UNIVERSITI TEKNOLOGI MARA

EFFECT OF ASTAXANTHIN ON SHORT-TERM MEMORY AND LEVELS OF ACETYLCHOLINESTERASE (AChE) AND MITOCHONDRIAL COMPLEX 1 IN SCOPOLAMINE TREATED MICE

ALIAH NATTASHA BINTI ABDUL HADI

Dissertation submitted in partial fulfilment of the requirements for the Bachelor of Pharmacy (Hons.)

Faculty of Pharmacy

2017

ACKNOWLEDGEMENTS

First and foremost, thanks to Allah S.W.T. for His opportunity and seeing me through some truly difficult times of this PHC567 (Research II) course. I would like to express my deepest gratitude to my supervisor, Professor Dato' Dr. Abu Bakar Abdul Majeed and my co-supervisor Miss Nor 'Awatif Osmanudin and Miss Rohana Che Nordin for their critical comments and kind help for the preparation of this thesis. A special thanks is dedicated to my partners; Nur Namira Binti Mahmad, Nurfarah 'Atiqah Binti Adzmi and Nur Jamilah Hani Binti Jamal for supporting me in completing this thesis. Thanks also to collaborators in the Brain Research Laboratory for the assistance and teamwork throughout the research.

My sincerest gratitude also goes to my parents Abdul Hadi Bin Abdul Rahman and family members, laboratory staffs, friends and all who were directly or indirectly involved in this research. With the full cooperation of these people, I was able to complete this research project.

TABLE OF CONTENTS

ABSTRACT

EFFECT OF ASTAXANTHIN ON SHORT-TERM MEMORY AND LEVELS OF ACETYLCHOLINESTERASE (AChE) AND MITOCHONDRIAL COMPLEX 1 IN SCOPOLAMINE TREATED MICE

Alzheimer's disease (AD) is a neurological disorder that eventually will cause memory loss and cognitive decline. To date, there is no pure treatment to cure AD. Current medication of AD can temporarily slow down Alzheimer's symptoms and improve the quality of life of patients but still show a lot of side effects. Astaxanthin was used in this study as it has antioxidants property. This study was performed to evaluate the effectiveness of astaxanthin in short-term memory and levels of acetylcholinesterase (AChE) and mitochondrial complex 1 in mice. Twenty-five mice were divided into five groups; control group, memory deficit group (MDG), group 1, group 2 and group 3. Mice in MDG, group 1, 2 and 3 were injected with 3mg/kg of scopolamine once daily through intraperitoneally (i.p.) for 28 days. However, on day 22, mice in group 1, 2 and 3 were administered with incremental dosage of astaxanthin that is 12.5, 25 and 50 mg/kg respectively for 7 days. The administration of astaxanthin was given once daily and orally (p.o.). In addition, mice in control group were administered with 0.5ml/100g of 0.9% normal saline once daily via intraperitoneally (i.p.) for 28 days. The short-term memory was tested in behavioural test by using Morris Water Maze (MWM). Meanwhile, test on levels of acetylcholinesterase (AChE) and mitochondrial complex 1 were tested in laboratory.

In behavioural test, the effect of 3mg/kg of Scopolamine showed an increase in total distance travelled by the mice especially in MDG on day 1 to 21. On day 22 to 28, mice in astaxanthin-treated group showed a gradually decrease in total distance travelled compared to MDG. The shortest total distance travelled among these three astaxanthin-treated groups were shown in mice in group 3 (50mg/kg astaxanthin). Meanwhile, the level of AChE in MDG was higher compared to control group. In comparison of mice in astaxanthin-treated group and MDG, mice in group 3 showed lower level of acetylcholinesterase compared to MDG. Lastly, in mitochondrial Complex 1 test, mice in MDG showed lower level of free radicals reduction at Complex 1 compared to control group. Meanwhile, mice in group 3 which were administered with 50mg/kg astaxanthin, showed higher level of free radicals reduction at Complex 1 compared to MDG. The rest showed no difference.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Alzheimer's disease (AD) is a chronic neurodegenerative disease. It is an irreversible, progressive brain disorder that slowly destroys memory and thinking skills and, eventually the ability to carry out the simplest tasks. Usually, the symptoms first appear in most people with AD in their mid-60s. AD is the most common cause of dementia among older adults. Dementia is the cognitive impairment affecting thinking, memory and communication and also behavioural abilities to such an extent that it can interfere with a person's daily life and performing daily activities (Alzheimer's Disease Education & Referral (Adear) center, 2011).

Besides AD, there are many other types of dementia. Treatable conditions such as vitamin deficiencies, thyroid disease, sleep disorders, or mental illness can cause memory loss or dementia symptoms. Other irreversible dementias include vascular dementia, which is due to strokes, Lewy Body disease, frontotemporal dementia, Creutzfeldt-Jakob disease, Parkinson's disease and Huntington's disease. Since these conditions have similar and overlapping symptoms, many of them can be only diagnosed with certainty by an autopsy of the brain (Alzheimer Society of Canada, 2014).