COMMENTARY

HIGH LEVELS OF HYDROGEN PEROXIDE IN OVERNIGHT TOOTH-WHITENING FORMULAS: EFFECTS ON ENAMEL AND PULP

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The researchers have contributed to the growing base of evidence that indicates that tooth whitening using peroxide bleaching agents is a safe procedure when used under professional supervision. The clinical effectiveness of custom-tray delivered bleaching is well documented, and there are virtually no reports of adverse effects that result in tooth damage. Transient tooth sensitivity and gingival irritation are commonly reported by patients using bleaching agents; however, these symptoms resolve when the whitener is discontinued.

This study is important because the data indicate that measurable damage to tooth structure is not seen even when experimental concentrations of hydrogen peroxide up to 12% are evaluated. The authors measured microhardness and found no significant difference between specimens exposed to bleaching agents and artificial saliva following a simulated home tray-delivered whitening treatment. One concern that has been voiced against bleaching is the possible softening of enamel, which would result in accelerated wear. These data indicate otherwise. Further confirmation that enamel damage does not occur is provided by data from ESCA and AFM. There were no changes in the calcium and phosphorous levels on the enamel surface of bleached specimens when compared with controls. Likewise, bleaching did not increase the enamel roughness as measured by AFM. Even subtle enamel damage that would not be detected using microhardness measurements would be detected by ESCA or AFM. It appears that with the products tested in this study, enamel damage does not occur when used over a total of 98 hours.

The authors reported that the pH value of the materials evaluated in this study was above 5.5. The critical pH range for enamel to dissolve is 5.1 to 6.5 and is dependent on salivary and plaque concentrations of calcium and phosphate.[1] Other recent studies have evaluated the effects of peroxide bleaching on enamel microhardness and morphology.[2–9] These studies found variable effects, depending on the specimen storage solution and the pH, peroxide concentration, brand of product, and fluoride content of the materials tested. Fluoride-containing materials may have a mitigating effect on the loss of enamel minerals. Studies that used artificial or human saliva tended to show less or no enamel damage.

In the present study, the specimens were stored in human stimulated whole saliva, which likely mitigated the acidic effects of the bleaching materials and contributed to the lack of observed enamel damage. This may not be the case for all peroxide-containing whitening products. Hydroxyapatite is the primary component of dental enamel, and its solubility increases by 10 for each unit pH decrease below pH 7. A decrease in pH from 7 to 5 results in a 100-fold increase in hydroxyapatite solubility. Use of bleaching materials with pH below 5.5 will likely result in enamel damage even in patients with adequate salivary flow and higher salivary concentrations of calcium and phosphate.

The market of professional and over-the-counter tooth-whitening products has expanded rapidly. Dentists and patients should be careful in selecting products that have proven effectiveness and are near neutral pH.

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