



Ontario Centres of Excellence

Research with More Bite

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**Dr. Stephen Abrams, CEO,
Quantum Dental Technologies**

Most people see their dentist once every six months or so. University of Toronto professor Andreas Mandelis is an exception. His first time in Dr. Stephen Abrams’ dental chair sparked a partnership that is still flourishing and will reach far beyond the health of just Mandelis’ teeth.

Nearing the end of a particularly hard day – and with a captive audience in the open mouthed Mandelis – Abrams began complaining about the state of dental practice, still characterized by what he calls the drill, fill and bill mentality. He was seeing too many young patients with stained grooves on their back teeth and no way of assessing if this was decay or just stain. Abrams was frustrated by the profession’s general inability to discover the extent of decay before drilling especially on the biting surfaces of teeth. When Mandelis finally regained the powers of speech, he said he could help.

Professor Andreas Mandelis, a graduate of Yale and Princeton, has been with the Departments of Mechanical and Industrial, and Electrical and Computer Engineering at the University of Toronto since 1982. Earlier in his career, he had worked with OCE’s Centre of Excellence for Materials and Manufacturing on a project involving thermophotonics in the testing of case-hardened parts. He was certain that the methodology of the research proven in that project could – with certain modifications based on the way teeth interact with photons – apply to dentistry and the testing of the integrity of teeth.

Partnering to Shine New Light on Dental Practice

Mandelis introduced Dr. Abrams to the team at Ontario Centres of Excellence that had supported his earlier research in thermophotonics. The new partnership had all the elements of a promising OCE research collaboration: an exceptional researcher; a committed and entrepreneurial industry partner; and a high-potential early-stage technology.

Together with OCE, Mandelis and Abrams are now working to develop a technology that may just move the dental profession from a surgical practice to a preventative one.

For years, dentists have searched for the signs of tooth decay by studying X-rays, visually inspecting teeth, and probing the stained grooves with the dreaded dental pick. Suspicion leads to drilling, which in turn leads to filling, and much early-stage decay goes undetected until it reappears as a full cavity.

But what if there was a way to find evidence of demineralization so early that dentists could treat patients before the development of a cavity, before the necessity of drilling and filling? Mandelis, Abrams and OCE are actively pursuing this goal and enjoying encouraging results.

Thermophotonics: A Real Mouthful

Using pulses of laser light focused on a tooth, they found that the tooth glows and releases heat – analysing the wavelengths and heat signatures of the emitted light and thermal radiation gave them very accurate information about the tooth’s condition.

As lesions grow, the signal changes; as remineralization progresses, the signal indicates that improvement.

“Every time we get data back,” says Dr. Abrams, “I am always amazed at the level of sensitivity. The technology is much more sensitive at this stage than the current gold standard of detection, x-rays and visual examination. We have even been able to identify demineralization between teeth.”

The non-invasive technology has a ready and reliable market – dentists have been moving in this direction for decades. Scientists at heart, dentists are known for their early adoption of technological innovation. This is one of the reasons Dr. Abrams is so excited about the potential of his partnership with Mandelis and OCE.

“OCE co-invested, and that was crucial,” says Dr. Abrams, “but their real value has been as a sounding board. They act as a true mentor: guiding our business plan, sharpening our focus and keeping us on track. It has been a very supportive relationship. When I meet with researchers worldwide, they are very impressed and envious of the relationship we have with OCE.”

Abrams and Mandelis have created an Ontario-based spin-off company, and are now working with OCE to develop a prototype of the technology for clinical use. As part of readying for the marketplace, they are also documenting the technology’s efficacy to certify it as a class-one medical device.

Expect great things to come from this partnership – not least of which could be lower dental bills and painless check ups.