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Efficacy of Alendronate Functionalized Solid Lipid Nanoparticles for Osteoporosis Treatment-Development and Release Kinetics Study

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Abstract: *Osteoporosis means "Porous bone" is a disease characterized by progressive bone thinning. The deterioration of bone tissue can lead to bone fragility and fracture, especially of the hip, spine, shoulder and wrist. Osteoporosis is caused generally due the decreasing bone mineral density (BMD). Osteoporosis affects 30-40% women after menopause all around the world. Bisphosphonates are the most commonly prescribed drugs for the treatment of osteoporosis in the US and many other countries including India. Alendronate- sodium (AS) is a widely used anti-osteoporosis drug, exhibits strong inhibitory effect on bone resorption performed by osteoclast cells and acts as a potent, specific inhibitor of osteoclast-mediated bone resorption. AS was the first FDA approved bisphosphonate for treatment of osteoporosis in the US in 1995. The objective of the present study was to develop, optimize, and evaluate Solid Lipid Nanoparticles (SLN) of Alendronate-sodium drug which improve the solubility, dissolution rate and enhance the bioavailability of the drug. AS loaded Solid Lipid Nanoparticles have been developed using Glyceral Monosterate (GMS) as lipid and poloxamer 407 as the emulsifier by Emulsion -Solvent evaporation method. Different process variables i.e. concentration of surfactant, homogenization speed and time have been optimized. Formulated SLNs with GMS showed low particle size and high entrapement efficiency. The SLNs were characterized using Zeta sizer, transmission electron microscopy (TEM) and scanning electron microscopy (SEM). In-vitro drug release study was performed by dialysis bag diffusion method and different mathematical models were applied for the release study.*

Keywords: Bisphosphonates, Bone Mineral Density (BMD), Drug release, Osteoporosis, Solid Lipid Nanoparticles (SLNs)

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