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Preparation and characterization of Tri-block poly(lactide)-poly(ethylene glycol)- poly (lactide) nanoparticles for sustained release of rivastigmine

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Background and Aims: In the recent years there has been increased interest in the use of Biodegradable and biocompatible polymeric nanoparticles for drug delivery application. Nanparticles owing core-shell structure as same as micelles can incorporate different drugs and their small size is suitable for site specified delivery by injection. This study was aimed to fabricate of nanoparticles with hydrophobic core and hydrophilic shell with the goal of obtaining a biocompatible and biodegradable drug carrier for hydrophilic drugs.
Methods: Tri-block copolymer PLA-PEG-PLA was synthesized using ring opening polymerization of lactide in the presence of PEG. The copolymer was made into nanoparticles by double emulsion technique. The structure of synthesized copolymer and the MW distribution were investigated with HNMR, FT-IR DSC, and GPC. The release behavior of obtained nanogels was examined by UV spectrophotometery at λmax=260. The resulting nanoparticles were characterized by various techniques such as particle size analyzer (PSA), AFM and DSC.
Results: The structure and composition of the synthesized PLA-PEG-PLA Tri-block copolymer was confirmed by HNMR, and FT-IR. PSA and SEM analysis confirmed the formation of nanoparticles. The size of nanoparticles is easily manipulated in rang of 150-200nm and their zeta potential was found to be -26.9 mV. The nanoparticles achieved encapsulation efficiency around 20% and offer a steady and long-term release mechanism for the Rivastigmine. The Rivastigmine -loaded nanoparticles were able to sustain the release of the naltrexone for 24 hours.
Conclusions: In general, it can be concluded tri-block copolymer PLA-PEG-PLA nanoparticles are suitable for sustain released of hydrophilic drug.

Keywords: PLA-PEG-PLA; Nanoparticles; Rivastigmine