Peroxide Whitening Efficacy on Stained Surfaces *In Vitro*

K.M. Kozak*, D.J. White, J.R. Zoladz, E.M. Leicht

Procter & Gamble, Mason, OH, USA

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ABSTRACT

Clinical experience supports that tooth bleaching is effective without prophylaxis. **Objective**: To quantitatively verify this observation under controlled conditions, we examined the proportional efficacy of Crest Whitestrips (CWS) bleaching on stained and prophylaxis cleaned (pre stained) enamel surfaces *in vitro*. **Methods**: Human enamel crowns were sectioned and mounted in methacrylate blocks. Enamel was polished with prophylaxis paste and exposed to laboratory PCR staining. Following staining surface color was determined quantitatively (Fuji Camera) as CIELAB L*, a*, b*. ½ of each stained surface was cleaned of extrinsic stains using prophylaxis paste and surface color of both sides were re-measured. Teeth were then cycled for 14 days with continuous immersions in pooled human saliva at 37°C interrupted by bid ½ hour CWS applications. Controls were brushed 2x/day with a slurry of non-peroxide dentifrice (Crest Dual Action Whitening - CDAW). Color assessments on stained and prophied sides were made at days 1, 3 and 14. **Results**: L* color response was the most reproducible for whitening assessments. L* values were compared via Students t. Baseline stained, day 14 stained and baseline prophy side L*: CDAW 34.9±2.5; 69.6±2.2; 65.6±2.8; CWS 32.6±1.5; 74.6±3.3; 65.2±1.5. There were no significant differences (nsd) in prophied vs stain portions at day 14 (within treatments), though Day 1, 3, 14 L* was lighter for CWS treatment vs. CDAW paste treatment (e.g. at day 14 CWS L* stained 74.6±3.3 nsd vs. prophied 73.9±3.8 sig. > CDAW L* stained 69.6±2.2 nsd vs. prophied 70.3±2.9). **Conclusions**: The presence of extrinsic staining had no impact on final whitening results for CWS or CDAW dentifrice. The dentifrice removed extrinsic stain only while CWS produced complete stain removal and intrinsic whitening as well.

INTRODUCTION

Clinical experience suggests that peroxides are effective in tooth whitening with or without dental prophylaxis (Collins et al., J Dent Res 2000; 79:583). The effect of extrinsic stain on whitening performance is quantitatively difficult to determine due to variations in tooth color and bleaching susceptibility in parallel study designs. Crest® Whitestrips® has been shown to provide clinical efficacy in the whitening of teeth including both extrinsic and intrinsic stain discoloration. Separately, Crest Dual Action Whitening dentifrice has been shown to provide clinical efficacy in the removal and prevention of extrinsic tooth stain. In this study, a Split Tooth design was used to quantitatively assess the effects of extrinsic stain on whitening efficacy of Crest Whitestrips peroxide bleach and to compare whitening efficiency of Crest Whitestrips to a clinically effective whitening dentifrice.

MATERIALS AND METHODS

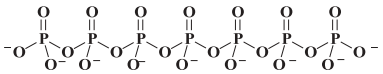
Crest® Whitestrips®
(also marketed as AZ and Blend-a-Med)

Treatments

H_2O_2 bleaching gel on strip

Strip applied to teeth

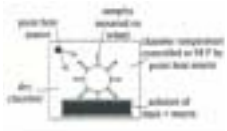
Crest Dual Action Whitening Dentifrice



Polyphosphate (sodium hexametaphosphate) in CDAW Dentifrice

Treatment Protocol
Preparation of PCR Stained Human Enamel With ½ Prophylaxis and Measures of Color

Mounted Enamel



Staining Wheel: Stookey Method

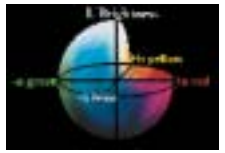
Stained Specimen

Prophy Process

Half Stained Tooth

Computer Mask for Color Assessments

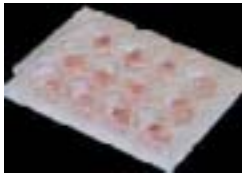
Color Assessments With Fuji Camera

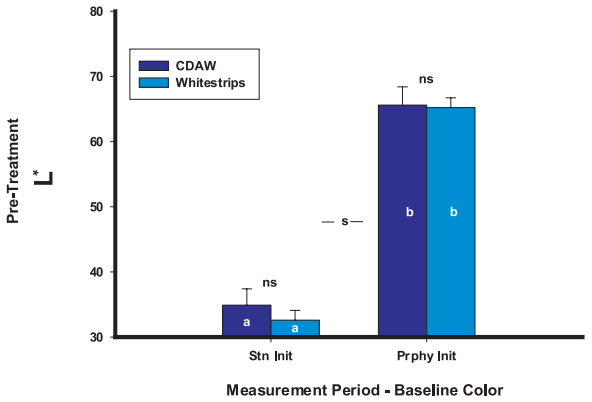


CIELAB Scale of Color

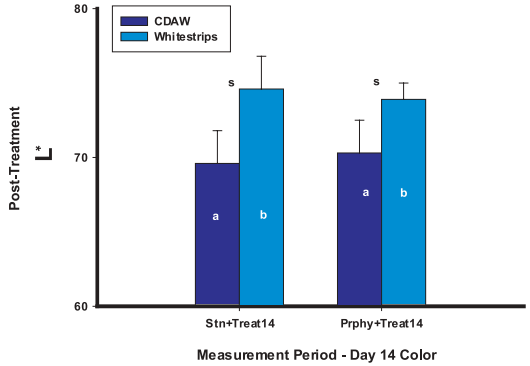
Cycling treatment protocol

- Pooled human saliva immersion with agitation at 37 C
- Whitestrips – bid treatment ½ hour cut strip
- CDAW brushing – 2x/day 45 second brushing with 25 % water slurry
- Color Assessments Repeated: Day 1, Day 3, Day 14





Comparisons in periods Students t $p < 0.05$
Comparisons between periods Students t $p < 0.05$
Comparisons a ≠ b



CONCLUSION

- CDAW dentifrice brushing and Whitestrips bleaching treatments produced significant whitening (L* increase)
- CDAW dentifrice whitened slightly (nsd) better than initial prophy score – equivalent on stain and prophy side
- Whitestrips bleaching whitened significantly better than initial prophy score and stained and prophied portions resulted in equivalent whitening
- These results conclusively demonstrate mechanisms of whitening technologies, with effective dentifrices removing extrinsic stains 'only' and effective bleaching technologies removing both extrinsic and intrinsic color sources

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