

How technology can help to find a new treatment for patients with type 1 diabetes mellitus

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The current paradigm for the treatment of type 1 diabetes mellitus is to replace the function of pancreatic beta-cells that have been destroyed. One first direction is to mimic the function of these cells, through the use of sensors (of glucose levels) and actuators (insulin release with a pump) in a control physiological feedback loop that will be managed by a dedicated software. This is the concept of an artificial pancreas. The alternate direction is to replace the beta cells. In its current form, allogenic islet transplantation allows for an insulin independence rate of 44% at 3 years and for the absence of severe hypoglycemia in 90% of recipients at 5 years. To become a routine therapeutic option, cell therapy must fulfill two requirements: to avoid heavy and prolonged immunosuppression; to use an alternative cell source. Immunoprotection of stem cells within microcapsules or macrodevices addresses these issues. This is the concept of a bioartificial pancreas. Advantages and drawbacks of both concepts will be discussed.