ABSTRACT

Charles University
Faculty of Pharmacy in Hradec Kralove
Department of Pharmaceutical Technology

Author: Karolína Hamplová
Title of thesis: Polymer nanoparticles with rifampicin
Supervisor: PharmDr. Eva Šnejdrová, Ph.D.

The aim of the work was to formulate nanoparticles (NPs) with rifampicin by nanoprecipitation using polyesters of lactic acid and glycolic acid of linear or branched architecture. NPs were characterized by size, polydispersity, zeta potential, and scanning electron microscopy (SEM). Encapsulation efficacy (EE), loading capacity (LC), and dissolution profile of rifampicin were determined. NPs were stabilized by lyophilization, the effectiveness of cryoprotectants was tested and NPs were characterized after reconstitution. Although the size of the NP can be modified by a number of formulation factors, the concentration of the polymer in the internal phase and the molar weight of the polymer play a crucial role. Surprisingly promising for the formulation of nanoparticles with rifampicin by the nanoprecipitation method was the polymer PLGA 70:30. A 0.5% poloxamer solution was the most effective for steric stabilization of nanoparticles under given formulation conditions, and a 0.01% solution of didodecyldimethylammonium bromide was the most effective for electrostatic stabilization. SEM demonstrated the spherical shape of the nanoparticles and the software-determined size of the NPs confirmed the results obtained by the dynamic light scattering method. The time of rifampicin release from polyester nanoparticles was 7 days. After a five-hour burst effect of 25 %, liberation was performed by linear kinetics until day 6.

Key words: rifampicin, polymer nanoparticles, PLGA, zeta potential, polydispersity, encapsulation efficiency, SEM, lyophilization, cryoprotectants.