

The polymer-based nanoparticles as neuroprotectants-loaded carriers for brain drug delivery

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Prevention and treatment of stroke-related brain damage and neurodegenerative diseases such as Alzheimer's and Parkinson's are major and still unresolved problems of contemporary medicine. In the clinical trials we may find only few neuroprotective substances, however their efficiency in the treatment is not satisfactory. One of the major limitations is an inefficient delivery of neuroprotectants by the blood-brain barrier (BBB). Therefore, the main aim of the research is to develop a new strategy of delivery of neuroprotective drugs by the nanocarriers that are able to cross the BBB without imposing side effect on its normal function.

In the present work we were focused on preparation of neuroprotectants-loaded nanoparticles (NP's) from nanoemulsion by the Phase Inversion Composition (PIC) technique. The NP's were composed of the biodegradable and biocompatible polymers (polycaprolactone, PCL and/or poly(lactic acid), PLA) containing active neuroprotective agents (Curcumin, Undecylenic acid, MDL28170) as well as model drug (Cumarin-6 and/or Cyclosporin). Moreover, the surface of received NP's were functionalized by poly(ethylene glycol), PEG chains. All synthesized nanocarriers were characterized by size, size distribution, zeta potential, imaged by Cryo-SEM and their stability in the simulated body fluid (SBF) was also determined. The neuroprotective action of encapsulated drugs were evaluated in the SH-SY5Y human neuroblastoma cell line. Cytotoxicity, cellular uptake and transport through the blood-brain barrier were also tested.

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