

## Association of remineralizing agents to high concentration of hydrogen peroxide: effects on enamel morphology

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### Abstract

Remineralizing agents (RA) have been used coupled with hydrogen peroxide (HP) to reduce its negative effects into tooth structure. This study evaluated the association of Chitosan (Chi) and Calcium (Ca) to HP in relation to the physical properties of enamel. This combination was effective in reduce the changing of roughness and microhardness, without affect the whiteness effect. Also, the combination HP+Chi, with or without Ca showed the best result in preventing these alterations.

*Key words: bleaching, hydrogen peroxide, color.*

### Introduction

Tooth bleaching is a safe and conservative procedure, nevertheless, it is known that the hydrogen peroxide (HP) can cause damages in the dental structures.<sup>1</sup> In this context, the association of remineralizing agents with HP has been studied with the purpose to prevent its effects on the physical properties and morphology of enamel, as roughness and microhardness.<sup>2</sup>

### Results and Discussion

Fifty enamel bovine blocks were divided into 5 groups (n=10) in according to the bleaching compound: 1) Without bleaching (Control); 2) HP 35%; 3) HP/Chitosan (Chi); 4) HP/Calcium (Ca); 5) HP/Ca/Chi. The evaluation of roughness (Ra) and color ( $\Delta E$ ,  $\Delta L$ ,  $\Delta a$  e  $\Delta b$ ) were performed before (T0) and after the bleaching (T1); and after saliva storage (T2). The surface microhardness (SMH) was analyzed just in T2. Statistical analysis was applied with analysis of variance (ANOVA 1-way) and Tukey test ( $p < 0.05\%$ ). For SMH, the groups with Chi showed the highest values, without differences in relation to the control group. For Ra, all groups with remineralizing agents showed the lowest values in comparison with the PH, in all of frames analyzed. Also, the group PH/Chi/Ca demonstrated the lowest value, with statistical difference in relation to the others. Regarding the saliva storage effect, the presence of remineralizing agents resulted in the lowest changing in Ra, with significant differences in relation to the group bleached just with HP. In the comparison T2xT0, the PH/Chi presented changing in Ra similar to that found in the control group. The  $\Delta E$  and the  $\Delta L$  evaluation did not showed significant differences between the groups with remineralizing agents in T2xT0. For  $\Delta L$ , in T1xT0, the PH/Chi showed the best result, with statistical difference in relation to all of other

groups. In relation to  $\Delta a$ , it was not found statistical significant differences between the groups with remineralizing agents in T2xT0. The group PH+Chi presented the highest value of  $\Delta b$ , with statistical differences in relation to the other groups. In the association between HP and Ca, the bleaching gel is saturated with this mineral and, in case of demineralization, the ions Calcium can be deposited on the enamel surface.<sup>2</sup> Chitosan is a natural polissacaride, with higher ionic potential, and it has the ability to adhere the enamel surface at the same time that it can bin itself with another compounds, like ions and proteins from saliva, inducing the remineralizing effect under the tooth structure.<sup>3</sup>

### Conclusions

The addition of Chi with hydrogen peroxide may be a reliable option to the bleaching therapy, once this association showed reduction of the negative effects of HP on enamel without influence its whiteness efficacy. Also, the results of the color evaluation suggest a positive correlation between the presence of Chitosan and the color changing.

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<sup>1</sup> Goldberg M, Grootveld M, Lynch E. Undesirable and adverse effects of tooth whitening products: a review. *Clin Oral Inv.* 2010; 14:1-10.

<sup>2</sup> Cavalli V.; Rodrigues L. K.A.; Paes-Leme A. F.; Soares L. E. S.; Martins A. A.; Berger S. B.; Giannini M. Effects of the addition of fluoride and calcium to low-concentrated carbamide peroxide agents on the enamel surface and subsurface. *Photom Laser Surg.* 2011; 29(5): 319-325.

<sup>3</sup> Arnaud TMS, Neto BB, Diniz FB. Chitosan effect on dental de-mineralization: An in vitro evaluation. *J Dent.* 2010; 38:848-852.