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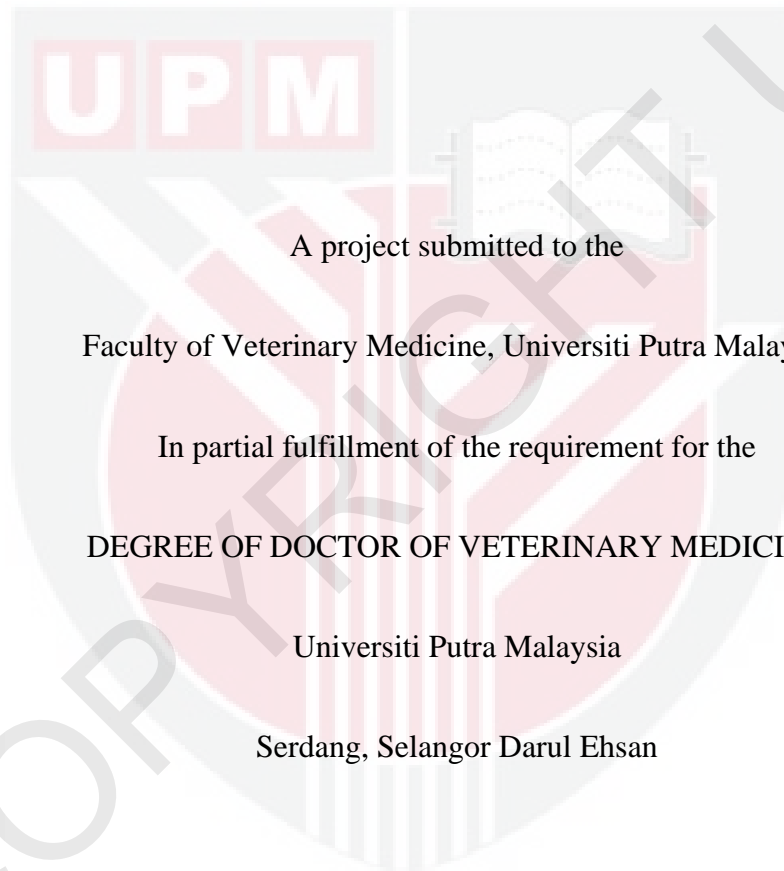
***EXPRESSION OF ZENK AND FOXP1 GENE IN A BRAIN OF A
PARROT***

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EXPRESSION OF ZENK AND FOXP1 GENE IN A BRAIN OF A PARROT

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It is hereby certified that we have read this project paper entitled “Expression of ZENK AND FOXP1 gene in a parrot”, by Nurul Afiqah binti Yazid and in our opinion it is satisfactory in terms of scope, quality, and presentation as partial fulfillment of the requirement for the course VPD 4999 – Project.

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DEDICATION

I dedicate this thesis with love and appreciation to :

My parents

Yazid bin Habib

Azizah binti Omar

My siblings

Mohd Azrul bin Yazid & family

Nurulafzan binti Yazid & family

My Supervisor

Dr. Hafandi bin Ahmad

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ABSTRAK

Abstrak daripada kertas projek yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan kursus VPD 4999 - Projek.

EKSPRESI GEN ZENK DAN FOXP1 DI DALAM OTAK BURUNG NURI

Oleh

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2015

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Penyelia Bersama : Prof. Madya Dr. Jalila Abu

Burung nuri adalah salah satu burung yang terkenal dengan kemahiran komunikasi dan vokal mereka . Berdasarkan kajian yang dilakukan sebelum ini, pengeluaran vokal dikawal oleh otak depan dan juga ianya berkaitan dengan perubahan beberapa gen ungkapan yang bertanggungjawab mengawal persepsi lagu dan pengeluaran bunyi. Walaupun banyak kajian yang dilaporkan berkenaan ekspresi gen yang dikaitkan dengan perkembangan pembelajaran dan ingatan pada manusia penemuan terhad dilaporkan pada gen yang berkaitan dengan penghasilan vokal oleh burung nuri. ZENK dan FOXP1 adalah gen yang bertanggungjawab dalam kemahiran komunikasi dan vokal burung nuri. Oleh itu , kajian ini dijalankan untuk

menganalisis ekspresi gen yang dikaitkan dengan pengeluaran vokal yang dikawal oleh ZENK dan FOXP1. Tisu otak diambil daripadaburung yang telah mati dan disimpan di dalam RNA *later*. Pengekstrakan RNA dilakukan diikuti oleh qPCR untuk kuantifikasi gen FOXP1 dan ZENK dalam sampel. Gel elektroforesis telah dilakukan untuk membuktikan bahawa terdapat kehadiran FOXP1 dan ZENK dalam otak nuri .Kepekatan RNA yang berbeza telah digunakan iaitu 170 ng/ml, 17 ng/ml, 1.7 ng/ml, 0.17 ng/ml dan ng 0.02/ml. Hasilnya telah didokumenkan sebagai nilai ambang kitaran (CT). Dalam kepekatan RNA 170 ng/ml, nilai CT terendah dicatatkan iaitu 22.91 dalam ZENK dan 23.39 dalam FoxP1 manakala kepekatan RNA 0.02 ng/ml mempunyai nilai CT 23.94 untuk ZENK dan 23.99 untuk FOXP1 . Oleh kerana nilai CT adalah berkadar langsung kepada ungkapan gen , kita dapat membuat kesimpulan bahawa gen adalah kehadiran dalam jumlah yang besar dalam kepekatan yang tinggi RNA .

Kata kunci : burung nuri, ekspresi gen, FOXP1, ZENK, PCR

ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfillment of the course VPD 4999 – Project.

EXPRESSION OF ZENK AND FOXP1 GENES IN A PARROT BRAIN**By****Nurul Afiqah Yazid****2015****Supervisor : Dr Hafandi Ahmad****Co-supervisor : Assoc. Prof. Dr. Jalila bt Abu**

Parrots are one of the songbirds that are well known for their vocalization skills. Based on previous study, the production of songbirds is being controlled by the forebrain and also related with changes of some genes expression that is responsible for song perception and production. Although many studies on the genes expression associated with the learning and memory development in humans are being reported, limited findings are reported on genes related with the songbird. The ZENK and FOXP1 are the most likely genes that are responsible in the songbird. Therefore, we conducted a study to analyze the gene expression associated with songbirds which are ZENK and FOXP1. A brain tissue of dead parrot was obtained and preserved in RNA*later*. The RNA extraction was done followed by qPCR for

quantification of the FOXP1 and ZENK expression in the sample. Gel electrophoresis was done and result shows that there is presence of FOXP1 and ZENK in the parrot brain. Different RNA concentration was used which are 170 ng/ml, 17 ng/ml, 1.7 ng/ml, 0.17 ng/ml and 0.02 ng/ml respectively. The result was documented as cycle threshold (CT) value. In RNA concentration of 170 ng/ml, the lowest CT value was recorded which are 22.91 in ZENK and 23.39 in FoxP1 while RNA concentration of 0.02 ng/ml has CT value of 23.94 for ZENK and 23.99 for FOXP1. As the CT value is indirectly proportional to gene expression, we are able to conclude that genes are presence in high amount in a high concentration of RNA.

Keyword: songbirds, gene expression, ZENK, Foxp1, PCR

1.0 INTRODUCTION

Parrots are being define as the bird in the order of Psittaciformes, often vividly colour, short down curved hooked bill, grasping feet, raucous voice, found especially in the tropics and feeds on fruits as well as seeds (Oxford, 2014). They are characterized by distinctive vocalizations, lifelong capacity for learning and their adaptability to changing environmental conditions (Homberger, 2006).

Parrots are a popular choice of companion animals because of their ability to mimic many sounds such as human speech, song and laughter. Some of the popular choices of parrots as a pet include African Grey Parrot and Lovebirds which are very intelligent, affectionate and can be trained to talk and sing.

There are two phases of song learning process in birds. The first phase is the memorization phase which occurs when the birds listen and learn a song. The song learning process is influenced by the surrounding such as their owners and members of the same group. The song that was learned was stored in a long-term memory. After that, sensorimotor phase takes place. Sensorimotor occurs when the vocal output of the bird is matched with the memorized information. Further practice by the bird will makes the song becomes similar with the learned song. This is why the birds are able to mimic every sound and tone of the learned song (Mendoza, 2011).

In addition, songbirds and vocalization in a parrot are also controlled by few genes in the brain. Previous study has reported that FOXP1 are most likely related

with speech disorder and vocalization. In a study done by Teramitsu et al, (2004) the expression pattern of FOXP1 and FOXP2 in human brain are similar to those in songbirds including their localization to subcortical structures that function in sensorimotor integration and control of skilled, coordinated movement. Other than that, the specific colonization of FOXP1 and FOXP2 found in several structures in the bird and human brain predicts that mutations in FOXP1 could also related to speech disorders (Teramitsu et al, 2004).

Indeed, when songbirds hear the song of another individual of the same species or when they sing, the mRNA levels of ZENK gene increased rapidly in the forebrain areas which involved in vocal communication (Mello and Ribeiro, 1998). Therefore, it is highly suggested that these two genes are most likely to be responsible for songbirds and vocalization in parrots.

1.1 OBJECTIVE

The objective of this study is to analyze and evaluate the brain gene expression associated with the vocalization of a parrot.

1.2 HYPOTHESIS

We hypothesized that the ZENK and FoxP1 gene expressions are significantly higher in the brain of a parrot.

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