BIODEGRADABLE *IN-SITU* GEL FOR SUBCUTANEOUS ADMINISTERATION OF A STATIN DRUG FOR OSTEOPOROSIS

Submitted By

Shekhawat Monika N.

Supervised by

Dr. Naazneen Surti

M. Pharm., PhD. / Assistant Professor

Department of Pharmaceutics

Parul Institute of Pharmacy and Research

Limda, Vadodara

Abstract

A number of observational studies and animal research suggested that the statins may not only lower cholesterol but they may stimulate bone formation also. Hence, the objective of this study was to prepare and characterize biodegradable *in-situ* gel for subcutaneous administration of Simvastatin drug for osteoporosis.

Biodegradable *in-situ* gel was prepared by using chitosan as biodegradable polymer and β-glycerol phosphate disodium salt hydrate (β-GP) as a buffering agent to achieve in-situ gelation at physiological pH and temperature. To evaluate the effect of chitosan and β-GP, manual experimental design was applied. Two independent factors i.e. chitosan concentration and β-GP concentration were varied over four levels. In-situ gel was characterized in terms of pH, gelling capacity, drug content, sedimentation volume, resuspendability, syringeability, *in-vitro* drug release, and particle size.

1.25 % w/v of chitosan concentration and 1% β-GP concentration were selected as optimum formulation parameters. pH (5.85), gelling capacity (+++), drug content

(98.7 %), sedimentation volume (0.42), *in-vitro* drug release (98.7%), particle size (7.07 µm), and viscosity (22.66 cP) gave the best results. The FTIR and DSC results reveal that drug & polymers were chemically compatible. From regression value it revealed that the optimised formulations followed Higuchi square root kinetic which indicates that drug release follows diffusion mechanism. Stability study at 40^0C±2^0C / 75 ± 5 % RH and 25°C ± 2°C and 60% RH ± 5% RH revealed that there was no significant change in pH, particle size, gelling capacity, sedimentation volume and drug content after 2 weeks. So, prepared formulation was stable during stability study. The developed biodegradable in-situ gel administered subcutaneously can prove to be an effective alternative drug delivery system for the treatment of osteoporosis.

Keywords: Simvastatin, *in-situ* gel, osteoporosis, subcutaneous, biodegradable.