

## **Optimization of hydrocortisone-loaded nanoemulsion formulation using d-optimal mixture design**

### **ABSTRACT**

Optimization of hydrocortisone-loaded nanoemulsion formulation was achieved by low energy emulsification method. D-optimal mixture design was used with the variables parameters of Tween-20, lipoid S75, palm kernel oil ester (PKOE) and deionized water towards a response (viscosity). Hydrocortisone, ethanol and phenonip were kept constant (1.0, 24 and 0.5 wt. %). The mixing rate and time were kept constant at 400 rpm and 4 h, respectively. The optimum formulation conditions were successfully predicted. From the results obtained, it shows that the higher the concentration of palm kernel oil ester, the less the viscosity of the nanoemulsion. The optimized formulation showed good stability with the viscosity of 2.85 Pa.s. The particle size, polydispersity index and zeta potential of the optimized nanoemulsion gave a result of 172.56 nm, 0.184 and -50.03 mV, respectively. The results are in agreement with the TEM micrograph. The viscosity of the optimized nanoemulsion decreased with increased shear rate, showing a shear thinning behaviour (pseudoplastic) suitable for pharmaceutical application.

**Keyword:** Hydrocortisone; Nanoemulsions; Hydrophobic drug; Viscosity