

**EFFECTS OF DIFFERENT OIL TYPES AND SURFACTANT
CONCENTRATIONS ON THE PHYSICAL STABILITY OF
NANOEMULSIONS AND *IN VITRO* RELEASE OF
DICLOFENAC-LOADED NANOEMULSIONS**

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ABSTRACT

In this study, formation of oil in water nanoemulsions in oil/non-ionic surfactant/water has been produced by a high pressure homogenization technique. Four different kinds of oil (mineral oil, soybean oil, Eutanol G and Myritol 318) and three concentrations of surfactant (5%, 7.5% and 10%) were studied. The ratio of non-ionic surfactant (Brij 721 and Brij 72) used was 3:1. A decrease in droplet size was observed through three homogenization cycles at a pressure of 200 bar and a temperature of 75°C. All nanoemulsions were found to possess a small size, around 168-233 nm. It was revealed that the different physicochemical properties of oils (polarity, solubility and chemical structure), surfactant concentrations and storage temperature had an effect on Ostwald ripening rate. Both conventional emulsion and nanoemulsion formulations maintained stability for 4 months storage at room temperature and 45°C, except the formulations that were prepared using Myritol 318 as the oil phase. Moreover, it was also found that conventional emulsion of Eutanol G with 5% surfactant concentration at 45°C showed Ostwald ripening rate. The formulations containing mineral oil and soybean oil as the oil phase did not exhibit droplet growth during storage for 4 months, which showed that it was stable to Ostwald ripening because of low extremely water solubility of these oils. An emulsion system composed of diclofenac acid and diclofenac sodium was characterized in terms of *in vitro* drug release. The release profiles of conventional emulsions and nanoemulsions were not significantly different since their particle sizes were comparable. The *in vitro* release rate showed that the release of drugs from both conventional emulsions and nanoemulsions depended on the polarity of oil and oil/water partition coefficient. It was also observed that the high surfactant concentration retarded the release of both drugs due to the formation of thick multilayer of surfactants around the oil droplets. When comparing release profiles between lipophilic and hydrophilic drugs from nanoemulsions, it was noticed that the hydrophilicity of oil plays an important role in drug release.

KEY WORDS: NANOEMULSIONS/ OSTWALD RIPENING/ NON-IONIC SURFACTANT/ RELEASE CHARACTERISTICS/ STABILITY

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