

**UNIVERSITI SAINS MALAYSIA  
GERAN PENYELIDIKAN UNIVERSITI PENYELIDIKAN  
LAPORAN AKHIR**

**EOIGENETIC REMODELING OF MESENCHYMAL STEM  
CELL (MSC), BY TARGETING SPECIFIC MICRORNAS TO  
INDUCE LONG TERM NEUROGENESIS: AN IN VITRO  
ANALYSIS OF MSC PLASTICITY**

**PENYELIDIK**

**PROFESOR HASNAN JAAFAR**

**PENYELIDIK BERSAMA**

**PROF. DR. JAFRI MALIN BIN ABDULLAH  
DR. SOUMYA PATI**

**2015**

F0550

Kod Projek :

FRGS/FASA1-2009/(BIDANG)/(NAMA IPT)/(NO.RUJ. KPT)



**FINAL REPORT**  
**FUNDAMENTAL RESEARCH GRANT SCHEME (FRGS)**

*Laporan Akhir Skim Geran Penyelidikan Asas (FRGS) IPT*  
*Pindaan 1/2009*

**A RESEARCH TITLE** : Epigenetic Remodeling of Mesenchymal Stem Cell (MSC), by Targeting Specific microRNAs to Induce Long Term Neurogenesis: An In Vitro Analysis of MSC Plasticity

*Tajuk Penyelidikan*

**PROJECT LEADER** : Prof Dr Hasnan Bin Jaafar

*Ketua Projek*

**PROJECT MEMBERS** : 1. Prof Dr Jafri Malin Bin Abdullah  
 (including GRA) 2. Dr Soumya Pati

*Ahli Projek*

**PROJECT ACHIEVEMENT (Prestasi Projek)**

**B**

**ACHIEVEMENT PERCENTAGE**

Project progress according to milestones achieved up to this period	0 - 50%	51 - 75%	76 - 100%
Percentage			100%

**RESEARCH FINDINGS**

Number of articles/ manuscripts/ books	Indexed Journal	Non-Indexed Journal
	1	-
Paper presentations	International	National
	-	2
Others (Please specify)		

**HUMAN CAPITAL DEVELOPMENT**

Human Capital	Number		Others (Please specify):
	On-going	Graduated	
PhD Student			
Masters Student	1	1	
Undergraduate Students			
Temporary Research Officer			
Temporary Research Assistant			
<b>Total</b>	<b>2</b>		

**EXPENDITURE (Perbelanjaan)**

C Budget Approved (Peruntukan diluluskan) : RM 78,000.00  
 Amount Spent (Jumlah Perbelanjaan) : RM 76,833.42  
 Balance (Baki) : RM 1,166.58  
 Percentage of Amount Spent : 98.50%  
 (Peratusan Belanja)

**ADDITIONAL RESEARCH ACTIVITIES THAT CONTRIBUTE TOWARDS DEVELOPING SOFT AND HARD SKILLS  
 (Aktiviti Penyelidikan Sampunear yang menyumbang kepada pembangunan kemahiran insaniah)**

D

International		
Activity	Date (Month, Year)	Organizer
(e.g : Course/ Seminar/ Symposium/ Conference/ Workshop/ Site Visit)	-	-
National		
Activity	Date (Month, Year)	Organizer
17th National Conference of Medical and Health Sciences	May, 2012	School of Dental Sciences, Universiti Sains Malaysia.

**PROBLEMS / CONSTRAINTS (IF ANY) (Masalah/ Kekangan sekiranya ada)**

E The main problem of this research is the delay in obtaining the reagents for the experiments. Most of the reagents are custom-made and need to be ordered from oversea.

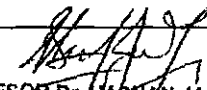
**RECOMMENDATION (Cadangan/ Penambahbaikan)**

F Nil

**RESEARCH ABSTRACT - Not More than 200 words / Abstrak Penyelidikan - Tidak Melebihi 200 patah perkataan**

**G** Recently, there has been an increasing interest in MSCs plasticity and their potential to transdifferentiate into neural lineages. To have an in-depth understanding of optimal transdifferentiation and its microenvironment, we have transdifferentiated MSCs in different combinatorial treatment of growth factors. Based on previous studies about the roles of IGF-1 in the laboratory, we hypothesized that IGF-1 can provide an optimal microenvironment for long-term maintenance and efficient neural induction. Here, we also analysed the roles of differential microRNAs in the transdifferentiation of MSC into neural lineage in the presence of IGF-1. Neuronal induction was carried under four different microenvironments: (A) EGF/bFGF, (B) EGF/bFGF/IGF, (C) EGF/bFGF/LIF, (D) EGF/bFGF/BDNF and (E) without growth factor as negative control. Neurospheres formed were characterized by immunofluorescence staining against nestin and the expression was measured by flow cytometry. The cell proliferation and apoptosis was also studied by MTS and Annexin V assay respectively at three different time intervals (24 hours, Day 3 and Day 5). All groups showed significant higher in nestin expression as compared to negative control group. Interestingly, IGF-1 treated group shows better enhancement in cell proliferation and cell survival efficiency. To delineate the exact miRNA signatures in IGF-1 treated sample, we performed miRNAs profiling and analyzed using Genespring software. Among the 21 miRNAs differentially expressed, let-7b, miR-181a, and miR-26a were found to be specially expressed in IGF-1 treated group. All of them are involved in apoptosis suppression, improve cell proliferation and promote neuronal differentiation. Our results demonstrate that IGF-1 enhanced cell proliferation and suppressed cell death by triggering the expression of specific miRNAs. This information will be beneficial for improving both cell-based and cell-free therapy of neurodegenerative diseases in the long run.

Date : 6/1/2014  
Tarikh


Project Leader's Signature:   
Tandatangan Ketua Projek  
PROFESOR DR. HASNAN JAAFAR  
(NPM : 27251)  
Jabatan Patologi

**COMMENTS IF ANY ENDORSEMENT BY RESEARCH MANAGEMENT CENTER (RMC)**  
(Komen, sekiranya ada Pengesahan oleh Pusat Pengurusan Penyelidikan)

**H** .....  
Ok.  
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16150 Kubang Keratan, Seremban.

Name: PROF. MADYA LEE KEAT TEONG  
Nama: Pengarah  
Pejabat Pengurusan & Kreativiti Penyelidikan  
Universiti Sains Malaysia  
11800 USM, Pulau Pinang.

Signature:   
Tandatangan:

Date: 7/1/14  
Tarikh: