EDITORIAL

Artificial Pancreas: An Overview

Guntars Pupelis

Riga East Clinical University Hospital Riga, Latvia

INTRODUCTION

What is an Artificial Pancreas?

It is a man-made device, which closely mimics the glucose regulating function of real pancreas. It is designed to release insulin in response to changing blood glucose levels.

It can be mainly used to control glucose levels in those who suffer with type-1diabetes.

WORKING OF 'REAL PANCREAS' AND 'ARTIFICIAL PANCREAS'

Working of Real Pancreas

After eating food blood sugar (glucose) rises, pancreas sense the rise in glucose and begins to release insulin hormone to move sugar to blood stream to cells. So, that it can be utilized in the form of energy or can be stored for later. When pancreas senses low blood sugar level, it releases another hormone glucagon, this stimulates liver to release stored sugar to the blood stream.

Type-1 diabetes destroys insulin making cells of pancreas, as pancreas can't produce insulin at the time of high blood sugar level, it is required to be injected from outside. It requires a continuous blood sugar check, by finger prick several times a day, so that insulin can be injected from outside. This process becomes very tedious for both patient and doctors as well.

Working of Artificial Pancreas

It has a same functioning to that of a real pancreas. It takes a constant check of blood sugar and release insulin when the sugar level is high.

The Artificial Pancreas is a device set-up which comprises of Continuous Glucose Monitor (CGM), insulin pump and a transmitter (phone/computer device). CGM and insulin communicate with each other via transmitter. CGM reads the blood sugar level and sends the reading to transmitter; transmitter then calculates the total requirement of insulin and sends the signal to insulin pump to release the amount of insulin.

In other words, an Artificial Pancreas Device System not only monitors glucose levels but also automatically adjusts the delivery of insulin to reduce high blood glucose levels (hyperglycemia) and minimize the conditions of low blood glucose (hypoglycemia).

The system frees people from testing their blood sugar levels multiple times a day by fingerstick, and from delivery of insulin by multiple daily injections.

TYPES OF ARTIFICIAL PANCREAS

Closed-loop artificial pancreas

Bionic pancreas

Implanted artificial pancreas

Closed-loop artificial pancreas: It is the most commonly used artificial pancreas, made up of an externally worn insulin pump which communicates wirelessly to a CGM which is worn as a patch on skin. The CGM measures blood sugar levels and the result is fed into a small computer which calculates the insulin requirement (if any) which needs to be delivered by the insulin pump. The required amount is then delivered into the body, completing the cycle.

Bionic pancreas: It automatically controls blood glucose levels. It comprises of two insulin pumps which deliver insulin and glucagon respectively. The pumps are connected with an iPhone app via Bluetooth, which enables communication between the devices that helps calculate the required doses needed. Automated dosing decisions for insulin and glucagon are made in every 5 min based on updated CGM readings.

Implanted artificial pancreas: This device features a gel which responds to changes in blood glucose levels. When blood sugar is elevated, the gel enables a higher rate of insulin to be released; during lower sugar levels, the gel decreases the amount of insulin. The implantable system could be refilled with insulin on a regular basis.

Conflicts of Interest

All named authors hereby declare that they have no conflicts of interest to disclose.

Received July 27th, 2020 - Accepted August 13th, 2020
Keywords Pancreas; Artificial Pancreas; Blood Glucose; Insulin
Correspondence Guntars Pupelis
Riga East Clinical University Hospital
2 Hipokrata St., LV 1038, Riga, Latvia
Tel + 37129404783
Fax + 37167042763
E-mail aslimnicagp@gmail.com