Intranasal Insulin

Overview

While insulin is generally regarded as a treatment for diabetes, it's underlying mechanism of action to facilitate energy within the cells. There is a vast quantity of research regarding intranasal insulin and the study of Alzheimer's disease. Dr. William Frey is one of the leading researchers in the discovery of using intranasal insulin in the late 1980's. Dr. Frey has shared openly about his publications and the protocols associated with treating Alzheimer's disease with insulin.

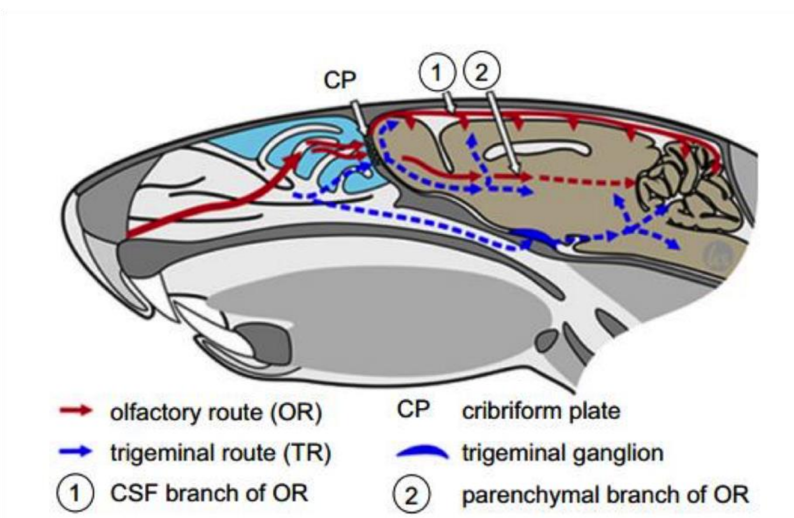
Benefits

- Improves brain ATP production
- Decreases cerebrospinal fluid (CSF) cortisol
- Improves neuronal viability in the hippocampus
- Increases the expression of anti-inflammatory microglia
- Reduces beta-amyloid and tau protein deposition

Application for TBI

Several mechanisms have been identified through which insulin administration may facilitate cognition, including regionally specific central nervous system (CNS) effects on glucose metabolism modulation of long-term potentiation (LTP), as well as modulation of CNS concentrations of neurotransmitters, such as norepinephrine and acetylcholine. However, peripherally administered insulin is not a viable treatment, in part due to risks associated with hypoglycemia.

The following diagram is key for understanding how the insulin and other substances can get into the brain—in the CSF or parenchyma.

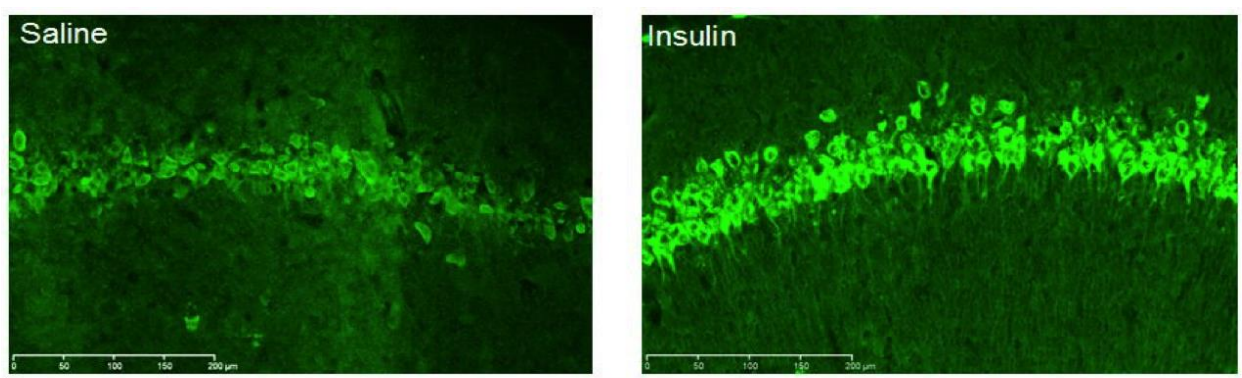


A number of compounds, including insulin and insulin-like growth factor I, have been successfully delivered to the brain or CSF following intranasal administration. Intranasal insulin administration increases CSF insulin levels in humans about 10 minutes after the injection, with peak levels achieved in about 30 minutes. Blood glucose and insulin levels do not change after intranasal administration, demonstrating that the changes in CSF are not due to transport from the nasal cavity to the systemic circulation.

Insulin can access the CSF along the olfactory neurons through the cribriform plate, or they can enter the CNS parenchyma through perivascular channels associated with the olfactory or trigeminal systems. In addition, a slower axonal transport pathway has been identified along which insulin can access the CNS several hours after intranasal administration. [1]

Intranasal insulin has extraordinary effects on the brain, now visualized and proven. See the following figures for the effects on the neurons of the hippocampus and the microglia.[2] TBI results in neuronal cell death. Neuronal cell death in the hippocampus impairs memory function. NeuN, an immunohistochemical marker of neurons, was used to examine the effect of intranasal insulin on neurons after injury. Qualitative assessment of histology showed improved neuronal viability in the hippocampus of the insulin treated rats.

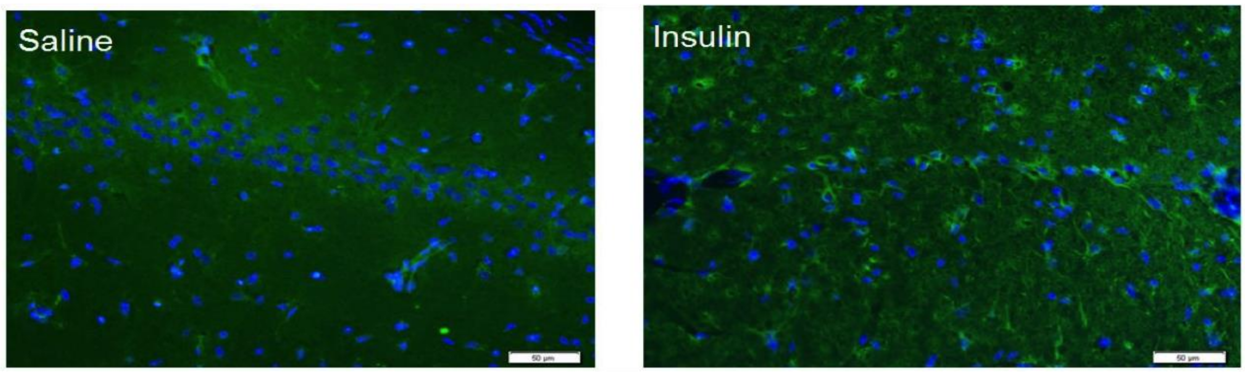
Figure 2. NeuN staining was increased with intranasal insulin treatment



[1] Danielyan, L., Beer-Hammer, S., Stolzing, A., Schäfer, R., Siegel, G., Fabian, C., ... & Novakovic, A. (2014). Intranasal delivery of bone marrow-derived mesenchymal stem cells, macrophages, and microglia to the brain in mouse models of Alzheimer's and Parkinson's disease. *Cell transplantation*,*23*(1), S123-S139.

[2] Brabazon, F. P., Khayrullina, G. I., Frey, W. H., & Byrnes, K. R. (2014, June). INTRANASAL INSULIN TREATMENT OF TRAUMATIC BRAIN INJURY. *In JOURNAL OF NEUROTRAUMA (Vol. 31*, No. 12, pp. A106-A106). 140 HUGUENOT STREET, 3RD FL, NEW ROCHELLE, NY 10801 USA: MARY ANN LIEBERT, INC.

Figure 3. Intranasal Insulin increases the expression of anti-inflammatory microglia in the hippocampus



Protocols

Patients with TBI will receive intranasal insulin at their first appointment along with a 10-day take-home administration kit.

Dangers/Side Effects

Bloody noses and swallowing the intranasally administered insulin are the biggest side-effect. If the insulin is swallowed, some form of sweet substance to eat may be needed to prevent a drop in blood sugar. Sneezing is another danger of the treatment.