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Nano therapeutics in Central Nervous System (CNS) Disorders

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Abstract

Statement of the Problem

Central nervous system (CNS) is a closely intricate control system of human body, regulating almost all the physiological mechanism directly or indirectly. Any imbalance or damage in this neural architecture leads to cascade of neural dysfunction. Fixing them has been a challenging task due to different inevitable physiological limitations like circulation barriers, drug permeability and their degradation. These factors limit the drug distribution towards the affected location in brain. The AD treatments used currently are facing constraints due to their pharmaceutical limitations and intend to provide the symptomatic relief alongwith potential side effects. So, new alternatives for the treatment of AD are highly desired and hence, natural products have been considered as more viable therapeutic options, owing to their wide spectrum of medicinal properties. The efficient therapeutic impact of Ginkgo biloba (GB) and its standardized extract (EGB761) is already known for improving the pathological landmarks in AD but it has shown pharmaceutical limitations like - fast degradability, lower bio-availability and delay in reaching the site of action. To address many of such issues, designed the study to develop the formulation for the same to be delivered through intranasal route as enables the delivery of drug compounds directly in to the targeted site of action (brain).

Findings: The present study results exhibited the nanometric size range (80 – 260nm) of the optimized standard extract (EGB761) microemulsion system (GBME) with desired Rheological parameters. GBME was also evaluated for its neuroprotective efficiency through in vitro and in vivo experimental models and there data indicated comparatively higher neuroprotective efficiency of GBME in comparison to the extract (EGB761) and positive standard (Reminyl) in Alzheimer's induced mice model (in vivo) and neuronal cell lines. In conclusion, the present study demonstrated that the developed formulation (GBME) has potential therapeutic effects on improving the pathological state of AD, and might be taken further as a promising candidate for clinical research to evaluate its efficacy in humans.

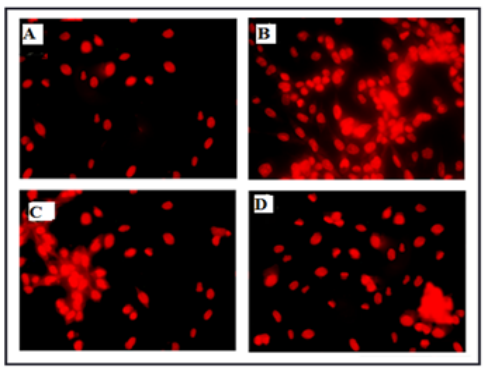

Figure 1: Fluorescence viewing (40X) of NB41A3 cell lines, after treatment with various testing compound combinations for 12 hours. A) Control (B) Scopolamine C) EGB761 D) GBME

Biography

Dr. Manisha Singh has her expertise in nanoparticle based drug delivery systems, specially oriented towards neurological disorders. She has developed various nano formulations of phytocompounds (Catechins, Gingko biloba, Centella etc.) and synthetic drugs (Losartan, Escitalopram, Hydrochlorothiazide etc.) for improving their therapeutic efficiency and suitability. Her expertise also include testing of these Nano formulations on various in vitro and in vivo models through targeted delivery routes like intra nasal delivery.She did her bachelors and masters in the area of neurological rehabilitation and had also served in various hospitals and rehabilitation centers for improving the physical and mental abilities of the neurologically compromised patients.

Recent Publications

1. R. Kaur, S. Verma, P. Joshi, S. P. Singh, M. Singh. Cytotoxicity of Graphene Oxide (GO) and Graphene Oxide Conjugated Losartan Potassium (GO-LP) on Neuroblastoma (NB41A3) Cells, Journal of Nanoscience and Nanotechnology. 18, 1–11, 2018.

2. R Kaur, R Rajput, P Nag, Rachana, M. Singh. "Synthesis, characterization and evaluation of antioxidant properties of Catechin hydrate nanoparticles". Journal of Drug Delivery Science and Technology. 39: 398-407;2017

3. R Rajput, R Kaur, M. Singh. In vitro cyto toxicity evaluation of escitalopram loaded nanoparticles after exposure to Neuroblastoma cell lines. International journal of pharmaceutical sciences and research. 8(6): 1000-07; 2017.

4.M. Singh, S. P. Singh, Rachana R. Antioxidant, cytotoxicity and stability evaluation of Ginkgo biloba extract (EGB761) based microemulsions (GBME) for enhanced therapeutic activity, Asian journal of pharmaceutical and clinical research; Vol.10 (08); 2017.

5. M. Singh, S. P. Singh, Rachana R. Development, characterization and cytotoxicity evaluation of Gingko biloba extract (EGB761) loaded microemulsion for intra nasal application, Journal of applied pharmaceutical science: Vol.7 (01); 24 – 34: 2017.

6. P. Nag, R. Rajput, S. Dhaliwal, S. Kumar, D. Prajapat, M. Singh, Formulation and Characterization Of Propranolol Nanoparticles For Transmucosal Nasal Drug Delivery, Macromolecular symposia, Volume 347, Issue 1, pages 32–38, January 2015.

7. N. Aminu, S. Baboota, K. Pramod, M. Singh, S. Dang, S.H. Ansari, J. K. Sahni, J. Ali, Development and evaluation of Triclosan loaded poly-ε-caprolactonenanoparticulate system for the treatment of periodontal infections, Journal of Nanoparticle Research, 15:2075 (2013).

Citation

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