ABSTRACT

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Title of Thesis: Optimization of drug-loaded nanoparticles preparation

At the beginning of the work there are described various types of nanoparticles, the polymer particles are described in more detail, which is also dealt with in the experimental part. Furthermore, possible methods of preparation of polymer nanoparticles and their use in medicine are listed.

Two methods of nanoparticles preparation from materials based on of poly (lactic-co-glycolic acid) were used. First method was emulsion-sonication, where the particles were formed using high frequency ultra-sound probe. The second method was spontaneous emulsification, where two solvents with different hydrophilicity were used.

Different properties of resulting nanoparticles were assayed – size, polydisperzity, encapsulation efficacy, drug loading and recovery yield. Rhodamine B, a fluorescent dye, was used as a model substance for encapsulation experiments Nanoparticles were prepared from linear PLGA and PLGA branched by polyacrylic acid. Nanoparticles were stabilized by three different surfactants – poloxamer Pluronic® F127, polysorbate Tween® 20 and poly(vinyl)alcohol. Each surfactant was used in three different concentrations. Acetone, ethyl acetate, ethanol, dichloromethane were used as organic solvents.

Using both methods nanoparticles of the size of 200 nm and less were produced. In case of spontaneous emulsification also with very good polydispersity index, ranging between 0,2 and 0,1. Encapsulation efficacy at the produced particles was ranging between 60 % - 95 %. Generally, emulsication-sonication method proved to be suitable for preparation of very small nanoparticles (down to 50 nm). Spontaneous emulsification is characterized by high recovery yields and very good polydisperzity of resulting nanoparticles.