UNIVERSITI TEKNOLOGI MARA

IN VITRO SKIN PERMEATION STUDY OF MEDIUM-CHAIN TRIACYLGLYCEROLS (MCTs)

ZULKEFLI BIN MOHAMAD

Dissertation submitted in partial fulfilment of the requirements for the degree of Bachelor of Pharmacy (Hons.)

FACULTY OF PHARMACY

2013

ABSTRACT

Many approaches have been used to increase the low permeability of the drug through the skin. One of them is by including permeation enhancers such as medium chain triacylglycerols (MCTs). These agent, reversibly alter the barrier resistance of the stratum corneum and allow the drug to permeate into the viable epidermis and systemic circulation. This study was carried out to evaluate the *in vitro* skin permeation of α-tocopherol, the model antioxidant in different MCTs namely virgin coconut oil (VCO) and structured virgin coconut oil (SVCO) creams. VCO is rich in lauric acid (60%) while SVCO which was produced by lipase catalysed acidolysis of caprylic acid and VCO contains highly in caprylic acid (60%). The skin permeation of α-tocopherol in the formulation was measured for 24 hour test through the finite dose technique using Franz diffusion cells. The 24 hour skin permeation of α-tocopherol using synthetic membrane shows greater release rate in SVCO cream than the VCO cream with the maximum flux rate of 0.57 $mg/cm^2/h$ and 0.4 $mg/cm^2/h$, respectively. The *in vitro* skin permeation study using rat's skin showed no absorption profile, however results of the stratum corneum and viable epidermis extracts showed higher amount of α-tocopherol in the skin applied with the SVCO cream compared to the VCO cream. Amounts of α-tocopherol recovered from the stratum corneum and viable epidermis in VCO and SVCO creams were 93.43 μg/ml, 121.18 μg/ml, 99.37 μg/ml and 151.01 μg/ml respectively. These results revealed that triacylglycerols (TAGs) carbon chain lengths influence the permeation of the

ACKNOWLEDGEMENT

Alhamdulillah, all praise to Allah S.W.T., the Most Merciful and the Most Gracious. With His helps and blessings, this study has been done successfully. Praises to Prophet Muhammad peace be upon him, the greatest creation who brought light and peace towards mankind.

The writing of this dissertation has been one of my biggest academic challenges I have ever had throughout my life as a student. Special thanks and deepest gratitude to my supervisor Madam Salizatul Ilyana binti Ibrahim for her never ending support, patience and guidance in every step of my way to complete this study. Not forgotten, the coordinator of this course Dr. Mohd Shihabuddin Ahmad Noorden for his support and advice. I pray to Allah preserve your time in doing good deeds and charity.

My greatest thanks to my helpful friends who has been a good partner in doing laboratory works during this study.

My precious thanks go to my family especially to my parents for their support. Last but not least, thanks to my fellow friends of Pharmacy program for being there for me when I need for helps.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Background

Skin is a tissue subjected to a high degree of oxidative stress from both endogenous and exogenous sources. Excessive levels of free radicals formation in the skin can lead to significant damaging reactions such as skin ageing, skin disorders and skin diseases. Vitamin E is one of the common antioxidant used topically to protect the human skin against damaging reactive metabolites (Kohen *et al.*, 2000; Packer *et al.*, 1993). Vitamin E is the most important chain-breaking radical scavenger in the lipid soluble compartment, thus forming the major specific defense line against lipid peroxidation. In membranes, vitamin E is oxidized when it quenches peroxyl free radicals (Branka *et al.*, 2009).

The ideal strategy for enhancing the skin protection from the oxidative stress would be to support the endogenous skin antioxidant system. In order to protect the skin from the oxidative damage, the antioxidant must first be able to penetrate the upper layer of the stratum corneum (SC) which is the main barrier for percutaneous absorption. The SC (horny layer) is the top layer of the epidermis. These SC cells are dead, contain a lot of keratin and are arranged in overlapping layers that give a tough