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EVALUATION OF STRATEGIES FACILITATING TOPICAL DELIVERY OF VITAMIN E

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The stratum corneum, being the outermost layer of skin, constitutes the principal barrier for topical delivery of bioactive agents. It consists of dead keratinized cells and multiple lipid bilayers that resist passage of molecules. In order to overcome the stratum corneum barrier and to improve topical delivery of bioactive agents, numerous strategies such as utitilizing emulsions and liposomes have been employed. Vitamin E is the major lipid soluble antioxidant of the skin, which protects the lipidic component of the skin from oxidative stress by functioning synergistically with other antioxidants. Thus, we employed Vitamin E as the model drug in this study. Incorporating in emulsions and encapsulating in liposomes, both confer favourable properties on Vitamin E which is a photolabile air-sensitive compound, by increasing its stability. Another such property is increased topical delivery when applied on the skin, which leads to increased bioavailability of Vitamin E in the epidermis. The aim of this study was to investigate the effectiveness of emulsions and liposomes in topical delivery of Vitamin E.

A Franz diffusion cell was used for in vitro permeation studies. A layer of an excised pig ear and a cellophane membrane were the two membranes used. The membrane permeability of Vitamin E was evaluated with three formulations: 1. Vitamin E incorporated macroemulsion, 2. Vitamin E encapsulated liposome and 3. Liposome incorporated macroemulsion each containing of 0.05% Vitamin E. The receiver solution was phosphate buffered saline (PBS). The membrane of interest was placed between the donor and receiver compartments and either an emulsion or liposomal preparation was introduced onto the membrane through the donor compartment. Vitamin E concentration in the buffer was evaluated at pre determined intervals by measuring UV absorbance at 291.4 nm. Permeability studies were conducted for 5 hours and 24 hours with the pig ear and cellophane membrane, respectively.

It was observed that encapsulating Vitamin E in liposomes enhances the topical delivery of the drug. Furthermore, the emulsion itself was found to be functioning as a medium that facilitates the topical delivery of Vitamin E. Moreover liposome in macroemulsion showed the highest permeability compared to other formulations. Average membrane permeability values for formulations 1, 2 and 3, with the pig ear were $5.82X10^{-6}$ cm min^{-1}, 9.28×10^{-6} cm min^{-1} and 3.73×10^{-3}cm min^{-1} respectively. For the cellophane membrane the average permeability values for three formulations were 1.31×10^{-6} cm min^{-1}, 1.59×10^{-6} cm min^{-1} and 2.64×10^{-6} cm min^{-1} respectively.

In summary, formulations in the increasing order of the extent of topical delivery of Vitamin E were; macroemulsion with Vitamin E, liposomal Vitamin E solution and liposomal Vitamin E in macroemulsion.

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