ABSTRACT

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Title of thesis: Polymeric particles for targeted and enhanced bioavailability

Nanoparticles prepared from biodegradable and biocompatible polymers are useful for targeted therapy of inflammatory diseases and increase the bioavailability of poorly water-soluble anti-inflammatory drugs. Targeted distribution is mainly mediated by the physico-chemical properties of nanoparticles. This can reduce unwanted side effects of encapsulated drug. The ideal properties of nanoparticles for passive targeting to cells of the mononuclear phagocytic system (MPS) are size in the range of 100 nm to 300 nm, hydrophobic character and negative surface charge.

Matrix-type polymeric nanoparticles were prepared. Prepared nanoparticles were evaluated for size, polydispersity index, zetapotential and encapsulation efficiency of the drug. Three anti-inflammatory substances with different water solubility – a dexamethasone, a dexamethasone acetate and a curcumin were encapsulated. The matrix of nanoparticles was made of PLGA copolymer, three types of PLGA with different lactide:glycolide ratio were used. Nanoparticles were prepared using two methods – emulsification solvent evaporation method and nanoprecipitation. A suitable composition of the organic phase, a type and concentration of surfactant ensuring the stability of the nanoemulsion was investigated.

The results suggest that the polymer type has the greatest influence on the properties of the nanoparticles and drug encapsulation. The method of preparation does not seem to be critical. Prepared nanoparticles possesed optimal properties for MPS targeting. The ideal conditions for emulsion method are ethyl acetate:acetone (1:9), for the nanoprecipitation method are the best acetone and surfactant is 0,5% Pluronic F®-127 as aqueous phase.

Keywords: Passive targeting, nanoparticles, curcumin, dexamethasone, dexamethasone acetate, PLGA polymer, emulsification solvent evaporation method, nanoprecipitation