**Oral bioavailability enhancement of raloxifene by developing microemulsion using D-optimal mixture design: optimization and *in-vivo*pharmacokinetic study**

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**Abstract**

The objective of this work was to utilize a potential of microemulsion for the improvement in oral bioavailability of raloxifene hydrochloride, a BCS class-II drug with 2% bioavailability. Drug-loaded microemulsion was prepared by water titration method using Capmul MCM C8, Tween 20, and Polyethylene glycol 400 as oil, surfactant, and co-surfactant respectively. The pseudo-ternary phase diagram was constructed between oil and surfactants mixture to obtain appropriate components and their concentration ranges that result in large existence area of microemulsion. D-optimal mixture design was utilized as a statistical tool for optimization of microemulsion considering oil, Smix, and water as independent variables with percentage transmittance and globule size as dependent variables. The optimized formulation showed 100 ± 0.1% transmittance and 17.85 ± 2.78 nm globule size which was identically equal with the predicted values of dependent variables given by the design expert software. The optimized microemulsion showed pronounced enhancement in release rate compared to plain drug suspension following diffusion controlled release mechanism by the Higuchi model. The formulation showed zeta potential of value −5.88 ± 1.14 mV that imparts good stability to drug loaded microemulsion dispersion. Surface morphology study with transmission electron microscope showed discrete spherical nano sized globules with smooth surface. *In-vivo*pharmacokinetic study of optimized microemulsion formulation in Wistar rats showed 4.29-fold enhancements in bioavailability. Stability study showed adequate results for various parameters checked up to six months. These results reveal the potential of microemulsion for significant improvement in oral bioavailability of poorly soluble raloxifene hydrochloride.

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