ABSTRACT

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The treatment of musculoskeletal infections requires the presence of high antibiotics concentration at the infection site. However, high doses of orally administered drugs cause the risk of increased systemic toxicity and serious adverse effects. Targeted drug delivery, currently one of the main areas of pharmaceutical research, represents a suitable option of a treatment without excessive burden on the organism.

This diploma thesis focuses on the formulation of a therapeutic system for the local treatment of musculoskeletal infections in the form of polymer nanoparticles containing the antibiotic vancomycin. Due to the need of incorporation of a hydrophilic antimicrobial substance into them, the suspension-emulsion method of their preparation was used. Different concentrations of polyvinyl alcohol stabilizer and tripentaerythritol branched hydrophobic polymer poly(D,L-lactide-co-glycolide) were used for the preparation. Within the study the size of nanoparticles, polydispersity, zeta potential, encapsulation efficiency determined by direct and indirect methods, and dissolution profile of the antibiotic, differential scanning calorimetry and scanning electron microscopy, were monitored. Preparation of nanoparticles without forming agglomerates in a size range from approximately 330 to 740 nm was achieved. However, the problem was the poor encapsulation efficiency enabling to capture no more than 50.9 % of the drug. The spherical shape of the nanoparticles was shown by scanning electron microscopy. The course of the liberation showed a high burst-effect at the beginning. Subsequently, the release period continued until day 3, when approximately 80 % of the drug was released.

Key words: Vancomycin, PLGA, nanoparticles size, polydispersity, drug release.