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Solid Lipid nanoparticles for Sulfasalazine: fabrication, characterization, *in-vitro* and *in-vivo* assessment for oral bioavailability

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Abstract

Sulfasalazine is used to treat rheumatoid arthritis and also its other kinds related with ankylosing spondylitis and inflammatory bowel disease. Unfortunately, its hydrophobic nature reduces its aqueous solubility which contributes to its variable and poor oral bioavailability. To fabricate sulfasalazine loaded Solid lipid nanoparticle (SLNs) as drug delivery vehicle which satisfies prolonged release with improved oral bioavailability.

Sulfasalazine (SZN) loaded Solid Lipid Nanoparticles (SLNs) were fabricated by solvent emulsification diffusion technique. SLNs were characterized for Average Particle size, zeta potential, morphology, entrapment efficiency, drug loading capacity, stability, in-vitro and in-vivo assessment for oral bioavailability. The SSED-2 formulation gave Average Particle size 202.3nm±2.2, PDI 0.376±0.02, zeta potential -35.82mV±2, entrapment efficiency 86.3%±0.02 and drug loading capacity 3.03%±0.04. Spherical shaped particles in nanometric range were confirmed from Scanning Electron Microscopy (SEM). Compatibility between drug and excipients were confirmed by Fourier Transformed Infrared (FT-IR) spectroscopy. Powder X-ray diffractometry (P-XRD) and Differential Scanning Calorimetry (DSC) showed change in physical nature of the drug. Sulfasalazine loaded SLNs were found stable at refrigerated temperature.

The increase drug pay load from 40mg to 200mg resulted in enhanced sustained release behaviour. Mixed order kinetics was observed during release kinetic modelling studies. Release exponent was greater than 0.89, regarded as Super case-II diffusion mechanism. In-vivo pharmacokinetic study revealed 1.86-fold, increase in SZN bioavailability in SLN formulation compared to marketed product (Salazodine®). These results validated that SLNs as drug delivery vehicle satisfies prolonged release having improved bioavailability for sulfasalazine which offers new slant to enhance bioavailability of poor water-soluble drugs.

Biography

Maqsood Ur Rehman has completed his Ph.D. in Pharmaceutical nanotechnology (Nanomedicine) from University of Malakand-Pakistan. His interdisciplinary study was to prepare and evaluate the key process parameters for fabrication of Sulfasalazine, Niclosamide, Famotidine and Roxithromocin loaded solid lipid nanoparticles, in-vitro Characterization and Comparative in-vivo Evaluation to enhance their oral bioavailability. Rehman remained as research fellow under the supervision of Dr. Waheed S. Khan at National Institute for Biotechnology and Genetic Engineering (NIBGE), Faisalabad-Pakistan in Nanobiotech Group, which is a well reputed public sector R&D organization as well as an academic institute of the country. He has published many research papers in same field in prestigious and reputable journals. Dr. Rehman is also working as faculty member in Department of Pharmacy, University of Malakand. He is the incharge of Pharmaceutical Analysis and Nanomedicine Lab in Department.

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