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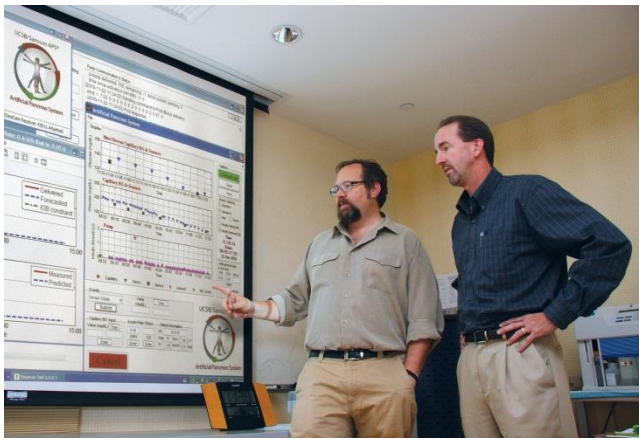
NIH Awards $4.5M to International Research Group for Smart Artificial Pancreas Technology

An international team of diabetes research experts is engineering an intelligent artificial pancreas system that responds in real-time to meals, exercise, stress and changes in physiology for type 1 diabetes patients

(Santa Barbara, Calif. –) The National Institutes for Health (NIH) have awarded $4.5 million to a group of international diabetes researchers to engineer an artificial pancreas system that will monitor and adapt to the body's complex real-time changes in behavior and physiology. This collaboration between physicians and engineers aims to merge three key aspects of type 1 diabetes management – human behavior, physiology, and medical technology – and ultimately to transition their artificial pancreas technology into clinical practice.



Researchers Howard Zisser (left) and Frank Doyle (right) - *UCSB*

"This is a groundbreaking project that assembles the world's leaders in artificial pancreas technology to not only expand in-clinic methods for control of blood sugar, but to pioneer the development of outpatient solutions that can bring improved quality of life to patients in their natural environment," said Professor Frank Doyle of UC Santa Barbara, Principal Investigator for this study. "It is a unique team with interdisciplinary strengths that range from control engineering to medical practice to behavioral science."

Setting their study apart is the focus on developing a more sophisticated program, or algorithm, which acts as the "brain" of the artificial pancreas. Called a closed-loop control (CLC) system, this algorithm is informed by the numerous physiological changes – such as hormones, meals, stress, exercise and sleep – and mimics the insulin creation function of a healthy pancreas. A CLC system that treats type 1 diabetes must be responsive to all daily challenges in life, and able to accurately predict blood glucose levels in advance.

"This is medically-inspired engineering, or engineering-inspired medicine," commented Doyle, a Chemical Engineering professor at UCSB who holds the Mellichamp Chair in Process Control. "One of the great advantages we have is that we are collaborating to mutually understand what is needed in both the research and clinical environments to make the artificial pancreas technology a reality."

UCSB is playing the lead role in organizing this international consortium of prominent diabetes researchers, an assembly of world leaders in the fields of computer modeling, control systems, simulation and clinical research. The artificial pancreas research group includes Professor Doyle, Howard Zisser of

the Sansum Diabetes Research Institute, Boris Kovatchev of University of Virginia, Ananda Basu of the Mayo Clinic, and Claudio Cobelli of University of Padova, Italy.

In the United States, as many as 3 million people are living with type 1 diabetes, with more than 30,000 youth and adults diagnosed every year. Type 1 diabetes is an autoimmune disease wherein the body's immune system attacks and destroys the insulin-producing cells of the pancreas. For someone with type 1 diabetes, regulating their blood sugar level currently involves a daily regimen of multiple insulin injections or an insulin pump, in addition to blood sugar testing 8 – 10 times a day.

"Our final goal of an ambulatory artificial pancreas has the potential to make a tremendous impact on the health and lives of people with type 1 diabetes," said Howard Zisser, co-Principal Investigator and Director of Clinical Research at Sansum Diabetes Research Institute.

In recent years, Doyle and Zisser have collaborated to launch the Artificial Pancreas Program at SDRI and UCSB, and have been testing their system in inpatient clinical trials at SDRI. The development of CLC technology has made significant strides over the last five years, but the research consortium understands the challenges faced in gaining FDA approval for an artificial pancreas system.

"The typical research-to-clinical process can be slow because the academic research must be complete and approved before clinical trials can begin," explained Zisser. "Our study will be an example of translational medical research, or research conducted in the lab and safely in a clinical setting in a complementary way, continuously informing each process of what is successful or not. That is the strength of our collaboration."

Their ambulatory artificial pancreas project is supported by the National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, and administered by the Institute for Collaborative Biotechnologies at UCSB.

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News release .pdf and images available at: http://engineering.ucsb.edu/news/528/

Related information

Frank Doyle, UC Santa Barbara: http://www.chemengr.ucsb.edu/people/faculty_d.php?id=18

The Doyle Group – Research Lab of Professor Frank Doyle: http://thedoylegroup.org/

Howard Zisser, Sansum Diabetes Research Institute: http://www.sansum.org/about/staff/senior-staff/howard-zisser-m-d/

Boris P. Kovatchev, University of Virginia: http://www.virginia.edu/uvatoday/newsRelease.php?id=14604

Ananda Basu, Mayo Clinic: http://cancercenter.mayo.edu/mayo/research/staff/basu_a.cfm

Claudio Cobelli, University of Padova: http://www.amylinbuildingblocks.com/index.php/claudio-cobelli-prof/