

# Inhibition of Denture Stain with Denture Adhesive Use

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## ABSTRACT

**Objective:** The objective of the study was to determine whether the use of a calcium/zinc gantrez denture adhesive inhibits stain deposition on the denture surface when compared to no denture adhesive using digital image analysis. **Methods:** This randomized and controlled, 2-period cross-over study was designed to examine the effect of calcium/zinc gantrez denture adhesive (Fixodent® Original) versus no denture adhesive on denture stain in 12 subjects with full maxillary dentures. Subjects underwent a 96-hour period of extrinsic stain induction by rinsing their mouth with tea 6 times daily in combination with denture brushing once daily according to their assigned treatment sequence. A 72-hour washout phase separated the two treatment periods. Efficacy was measured using digital images of the anterior teeth, posterior buccal regions, and the molar occlusal regions to determine color change in CIELAB units (L\* lightness, a\* redness and b\* yellowness). Images captured at 48, 72 and 96 hours after the start of treatment were compared to their respective baseline. A mixed effects model was used to analyze the data separately for each visit. All treatment comparisons were tested at a two-sided 0.05 level of significance. **Results:** There were essentially no differences between treatments in L\* or a\*, but consistent differences over time for b\* for the anterior, left and right posterior views. All three views demonstrated statistically significant reductions in yellowness for subjects who applied denture adhesive versus no adhesive at 96 hours ( $p < 0.05$ ). There were no differences detected in L\*, a\* or b\* when the molar occlusal views were examined between the two treatments. **Conclusions:** This study found that the use of calcium/zinc denture adhesive in conjunction with routine denture cleaning inhibits stain accumulation.

## INTRODUCTION

Current denture adhesive technologies, such as Fixodent®, were initially developed for improving denture retention and stability. He et al., (2001) reported on the ability of a calcium/zinc Gantrez denture adhesive to inhibit growth of denture plaque microorganisms *in vivo*. Since accumulation of plaque is associated with the development of extrinsic stain (Theilade and Pang, 1977; Reid et al., 1977; Budzt-Jorgensen and Theilade, 1983; Hickey et al. 1985, Ohmura et al., 2002), it is plausible that the use of a denture adhesive containing the anti-microbial agent zinc, may prevent stain formation on the denture surface. The current study was designed to determine whether the use of a calcium/zinc Gantrez denture adhesive inhibits stain deposition on the denture surface when compared to no denture adhesive using digital image analysis.



Denture appearance at baseline

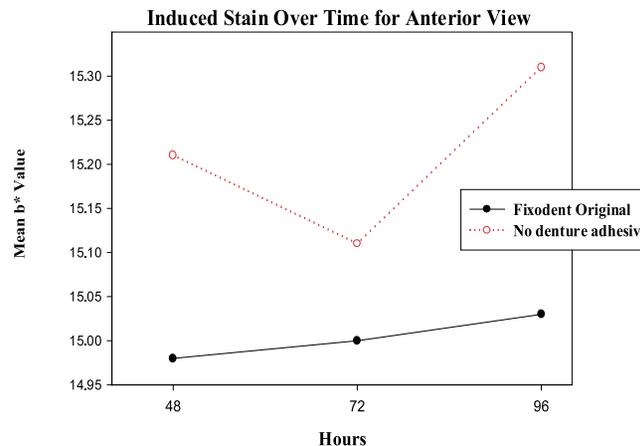


Denture at 96 hours with no adhesive

## MATERIALS AND METHODS

This was a controlled, randomized, crossover study comparing a calcium/zinc Gantrez denture adhesive (Fixodent® Original) and no denture adhesive. Twelve subjects with full maxillary dentures were recruited for the study. At the start of each treatment period each subject's denture was cleaned using an ultrasonic bath. A digital image was captured of the denture anterior teeth regions, left and right posterior regions, and the molar occlusal surfaces. A study technician brushed the subjects' dentures with water once per day during the study period prior to imaging and the application of denture adhesive ( $0.8g \pm 0.05g$ ) to simulate stain removal that could be expected following denture cleaning procedures. Subjects underwent a 96 hour period of extrinsic stain induction by rinsing their mouths with a standardized tea solution 6 times daily while using their assigned treatment regimen. The same regions of the denture described above were also imaged for the amount of stain formed at 48, 72 and 96 hours following commencement of staining. A 72 hour washout interval occurred between each 96 hour treatment period. A mixed effects model was used to analyze the data for each visit separately with period, baseline and treatment as fixed effects and subject as random effects. The data were analyzed to see the differences over time for all images using 3 color parameters, including b\* (yellowness), L\* (lightness), and a\* (redness). All treatment comparisons were tested at a two-sided 0.05 level of significance.

## RESULTS



## RESULTS (Cont.)

b\* Values at End of Stain Induction (96 Hours)

	LS Means (S.E.)	Trt. Diff (S.E.)	P-value
<b>Anterior</b>		-0.28 (0.10)	0.017
Fixodent	15.03 (0.14)		
No Adhesive	15.31 (0.14)		
<b>Left Posterior</b>		-0.32 (0.08)	0.002
Fixodent	16.17 (0.15)		
No Adhesive	16.56 (0.15)		
<b>Right Posterior</b>		-0.39 (0.12)	0.011
Fixodent	16.17 (0.19)		
No Adhesive	16.56 (0.19)		
<b>Occlusal</b>		-0.11 (0.18)	0.569
Fixodent	17.61 (0.15)		
No Adhesive	17.77 (0.15)		

A total of 12 subjects were randomized to treatment and participated in all study days. No carryover effects were detected in the Week 2 data.

There were essentially no differences in the L\* (lightness) or a\* (redness) between the two treatment regimens, but consistent statistically significant differences at the end of treatment for b\* (yellowness) for the anterior views, as well as for the left and right posterior views were observed ( $p < 0.05$ ).

## CONCLUSION

The use of calcium/zinc Gantrez denture adhesive in conjunction with daily denture cleaning inhibits stain accumulation when compared with what is obtained with daily denture cleaning alone. In addition to reducing the movement of the denture, the denture adhesive matrix allows for throughout the day delivery of stain prevention benefits to the denture wearer.