIC) was determined using nutrient broth dilution. Based on MIC value the concentration of paste was fixed to evaluate the spectrum of antibacterial property. The laboratory culture of *S.aureus, S.pyogenes, E.coli* and *B.subtilis* were sub cultured and the concentration of working stock culture was assessed as 10^{-5} CFU/ml. The agar well diffusion technique was followed for antibacterial susceptibility test. Specified quantity of Muller Hinton (MH) agar was prepared and plated in aseptic condition. 0.1 ml of standardized culture was poured on the MH agar plate and spread with L shaped glass spreader. By using sterile cork borers wells were made. The pastes were dissolved in distilled water to get the known concentrations of 2% and 0.1 ml of paste solution was poured in to the respective wells. After 24 h of incubation at 37^{0}C the zone of inhibition was measured and tabulated.

Statistical analysis

All the experiments were performed six times (n = 6), the data were subjected to one way analysis of variance (ANOVA), the level of significance is $P<0.05$ using Graph pad Instat software, USA. The efficacy was compared by performing Tukey comparison test and Bartlett's test (posttest).

RESULTS AND DISCUSSION

The purpose of tooth paste with tooth brushing is for to maintenance of oral hygiene and prevention of plaque formation by interfering with the bacterial adherence on the tooth surface. Based on MIC studies, 2% concentration was fixed for all the paste to screen against selected bacteria. In our results all the tooth pastes tested were showing significant anti-bacterial activity. It is quite interesting to note that all the paste that we have screened for antibacterial action did not show any activity against *E.coli* (Table 1). The highest activity was exhibited by Himalaya dental cream against *S.aureus*, followed by *S.pyogenes* and *B.subtilis*. However, Aloe dent paste has also shown good activity, which is nearing the values of Himalaya dental cream. In our study Dabur tooth paste has shown better activity against *S.pyogenes* and *B.subtilis* when compare to *S.aureus.* The anti-bacterial spectrum of Colgate paste was more than the Colgate white. The Colgate paste was found to be more active against *B.subtilis* followed by *S.pyogenes*. In the case of Colgate white paste the antibacterial spectrum was shown against *S.aureus, B.subtilis* and *S.pyogenes* (Figure 1). It is note worthy that

sodium lauryl sulfate (SLS) is used as in formulating tooth pastes. It has been reported that SLS is having known antimicrobial properties [6-7] but all the pastes which we had screened failed to show any activity against *E.coli*. Thus influence of SLS is not much significant as far as our study is concern. In this work we have preferred tooth pastes of herbal origin and non-herbal origin. In our study we had not screened any fluoride tooth paste. Jabbarifar et al., 2005 [8] reported that fluoride tooth paste reduces the streptococcal colony causing dental plaque. Some of the reports [9] showed that the purpose of adding fluoride in paste is as a preservative and also for teeth protection. According to WHO, ADA, FDI guidelines fluoride should be included in the tooth pastes inorder to prevent plaques. However, the excess use of fluoride may leads to dental fluorisis.

Table 1: Anti-bacterial effect of commercially available various tooth paste against selected human pathogens

Name of the product	Zone of inhibition (mm)			
	S.pyogenes	*S.aureus*	*E.coli*	*B.subtilis*
Himalaya Dental Cream	24.3 ± 0.65	26.3 ± 1.2	-	24.2 ± 0.36
Aloe dent tooth paste	24 ± 0.86	25.3 ± 2.1	-	22.5 ± 1.6
Dabur tooth paste	22.3 ± 0.9	19.3 ± 1.4	-	22 ± 1.7
Colgate paste	21 ± 0.7	21 ± 0.98	-	22.6 ± 1.2
Colgate white paste	19.6 ± 1.3	22.6 ± 0.45	-	20.6 ± 1.8

* Each value is the mean of six batches with standard deviation
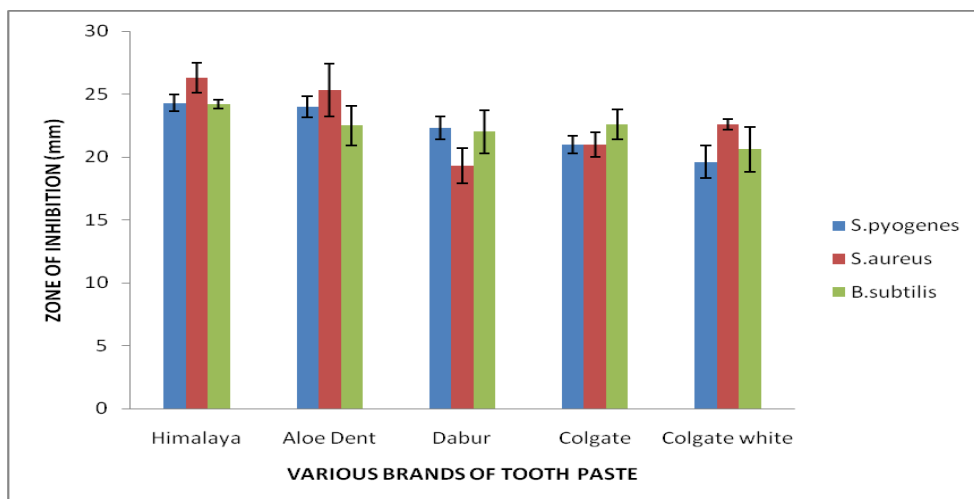
Figure 1: Antibacterial efficacy of various tooth paste

CONCLUSION

The present study provides useful information on the comparative efficacy of various brands of commercially available tooth pastes in the Kingdom. This preliminary work is suggesting that the efficacy of herbal tooth pastes is better than non-herbal tooth pastes.

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