UNIVERSITI TEKNOLOGI MARA

CAFFEINE EFFECTS ON SPATIAL MEMORY USING MORRIS WATER MAZE IN BALB/C MICE

NUR FARAHIM BINTI AMIRUDIN

Dissertation submitted in partial fulfillment of the requirements for the degree of

Bachelor of Pharmacy (Hons)

Faculty of Pharmacy

2015

ABSTRACT

Background: Learning and memory are part of cognitive functions that are essential in human. Caffeine is known to be a stimulant on the central nervous system. It is suggested to have effect on learning and memory through its antagonism action on adenosine receptor. This study was performed to observe the effects of caffeine on spatial memory in BALB/c mice using Morris Water Maze. *Results and Discussions*: The results showed that caffeine does not have effects on the time spent in the original platform quadrant of the pool as compared to the saline. Interestingly, caffeine-treated mice with dose 3 mg/kg spent more time in the quadrant than dose 1 mg/kg. On the other hand, caffeine did reduce the distance to get to the quadrant that containing the original platform. Although, the value was not significant, mice administered with caffeine 3 mg/kg has the lowest distance followed by caffeine 1 mg/kg and saline. Another procedure observed in this study was the latency for mice to reach the submerged platform during the acquisition training. Although mice from each group was not given drug treatment, only group 1 and 2 showed enhancement in term of their spatial memory as their latency is lower compared to the group 3. *Conclusion*: In summary, this present study documents the spatial memory-enhancing properties of caffeine administration in BALB/c mice. To further explain the cognitive effects of caffeine, the study should be repeated on different strain of mice with different doses of caffeine.

ACKNOWLEDGEMENT

Firstly, I am thankful to Allah, the All Mighty, The Most Merciful and The Most Graceful for giving me opportunity, good health and wellbeing to complete this study. I owe my deepest gratitude to my supervisor Dr Nur Suraya Adina binti Suratman, for her endless encouragement, valuable guidance and unceasing patience throughout this study and thesis writing.

I also acknowledge the help from Dr Vasudevan and Dr Richard for their valuable input for the studies and also for the staff of Behavioral and Experimental therapeutic laboratory for their assistance. Last but not least, I would like to express my gratitude to my research partners, Izzura and Hidayah for their help throughout this venture.

TABLE OF CONTENTS

APPROVAL SHEET i

ABSTRACT ii

ACKNOWLEDGEMENT iii

LIST OF TABLE vii

LIST OF FIGURES viii

LIST OF ABBREVIATIONS/NOMENCLATURE ix

CHAPTER 1 1

INTRODUCTION 1

1.1 BACKGROUND OF STUDY 1

1.2 PROBLEM STATEMENT 2

1.3 HYPOTHESIS 2

1.4 RESEARCH OBJECTIVE 2

1.5 RESEARCH SIGNIFICANCE 2

CHAPTER 2 3

LITERATURE REVIEW 3

2.1 COGNITION AND COGNITIVE IMPAIRMENT 3

2.2 ADENOSINE 4

2.3 ADENOSINE: RECEPTORS AND FUNCTIONS 5

CHAPTER 1

INTRODUCTION

14.1 BACKGROUND OF STUDY

Learning, attention and memory is part of activities associated with cognition in brain. Caffeine is recognized to be a stimulant on central nervous system. Aside from its effect on alertness and arousal, it is also proposed to have effect on learning and memory (M. E. M. Angelucci et al., 1999).

Caffeine acts in the central nervous system through several mechanisms which are antagonism of adenosine receptors, inhibition of phosphodiesterase (PDE) and interferes with $GABA_A$ receptors (Smit & Rogers, 2000). Mainly, caffeine affects cognition by interacting with adenosine receptors especially A_1 and A_{2A} to facilitate the release of neurotransmitter such as acetylcholine, dopamine and glutamate. Adenosine, found in all cells has association with various brain disorders – Alzheimer disease, Parkinson's disease and Schizophrenia.