

Artificial Pancreas for Patients with Type 1 Diabetes

In healthy individuals, blood sugar levels are tightly controlled by two hormones: insulin and glucagon. Secretion of insulin, a vital hormone to reduce blood sugar levels, is lost in type 1 diabetes. Type 1 diabetes is therefore treated with life-long insulin replacement therapy using multiple daily injections or a portable infusion pump. However, hypoglycemia (low blood sugar) is still frequent in type 1 diabetes patients and causes physical and psychological morbidity and sometimes leads to death. Hyperglycemia (high glucose levels) is also very common and leads to long-term complications such as heart diseases, blindness, and kidney failure. Over 300,000 Canadians currently live with type 1 diabetes, and Canada has the sixth highest incidence rate in children and adolescents younger than 14 years old.

The focus of our research at the Institut de recherches cliniques de Montréal (IRCM) is to develop an artificial pancreas that automatically regulates sugar levels for patients with type 1 diabetes. The artificial pancreas is composed of three components: continuous glucose sensor (to read blood sugar levels), infusion pumps (to deliver insulin and glucagon), and an intelligent dosing algorithm that links the sensor with the pump (to continuously alter insulin and glucagon delivery based on the sensor readings). We are combining commercial pumps and sensors with our developed dosing algorithms.

The artificial pancreas is considered the most promising therapy for type 1 diabetes and its development is eagerly followed by the patients and the media. We have tested the systems in a series of short-term clinical trials (15-24 hours) and the results are very promising. We are currently moving to outpatient longer and larger clinical trials.

The artificial pancreas has a great potential to revolutionize diabetes care and patients' safety, improve patients' quality of life, and reduces the burden of diabetes management from the patients and their health care providers.



Ahmad Haidar
PhD

Dr. Haidar is leading a unique engineering addition to the metabolic unit of the IRCM, developing in collaboration with clinicians an artificial pancreas for type 1 diabetes.

ahmad.haidar@ircm.qc.ca
514-987-5500 x 3238

