

## ABSTRACT

Charles University

Faculty of Pharmacy in Hradec Kralove

Department of Pharmaceutical Technology

Author: Pavlína Drdová

Title of thesis: Formulation and characterization of hydrogels for local treatment of musculoskeletal infection

Supervisor: PharmDr. Eva Šnejdřová, Ph.D.

Local anti-infective therapy for musculoskeletal infections eliminates systemic drug toxicity. By selecting a suitable drug delivery system, higher drug concentrations at the site of infection and sustained release can be achieved. Such a system may be gels, formulated and tested in the submitted diploma thesis. The theoretical part of the work was devoted to the description of musculoskeletal infections and their treatment, characterization of gels and their use in parenteral administration. Hydrophilic gels based on hypromellose, carrageenan, gelatin and fish gelatin containing vancomycin hydrochloride and gentamicin sulfate were formulated. Flow and viscoelastic properties were tested on a rotational rheometer. The analysis of flow curves by the Power law model proved a non-Newtonian type of flow. The most sensitive to applied stress is a 3 % hypromellose gel, the least a dispersion of iota-carrageenan with povidone 25. Viscoelastic properties were evaluated based on elastic, viscous and complex modulus, phase angle and yield point. Of the formulations tested, only 3 % hypromellose dispersion and 10 % fish gelatin dispersion have an inner 3D structure corresponding to gels. A 3 % hypromellose gel with antibiotics was selected for *ex vivo* toxicity and dissolution testing. Mesenchymal cell viability and proliferation were not significantly affected. In *ex vivo* dissolution tests after gel impregnation of bone grafts, the burst effect was reduced compared to the antibiotic solution and the release was prolonged in the case of gentamicin sulphate to 3 days, in the case of vancomycin hydrochloride to 5 days.

**Keywords:** musculoskeletal infections; antibiotics; hydrogels; flow properties; viscoelastic properties; drug release