Abstract

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Title of thesis: Preparation of biodegradable nanoparticles for hydrophilic macromolecular drugs delivery

This study investigates the formulation of nanoparticles containing hydrophilic macromolecular components (e.g. proteins). Selected material was PLGA based compounds synthesized at Department of Pharmaceutical Technology. As model compounds were used Rhodamine B, FITC labelled dextran and FITC labelled albumin. Selected methods of nanoparticles formulation were double-emulsion technique and nanoprecipitation. Prepared nanoparticles were purified by three cycles of centrifugation and encapsulation efficacy and recovery yield was measured. Effect of different polymers and stabilizers was followed. More specifically, the principal objective was to explore the differences between size, zeta potential and efficacy of encapsulation. Changes in these characteristics were brought about by the chosen polymers, stabilizers, encapsulated compound, length of centrifugation period.

Prepared nanoparticles had size ranging between 150-474 nm and zeta potential approximately 30 mV. Even though the main goal of the study was to efficiently encapsulate protein, the amounts of encapsulated albumin were a lower compared to Rhodamine B or dextran. Main obstacles were presented by separation of nanoparticles from the medium. The centrifugation time had a significant impact on the amount of collected nanoparticles. During the centrifugation nanoparticles tended to aggregate. In case of smaller particles, centrifugation proved to be ineffective way of purification, therefore it was problematic to gain them. From the observation of the two methods working with the same substance (FITC labelled dextran) to encapsulate is clear, that nanoprecipitation is more suitable for the use of polymers branched polymers, while for double-emulsion is more appropriate for the linear PLGA polymer-based nanoparticles.

Key words: nanoparticle, Rhodamine B, FITC-dextran, FITC-albumin, double emulsion, nanoprecipitation