

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

**TUMORICIDAL EFFECT OF SKELETAL VIBRATORY
SIGNAL DURING AL-FATIAH RECITATION ON HUMAN
CANCER CELLS**

PENYELIDIK

ABU DZARR GANESH B ABDULLAH

PENYELIDIK BERSAMA

PROF. MADYA WAN AHMAD KAMIL WAN ABDULLAH

PROF ABDUL AZIZ BABA

DR. MOHD NORMANI ZAKARIA

PROF. DR. ZAIDI MOHD RIPIN

2015

Panggi pementaran

Sufy 16/2/15

BORANG ERGS - P3(R) ✓

Code Project : ERGS / 1 / 2011 / SKK / 45m / 02 / 37

KEMENTERIAN
PENDIDIKAN
MALAYSIA

FINAL REPORT EXPLORATORY RESEARCH GRANT SCHEME (ERGS)

Laporan Akhir Skim Geran Penyelidikan Eksploratori (ERGS) IPT
Pindaan 1/2015

A RESEARCH TITLE: Tumoricidal Effect of Skeletal Vibratory Signal During Al-Fatihah Recitation on Human Caner Cells

PHASE & YEAR: 1/2011

START DATE: 15 August 2011

END DATE: 14 August 2013

EXTENSION PERIOD (DATE): RMC LEVEL: 15 August 2013 – 14 Feb 2014, 15 Feb 2014 – 14 August 2014
KPM LEVEL: -

PROJECT LEADER: Abu Dzarr Ganesh b Abdullah

I/C / PASSPORT NUMBER: 680422085377

PROJECT MEMBERS: 1. Prof Madya Wan Ahmad Kamil Wan Abdullah
2. Prof Abdul Aziz Baba
3. Dr Mohd Normani Zakaria
4. Prof Dr Zaidi Mohd Ripin

(including GRA)



PROJECT ACHIEVEMENT (Progres Projek)

ACHIEVEMENT PERCENTAGE			
Project progress according to milestones achieved up to this period	0 - 50%	51 - 75%	76 - 100%
Percentage		1	
RESEARCH OUTPUT			
Number of articles/ manuscripts/ books (Please attach the First Page of Publication)	Refereed Journal	Non-Refereed Publication	
	nil	nil	
Conference Proceeding (Please attach the First Page of Publication)	International	National	
	nil	nil	
Intellectual Property (Including Paten, Copyright, Industrial Design, layout Design of Integrated Circuit & Trademarks)	nil		

Panggi uke pementaran

PROF. DR. LEE KEAT TEONG

Pejabat Pengurusan & Kreativiti Penyelidikan
Universiti Sains Malaysia
11800 USM, Pulau Pinang.

Sufy 16/2/15

HUMAN CAPITAL DEVELOPMENT					
Human Capital	Number				Others (please specify)
	On-going		Graduated		
Citizen	Malaysian	Non Malay sian	Malaysian	Non Malaysian	
No. PHD STUDENT	1				
Student Fullname: IC / Passport No: Student ID:	Abu Dzarr Abdullah 680422085377 P-UD0002/12(R)				
No. MASTER STUDENT					
Student Fullname: IC / Passport No: Student ID:	nil				
No. UNDERGRADUATE STUDENT					
Student Fullname: IC / Passport No: Student ID:	nil				
Total	1				

EXPENDITURE (Perbelanjaan)

C Budget Approved (Peruntukan diluluskan) : RM 139 050.00
Amount Spent (Jumlah Perbelanjaan) : RM 133 733.53
Balance (Baki) : RM 536.47
Percentage of Amount Spent : 96 %
(Peratusan Belanja)

ADDITIONAL RESEARCH ACTIVITIES THAT CONTRIBUTE TOWARDS DEVELOPING SOFT AND HARD SKILLS (Aktiviti Penyelidikan Sampingan 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
	(e.g : Course/ Seminar/ Symposium/ Conference/ Workshop/ Site Visit)		
	1. Introduction to LabVIEW and Fundamentals of Data Acquisition with Compact DAQ Hands on Workshop	July 2012	National Instrument (Wisma Kemajuan, Petaling Jaya)

2. Seminar Cum Workshop in Live Cell Staining & Imaging	October 2012	School of Dental Sciences, USM Kubang Kerian, Kelantan
3. Short Course on Experimental Data Analysis	November 2012	School of Mathematical Sciences, USM, Penang
4. Kursus Tahsinul Quran Modul 1-2 (Asas Tajwid 1 & II)	October 2012 – Mei 2013	Kolej Islam Antarabangsa Sultan Ismail Petra (KIAS) Nilam Puri Kota Bharu
5. Meeting with Expert in Digital Signal Processing, Dr Basem Abu Zneid, from the Faculty of Bioengineering UTM.	December 2012	UTM Skudai, Johor
6. Course: 2 nd Multivariable STATA workshop on Statistical Methods in Medical and Health Sciences Research	October 2013	School of Medical Sciences, USM, Kubang Kerian
7. Meeting & Discussion with Professor Zaidi Ripin from School of Mechanical Engineering, USM	December 2013	Vibration Lab, USM, Transkerian Pulau Pinang
8. Course: Data Acquisition and Signal Conditioning	March 2014	National Instrument (Wisma Kemajuan, Petaling Jaya)
9. Intermittent Short Stay at Transkerian for Research Activity in Vibration Lab	Jan – Aug 2014	Vibration Lab, USM, Transkerian Pulau Pinang

E. PROBLEMS / CONSTRAINTS IF ANY (Masalah / Kekangan sekiranya ada)

Please see attachment

F. RECOMMENDATION (Cadangan Penambahbaikan)

Research of such nature would require longer research duration.

We could have chosen to ignore the fundamentals and progress on despite all the limitations fulfilling KPI achievements as the priority. This would have led the outcome of this research exposed to indefensible scientific criticism which in the end discredited and proved worthless.

We are thankful that the ERGS research grant had provided the impetus to stimulate the initiation and progress of research to the current stage. Although the objective that was set for this grant was not achieved within its time frame but the momentum it has help generated will ensure that the research will continue to its eventual conclusion.

We hope that there will be avenue for us to continue updating the outcome of this grant in terms of output and not closed as failure as it is now.

G. RESEARCH ABSTRACT – Not More Than 200 Words (Abstrak Penyelidikan – Tidak Melebihi 200 patah perkataan)

This research attempts to study if physical vibration generated in the human body during recitation of *Al-Fatihah* has an effect on cancer cells. This includes working sequentially on two main objectives. The first objective is to measure and model skin vibration signals using accelerometer (skin acceleration level) on a cohort of verified reciters whereby measurement is carried out during recitation. Subsequently the modeled vibration is simulated on cancer cells (NCI H929: Myeloma) and its growth and viability assessed. At the time of this final report the first objective was not achieved hence prevented progression to the second objective. A cohort of 15 reciters has been established but we could not proceed to gauge skin acceleration level as currently available methods were found to be unreliable. Current methods of mounting accelerometer to the skin produce highly variable acceleration amplitudes. Various alternatives were devised and attempted, such as using polystyrene, plastic holders etc failed to fulfil gage repeatability and reproducibility criteria. Towards the end, preliminary gage study using suction cups as accelerometer mounting adapter showed promise but the final measurement analysis is yet to be carried out. This research is still ongoing in spite of the end of study period.

Date : 2 Feb 2015
Tarikh

Project Leader's Signature:
Tandatangan Ketua Projek

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

Projek sudah selesai dan telah selesai

Name:
Nama:

Signature:
Tandatangan:

Date:
Tarikh:

10/2/15

UNIVERSITI SAINS MALAYSIA
JABATAN BENDAHARI
KUMPULAN WANG PENYELIDIKAN FUNDAMENTAL
PENYATA PERBELANJAAN SEHINGGA 31 DISEMBER 2014

Jumlah Geran	RM139,050.00	Ketua Projek	DR. ABU DZARR GANESH ABDULLAH
Peruntukan 2011 (Tahun 1)	RM56,050.00	Tajuk Projek	TUMORICIDAL EFFECT OF SKELETAL VIBRATORY SIGNAL DURING AL-FATIAH RECITATION ON HUMAN CANCER CELLS
Peruntukan 2012 (Tahun 2)	RM83,000.00		
Peruntukan 2013 (Tahun 3)		Tempoh	30 BULAN (15 OGOS 2011-14 FEBRUARI 2014)
		No. Akaun	203/PPSP/6730022

Kwgan	Akaun	PTJ	Projek	Peruntukan Projek	Perbelanjaan Terkumpul sehingga Tahun lalu	Peruntukan Semasa	Tanggungan Semasa	Bayaran Tahun Semasa	Belanja Tahun Semasa	Baki Projek
203	11000 PPSP		6730022		-	-	-		-	-
203	14000 PPSP		6730022		-	-	-		-	-
203	15000 PPSP		6730022	-	-	-	-		-	-
203	21000 PPSP		6730022	12,000.00	6,625.97	5,374.03		7,825.70	7,825.70	(2,451.67)
203	22000 PPSP		6730022	-	-	-			-	-
203	23000 PPSP		6730022	1,000.00	3.71	996.29		3.71	3.71	992.58
203	24000 PPSP		6730022	8,050.00	-	8,050.00	-		-	8,050.00
203	26000 PPSP		6730022	10,000.00	-	10,000.00	-		-	10,000.00
203	27000 PPSP		6730022	75,500.00	42,735.22	32,764.78	-	61,912.23	61,912.23	(29,147.45)
203	28000 PPSP		6730022	3,000.00	-	3,000.00			-	3,000.00
203	29000 PPSP		6730022	18,500.00	1,450.00	17,050.00	-	3,773.99	3,773.99	13,276.01
203	35000 PPSP		6730022	11,000.00	9,403.00	1,597.00			-	1,597.00
203	52000 PPSP		6730022		-	-			-	-
203	A11102 PPSP		6730022	-	-	-		-	-	-
				139,050.00	60,217.90	78,832.10	-	73,515.63	73,515.63	5,316.47

Attachment

This research started from an idea. An idea which is yet to be explored. In order to reach the desired conclusion, that idea apparently has to traverse several stages.

We had the idea but not the technical knowhow to translate that idea into an appropriate research protocol. It involved various discipline from phonetics, arabic linguistic, electronics, digital signal processing, vibration mechanics and cell biology among others. Hence we were slow to start.

Firstly a reliable and accurate method for measuring body vibration during speech has to be established. In the literatures, body vibration is represented and measured via skin acceleration level. Although measurement of skin acceleration using MEMs type accelerometers with double sided tapes and straps has been the main stay method as published in several studies, unfortunately these measurement methods have never been validated. Perhaps accuracy and precision is not fundamental when the aim of measurement is for voice recognition in research involving bone conducted microphones and hearing aids. During our investigations we have found that these methods were unreliable and we are concerned this issue if not sorted may invalidate our research findings at the end. This has been the main stumbling block that had prevented this research from progressing.

Hence almost two years were spent trying to figure out the measurement method that could fulfil the rigor of GAGE analysis. In fact towards the end we have some glimpse of hope. Perhaps it was 'Eureka' of sort when I observed patients undergoing electrocardiographic measurement. A preliminary test was carried out in Aug 2014 using a modified ECG suction cups (fig 1 & 2) (This research period officially ended its three year period in 14 August 2014) and that was the first time we were able to demonstrate acceptable reliability and reproducibility for skin acceleration measurement at μg level (*g for gravitational g*).

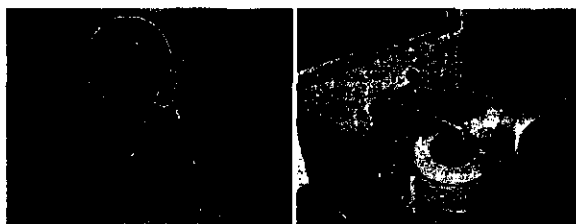


Fig 1

Fig 2

We have conceptualize and design an adapter device, which I have named Skin Accelerometer Mounting Adapter, *SAMA* for short. Unfortunately getting an experienced and willing machinist is a problem in Kota Bharu. I have waited 5 weeks for him (a private willing machinist) to provide me a sample (fig 3 & 4) and I am still waiting for the past 6 weeks for him to provide me a set of 15 adapters. Below is the picture of the sample mounting adapter.

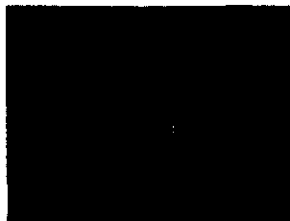


Fig 3



Fig 4

Once this is ready and hopefully if a full gage using this device is as good as shown in the earlier analysis then insyaAllah, a refereed publication and a patent application is expected. Intellectual property was not in the expected list of achievements but a bonus.

Once the above obstacle is out of the way, the second major obstacle is how do we simulate that vibration on to the cell culture. When the preliminary vibration waveform was translated from acceleration to displacement data we found that it's amplitude is around ± 7 micron from zero point. How do we agitate the studied cells at this dimension. We could not find a dynamic agitator that could agitate at that range in nanometer resolution. Even the smallest heterodynamic shaker costing around RM50,000 could not fulfil our needs. SO WE HAD TO BUILD ONE.

Hence from March 2014 onwards we have been in discussion with engineers to determine the suitable component for such a shaker. Although we received technical advise from engineers, the owners is still on us to finally come up with a workable model. We are concerned that the money and effort spent would materialised into a product that would function as expected. So you can imagine the journey a person with a medical background has to take to digest the technical knowhow in creating and building a shaker. By the time that learning curve is attained and an affordable setup could be envisioned it was close to the end of the grant period. An attempt was made to try converting part of the grant fund to VOT35000 to purchase two essential part of the shaker, the piezoelectric actuator and the controller for a close loop operation. Unfortunately, the application was turned down as it was deemed too late.

By the way, it was not the end. I managed to accumulate personal fund to purchase P-841.10 *Preloaded Piezo Actuator* and E-709.SRG *Digital Piezo Controller, 1 Ch, Benchtop Module, -30 to -130V, SGS* which cost SGD 6,444.00 (RM17032.65). Both items was purchased from *Physik Instrumente*, Germany in October and was delivered on 22 Dec 2014. (fig 5) The P-841.10 actuator has a maximum displacement of 15 micron with 0.3 micron resolution for closed loop operations. Apparently this model is the actuator with the smallest resolution that we could find. The piezo controller will allow close loop operation and it was deemed necessary to overcome hysteresis which is expected at low frequency.

Other items that was acquired include; Anti-vibration components (fig 6) were purchased from Newport Corporation (USA) and structural components fabricated at a local machinist (fig 7)

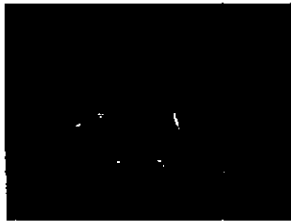


Fig 5



Fig 6

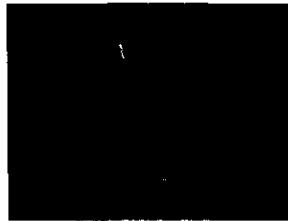


Fig 7

At the moment I am familiarizing (Nanocapture tm) the control software that comes with the piezo controller .

I would expect that a period of 6 months will be required to construct, test and optimize this shaker.

The final stumbling block will be after the shaker is operational. The analysis of cell performance towards exposure to the vibration. The items and related disposables has been purchased and prepared. All in whole another two years is perhaps needed to accomplish this study.