

UNIVERSITI TEKNOLOGI MARA

**DEVELOPMENT AND CHARACTERISATION OF
WATER SOLUBLE CHITOSAN AND ITS EFFECT
ON SKIN PENETRATION IN CAFFEINE CREAM**

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TABLE OF CONTENTS

Contents	Page
Acknowledgement	ii
Table of contents	iii
List of figures	v
List of tables	vii
Abstract	viii
1.0 Introduction	1
1.1 Background of study	1
1.2 Problem statement	2
1.3 Objective study	3
1.4 Hypotheses	3
2.0 Literature review	5
2.1 Chitosan	5
2.1.1 Properties	7
2.1.1.1 Degree of deacetylation	8
2.1.1.2 Molecular weight	9
2.1.1.3 Solubility	11
2.1.2 Function	14
2.1.2.1 Pharmaceutical and medical	14
2.1.2.2 Cosmetics	16
2.2 Skin	18
2.2.1 Skin structure	19
2.2.2 Skin penetration	25
2.3 Caffeine	30
2.3.1 Properties	30
2.3.2 Function	32

ABSTRACT

Chitosan and chitosan derivatives have been used in medical, cosmetic and biotechnology preparations. It has been shown to have antibacterial, hydrating, and wound healing properties. It also can act as a penetration enhancer. Chitosan is insoluble in water, hence a main problem for formulation. In this study, insoluble low molecular weight chitosan was converted into water soluble chitosan using cheap hemicellulase enzyme. It was then characterised using FTIR, XRD and Contact angle measurement. Then it was incorporated into the caffeine cream at a percentage of 2%, 3% and 4% w/w respectively. All creams were characterised using Mastersizer and Rheometer to see the particle size, uniformity and viscosity. Skin penetration studies were conducted via Franz cell diffusion equipment. The results obtained showed after enzymatic degradation, chitosan became soluble in water. This will ease formulation of the caffeine cream. FTIR spectrum water soluble chitosan showed that the backbone of chitosan remained intact. XRD showed that the crystal structure of LMWT chitosan changed from crystalline to amorphous after the enzymatic degradation, while the contact angle studies also showed that contact angle of water soluble chitosan and water was $<45^\circ$ which indicated a higher degree of wettability properties. However, penetration studies showed negative results. This may be due to the inconsistent formulation and human error during the experiments.

CHAPTER 1

INTRODUCTION

1.1 Background of study

Creams are therapeutic dosage forms which contain one or more active ingredients dissolved or dispersed in a suitable base. (U.S Pharmacopeia, 1151: Pharmaceutical Dosage Forms). Having base and excipient as the main ingredients in the formulation, both must satisfy the properties of an ideal cream. Choice of base depends on various factors, include the therapeutic effect desired, compatibility upon active ingredients, storage condition and shelf-life of the end product. Excipient used as additional ingredients provide stability and protect the creams by enhancing its stability, assist during the manufacturing process and enhancing bioavailability of the creams while delivering the therapeutic action. Both should neither irritate nor sensitize the skin, and supposedly inert, non-toxic, physically and chemically stable, and compatible with both the skin and the active ingredient to be incorporated.

The main highlight in this research is the use of water soluble chitosan in caffeine cream. Caffeine has been used widely in cosmetics and pharmaceutical products. Creams are preferable compared to other dosage forms due to the ability in delivering drugs which are exposed to mechanism of first pass metabolism in the body. In addition, it is a good delivery system for achieving local effect. Topical products possess the advantage of local drug delivery at the site of action while avoiding any potential systemic adverse effects. However, the barrier in achieving the extensive delivering is due to the skin arrangement.