ABSTRACT

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Title of thesis: Preparation of polymeric fluorescent nanoparticles

Nanoparticles based on biodegradable polyesters are a widely used platform for targeted drug delivery and subsequent controlled release.

The aim of this diploma thesis was to prepare and optimize the preparation of polymeric nanoparticles with a fluorescent dye as a model substance. The nanoprecipitation method was used to prepare the nanoparticles. Nanoparticles prepared from two types of PLGA polymers (COOH terminated and ester terminated) were evaluated and compared. The surfactant and stabilizer were used in various concentration ratios to optimize the preparation. The surfactant was sodium cholate at concentrations of 0.1%, 0.5%, 1%, 2% and 5%. The nanoparticles were stabilized with Pluronic F-127 poloxamer at concentrations of 0.1%, 0.5% and 1%. Nanoparticles were compared in terms of encapsulation efficiency, particle size and zeta potential. In a dissolution experiment, the amount of fluorescein released was evaluated and compared as a function of time (48 hours) with acid-terminated PLGA and sodium cholate at concentrations of 0.1% and 2%.

Nanoparticles prepared from both polymers in the presence of different concentrations of cholate and Pluronic F-127 are equally advantageous in fluorescein incorporation and almost complete encapsulation occurs. The slight decrease in encapsulation efficiency was caused by the increasing concentration of sodium cholate. The Pluronic F-127 stabilizer had probably no effect on the encapsulation value. The size of the nanoparticles prepared from the carboxyl-terminated polymer in the presence of increasing cholate concentrations showed a decreasing trend up to a cholate concentration of 5% when the nanoparticle size value was higher. For ester-terminated PLGA polymer nanoparticles in the presence of sodium cholate, a higher nanoparticle size value was measured with increasing cholate concentration. By adding a stabilizer at various concentrations, the size value of the nanoparticles prepared from the PLGAA polymer was slightly increased.

Keywords: PLGA, nanoparticles, fluorescein, nanoprecipitation, encapsulation efficiency