Short Communication

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

**Swastika Mishra[1,2], Shubhra Chaturvedi[2], Philippe Barthelemy[2], B Singh[3] and Anil Kumar Mishra[*]**

[1]Institute of Nuclear Medicine and Allied Sciences, India
[2]INSERM U869 and University of Bordeaux, France
[3]Banaras Hindu University, India

## Abstract

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. The blood-brain barrier is the barrier between the cerebral capillary blood and the interstitial fluid of the brain. It is made up of capillary endothelial cells and basement membrane, neuroglial membrane, and glial podocytes, i.e., projections of astrocytes. These 3 components work in synchronicity with one another to limit the entry of various substances into the cerebral blood flow and subsequently the brain parenchyma.

Central nervous system (CNS) structures are highly unique in structure and function, and therefore require a stable environment with a composition that differs from that of the peripheral circulation. For this reason, the blood-brain barrier exists to maintain a homeostatic environment in which CNS structures can function without disruption from other bodily functions. It functions as a semipermeable membrane that separates the peripheral blood from the cerebrospinal fluid (CSF) to maintains homeostasis within the central nervous system. It accomplishes this through several mechanisms that regulate the composition and volume of the cerebral structures 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 99mTc.

**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 99mTc 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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