UNIVERSITI TEKNOLOGI MARA

A COMPARATIVE STUDY OF AUTOMATED AND MANUAL FRACTION COLLECTORS OF STATIC DIFFUSION CELLS FOR *IN VITRO* SKIN PERMEATION STUDIES

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Abstract

Caffeine is being increasingly used in cosmetics due to its biological activity and ability to penetrate the skin barrier. This alkaloid is frequently used as a hydrophilic model substance for *in vivo* and *in vitro* permeation studies. As for a cosmetic purpose, caffeine has potent antioxidant properties that can help protect cells against the UV radiation and commonly used in the sunblock product as well as to reduce the dark circles under the eye by increase the microcirculation of the blood in the skin. The permeation of caffeine through the skin test can be measured by *in-vivo* and *in-vitro* techniques. *In-vitro* techniques are generally used due to simple experimental conditions and it should be done closely mimic *in vivo* conditions so that can be extrapolated. Franz diffusion cell is widely used static design for studying *in-vitro* permeation if the permeation of the drug across the skin will not result in a concentration of >10% of the maximal solubility in the receptor fluid. Therefore, two types of static Franz diffusion cell have been used in this study that are automated and manual Franz diffusion cell with the same condition in both experiments. However, there is significant different of permeation profiles between the two types of static Franz diffusion cell that have been used in this research. The objective of this project is to assess the permeation profile of caffeine across a synthetic membrane by using two different fraction collectors (manual versus automatic) of static diffusion cells for *in vitro* permeation studies.

CHAPTER 1

Introduction

1.1 Topical drug delivery

The delivery of drugs across the skin and into systemic circulation that is distinct from topical drug penetration is the transdermal drug delivery, which targets local areas. Several advantages of drug delivery via skin in comparison to other administration routes, such as the avoidance of first-pass gut and hepatic metabolism, fewer side effects with a decrease in the risks of systemic toxicity and relative ease of drug application ([1]). However, the highly resistant barrier properties of the epidermis restrict the transport of many exogenous molecules through the skin. Compounds intended to be delivered via skin should be ideally possess physicochemical properties such as low molecular weight (< 500 Dalton), moderate lipophilicity (octanol – water partition coefficient between 10 and 1000), and modest melting point (< 200 °C) correlating with good solubility ([2]). Although an active substance exhibits such properties, it is still necessary to find additional means to increase its transport across the skin.

Caffeine is a relatively polar compound with low solubility either in water or oil. It is widely used in cosmetics such as it is claimed to have a lipolytic activity on adipose