Nucleo-liposomes as neurotracer for SPECT and anti-cancer drug delivery agent

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Abstract

Objective:

The Blood-Brain Barrier (BBB) is a major obstacle for drug delivery to the brain. Nucleolipid based liposomes are promising drug delivery systems allowing *in vivo* tracking using molecular imaging techniques and have proved promising theranostics agents especially for tumors. However, an efficient liposomal preparation for theranostic of neuro-onco, neuro-infection and neurodegenerative diseases needs further research. Nucleolipidic liposomes (NL-Nps) are of great interest because of the site-recognition (nucleoside), lipophilicity (long alkyl chain) and better membrane translocation by interaction of fatty acid with the lipid bilayer. Thus, we have evaluated uridine derived nucleolipidic liposomes for encapsulation efficiencies of MTX (Methotrexate) anti-cancer and sulfanilamide anti-infection drug and *in vivo* tracking by radio labeling with ^{99m}Tc.

Materials & Method:

(NL-Nps) were prepared using NL-DTPA (synthesized), heated to 50° C when mixed with organic solvent and added to aqueous phase containing the surfactant Tween-80 and the co-surfactant soya lecithin. NL-Nps were encapsulated with MTX and sulfanilamides were similarly prepared by adding drugs (0.1 to 1.5%) to the formulation. NL-Nps were evaluated for release kinetics and brain targeting in BMG-1 (brain glioma) and neuronal cell line in murinae model.

Results:

Multi-step synthesis leads to the final compound (NL-DTPA) and its liposomal preparation (size 113 to 130 nm, zeta potential -14 to -28 mV) with EEs of 64% was achieved. Liposomes showed sustained drug release for 2-5 days negligible hemolytic activity, no cytotoxicity in HEK cells. Radio labeling efficiency of 98% was achieved using ^{99m}Tc conferring prolonged systemic circulation and renal route excretion.

The biodistribution showed 1.8% ID/gm to 2.3% ID/gm for intact versus disrupted BBB in mice models. (NL-Nps) also in BMG tumor mice depicted higher tumor uptake (2.3T/M).

Conclusion:

Nucleolipid functionalized liposomes as candidates to be used as biocompatible nanocarrier systems with high systemic retention and anti-tumor effects. Future work will concentrate on targeting of liposomes in brain tumor model using stereotaxis.

Biography:

Swastika Mishra is working under Division of Cyclotron and Radio pharmaceutical Sciences, Institute of Nuclear Medicine and Allied Sciences, India.

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