

Transdermal Delivery of Sodium Diclofenac from Palm Kernel Oil Esters Nanoemulsions

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Abstract : Sodium diclofenac is one of the most commonly used drugs of nonsteroidal anti-inflammatory drugs (NSAIDs). It is especially effective in the controlling the severe conditions of inflammation and pain, musculoskeletal disorders, arthritis, and dysmenorrhea. Formulation as nanoemulsions is one of the nanoscience approaches that has been progressively considered in pharmaceutical science for transdermal delivery of the drug. Nanoemulsions are a type of emulsion with particle sizes ranging from 20 nm to 200 nm. An emulsion is formed by the dispersion of one liquid, usually the oil phase in another immiscible liquid, water phase that is stabilized using the surfactant. Palm kernel oil esters (PKOEs), in comparison to other oils, contain higher amounts of shorter chain esters, which suitable to be applied in micro and nanoemulsion systems as a carrier for actives, with excellent wetting behavior without the oily feeling. This research aimed to study the effect of terpene type and concentration on sodium diclofenac permeation from palm kernel oil esters nanoemulsions and physicochemical properties of the nanoemulsions systems. The effect of various terpenes of geraniol, menthone, menthol, cineol and nerolidol at different concentrations of 0.5, 1.0, 2.0, and 4.0% on permeation of sodium diclofenac were evaluated using Franz diffusion cells and rat skin as permeation membrane. The results of this part demonstrated that all terpenes showed promoting effect on sodium diclofenac penetration. However, menthol and menthone at all concentrations showed significant effects (<0.05) on drug permeation. The most outstanding terpene was menthol with the most significant effect for skin permeability of sodium diclofenac. The effect of terpenes on physicochemical properties of nanoemulsion systems was investigated on the parameters of particle size, zeta potential, pH, viscosity and electrical conductivity. The result showed that all terpenes had the significant effect on particle size and non-significant effects on the zeta potential of the nanoemulsion systems. The effect of terpenes was significant on pH, excluding the menthone at concentrations of 0.5 and 1.0%, and cineol and nerolidol at the concentration of 2.0%. Terpenes also had significant effect on viscosity of nanoemulsions exception of menthone and cineol at the concentration of 0.5%. The result of conductivity measurements showed that all terpenes at all concentration except cineol at the concentration of 0.5% represented significant effect on electrical conductivity.

Keywords : nanoemulsions, palm kernel oil esters, sodium diclofenac, terpenes, skin permeation

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