conferenceseries.com SciTechnol

Konstantin Bloch et al., J Pharm Drug Deliv Res 2017, 6:4 (Suppl)
DOI: 10.4172/2325-9604-C1-020

Islet-based insulin delivery to the brain for treatment of cognitive and metabolic disorders

Konstantin Bloch, Irit Gil-Ad, Alexey Vanichkin, Shay Henry Hornfeld, Nickolay Koroukhov, Michal Taler, Pnina Vardi and Abraham Weizman
Tel Aviv University, Israel

Background: There is increasing evidence supporting a link between dementia associated with peripheral metabolic dysfunctions and impaired brain insulin signaling. Insulin therapy has previously been tested as an approach to ameliorate brain insulin resistance and deficiency in patients with various brain disorders. However, current strategies for insulin delivery to the brain may induce severe hypoglycemia when injected peripherally or show poor uptake when delivered intranasally. Recently, we have shown that intracranial transplantation of a small amount of naked or alginate immunoisolated pancreatic islets increased brain insulin content and attenuated cognitive dysfunctions without altering peripheral glucose homeostasis in rats with schizophrenia–like syndrome. In this study, we used a small number of intracranially grafted pancreatic islets for efficient and metabolically regulated delivery of insulin to the brain for treatment of cognitive and peripheral dysfunctions in a rat model of sporadic Alzheimer's disease (AD).

Results: The effect of intracranially grafted islets on cognitive and metabolic dysfunctions was tested using inbred Lewis rats with AD induced by a single intracerebroventricular administration of 3 mg/kg streptozotocin (icv-STZ). Six weeks after icv-STZ, the obese rats were transplanted with one hundred islets in the cranial subarachnoid cavity. Eight weeks after islet transplantation, the spatial learning and memory of the recipients as estimated by the Morris Water Maze test were significantly improved compared to non-transplanted icv-STZ rats. In addition, the transplanted icv-STZ rats demonstrated statistically significant reduction of food consumption, body weight and blood level of insulin compared to non-transplanted icv-STZ rats. Importantly, intracranially grafted islets increased brain insulin content without alteration in peripheral glucose homeostasis.

Conclusion: Our results provide a novel approach for efficient and metabolically regulated insulin delivery to the brain. Intracranial transplantation of a small amount of pancreatic islets attenuates cognitive decline and obese-related peripheral metabolic dysfunctions in a rat model of sporadic AD.

Biography

Konstantin Bloch, PhD, is the Head of research team at Felsenstein Medical Research Center and Associate Professor at the Sackler Faculty of Medicine, Tel-Aviv University, Israel. He is an expert in the field of Pancreatic Islet Transplantation and Cell Immuno-isolation. He is the Scientific Co-founder of the Beta-O2 Technologies, a biomedical company developing a highly oxygenated implantable bio-artificial pancreas for treatment of type 1 diabetes (currently in Phase I/II). Recently, his team developed a proprietary technology of cell-based insulin delivery to the brain for treatment of cognitive disorders.

kbloch@post.tau.ac.il

Notes: