

2599: In Vitro Assessment of Stain Removal/Prevention Properties of Dentifrices

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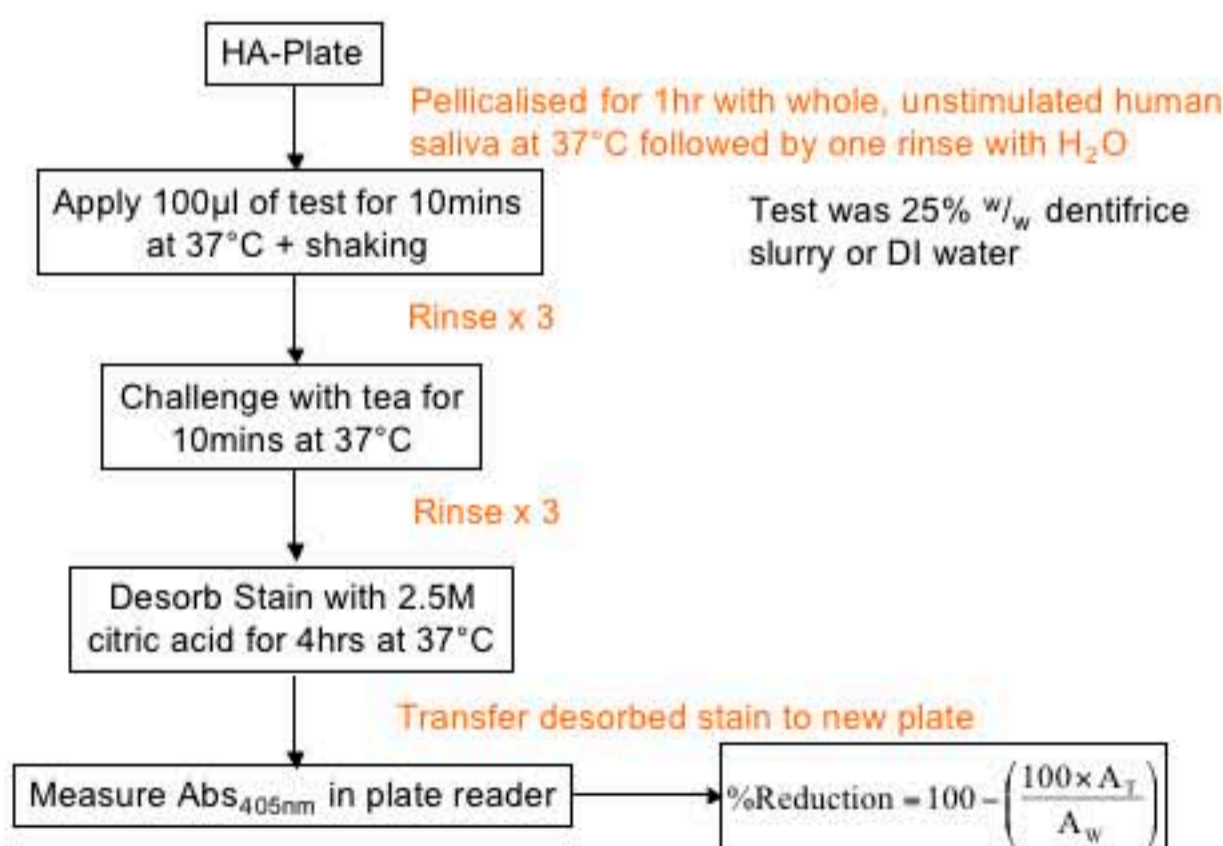
Introduction

A novel gel-to-foam dentifrice has previously been shown to remove more oral debris and bacteria than a conventional paste¹. Here we use *in vitro* models to assess the ability of an experimental gel-to-foam dentifrice containing sodium tripolyphosphate (STP) to both remove existing dental stain and to help prevent dietary staining compared to a standard silica-based sodium fluoride dentifrice.

Methods

The Natural Extrinsic Stain Removal (NESR) method² was used to measure the ability of the dentifrices to remove existing stain. Naturally-stained bovine teeth were randomised and divided into two groups. The teeth were brushed with a 25% w/w slurry of a low-abrasive children's toothpaste to remove loosely bound stain, dried and baseline whiteness measured using a colorimeter and expressed using the CIE L*a*b* colour sphere. Group A was brushed firstly with a 50% w/w slurry of the gel-to-foam dentifrice containing STP then with a 50% w/w slurry of the standard dentifrice, whilst the brushing order was reversed for Group B. The change in the whiteness of the teeth between baseline and the first brushing step and between baseline and the second brushing step was determined by colorimetry and expressed as the percentage stain removal as in Equation 1 where ΔL^* is the change in whiteness from baseline.

$$\% \text{Stain Removal} = \frac{\Delta L^* (\text{after } 1^{\text{st}} \text{ brush})}{\Delta L^* (\text{after } 2^{\text{nd}} \text{ brush})} \quad \text{Equation 1}$$



Abs= absorbance, A_T =Absorbance from test wells, A_w = absorbance from water control.

Process Flow detailing the HASP methodology.

Stain prevention was assessed by the Hydroxyapatite Stain-Prevention (HASP) method³ where the substrate was a 96-well microtitre plate coated with hydroxyapatite (HA-plate) in the base of the wells. The process flow details the experimental process.

Results

The NESR results (Figure 1) showed that Group A (67.02% stain removal) was statistically superior ($p=0.0141$) to Group B (39.90%). These data show that the gel-to-foam dentifrice was statistically superior at removing natural stain than the standard toothpaste.

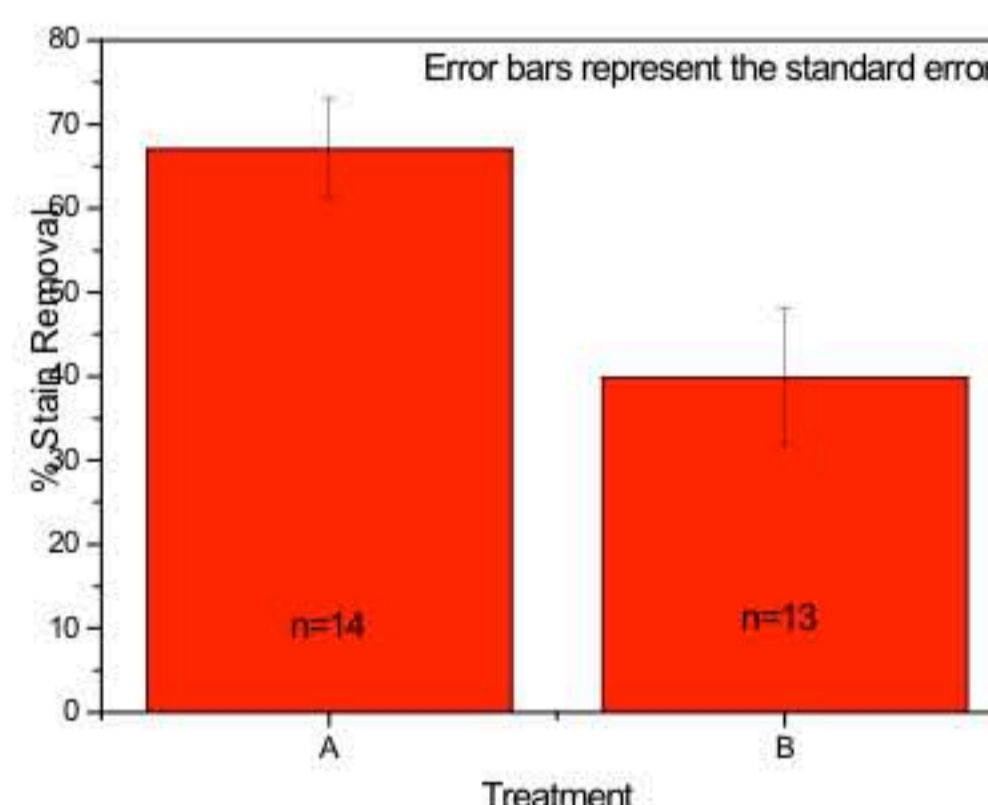


Figure 1: Graph showing the relative efficacy of the two treatment groups in the NESR model. The data show that the gel-to-foam dentifrice gave statistically superior cleaning compared to the standard dentifrice.

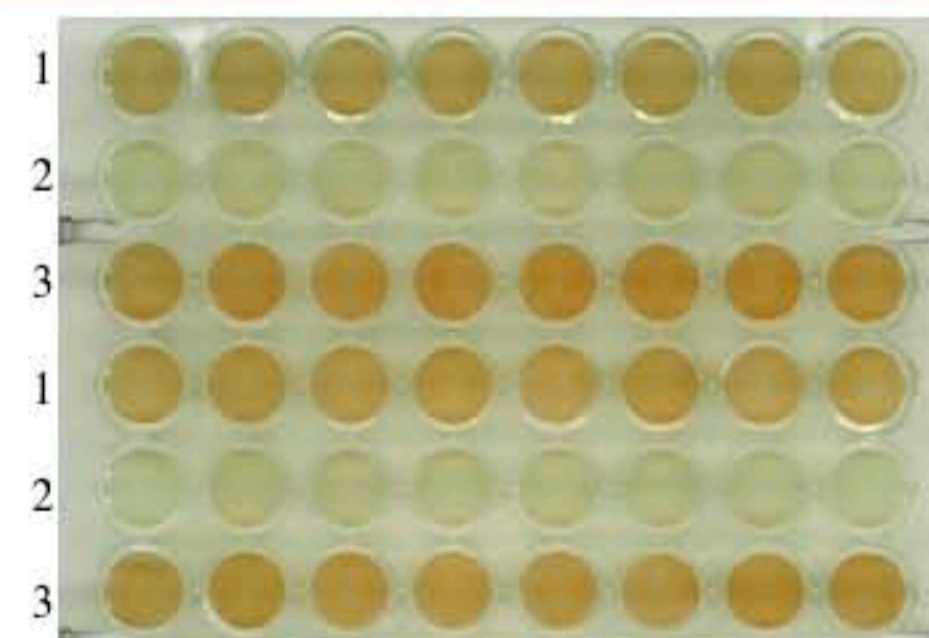


Figure 2: Photograph of the HA-plate used in the HASP assay. Rows were treated with (1) the standard toothpaste, (2) the gel-to-foam dentifrice and (3) with water. The photograph shows two replicates of the experiment.

The HASP method showed that the gel-to-foam dentifrice containing STP and the standard dentifrice prevented 79% and 28% of the dietary stain compared to water respectively. These data support the results found previously³ where sodium tripolyphosphate solutions were found to be highly efficient at preventing dietary stain in the HASP model.

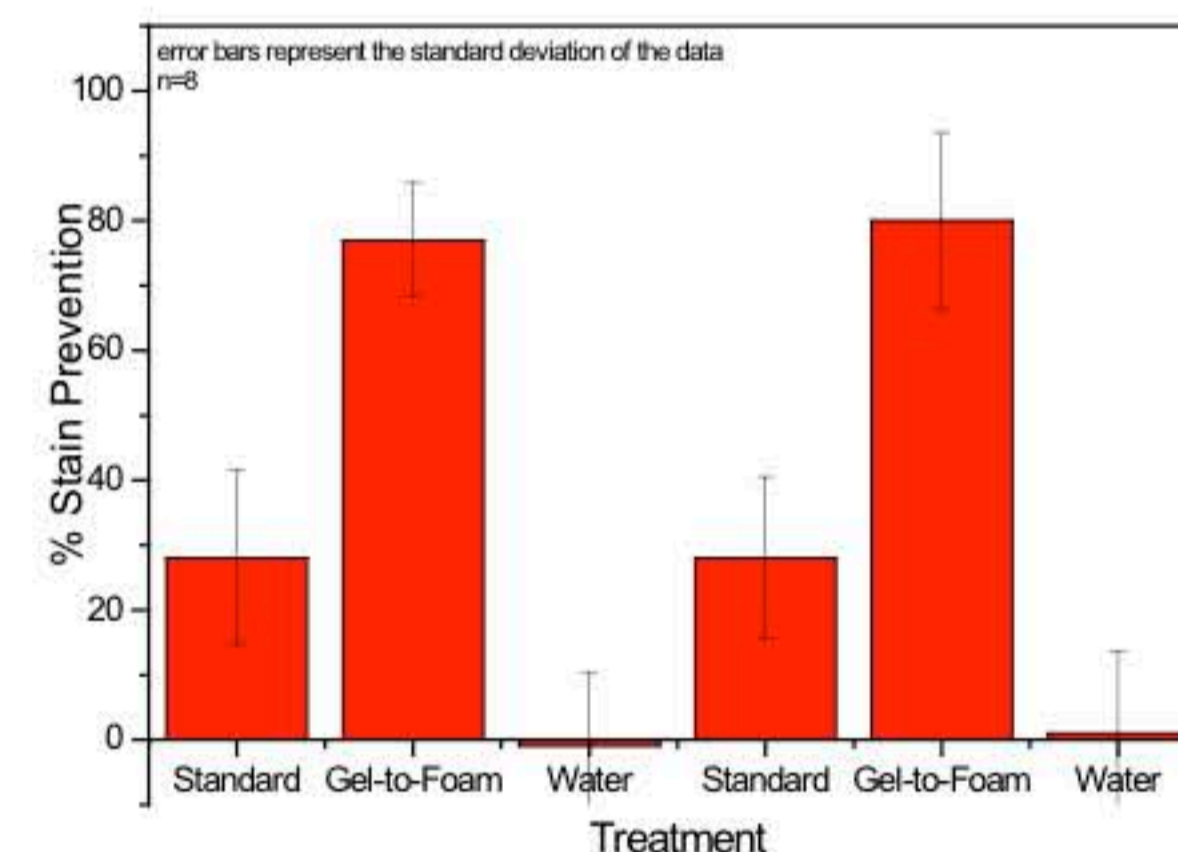


Figure 3: Graph showing the % stain prevention of the treatments in the HASP model. The data shows two replicates of the experiment.

Conclusions

The novel gel-to-foam dentifrice containing STP has been shown to have a superior cleaning capability compared to a conventional paste, based upon a brushing study of naturally-stained bovine teeth. The gel-to-foam dentifrice also shows excellent dietary-stain prevention properties, suggesting that this dentifrice has the ability not only to better whiten teeth but to also help prevent further staining of the teeth.

References

1. M. Bosma, R. McNab, A. Gallagher, K. Baxter, G. Shanga, A. Middleton, Removal of oral debris and bacteria during supervised tooth brushing, *Arch. Oral Biol.*, **53**, S26-S30 (2008).
2. JE Creeth, KS Price, MA Wicks, The Stain Removal Performance of a New Anti-Hypersensitivity Dentifrice, *J. Dent. Res.* **17**, 4, (2006).
3. GR Burnett, EL Macdonald, M Addy, R McNab, A New *In Vitro* Model for Assessing Dental Stain Prevention, *J. Dent. Res.* **86**: Spec Iss A, Poster 1055, (2007).