



Ontario Centres of  
Excellence

Where Next Happens

# Putting Technology Where Your Mouth Is

Researchers at the University of Toronto,  
in an OCE-supported collaboration with  
UHN's Laboratory for Applied  
Biophotonics, are giving dental patients  
something to smile about

Considered to be an advanced technological achievement of the 3rd century, B.C., Pharos was the name of the lighthouse of Alexandria. One of the seven wonders of the ancient world, its marvel for scientists was its mysterious mirror, the reflection of which could be seen more than 50 km off-shore. Just as Pharos used the power of light to protect travelers on the sea, a new Ontario company of that name is using the power of light to safeguard dental patients from periodontal disease.

Periodontitis is a serious inflammatory disease caused by bacterial infection. The disease destroys connective tissue and can result in the loss of bone around teeth. Dental practitioners typically treat periodontitis with scaling and root planing – scraping bacterial plaque from the teeth. The process is highly uncomfortable for patients, who are rarely able to withstand treatment of more than half their teeth in a single session. Practitioners may also apply local antibiotics – which, in continued use, may trigger the development of resistant bacterial strains.

But researchers at the University of Toronto, in an OCE-supported collaboration between the University Health Network (UHN) and industry partner EFOS Inc., are giving dental patients something to smile about. The partnership has developed a non-invasive treatment using light-activated drugs to target infected cells. In this process, a photoreactive drug that binds to targeted cells is illuminated causing the drug to destroy the bacterial cell structure. Photodynamic therapy (PDT) of this kind is highly effective in killing bacteria that leads to periodontal disease – and it is virtually painless.

## Enlightening the Whole Mouth

The approach has already shown strong results using localized illumination of periodontal pockets – unwanted gaps around the teeth that can fill with harmful bacteria that are particularly difficult to remove. But this group wanted to take the technology a step further and give practitioners the ability to treat the whole mouth simultaneously – reducing treatment time, and killing residual bacteria in other areas of the mouth that might cause re-infection.

Ontario Centres of Excellence assembled a unique group of researchers around this problem. Led by Dr. Brian Wilson, the Scientific Director of the Laboratory for Applied Biophotonics (LAB) at UHN, the project brought the dentistry expertise of Dr. Howard Tenenbaum together with the innovative lighting expertise of Dr. Zhenghong Lu. A professor in the Department of Materials, Dr. Lu has developed highly flexible and bright organic light emitting diodes. Success depended on the team's ability to create effective new methods of light and drug delivery to the whole mouth.

## Pharos: A New Ontario Company

When research showed that PDT was effective, Pharos Life, a new Ontario company was established to further commercialize the research. OCE and the young company are exploring further applications and readying the technology for the marketplace. Like its lighthouse namesake, Pharos is a bright light on the Ontario landscape.