

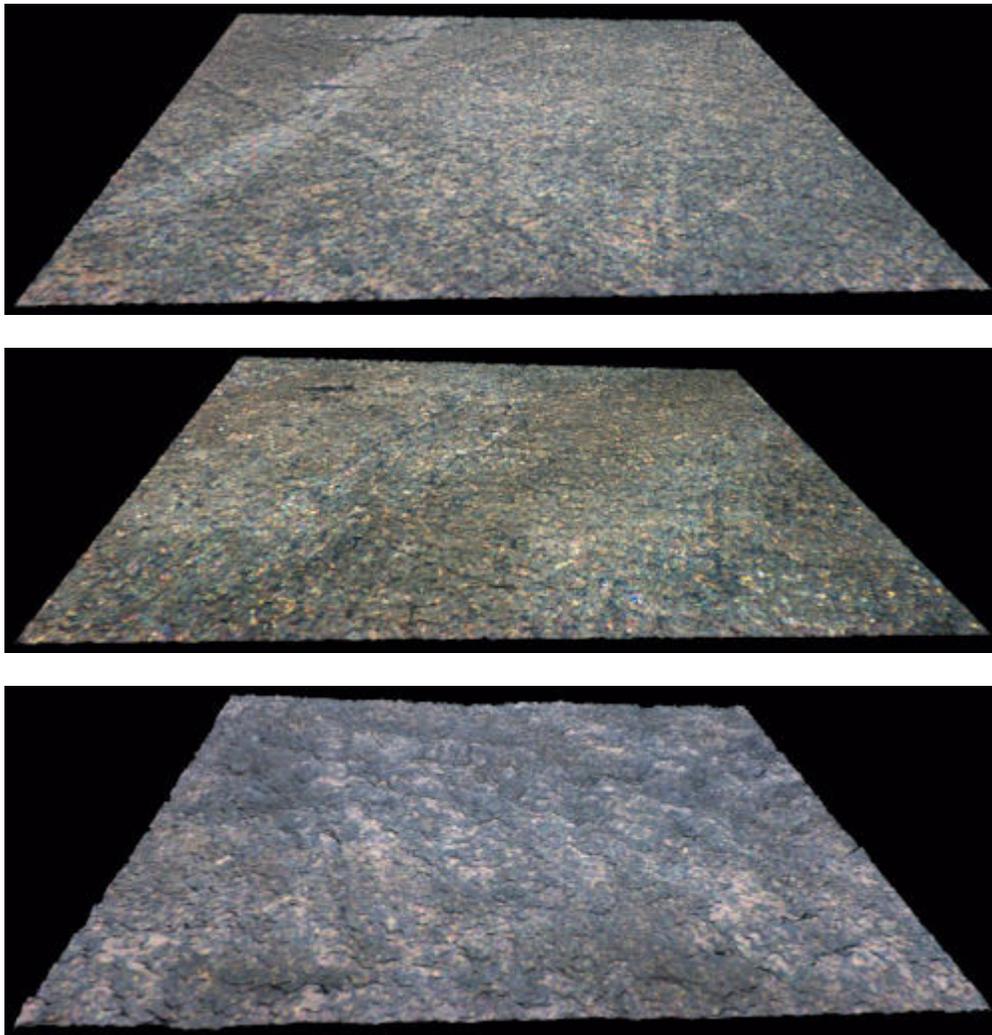
Orange juice and other acidic fruit juices are more harmful to tooth enamel than hydrogen peroxide, the common ingredient in professional and over-the-counter whitening products, according to researchers from the Eastman Institute for Oral Health at the University of Rochester Medical Center.

Yanfang Ren, D.D.S., Ph.D., M.P.H., and his team determined that the effects of 6% hydrogen peroxide activated with LED light on tooth enamel are insignificant compared to the effects of acidic fruit juices, and that orange juice markedly decreased hardness and increased roughness of the enamel.

For the study, published in the [Journal of Dentistry](#) (June 2009, Vol. 37:6, pp. 424-431), 40 human enamel disks were incubated in saliva overnight to allow pellicle formation, then divided into three groups: 15 for whitening, 15 for orange juice immersions, and 10 for normal saline controls. The disks were treated with 6% hydrogen peroxide (eBright Tooth Whitening Accelerator, [Beyond Dental and Health](#)) or orange juice for 20 minutes each cycle for five cycles to simulate daily treatment with these products for five days. The disks were stored in saliva between treatment cycles.

Using a new focus-variation vertical scanning microscope and a Knoop indenter, Dr. Ren and his colleagues evaluated the surface topography and the microhardness of the disks before and after treatment. They found that enamel surface hardness decreased 84% after orange juice immersion, but saw no statistically significant changes in the whitening and control groups.

In addition, the surface topography changed significantly only in the orange juice groups, as shown by increased roughness, peak-to-valley distance, and surface area ratio. No such changes were observed in the other groups.



*These 3D images, acquired by a focus-variation vertical scanning microscope, show enamel surface after erosion by physiological saline (top), enamel surface after whitening (middle), and enamel surface after erosion by orange juice (bottom). Dr. Yanfang Ren and colleagues have also shown that surfaces eroded by orange juice more easily accumulate biofilms formed by *Streptococcus mutans*, the microorganism that causes caries. Images courtesy of Dr. Yanfang Ren.*

"The acid [in orange juice] is so strong that the tooth is literally washed away," Dr. Ren said.

It's long been known that juice and sodas have high acid content and can negatively affect enamel hardness. And while some studies have shown that whitening can affect the hardness of dental enamel, "until now, nobody had compared the two," Dr. Ren said. "This study allowed us to understand the effect of whitening on enamel relative to the effect of a daily dietary activity, such as drinking juices."

"These findings suggest that daily challenges from acidic soft drinks are potentially much more detrimental to dental hard tissues than periodic applications of hydrogen peroxide-based tooth-whitening products," the authors concluded.

Beyond Dental and Health sponsored the trial in part by providing the eBright accelerator product.

Calcium-fortified juice

Fruit juice lovers may be in luck, however. A study published in the [*Journal of the American Dental Association*](#) (December 2007, Vol. 138:12, pp. 1593-1598) found that calcium-fortified juice drinks can actually help prevent dental erosion.

In that study, researchers from the University of Iowa compared the pH levels and titratable acidities of commercially available calcium-fortified and unfortified 100% juices, plus enamel and root surface lesion depths after they were exposed to different juices. They exposed enamel and root surfaces to different 100% juices for 25 hours and measured lesion depths.

They found that fortifying apple, orange, and grapefruit juices with calcium prevented enamel erosion and decreased root surface erosion ($p < 0.01$).

"Calcium concentrations in commercially available, calcium-fortified 100% juices are sufficient to decrease and prevent erosion associated with extended exposure to a beverage," the researchers concluded.