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"Artificial Pancreas" Controls Blood Glucose Levels in Diabetes Patients

Study Presented at American Diabetes Association Scientific Sessions

New Orleans, LA?June 6, 2009?UC Santa Barbara and Sansum Diabetes Research Institute scientists have demonstrated for the first time that an automated artificial pancreas system (APS) can safely and effectively maintain desired blood glucose levels in patients with type 1 diabetes. The clinical study results will be presented Monday in a late-breaking poster session at the American Diabetes Association's 69th Scientific Sessions in New Orleans.

The UCSB and Sansum researchers, working with the Schneider Children's Medical Center of Israel , tested an automated insulin delivery system comprising the OmniPod® System and the DexCom STS7® continuous glucose monitor, linked and controlled through UCSB's artificial pancreas software. The software's insulin delivery algorithm, optimized for each patient, includes a unique safety feature, based on clinical parameters, which prevents insulin-induced low blood glucose levels (hypoglycemia).

Without any outside intervention, the system restored normal blood glucose levels following both induced high levels (hyperglycemia) and unanticipated meals, while avoiding hypoglycemia. This was achieved through the automatic delivery of insulin to correct for the induced high blood glucose levels, and an insulin infusion rate moderated to ensure a smooth return to normal levels and avoid low blood glucose levels.

"This study demonstrates for the first time a completely automated insulin delivery system that frees the patients from controlling their pumps manually, eliminating the question of compliance in treatment," said principal investigator Frank Doyle, Professor of Chemical Engineering at UCSB.

Doyle continued, "We pulled together a talented team of engineers and medical doctors who created the critical element of the artificial pancreas-a unique algorithm that is robust and straightforward to implement. It's become the gold standard." The UCSB APS software platform is also being used by a number of other teams working on the artificial pancreas project, but no other team has advanced yet to wholly-automated clinical trials.

Closed loop trials were performed in four patients for a mean duration of 5 hours (range of 2-7 hours) and included a meal of 30 grams of carbohydrates. The mean Low Blood Glucose Index was 0.02 (range 0-0.06), the mean High Blood Glucose Index was 9 (range 4.2-15), and the median Daily Risk Range was 'low' (range 'low' to 'moderate').

The poster was presented in New Orleans by Matthew Percival of Doyle's research group . Other researchers in the study included Eyal Dassau, senior investigator, and Benyamin Grosman , both of Doyle's group; and Sansum's Dr. Lois Jovanovi?, CEO and Chief Scientific Officer, and Dr. Howard Zisser, Director of Clinical Research.

The research is part of the artificial pancreas project, which is funded by the Juvenile Diabetes Research Foundation and is being conducted by an international group of diabetes research centers. The project's first goal is to integrate an insulin pump and continuous blood glucose monitor to closely replicate a healthy pancreas for patients with type 1 diabetes-patients whose pancreases no longer produce insulin, which is used by the body to control blood glucose levels. An artificial pancreas will allow for tighter and automated control of blood glucose levels, which would significantly help to avoid the long-term complications of the disease.

Related Links

Frank Doyle's Research Group

Sansum Diabetes Research Institute

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