UNIVERSITI TEKNOLOGI MARA

# PACLITAXEL LOADED AND SURFACE COATED POLY METHACRYLIC ACID-PEG-CHITOSAN BASED NANOPARTICLES FOR BREAST CANCER DELIVERY

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# ABSTRACT

Polymeric nanoparticles have shown tremendous promise for targeted delivery of various chemotherapeutic agents. The aim of present work was to develop and characterize paclitaxel incorporated Poly MAAc based nanoparticles for breast cancer delivery. The polymer nanoparticles were developed by aqueous dispersion polymerization method. The physicochemical properties of the nanoparticles were evaluated by Fourier transform infrared (FTIR) spectroscopy, differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). Surface charge and morphology of the polymer nanoparticles were evaluated by Zeta potential, scanning electron microscopy (SEM) and Transmission electron microscopy (TEM). The nanoparticles had spherical shape under TEM with sizes smaller than 50 nm. The zeta potential analysis showed that all nanoparticles (blank and paclitaxel loaded) bearing negative charges on their surface and no aggregation was observed in the nanoparticles. The higher zeta potential value of polymer nanoparticles showed more stability of nanoparticles in emulsion. The DSC studies on nanoparticles showed emergence of glass transition which probably associated with miscible nature of polymer and paclitaxel. TGA study showed some improvement in thermal stability after incorporation with paclitaxel. The results demonstrated that paclitaxel loaded PMAAc nanoparticles are a promising candidate for antitumor drug delivery.

# CHAPTER 1

## INTRODUCTION

Breast cancer is one of the most common form of cancer to be reported among other malignancies.In 2008, it is estimated that more than 1.34 million of people,mostly women reported to have breast cancer (Ahmad O. et. al. 2008).Breast cancer is the cancer with highest frequency of detection in most of countries all over the world except in a few Asian countries such as Vietnam and India (Danny R. Youlden et. al. 2011).In Malaysia breast cancer is the most common cancer in woman and in 2007 total 3, 242 cases were diagnosed (Malaysia Cancer Statistics, 2007). Chemotherapy is one of successful treatment for cancer,however the process is tedious and delicate(Si-Shi Feng,2004).It carries high drug toxicity risk as well as severe side effects.Nowadays,there are many methods discovered to improve chemotherapy as example the using of nanoparticles in chemotherapy.

In nanoparticle formulation the size of particles are extremely small,ranging from 10 nm to 1000nm.Eventhough nanoparticle has smaller loading capacity than microcapsules,it is proven that nanoparticles gives better stability to most of formulations. Nanoemulsion, for example does not need any emulsifier to maintain the dispersion of drug throughout the system.Smaller size of molecules also gives longer retention time for the drug to retain inside the body.Nanoparticles have another advantage over larger microparticles because they are better suited for intravenous delivery (Ruben T. Chacko et.al.2011).The smallest capillaries in the body are 5–6 $\mu$m in diameter. The size of particles being