

**UNIVERSITI TEKNOLOGI MARA (UiTM)**

***IN VITRO* STUDY OF ASTAXANTHIN LOADED  
WITH POLY(LACTIC-CO-GLYCOLIC) ACID  
(PLGA) NANOPARTICLE**

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## ABSTRACT

Poly(lactic-co-glycolic acid) (PLGA) are biodegradable polymer widely used in pharmaceutical industries as part of a formulation. The polymers are made up of two monomers, lactic acid and glycolic acid. Researchers often used PLGA to enhance drug absorption and to make it as sustained release products. PLGA can also be used as carrier to various types of drugs. This is also applicable to lipophilic substances such as astaxanthin. Astaxanthin is a natural antioxidant found in freshwater unicellular algae, *Haematococcus Pluvialis*. It is said to be the most powerful antioxidant leaving behind other types of antioxidant like vitamin c and beta carotene. However, Astaxanthin may encounter problem with poor absorption in the body. Therefore, this study aims on improving the absorption of the drug by incorporating it with PLGA nanoparticles. To prove the effectiveness of the formulation, dissolution test was carried out by using the dialysis bag technique. After 216 hours, drug release profile was identified and compared with other two formulations, Biolife astaxanthin and pure powder astaxanthin. Study revealed that the rate of drug release was low in all three formulations which suggest future investigation and experiment need to be done to establish a greater degree of validity of data on this matter.

# CHAPTER 1

## INTRODUCTION

### 1.1. Background

Antioxidant plays an important role in maintaining human health especially in neutralizing free radical. Our body may contain free radical as a results of metabolic reaction in the body itself or from external sources like cigarette smoke and pollutant in the environment. An active free radical can cause harmful effects to the cells molecule including lipids, carbohydrate, proteins and DNA (Pala & Tabakçioğlu , 2007 ; Shiv et. al., 2011). Enzymes produced by the body might act as a natural antioxidant in the body to neutralize the free radical (Eliot et. al., 2006). However, during excessive physical activity that exceed the body's capacity to recover between bouts , our body produce a larger amount of free radical that the enzymes cannot neutralize. Thus, antioxidant supplement is required to be taken in this condition.

Astaxanthin is an example of antioxidant supplement. In fact, it is said to be the king of antioxidant where it can neutralize several free radical at a time compared to other types of antioxidant like beta-carotene or vitamin c that can only neutralize one radical at any one time (Nishida et. al., 2007). Astaxanthin can only be synthesis in plant, thus the only way human can get benefit from it is through daily diet. The freshwater unicellular algae, *Haematococcus pluvialis* is one of the richest known sources of red secondary carotenoid Astaxanthin (Ranjbar et al., 2008).