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Reason to Smile: New Technology Aims to Eliminate Pain from Cavity Treatment Procedures

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Tooth decay and cavities are no smiling matter - especially when fillings are required. The drilling procedure is cumbersome and outright painful in some cases. To alleviate the discomfort and improve the durability and quality of fillings, Missouri researchers are developing a high-tech device that will offer improved treatment for cavities.

Overseeing the project is Qingsong Yu, assistant professor of mechanical and aerospace engineering at the University of Missouri-Columbia. His collaborators are Hao Li, assistant professor of mechanical and aerospace engineering at MU, and Yong Wang, associate professor and director of craniofacial bioengineering at the University of Missouri-Kansas City. The team of researchers recently received a three-year, $270,000 National Science Foundation grant to lay the groundwork for their endeavor - a non-thermal plasma brush using a low-temperature chemical reaction to disinfect and prepare cavities for fillings

"Successful development of the plasma brush could replace the painful and destructive drilling currently practiced in dentistry," Li said.

The brush, researchers said, will operate without vibrations and heat, which disturbs tooth nerves and causes much of the pain that is felt using current dental procedures. In addition, it will operate silently - without the distinctive noise of a drill.

"Plasma treatment would be a painless, nondestructive and tissue-saving way to care for and treat cavities because it relies on chemical reactions instead of heat or mechanical interactions," Yu said. "And the chemical bonding between teeth and fillings that the plasma treatment would create would be much stronger than dentists currently get with drills or laser techniques."

Along with eliminating pain, the brush will change the surface chemistry of its target - resulting in a stronger bond to extend a tooth's lifetime. In addition to patients, the emerging technology also will benefit dentists.

"In general dentistry practices, nearly 75 percent of the dentist's time and effort is devoted to replacing fillings that fail prematurely," Wang said. "The premature failure of materials used to repair and replace damaged tissues in the mouth can be traced to breakdown of the bond or seal formed between the filling and the tooth surface."

Yu and Yixiang Duan, a scientist at Los Alamos National Laboratory, have filed two U.S. patent applications for the plasma brush.

Source: University of Missouri

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