Development and evaluation of polyvinyl alcohol stabilized polylactide-co-caprolactone-based nanoparticles for brain delivery

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Abstract

The biodegradable polymer poly-ε-(D, l-lactide-co-caprolactone) (PLCL) can be used to produce nanoparticles with tailored release pattern. In this study; the anti-epileptic drug, lamotrigine, was loaded in PLCL nanoparticles stabilized using various molecular weights and concentrations of polyvinyl alcohol (PVA). The nanoparticles were prepared by emulsification solvent evaporation technique. Nanoparticles were characterized for their morphology, particle size (PS), Zeta potential (ZP), entrapment efficiency (EE), drug loading capacity (DLC), yield percentage (YP)-values and drug release pattern. Drug concentration in Albino rats' blood and brain after intravenous injection of selected nanoparticles was also analyzed. Results indicated that PS, EE, DLC, YP and ZP-values for the PLCL nanoparticles decreased with increasing PVA concentration. Formulated nanoparticles using LPVA were stable under various storage conditions. Lamotrigine release from nanoparticles was sustained for nearly a week. The selected formulation showed significantly high drug concentration in the brain compared to that for oral conventional tablet. In conclusion; varying PVA concentration and molecular weight used to stabilized PLCL nanoparticles helped in providing versatile properties for designing nanoparticles with wide range of properties.

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