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Formulation development and characterization of supersaturatable self-nanoemulsifying drug delivery system (S-SNEDDS) of Dutasteride

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The present study is aimed to prepare and evaluate the supersaturated self nanoemulsifying drug delivery (S-SNEDDS) system of a poor water soluble drug dutasteride in order to achieve a better dissolution rate which would further help in enhancing oral bioavailability compared to the SNEDDS. The present research work describes SNEDDS and S-SNEDDS of dutasteride using Capryol PGMC, CremophorEL, PEG400 and HPMC as precipitation inhibitors. The pseudo-ternary phase diagrams with presence and absence of drug were plotted to check for the emulsification range and also to evaluate the effect of dutaseride on the emulsification behavior of the phases. The mixtures consisting of oil (Capryol PGMC) with surfactant (Cremophor EL), co-surfactant (PEG 400) in 2:3 ratios were found to be optimum formulations. HPMC 0.5 mg was added in the S-SNEDDS preparation along with the above mentioned oil, surfactants and co-surfactants. Prepared formulations were evaluated for its particle size distribution, nano-emulsifying properties and robustness to dilution, self-emulsification time, drug content and *in vitro* dissolution. The optimized formulations were further evaluated for heating cooling cycle, centrifugation studies, freeze thaw cycling, particle size distribution and zeta potential were carried out to confirm the stability of the formed S-SNEDDS formulations. The prepared S-SNEDDS formulation revealed some excellent physicochemical characteristics such as mean particle size of <100 nm and percentage of drug dissolved within 5 min, >90% in dissolution media of pH 1.2 and 6.8. The preliminary results from our study suggest that the dutasteride-loaded self-nanoemulsifying formulation shown a significant improvement in terms of the drug dissolution as compared with raw drug. Thus, this greater dissolution of dutasteride from formulations could lead to higher absorption and higher oral bioavailability in clinical application.

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Targeted deliveries of tocotrienol and statin accelerate healing of osteoporotic fracture

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Combination of oral tocotrienol and oral statin has been shown to be effective in the prevention of osteoporosis. In this study, tocotrienol and statin were combined with their carriers and delivered directly to the fracture site (controlled drug delivery system) of osteoporosis fracture model. Forty-eight Sprague-Dawley female rats were divided into 6 groups. The first group was sham-operated (SO), while the others were ovariectomized. After two months, the right tibiae of all rats were fractured at proximal upper third area and fixed with plates and screws. The SO and ovariectomized-control rats (OVxC) were given two single injections of carriers. The estrogen group (OVx+ERT) was given daily oral gavages of Premarin®. The Lovastatin treatment group (OVx+Lov) was given a single injection of lovastatin particles. The tocotrienol group (OVx+TT) was given a single injection of tocotrienol particles. The combination treatment group (OVx+Lov+TT) was given two single injections of lovastatin particles and tocotrienol particles. After 4 weeks of treatment, the fractured tibiae were dissected out for micro-CT and biomechanical assessments. Only combined treatment group (OVx+Lov+TT) showed significantly better callous structure but all treatment groups showed better callous strength than OVxC group. In conclusion, combined lovastatin and tocotrienol may promote better fracture healing of osteoporotic bone.

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