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Teeth whitening products can harm protein-rich tooth layer

Researchers show active ingredient in whitening strips damages dentin

EXPERIMENTAL BIOLOGY

Orlando, Fla. (April 9, 2019) - Americans spend more than a billion dollars on teeth whitening products each year. Although these products can make smiles brighter, new research shows that they might also be causing tooth damage.

In three new studies, researchers found that hydrogen peroxide, the active ingredient in over-the-counter whitening strips, can damage the protein-rich dentin tissue found beneath the tooth's protective enamel.

Undergraduates working in the laboratory of Kelly Keenan, PhD, associate professor of chemistry at Stockton University in New Jersey, will present this research at the American Society for Biochemistry and Molecular Biology annual meeting during the 2019 Experimental Biology meeting to be held April 6-9 in Orlando, Fla.

The tooth is made of three layers: the outer tooth enamel, an underlying dentin layer and connective tissue that binds the roots to the gum. Most studies of whitening strips have focused on tooth enamel, which contains very little protein. Kennan's research team focuses on dentin, which makes up most of the tooth and has high levels of protein, most of which is collagen.

It is well established that hydrogen peroxide can penetrate the enamel and dentin. Previous work by the researchers showed that collagen in the dentin layer decreased when teeth were treated with whitening strips.

"We sought to further characterize what the hydrogen peroxide was doing to collagen," said Keenan. "We used entire teeth for the studies and focused on the impact hydrogen peroxide has on the proteins."

In the new work, the researchers demonstrated that the major protein in the dentin is converted to smaller fragments when treated with hydrogen peroxide. In additional experiments, they treated pure collagen with hydrogen peroxide and then analyzed the protein using a gel electrophoresis laboratory technique that allows the protein to be visualized.

"Our results showed that treatment with hydrogen peroxide concentrations similar to those found in whitening strips is enough to make the original collagen protein disappear, which is presumably due to the formation of many smaller fragments," said Keenan.

The researchers point out that their experiments did not address whether collagen and other proteins in the teeth can be regenerated, so it is unknown if the tooth damage is permanent. Next, they plan to further

characterize the protein fragments released when collagen is treated with hydrogen peroxide and determine if hydrogen peroxide has the same impact on other proteins in the teeth.

Jonathan Tadros, Isaiah Ailes and Diana Valdes will present the findings from 11:45 a.m.-1 p.m. Tuesday, April 9, in Exhibit Hall-West Hall B, Orange County Convention Center (poster E163 783.3) (abstract), (poster E161 783.1) (abstract) and (poster E165 783.5) (abstract). Contact the media team for more information or to obtain a free press pass to attend the meeting.

Image available.

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About Experimental Biology 2019

Experimental Biology is an annual meeting comprised of more than 14,000 scientists and exhibitors from five host societies and multiple guest societies. With a mission to share the newest scientific concepts and research findings shaping clinical advances, the meeting offers an unparalleled opportunity for exchange among scientists from across the United States and the world who represent dozens of scientific areas, from laboratory to translational to clinical research. http://www.experimentalbiology.org #expbio

About the American Society for Biochemistry and Molecular Biology (ASBMB)

ASBMB is a nonprofit scientific and educational organization with more than 12,000 members worldwide. Founded in 1906 to advance the science of biochemistry and molecular biology, the society publishes three peer-reviewed journals, advocates for funding of basic research and education, supports science education at all levels, and promotes the diversity of individuals entering the scientific workforce. http://www.asbmb.org

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