Microemulsion based-novel binary drug delivery system with glycolipid as permeation enhancer

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Low solubility and low stability of drug within a delivery system are major limitations arising in the development of drug delivery systems. Dispersion systems such as microemulsions (ME) frequently serve as promising drug delivery vehicles because MEs can create a path to transport drugs overcoming physical barriers and have the ability to incorporation adrug into an inert lipid vehicle. Today MEs are used to deliver both hydrophilic and lipophilic drugs.

β-Carotene (BC) extracted from carrot and diclofenac sodium (DS) were incorporated separately into ME systems and their *in vitro* release has been reported elsewhere[1]. The glycolipid, hexadecyl-β-D-glucopyranoside, introduced into ME systems was found to be a good permeation enhancer for skin permeations[1]. In this investigation, a binary drug system of diclofenac sodium (1% w/w) and β-carotene (0.25% w/w) was introduced to W/O (water in oil) and O/W (oil in water) ME systems prepared using olive oil, water and the non-ionic lipophilic surfactant, sorbitan monooleate (Span 80).The *in vitro* release of both drugs in dual drug loaded W/O and O/W emulsions was observed through a pig ear skin fitted to a Franz diffusion cell with and without hexadecyl-β-D-glucopyranoside (0.05% w/w) as permeation enhancer. Further, the kinetics of the releasing processes was studied with available models related to release of drugs. Aqueous solution of DS (1% w/w) and 0.25% of BC dissolved in olive oil were used as controls.

Since ME exhibits hydrophilic and lipophilic domains, it enhances the percutaneous uptake of drugs considering that DS and BC dissolve separately in water and oil phase respectively. It was found that the release of DS and BC follows first order kinetics and the release of both drugs obey the Higuchi model of drug release and follow a one dimensional diffusion model. Furthermore, it was found that the drug release is diffusion controlled. In addition, for BC, optimized ME formulations with permeation enhancer show significantly higher amount of release of 60.59% and 70.24% for W/O and O/W respectively, with respect to control. Similarly, for DS, optimized formulations show higher amount of release of 65.09% and 58.01% for W/O and O/W respectively. Always the drug which is in the dispersed phase shows higher permeation.

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References

1. E. P. N. Premarathne, A. D. L. Chandani Perera and D. N. Karunaratne, Investigation of the potential ability of a microemulsion formulation for transdermal delivery of diclofenac sodium, *Peradeniya University Research Sessions (PURSE)*, 2012, **17**, 176; Enhancement of *in vitro* skin permeation parameters of β-carotene in O/W microemulsion in the presence of glycolipid, *Proc. PGIS Research Congress*, 2015, **2**, 81.