UNIVERSITI TEKNOLOGI MARA

CAMPTOTHECIN LOADED EGG ALBUMIN-GLYCINE NANOPARTICLES FOR TARGETED DELIVERY TO COLON CANCER CELLS

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Dissertation submitted in partial fulfilment

of the requirements for the degree of

BACHELOR OF PHARMACY (Hons.)

Faculty of Pharmacy

2015

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ACKNOWLEDGEMENT

Foremost, I would like to express my sincere gratitude to my advisor Professor Dato' Dr. Abu Bakar Abdul Majeed for the continuous support of my undergraduate study and research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me throughout the research and writing of this thesis. I could not have imagined having a better advisor.

Apart of my advisor, I would like to thank my co-supevisor Marsita Abdl Razak for her guidance throughout the project. She helped us in every single step involved in making this project a success. Without her, we could not complete this project efficiently.

I would like to thank my fellow labmates, Ihsan and Nisa for the stimulating discussions, for the sleepless nights we were working together before deadlines and the encouragement we shared together. The moral support they gave really helped me. Last but not the least, I would like to thank my family for supporting me spiritually throughout my life.

CHAPTER 1

INTRODUCTION

1.1 Research background

Cancer is one of the leading causes of death worldwide, accounting for 8.2 million mortality in 2012 ("Globocan 2012 Stats – Global Cancer Rates Continue to Soar"). In Malaysia, cancer is increasing in incidence with an estimated 30 000 annual cases. It is regarded as a giant killer among health diseases ("CARIF – Status of Cancer in Malaysia" 2014). This disease has become a public health burden which significantly affects the development and progress in order to achieve the ultimate goal of a healthy nation (Lim et al., 2003). In Malaysia, colon cancer ranks as the third most common cause of cancer deaths which accounts for 7.8% and 5.6% in males and females respectively. The majority of colon cancer victims are Chinese with more than 2.5 times the incidence compared to Malays and Indians (Lim et al., 2003; Yahaya et al., 2002). The risk of developing colon cancer in Asia is mainly influenced by lifestyle and environmental factors such as smoking, obesity, dietary factors, physical inactivity and to some extent, the ethnic background of the patients (Chong et al., 2009; Tsukuma et al., 2011). The most common approaches used for the treatment of colon cancer, based on the stages of the cancer are surgery, chemotherapy, radiation therapy and targeted therapy. Colon surgery is frequently used as the main treatment for earlier stage of colon cancer. Laparoscopic-assisted colectomy is the newer approach which removes part of the colon and nearby lymph nodes by making smaller incisions. Radiation therapy for colon cancer uses high-energy rays to destroy cancer that has attached to the internal organ or the lining of the abdomen

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(http://www.cancer.org, 2013). Most patients with stage III colon cancer and particular patients with stage II of the disease gain significant assistance from adjuvant chemotherapy (Carrato et al., 2008). Commonly used drugs in treating colon cancer are 5-fluorouracil (5-FU) combined with leucovorin, oxaliplatin, avastin and capecitabine. A number of targeted agents have been developed in targeted therapy which display improved outcome in metastatic colon cancer patients (Hagan et al., 2013).

In efforts to improve cancer treatment, a large number of nanoparticles as drug delivery systems enabled to improve therapeutic efficacy and safety of anticancer drugs have been introduced. Natural polymers such as albumins are an appealing alternative to synthetic polymers which are commonly used in drug formulations because of their safety. Protein nanoparticles offer a number of advantages including biocompatibility and biodegradability (Cui et al., 2013).

Existing cancer therapies are challenged by weakly soluble drugs and by drug combinations that exhibit non-uniform biodistribution. A new platform of advanced materials based on albumin nanoparticles has been developed as delivery carriers to cancer cells. Albumin plays a role as protein carrier for drug delivery which has been shown to be nontoxic, non-immunogenic and biodegradable (Ahmad et al., 2011). Albumin nanoparticles have high binding capacity of various drugs and are well tolerated without any serious side-effects (Elzoghby et al., 2011). Thus albumin is an ideal material to formulate nanoparticles for drug delivery.