

Press release

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ARTORG and Inselspital develop artificial pancreas

Artificial pancreas devices so far cannot compensate the daily varying food intake or physical activities of diabetes patients. The University of Bern, the Bern University Hospital and an industry partner have therefore set out to develop a more flexible device to continuously control patients' blood sugar.

"Today, a diabetic patient must follow a very constraining therapy with many blood glucose measurements, dose calculations and insulin injections. The ideal would be to have a single system that can conduct all of these operations without requiring any intervention", says Prof. Peter Diem, Chairman and Head of the Department of Endocrinology, Diabetes and Clinical Nutrition at Inselspital. Such a system needs to continuously measure and calculate the level of glucose present in the blood and to constantly deliver insulin via an infusion pump. The amount of infused insulin is determined by an algorithm that estimates the patient needs based on the measured glucose levels, the time of day or the expected activities and that will adapt the pump infusion rate accordingly.

Insulin need depends on daily activity and food profile

"Approaches taken so far do not resolve fundamental difficulties: the patients' variability, uncertainties related to system disturbances, e.g. food intake and physical activity, and errors related to the used devices," says Dr. Stavroula Mougiakakou, Head of the Diabetes Technology Research Group at the University of Bern's ARTORG Center. "The proposed algorithm is easy to use, introduces the concept of real-time personalisation based on reinforcement learning, is able to tackle inter- and intra-patient variability, and can compensate for the effects of uncertain events."

Artificial pancreas has to work accurately and flexibly

The new artificial pancreas ARTORG and Inselspital wish to develop will include an infusion pump produced by an industry partner and an algorithm to run on a wireless PDA device used for the programming of the pump. The accuracy of the different elements in an artificial pancreas is critical. The insulin levels have to be maintained in a very narrow window. Too little insulin will lead to hyperglycaemia, while too much insulin generates hypoglycaemia. Both situations may induce coma and even patient death. The proposed pump therefore emphasizes on accuracy and flexibility.

The patch pump will be directly placed on the skin, to continuously monitor therapy. It can be detached and reattached at will. A prototype of the pump has been tested by patients in a first clinical trial. After development and integration, the new control algorithm for the personalised delivery of insulin will be verified in a number of clinical trials.

"We are looking forward to seeing this new approach being used by patients and appreciate how much this may facilitate their treatment. It is even more important to improve their quality of life", says Prof. Christoph Stettler, newly elected Director of the Division of Endocrinology, Diabetes and Clinical Nutrition at Inselspital.

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