INHIBITION OF STAIN BY SOME COMMERCIALLY AVAILABLE ORAL HYGIENE PRODUCTS

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ABSTRACT

Side effects such as abrasion of the dental hard tissue have been frequently observed following the extensive use of mechanical cleansing. As promising antiseptics like chlorhexidine produces extrinsic dental staining on long term usage, there has been increasing interest and research generated towards chemically based stain removing agents. This invitro study examined whether some commercial oral hygiene products could inhibit chlorhexidine derived stain independent of any mechanical cleansing action. Perspex blocks were soaked in triplicate in chlorhexidine solution for 2 minutes and stain inhibition by these products was determined by further soaking the blocks in product/ water slurries for 2 minutes and finally in tea solution for 1 hourly periods. The optical density (OD) of each specimen was determined at each hourly interval by spectrophotometry at 395 nm and the mean values obtained. At the end of the study, most of the products inhibited stain compared to water control and there was a variation in the stain inhibiting efficacy of the products. It is thus concluded that oral hygiene products like dentifrices and mouthrinses can inhibit chlorhexidine derived extrinsic dental stain to a variable degree through a chemical action by contained ingredients.

Key Words: *Extrinsic dental stains, oral hygiene products, chlorhexidine, dentifrices.*

Introduction

Discoloration of teeth interferes with the aesthetic appearance of the teeth and is therefore of primary concern to most people.[2] Extrinsic tooth discoloration is also frequently noticed as an unwanted side effect of promising antimicrobial agents like chlorhexidine, alexidine and octenidine. Although the effectiveness of chlorhexidine mouthrinse in controlling plaque and salivary bacterial numbers remains unsurpassed to date, well documented side effects of which the production of extrinsic staining is the most troublesome. This staining once established usually requires a professional prophylaxis for its removal and this may be time consuming both to the patient and clinician. Much research has thus been directed at over coming this side effect of chlorhexidine mouthrinse on long term oral use.

Toothbrushing with a toothpaste is the most common form of oral hygiene practised by most individuals in developed countries. The extensive use of mechanical cleansing can often lead to abrasion of dental hard tissue as a result of abuse. The use of unsuitable toothbrush e.g. hard bristles, wrong toothbrushing technique and/or use of abrasive toothpaste/tooth powder can lead to abrasion of dental hard tissue. So the demand for chemically based stain removing agents to overcome some of the shortcomings of mechanical cleansing methods have increased over the years.

Aim of Study

The aim of this invitro study was to evaluate and compare the chemical stain inhibiting efficacy of several commercially available dentifrices, an-oxidising mouth rinse and a denture cleaner independent of mechanical action of any abrasives which may be included in their formulations.

Materials and Methods

The products examined in this study were:

A) Smoker's Toothpaste or cosmetic dentifrices namely:
   i) Pearl Drops 1 + 1 Tooth polish and stain remover.
   ii) Rembrandt Whitening Toothpaste
   iii) Eucryl Smoker's Toothpowder
   iv) Novatec Smoker's Toothpolish
   v) Novatec Regular
   vi) Topol Smoker's Toothpaste
   vii) Boots Tartar Control Smoker's Toothpaste
B) An Oxidising Mouthrinse
   i) Bocasan Mouthrinses
C) One Conventional Toothpaste
   i) Colgate regular
D) One Enzyme Based Toothpaste
   i) Zendium
E. One Denture Cleaner
   i) Dentu Creme
F. Water control specimens were exposed only to distilled water.

Perspex Blocks (Polymethyl methacrylate/Acrylic)

In order to prepare the specimens, rectangular pieces of perspex blocks were cut into dimensions 30mm x 10mm x 5mm to fit the specimen chamber of the uv/vis spectrophotometer. The blocks were washed in distilled water to remove any debris. Perspex blocks in triplicate

Table 1 Inhibition of stain using several oral hygiene products (Means of the optical density values after one hourly intervals)

	SOAKINGS																	
PRODUCT	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH	11TH	12TH	13TH	14TH	15TH	16TH	17TH	18TH
Pearl Drops	0.032	0.079	0.143	0.383	0.275	0.338	0.416	0.579	0.601	0.715	0.985	1.281	1.328	1.309	1.500	1.666	1.852	2.564
Rembrant	0.047	0.097	0.130	0.143	0.187	0.270	0.204	0.381	0.363	0.396	0.496	0.511	0.781	0.758	0.782	0.808	1.110	1.329
Eucryl	0.079	0.052	0.059	0.057	0.170	0.208	0.200	0.298	0.332	0.316	0.262	0.396	0.531	0.414	0.418	0.436	0.667	0.710
Novatec Smokers	0.062	0.100	0.173	0.216	0.384	0.513	0.374	0.528	0.480	0.548	0.613	0.661	0.929	0.879	0.906	0.842	1.120	1.620
Novatec	0.040	0.138	0.188	0.269	0.298	0.409	0.315	0.503	0.658	0.624	0.786	0.687	0.864	1.103	1.199	1.211	1.219	1.617
Bocasan	0.056	0.021	0.050	0.025	0.124	0.145	0.159	0.327	0.360	0.329	0.450	0.550	0.682	0.661	0.528	0.670	0.902	1.175
Topol	0.053	0.061	0.070	0.208	0.055	0.042	0.059	0.118	0.109	0.146	0.217	0.377	0.522	0.528	0.376	0.445	0.791	0.994
Boots Smokers	0.043	0.084	0.103	0.085	0.126	0.135	0.109	0.261	0.194	0.314	0.377	0.390	0.512	0.390	0.330	0.462	0.699	0.917
Dentu creme	0.115	0.216	0.293	0.516	0.515	0.478	0.528	0.791	0.833	0.863	0.979	1.168	1.301	1.477	1.421	1.526	1.655	2.016
Zendium	0.119	0.216	0.329	0.209	0.316	0.168	0.158	0.259	0.318	0.368	0.399	0.454	1.119	0.828	0.821	0.867	0.970	1.109
Colgate	0.044	0.166	0.206	0.213	0.224	0.297	0.238	0.466	0.495	0.543	0.642	0.653	0.978	0.871	1.055	1.211	1.366	1,635
water	0.062	0.073	0.084	0.088	0.179	0.298	0.281	0.462	0.546	0.636	0.805	0.918	1.245	1.327	1.346	1.406	1.777	2.217

were used for each product in this study.

Corsodyl Mouthwash
Made by Smith Kline Beecham Consumer Healthcare, Brentford UK. Active constituent: Chlorhexidine gluconate 0.2%.

Tea
Mark and Spencer's extra strong tea was used in this study. 8 grams of tea was placed in 800 ml of distilled boiling water and left for 2 minutes. The solution was then filtered through a piece of muslin and allowed to cool. Fresh tea solution was prepared for each treatment and 20 ml of the solution was placed in clean universal containers for each experiment carried out.

Spectrophotometer
A uv/vis spectrophotometer manufactured by Perkin Elmer, U.S.A. was used to measure the optical density of the blocks after each treatment.

Preparation of Slurries
5 grammes of each product was placed in 20 ml of distilled water in an universal container and thoroughly mixed using a Whirlmixer until the product had dispersed completely in the distilled water, 3 slurries for each product was prepared and placed in individual universal containers.

The slurries were agitated with a whirlmixer just prior to each treatment.

Inhibition of Stain using Several Commercially Available Dentifrices
Perspex blocks in triplicate were used for each treatment with each of the oral hygiene products. The baseline optical density of each of the three blocks was then determined before the treatment. The blocks were placed in solutions of chlorhexidine (Corsodyl) mouthwash for a period of 2 minutes, then washed with distilled water. The blocks were then soaked in slurries of the oral hygiene products for two minutes, then washed with distilled water. Finally the blocks were soaked in the prepared tea solution for one hourly periods. The blocks were removed from the tea solution after each one hour session and washed in distilled water and allowed to air dry. Control specimens were exposed only to distilled water after treatment with Corsodyl. The optical density of each of the blocks was determined on the uv/vis spectrophotometer at the lambda maximum for tea (395 nm) and a mean value obtained after each one hourly period in tea solution. This process was repeated until an optical density above 2 was recorded for any specimen in the spectrophotometer.

Results
The means of the optical density are shown in Table 1. It was apparent that some variation in staining of the blocks occurred after each treatment. Staining, as represented by optical density increased progressively from baseline to the last treatment for all products and the distilled water only control. By the 18th treatment obvious differences in staining of the blocks was apparent.

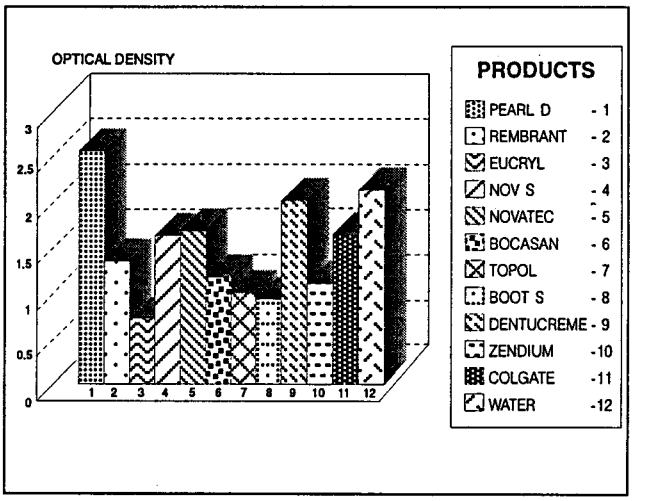

Figure 1: Inhibition of stains using several oral hygiene products

Figure 1 shows the optical density following exposure to all products after the final treatment. Most products inhibited stain compared to the water control. Notably, Eucryl Smoker's Toothpowder and Boots Smoker's followed by Topol, Zendium and Bocasan Mouthwash exhibited good stain removing capacity. Interestingly Pearl Drops Toothpolish did not inhibit stain but seemed to produce more stain than the water control.

Discussion
Over the last two decades much interest has been generated in the potential use of chemicals in particular antimicrobials and antiseptics in the control of plaque and gingivitis. There are numerous products in the market, although among them chlorhexidine remains the most effective agent to date. Clearly, indications for use of chlorhexidine are limited to relatively short/medium periods, primarily due to the major side effect of extrinsic staining seen in many if not most individuals. There is considerable evidence to support a dietary aetiology[3] and there were suggestions that staining occurred as a result of cationic-anionic interaction of adsorbed chlorhexidine with dietary chromogens[4]. Many studies in the past into the staining potential of oral antiseptics have used this knowledge of the aetiology of stain formation as a scientific model.

In the present study polymethyl methacrylate was chosen as the standard surface since it has been shown to readily adsorb cationic antiseptics.[3,4,5,6,7]. This model has clinical relevance since acrylic is a commonly used restorative dental material and staining of these materials in vivo is a well known consequence of the use of cationic antiseptic mouth rinses.[8] The degree of stain produced was determined with the use of a spectrophotometer. This method enables a quantitative measurement of staining to be obtained and is far more accurate than the subjective assessment of colour and shade.

Conclusion

It is concluded from this study that dentifrices/mouthrinses can inhibit chlorhexidine induced extrinsic dental stain to a variable degree through a chemical action by contained ingredients. It is not possible from this study to determine which chemical additives are responsible for this property, however from other studies, products with a high pH and containing the detergent sodium lauryl sulphate would appear to be more effective. Obviously, the ability of abrasives contained in products to affect stain should be assessed and would be of obvious relevance in recommending any particular product. Chemicals like Sodium lauryl sulphate (SLS) incorporated in chlorhexidine mouthwash appear to vitiate the antimicrobial action of chlorhexidine. Thus further research have to be undertaken to identify chemicals which can be incorporated into antimicrobial mouthwash like chlorhexidine which will either augment or have no interfering action rather than to vitiate its action so as to prevent the formation of extrinsic dental stain. Studies have shown that chlorhexidine delivered in toothpaste form and incorporated with detergents does not have the same potency as that delivered in mouthrinse form.

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