



## MEMS Research Opens New Doors for Drug Delivery

Dr. Wael Badawy, Professor at the University of Calgary, used tools and technologies provided by CMC to develop the iPill. He designed microelectronic components and developed sensors and pumps using modeling tools provided by CMC through the System-on-Chip Research Network. While the prototype cost about \$730,000 to develop, a mass-produced pill could be manufactured for as little as 10 cents per unit—helping to drive down the costs of health care.

**D**r. Wael Badawy has less time to focus on his research these days. The electrical engineer at the University of Calgary is flooded with requests for information on a new electronic pill that can dispense drugs, and potentially save lives.

The iPill—“intelligent pill”—is based on MEMS technology (microelectromechanical system), or small devices manufactured with dimensions of less than one millimetre (1000 microns). It uses

silicon-oxide-based sensors to monitor a person’s body temperature and pH balance. Micropumps in the iPill release a precise dosage of a drug exactly when needed. It could be used to treat life-threatening diseases such as AIDS or diabetes.

“Instead of a patient having to remember to take many pills at different times throughout the day, the iPill does it automatically,” explains Dr. Badawy, an expert in large-scale microelectronics integration who won Micralyne’s prestigious Microsystems Design Award at CMC’s annual symposium in 2001.

Dr. Badawy moved from the U.S. to Canada in July 2000. He was enticed by access to industry-grade modeling tools and fabrication facilities, made available through CMC. These technologies make it possible to prove that ideas work—a necessary precursor to commercialization. Looking ahead, he will work on boosting the iPill’s power capacity from four hours to 12 hours and longer. With CMC’s support, he has applied to NSERC for a five-year grant to design a second-generation iPill product.

While the University of Calgary is investigating commercialization of this technology, Dr. Badawy hopes to partner with a Canadian pharmaceutical company to test various drug options. He says the iPill could be available for animal testing within two years, and approved for human use within five years. International interest in the iPill was sparked this summer when Wired.com published an article on this innovative technology.

“What I’ve delivered is not a medical solution,” adds Dr. Badawy. “It’s an engineering solution for drug release. Microsystems make it possible to replace conventional drug delivery systems with more effective and affordable solutions that will ultimately help to improve patient care and quality of life.” *cmc*