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t-Micelles of curcumin: Strategy for enhanced brain uptake

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Curcumin -a polyphenol, exhibits strong anti-oxidant, neuroprotective and anti-amyloid potential that makes it a potent candidate for alleviation of oxidative stress induced neurodegenerative ailments viz. Alzheimer's disease. Though potent, its clinical translation is restricted due to poor aqueous solubility (~11ng/ml in pH5 aqueous buffer), chemical instability and meager permeability across brain barrier. This demands a smart nanodelivery platform that will not only ensure the drug stability but will also facilitate drug transport across brain barrier. With this rationale, we propose curcumin loaded targeted micellar nanocarriers (t-micelles) comprising a novel lipid bioconjugate (t-bioconjugate) with an ability to cross brain barrier via receptor mediated active transport.

The synthesized t-bioconjugate was characterized for its physicochemical properties, safety and brain permeation efficacy both in vitro and in vivo. The curcumin loaded t-micelles exhibited a spherical geometry (size:21.3±2.68 nm, PDI:0.148) and demonstrated safety and acceptable properties for nasal spray application. In vitro anti-oxidant assay revealed 1.6 fold better anti-oxidant activity (DPPH assay) of curcumin loaded t-micelles in contrast to curcumin loaded plain micelles and could be attributed to mild antioxidant potential of t-bioconjugate.

In vivo pharmacokinetic and biodistribution studies demonstrated enhanced brain transport of t-micelles via active transport and curcumin was quantified in brain tissue upto 12 hours predominantly in the olfactory region, hippocampus and cerebellum of the brain. The developed formulation was stable as per ICH stability guidelines.

The studies corroborated the potential of t-micelles as a platform and potential strategy in treatment of neural ailments to enhance brain bioavailability of therapeutic actives.

Biography

Preshita Desai is an INSPIRE-Fellow currently pursuing Ph.D. (Tech.) in Pharmaceutics at Institute of Chemical Technology, India under Professor Vandana Patravale. She has two patents, two reviews, two scientific publications in peer-reviewed international journals and a book chapter to her credit. She has presented 13 scientific abstracts in national and international proceedings and has received awards for 11. She was recently bestowed with Ranbaxy Science Scholar Award 2014. Her research interests include synthesis and application of novel lipid bioconjugates for targeted delivery to central nervous system, exploring hot melt extrusion, high pressure homogenization techniques toward bioenhancement of poorly bioavailable drugs.

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