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Targeting of therapeutic agents to the brain based on liposomes: A new method to control and improve the symptoms of Parkinson's disease

Kahana M[1], Segal-Gavish H[2], Gavish A[2], Loboda Y[1], Barhum Y[2], Gabay M[1], Offen D[2], Finberg J[1], Weizman A[2], Allon N[1], Gavish M[1]

[1]Rappaport Faculty of Medicine, Israel

[2]Tel Aviv University, Israel

Introduction: Parkinson's disease (PD) is a neurodegenerative disorder. Presently the early motor symptoms of the disease are managed primarily by replenishing dopamine in the striatum utilizing L-DOPA, its precursor that crosses the BBB. However, only 0.5-5% of the L-DOPA crosses the BBB and the rest cause severe side effects in peripheral tissues. We developed a targeted drug delivery system based on liposomes decorated with targeting peptides that are recognized by specific transporters located on endothelial brain cells. Upon binding to the transporter, the liposomes with their payload are transported over the BBB into the brain and the payload is released in a safe, controlled, and effective way without harming the BBB and maintaining the features and the efficacy of the drug. We selected dopamine, a drug that typically do not cross the BBB to be loaded into the liposomes, as a novel therapy for Parkinson's disease.

Methods: the prepared Liposomes have zeta potential of -42mV and the particle size was around 100 nm. This improved the quality, stability and the reproducibility of the liposomes during the loading of DA. The final loaded DA was between 0.5-1 μg per 1 mg formulated phospholipid.

Results: Following injection of our liposomes loaded with dopamine we demonstrate increase in striatal dopamine in mice within 5 minutes. The increase in concentration of dopamine in the striatum lasted for up to 3 hours after IP injection of the liposomes opposed to the control.

Conclusion: We present a strategy for delivery of drugs across the BBB by utilizing targeted liposomes as carriers. Encapsulated dopamine penetrates the striatum in about 100 times better than the control.

Biography

Kahana M has designed a targeted drug carrier system using liposomes containing a peptide fragments (6 amino acids from amyloid β) that bind to the Aβ transporters located on endothelial brain cells of the BBB-targeted liposomes. She used that system to deliver the drug of choice that cannot cross the BBB without the liposomes, to the brain, in a safe, controlled, and effective way without harming the BBB and maintaining the features and the efficacy of the drug, using mice and rat. This is innovating research, where she succeeds to produce liposomes containing dopamine that penetrate mice BBB in order to treat Parkinson's patients. She has acquired the technical, chemical and biological knowledge in preparing liposomes and work with animals to be applied for this research. She applies a various animal models to achieve the optimal results.

miglc@walla.com

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