ABSTRACT

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Title of thesis: Hybrid polymeric-lipid nanoparticles as drug carriers

The work is focused on hybrid polymer-lipid nanoparticles, their advantages obtained from polymer and lipid part, purpose of surface modification, basic properties of nanoparticles, methods of preparation, modification of preparation conditions and use of nanoparticles in medicine.

The aim of the experimental part was to prepare nanoparticles composed of polyester and lipid by emulsion evaporation method and nanoprecipitation. Two types of linear polymer poly (lactic-co-glycolic acid) and phosphatidylcholine were used in various ratios. The surfactant used for stabilization was poloxamer Pluronic® F127 and the organic solvents were ethyl acetate and acetone. Curcumin served as a model active substance. The effect of lipid and surfactant on the size and zeta potential of nanoparticles was evaluated. Modification of preparation conditions, which included many process parameters, also influenced the monitored parameters. Encapsulation effectivity and drug loading were also tested. Dissolution tests were performed.

It was found that size of nanoparticles increased with increasing polymer to lipid ratio. The emulsion evaporation method led to the formation of nanoparticles with more advantageous results of sizes and zeta potentials than in the case of nanoprecipitation. Values of zeta potential ranged from -21 mV to -42 mV, which is one of the indicators of stability of the resulting nanosuspension. The best results of size and zeta potential were in the preparation during which the aqueous phase was split into two aliquots and without ice during sonication. The encapsulation effectivity of curcumin ranged from 13 % to 65 %. The nanoparticles with higher amount of polymer showed higher values of encapsulation effectivity and faster release of curcumin.

Keywords: PLGA, phospholipid, lipid-polymer hybrid nanoparticles