

UNIVERSITI TEKNOLOGI MARA

**IN VITRO STUDY OF ASTAXANTHIN RELEASE
FROM SELF NANOEMULSIFYING DRUG
DELIVERY SYSTEM (SNEDDS)**

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ABSTRACT

The aim of the current study was to compare the release of a poorly soluble model drug compound, astaxanthin, from three lipid-based formulations and one formulation of astaxanthin extracted product in vitro. Drug release of astaxanthin was evaluated in vitro in four dissolution mediums: simulated gastric fluid (SGF), simulated intestinal fluid (SIF), 0.5% Tween 80 and distilled water. An oil solution, two self-micro and nano-emulsifying drug delivery systems and one astaxanthin extracted product were tested in the dissolution medium models. The release of astaxanthin to the aqueous phase (dissolution medium) was evaluated by removing 2ml sample at 0 hour and post 15 minutes, 30 minutes, 1 hour (h), 2 h, 3 h, 4 h, 5 h, 6 h, 8 h, 10 h, 12 h and 24 h. The best formulation among the four was found to be SNEDDS which had improved aqueous drug released in all the dissolution media. It is suggested that SNEDDS are physically stable formulations and may offer an improvement in dissolution rates and extents of absorption due to the nanometer sized droplets present. In conclusion, the release profiles in ranking the formulations results in the following order: SNEDDS > SMEDDS ~ oil solution > distilled water in vitro. On the other hand, distilled water was found as the best medium for enhanced astaxanthin dissolution where drug released was the highest.

Keywords: In vitro (IV); astaxanthin; drug release; Self-nanoemulsifying drug delivery systems (SNEDDS)

CHAPTER 1

INTRODUCTION

1.1 Introduction

Astaxanthin (3,3'-dihydroxy- β,β -carotene-4,4'-dione), is a naturally occurring carotenoid that can be found mostly in algae, plants and marine crustacean animals. Probably the most abundant source of astaxanthin is in a microalgae species, *Haematococcus pluvialis* which is currently a commercially promising source among the astaxanthin-producing organisms. This is due to its biocomposition that contain rich in astaxanthin which can reach up to 4% (w/w) on a dry weight basis (Boussiba, 2000). Other sources that contain reasonably amount of astaxanthin include *Phaffia rhodozyma* (Johnson et al., 1980), sea shrimp (Vernon-Carter *et al.*, 1996) and salmonids (Pickova *et al.*, 1998).

Vast studies were done to investigate on astaxanthin therapeutic potentials in treating some diseases which have been published in medical and nutritional literatures that suggested astaxanthin has several beneficial therapeutic effects in human bodies especially it has been proved to possess' superior antioxidant activity on cell membrane phospholipid bilayers by scavenging free radicals (Terao, 1989; Lim *et al.*, 1992; Naguib, 2000). In fact, there are increasing evidence suggesting that astaxanthin posses