

# Technology able to repair damaged teeth

Ultrasound technique stimulates tissue growth; may one day be used to stimulate bone tissue growth

TIM PEPPIN  
News Staff

Don't throw away your toothbrush—this is the message of University of Alberta researchers who have developed a new technique that repairs dental damage and, in the future, may be used in a variety of medical procedures.

Dr Ying Tsui, a researcher with the Faculty of Engineering, along with Dr Tarek El-Bialy from the Faculty of Medicine and Dentistry, and Dr Jie Chen from the Department of Electrical and Computer Engineering have successfully used low-intensity pulsed ultrasound (LIPUS) to stimulate the growth of tissues and bones in animals, including humans. The team's research, which has been reported as a way to regrow teeth, is actually a method to stimulate the growth of the roots of teeth damaged by injury or disease.

"Currently the device can be used to treat resorption of roots but cannot stimulate the growth of an entirely new human tooth if the tooth was completely lost," Tsui explained.

The device is referred to as an ultrasound transducer—an object that emits high-frequency sound waves. It has its own power source, a "smart" ultrasound emitter that monitors the power of the sound waves for best effects, and also wirelessly broadcasts feedback to the patient or dentist.

But despite the complexity of the device, the unit is now small enough to comfortably mount on orthodon-

tic braces inside the mouth thanks to a successful interdisciplinary collaboration between the researchers. El-Bialy had been researching the effects and potential of LIPUS for years. Previously, patients had to hold an ultrasound unit to the desired area for 20 minutes a day—a requirement that was inconvenient for the patient, and frustrated El-Bialy. With the nanotechnology and engineering expertise of Tsui and Chen, however, the ultrasound transmitter was shrunk to a size where it could be taken out of the hands of the patient, quite literally, and placed in the mouth.

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**DR YING TSUI,  
FACULTY OF ENGINEERING**

Currently, LIPUS has been used to treat Hemifacial Microsomia—a condition in which the lower half of one side of the face is underdeveloped, often requiring expensive surgery to correct—and to treat the resorption of teeth roots. The roots of teeth can



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**SAY CHEESE** Research aimed at stimulating the roots of damaged teeth to grow again is providing a lot to smile about.

be resorbed for many reasons: disease, hormonal changes, an attack by the body's own immune system, and even the simple wearing of orthodontic braces can all trigger it. LIPUS, however, can reverse the damage, allowing those with corrective braces to wear them longer, and those with degenerative disorders to maintain the

health of their teeth.

While their current research is limited to repairing and restoring damaged dental bone, Tsui is hopeful that LIPUS' applications may broaden, and be used in other fields and medical procedures.

"Ultrasound could be used to stimulate the growth of bones and tissues

in other parts of the body. Teeth are not unique. Our current experiments indicate LIPUS can be even used to stimulate stem cells to grow and differentiate into bone tissues. In the future, perhaps new teeth can be engineered from stem cells, but for this idea to materialize it will require a lot of research," Tsui said.

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