Delivery of pancreatic islets and beta cells to brain: a novel technology for treatment of neurodegenerative diseases (Ramot)

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THE NEED

Altzhiemer's disease is one of the most studied pathologies in the world. It is also one of the most frustrating, as many of the drugs that reach late clinical trials fail due to low efficacy. In the last decade it is becoming clear that insulin, that plays an essential role in another world pandemic (Diabetes) plays a significant role in neurodegenerative diseases in general and in Altzhiemer's disease in particular. Growing evidences support the concept that Alzheimer's disease, which is the most common cause of dementia in older adults, represents a metabolic disease with impaired brain glucose utilization and energy production. The term "Type III diabetes" was proposed for Alzheimer's disease as a form of brain diabetes that has elements of both insulin resistance and insulin deficiency.

In the past number of years, in order to fight this insulin deficiency and resistance in the brain, researchers have been searching for ways to deliver insulin into the brain as Insulin delivery to the brain was shown to improve memory and cognition in patients with brain disorders (e.g. Alzheimer's disease). However, a technology for safe, efficient and metabolically regulated insulin delivery to the brain is still not developed. To the best of our knowledge, direct delivery of insulin producing pancreatic islets to the brain has not yet been used as a therapeutic tool for treating cognitive dysfunctions.

TECHNOLOGY

In this project, we intend to overcome current limitations of insulin delivery to the brain using intracranially implantable miniature bio-hybrid device (brain implant) containing living insulin producing pancreatic islets. The brain implantation site is highly oxygenated and immune-privileged. Insulin release from islets is strictly regulated by metabolic signals (e.g. glucose).

The clinical size brain implant is placed in the subarachnoid cavity in the brain that is filled with cerebrospinal fluid (CSF). The pancreatic islets are isolated from immune system of the recipient by an alginate hydrogel and membrane permeable for insulin, glucose and oxygen.

POTENTIAL APPLICATION

Implantation of metabolically regulated Insulin secreting pancreatic Islets for the treatment of cognitive brain disorders

ADVANTAGES

- Most efficient insulin delivery to the brain
- Well oxygenated site of transplantation- important for the survival of the β cells
- Long term functionality of the transplant
- Easy insertion and simply removal and exchange of implant

PATENTS

US20130336938 A1- Granted Patent

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