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Effect of formulation variables on entrapment efficiency of Levodopa loaded PLGA nanoparticles

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Parkinson's is a major neurodegenerative disorder that occurs due to loss of dopaminergic neurons in basal ganglia. Conventional therapy includes surgery that involves a lot of risk and administration of levodopa which is accompanied by poor bioavailability, short half-life, and side effects. In this present study, poly(lactic-co-glycolic acid) (PLGA) nanoparticles-based drug delivery system to improve the bioavailability of the drug was evaluated. Nanoparticles were prepared by double emulsion solvent evaporation technique (w/o/w). The process of encapsulation of drugs by double emulsion/evaporation in a matrix of PLGA can be divided into three successive steps: first, an aqueous solution of the active compound is emulsified into an organic solution of the hydrophobic coating polymer; second, this primary water-in-oil emulsion (w/o) is dispersed in water with formation of a double water-oil-water emulsion (w/o/w); third, the organic solvent is removed with formation of solid particles. In our study, the effect of inner phase, evaporation time and polymers' moleculer weight on entrapment efficiency were evaluated. In the experiment, 5% poly vinyl alcohol is used as outer phase and 2 mL dichloromethane is used as the oil phase. The drug encapsulation efficiency were measured by high performance liquid chromatography (HPLC). 10 µl of supernatant was injected into an Agilent 1100 liquid chromatograph to determine the actual amounts of Levodopa non-incorporated within the nanoparticles. Separation was achieved using a C18 column (250 mm × 4.6 mm, 5 µm) at a flow rate of 1.0 ml/min and a detection of 280 nm. All the analysis was performed at 25°C. An increase in the encapsulation efficiency was observed in the nanoparticles prepared with PLGA with the lower molecular weight, showing that PLGA with the lower molecular weight effectively trapped Levodopa. When 1% Tween 80 solution was used in the inner phase with a 20 mM HCl solution a shortened evaporation time and an increased drug encapsulation were observed.

Biography

Tansel Comoglu was graduated from Ankara University Faculty of Pharmacy in 1991. She received her MSc degree on Pharmaceutical Technology. She obtained her PhD degree in 2002 and she worked as an Assistant Professor in 2010 and received her Associate Professor title in 2011. She was awarded Post-Doctoral Research support by the Scientific and Technological Council of Turkey (TUBITAK) and continued her work in Tromso University, Institute of Pharmacy, Department of Pharmaceutics and Biopharmaceutics, Norway on "physics of tabletting" in 2005. In 2017, she was appointed as Full Professor of Pharmaceutical Technology at the Ankara University, Faculty of Pharmacy. She has been serving as an Editorial Board Member of "Pharmaceutical Development and Technology" since 2012 and "AAPS Pharmaceutical Sciences and Technology Journal" since 2015 and is the Writer of more than 30 scientific articles, and 3 international book chapters.

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