DBS Bulletin

SUNWAY UNIVERSITY

March 2019
Issue 1

Monthly DBS Newsletter

Welcome to the "DBS Bulletin", a monthly newsletter of the Department of Biological Science, Sunway University. The purpose of this newsletter is:

- To highlight the achievements of DBS faculty in research and education
- To highlight research funding opportunities
- To share and promote departmental events (workshops, talks, conferences)
- To identify active research discovery areas for potential collaborations

Let us all come together to make this bulletin an informative and successful one. Please share your updates (publications, events, funding) via this link by the 25th of each month, to be published in the up-coming bulletin.

It's time to celebrate our successes!

Research

Recent Publications

1. Reginald K, Chew FT. The major allergen Der p 2 is a cholesterol binding protein. Sci Rep. 2019 Feb 7;9(1):1556. doi: 10.1038/s41598-018-38313-9.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6367342/

Significance of findings: Der p 2 is a major dust mite allergen and >80% of mite allergic individuals have specific IgE to this allergen. Although it is well characterized in terms of allergenicity, there is still some ambiguity in terms of its biological function. Three-dimensional structural analysis of Der p 2 and its close homologues indicate the presence of a hydrophobic cavity which can potentially bind to lipid molecules. In this study, we aimed to identify the potential ligand of Der p 2. Using a liposome pulldown assay, we show that recombinant Der p 2 binds to liposomes prepared with exogenous cholesterol in a dose dependent fashion. Next, an ELISA based assay using immobilized lipids was used to study binding specificities of other lipid molecules. Cholesterol was the preferred ligand of Der p 2 among 11 different lipids tested. Two homologues of Der p 2, Der f 2 and Der f 22 also bound to cholesterol. Further, using liquid chromatography-mass spectrometry (LC-MS), we confirmed that cholesterol is the natural ligand of Der p 2. Three amino acid residues of Der p 2, V104, V106 and V110 are possible cholesterol binding sites, as alanine mutations of these residues showed a significant decrease in binding ($p<0.05$) compared to wild-type Der p 2. These results provide the first direct experimental evidence that Der p 2 binds to cholesterol.

2. Gabriel S, **Khan NA, Siddiqui R.** Occurrence of free-living amoebae (Acanthamoeba, Balamuthia, Naegleria) in water samples in Peninsular Malaysia. J Water Health. 2019 Feb;17(1):160-171. doi: 10.2166/wh.2018.164.
https://www.ncbi.nlm.nih.gov/pubmed/30758312

Significance of findings: The aim of this study was to determine the occurrence of free-living amoebae (FLA) in Peninsular Malaysia and to compare different methodologies to detect them from water samples. Water samples were collected from tap water, recreational places, water dispensers, filtered water, etc. and tested for FLA using both cultivation and polymerase chain reaction (PCR) via plating assays and centrifugation methods. Amoebae DNA was extracted using Instagene matrix and PCR was performed using genus-specific primers. Of 250 samples, 142 (56.8%) samples were positive for presence of amoebae, while 108 (43.2%) were negative. Recreational water showed higher prevalence of amoebae than tap water. PCR for the plating assays revealed the presence of Acanthamoeba in 91 (64%) samples and Naegleria in 99 (70%) of samples analysed. All samples tested were negative for B. mandrillaris. In contrast, the centrifugation method was less effective in detecting amoebae as only one sample revealed the presence of Acanthamoeba and 52 (29%) samples were positive for Naegleria. PCR assays were specific and sensitive, detecting as few as 10 cells. These findings show the vast distribution and presence of FLA in all 11 states of Peninsular Malaysia. Further studies could determine the possible presence of pathogenic species and strains of free-living amoebae in public water supplies in Malaysia.

3. Aldoghachi AF, Tor YS, Redzun SZ, Lokman KAB, Razaq NAA, Shahbudin AF, Badamasi IM, Cheah PS, Stanslas J, **Veerakumarasivam A**, Rosli R, Ibrahim N, Lye MS, Ling KH. Screening of brain-derived neurotrophic factor (BDNF) single nucleotide polymorphisms and plasma BDNF levels among Malaysian major depressive disorder patients. PLoS One. 2019 Jan 24;14(1):e0211241. doi: 10.1371/journal.pone.0211241. eCollection 2019.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6345459/

Significance of findings:
BACKGROUND: Brain-derived neurotrophic factor (BDNF) is a neurotrophin found in abundance in brain regions such as the hippocampus, cortex, cerebellum and basal forebrain. It has been associated with the risk of susceptibility to major depressive disorder (MDD). This study aimed to determine the association of three BDNF variants (rs6265, rs1048218 and rs1048220) with Malaysian MDD patients. METHODS: The correlation of these variants to the plasma BDNF level among Malaysian MDD patients was assessed. A total of 300 cases and 300 matched controls recruited from four public hospitals within the Klang Valley of Selangor State, Malaysia and matched for age, sex and ethnicity were screened for BDNF rs6265, rs1048218 and rs1048220 using high resolution melting (HRM). FINDINGS: BDNF rs1048218 and BDNF rs1048220 were monomorphic and were excluded from further analysis. The distribution of the alleles and genotypes for BDNF rs6265 was in Hardy-Weinberg equilibrium for the controls ($p = 0.13$) but was in Hardy Weinberg disequilibrium for the cases ($p = 0.011$). Findings from this study indicated that having BDNF rs6265 in the Malaysian population increase the odds of developing MDD by 2.05 folds (95% CI = 1.48-3.65). Plasma from 206 cases and 206 controls were randomly selected to measure the BDNF level using enzyme-linked immunosorbent assay (ELISA). A significant decrease in the plasma BDNF level of the cases as compared to controls ($p<0.0001$) was observed. However, there was no evidence of the effect of the rs6265 genotypes on the BDNF level indicating a possible role of other factors in modulating the BDNF level that warrants further investigation. CONCLUSION: The study indicated that having the BDNF rs6265 allele (A) increase the risk of developing MDD in the Malaysian population suggesting a possible role of BDNF in the etiology of the disorder.

4. **Lai Ti Gew**, Vicit Rizal Eh Suk, Misni Misran. Preparation and Characterization of PEGylated C18 Fatty Acids/Anti-SNAP25 Antibody-Targeted Liposomes. Current Chemical Biology.
DOI: 10.2174/2212796812666180912113156 (E-pub Ahead of Print)
http://www.eurekaselect.com/165343

Significance of findings: Background: Unsaturated C18 fatty acids, such as oleic acid (L1), linoleic acid (L2), and linolenic acid (L3), are a good choice of lipids to prepare liposomes. They are inexpensive, biocompatible, nontoxic, and readily available compared with phospholipids. Moreover, cis-double bonds of unsaturated fatty acids prevent the packing of molecules which increases membrane fluidity in liposomes making them a good choice of starting materials to prepare liposomes. Objective: Unsaturated C18 fatty acid liposomes, as well as their PEGylated and non- PEGylated antibody-targeted liposomes, were prepared. Method: The particle size and zeta potential of the prepared liposomes (1 mM, pH = 7.4) for 28 and 14 days, respectively, were monitored and characterized. Membrane-bound antibodies Anti-SNAP25 (AS25) and DOPE PEG2000 (DP) were conjugated to pure C18 fatty acid liposomes to achieve stable fatty acid formulations. Results: The mean particle sizes of pure L1, L2, and L3 liposome solutions were 125, 129, and 122 nm respectively, while their polydispersity index values were 0.28, 0.21, and 0.40 respectively. A large negative zeta potential value of 45 mV was observed due to anionic carboxylate head-

group of pure liposomes. The incorporation of AS25 into L1/DP, L2/DP, and L3/DP liposome solutions stabilized their mean particle size and zeta potential measurements over 28 and 14 days, respectively. Conclusion: L1/DP/AS25 was found to be the most stable PEGylated antibody-targeted liposome system because its particle size remained between 90 and 125 nm in 28 days. Transmission electron microscopy observations also supported the incorporation of AS25 and DP on the membrane surface as predicted.

4. **Ayaz Anwar**, Aaliya Minhaz, Syed Saad Hussain, Areeba Anwar, Shabana Usman Simjee, Muhammad Ishaq, **Naveed Ahmed Khan**, Muhammad Raza Shah**.** Pyraziniumthioacetate capped gold nanoparticles as Fe(III) sensor and Fe (III) marked anti-proliferating agent in human neuroblastoma cells. Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 206 (2019) 135–140. DOI: 10.1016/j.saa.2018.07.099
https://www.sciencedirect.com/science/article/pii/S1386142518307637?via%3Dihub

Significance of findings:
Gold nanoparticles (AuNPs) stabilized by new cationic 1-(3-(acetylthio)propyl)pyrazine-1 –ium ligand (PPTA)were synthesized. AuNPs stabilized by PPTA (PPTA-AuNPs) were found to be spherical and polydispersed with the average size of 60 nm. Human neuroblastoma (SHSY-5Y) cells permeability of PPTA-AuNPs was found to be a key feature to study the intracellular quenching of Fe(III) proliferative activity. *In vitro* MTT assay revealed noncytotoxicity of PPTA and PPTA-AuNPs at 100 µM concentration, while treatment of 100 µM of Fe(III) with SHSY-5Y cells resulted into higher cells viability. Contrary, a mixture of 1:1 Fe(III) with PPTA-AuNPs showed no change in the viability of cells at same concentration which suggests the intracellular complexation and recognition of Fe(III) by PPTA-AuNPs. AFM morphological analysis of SHSY-5Y cells also supported the MTT assay results, and it is safe to conclude that PPTA-AuNPs can be used as Fe(III) probes in living cells. In addition, Fe (III) caused a significant decrease in the absorbance of surface plasmon resonance (SPR) band of PPTA-AuNPs in a wide range of concentration and pH, with limit of detection 4.3 µM. Moreover, the specific response of PPTA-AuNPs towards Fe(III) was unaffected by the interference of other metals and components of real samples of tap water.

5. **Lahiri C.** (2018) Quorum Sensing Complexity of the Gut Enterobacteria *Escherichia coli* and *Salmonella enterica*. In: Pallaval Veera Bramhachari (eds) Implication of Quorum Sensing System in Biofilm Formation and Virulence. Springer, Singapore. First online 29 January 2019. DOI: 10.1007/978-981-13-2429-1_15
https://link.springer.com/chapter/10.1007/978-981-13-2429-1_15

Significance of findings: The human alimentary canal is the reservoir of a diverse range of bacteria, of which the gram negative strains of *Escherichia coli* and *Salmonella enterica* mostly present themselves as beneficial and opportunistic pathogens, respectively. The complex environment of the human gut necessitates an adaptation by these bacterial species, which, primarily, is done through interspecies communication mediated by cell-density dependent gene regulation. This phenotype of sensing the quorum a.k.a. quorum sensing (QS), has been shown to play roles in bioluminescence, formation of biofilm, swarming motility and virulence for bacterial species over the years. For *E. coli* and *S. enterica*, quorum sensing (QS) a.k.a. intracellular signalling has been mediated by more than one mechanistic pathway involving the proteins and biomolecules such as the autoinducer-1 (AI-1) type LuxR homolog SdiA, AI-2 type LuxS, AI-3 type epinephrine/norepinephrine and/or indole. A usage of these proteins and/or biochemicals in

combination is a hint towards their adaption to the influencing factors in the external environmental milieu of the host human gut. Notably, high osmolarity, low or neutral pH and preferred carbon sources affect such adaptation processes. While numerous bioactive compounds like Artemisin, Digoxin, Flavonoids, Ginkgo, Phenols, Punicalagin, Stilbene, Taxol, Vincristine and Vinblastine act as anti-QS products and have been explored, novel brominated N-heterocycles have started gaining importance as new measure for the antimicrobial resistance threats posed by such *Enterobacteriaciae*.

Research

Funding opportunities

1. APEC funding: The deadlines for the Concept Note submission to APEC Program Directors are on 12 March 2019 (for Session 1/2019) and 15 July 2019 (for Session 2/2019). MESTECC will assist projects related to science, technology and innovation to secure co-sponsoring economies for the project before the above-mentioned submission deadlines. Hence, we urge all submissions of Concept Note to reach the secretariat (undersigned) latest by 19 February 2019 (for Session 1/2019) and 24 June 2019 (for Session 2/2019 – preferred).

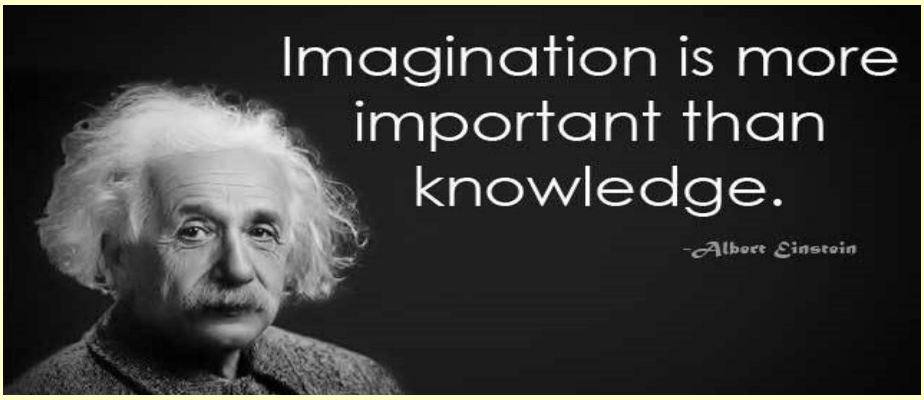
   For further details:
   https://www.apec.org/Projects/Funding-Sources,
   https://www.apec.org/Projects/Applying-for-Funds

2. Fundamental Research Grant Scheme (FRGS)
   Background: Basic research that can produce new theories, concepts and ideas for the development of knowledge.
   Quick facts: Maximum award of RM 250,000 for a maximum of 3 years.
   Deadline: 11 April 2019
   More details: http://mygrants.gov.my/main.php

3. Prototype Development Research Grant Scheme (PRGS)
   Background: Help bridge the gap between research findings and commercialization for the purpose of creating new technologies / discoveries.
   Quick facts: Maximum award of RM 500,000 for a maximum of 2 years.
   Deadline: 28 February 2019
   More details: http://mygrants.gov.my/main.php

4. Hubert-Curien Partnership (PHC)-Hibiscus – France-Malaysia
   Background: Aims to support research projects carried out jointly by Malaysian and French teams.
   Quick facts: RM 33,000 per year for each project, duration 2 years. Co-application by Malaysian and French teams necessary.
   Deadline: 15 March 2019
   More details: http://mygrants.gov.my/main.php

5. Research Collaboration Grant Scheme 2019
   Quick facts: Maximum award of RM 250,000 which must have a co-PI from the collaborating institution
   Deadline: None
   More details: http://bit.ly/researchcollaborationgrant2019



Department Events

1. **Visit of Prof. Stephen Roberts (Lancaster University)**
   Date: 24th January 2019
   Prof. Roberts met with different faculty members and students to discuss regarding matters pertaining to the undergraduate and postgraduate programs. He also attended the Program Assessment Board (PAB) meeting.

2. **Sunway University Graduation**
   Date: 25th January 2019
   A number of DBS faculty members attended the January graduation ceremony held at the Sunway Resort Hotel & Spa. Two students graduated with Master of Science in Life Sciences, and one with BSc (Hons) Biology with Psychology degree (Class II (2). Twenty-two students graduated with BSc (Hons) Medical Biotechnology degrees, with 14 obtaining class I, 3 obtaining class II (1) and 5 obtaining class II (2).

Department Events

3. **Biosafety Awareness Workshop**
   Date: 26th February 2019
   This half-day workshop was organized by the IBC (Institutional Biosafety Committee) of Sunway University in collaboration with the Biosafety Department and Genetic Modification Advisory Committee (GMAC) which are under the Ministry of Water, Land and Natural Resources. Approximately 40 participants comprising of graduate students and staff from DBS, CVVR and SHMS attended the workshop. Among topics covered were: Introduction to the Biosafety Act 2007 and Regulations (including requirements for contained use, import and export of GMOs), work practices for GM microbes (BSL1 and BSL2) - this would include the storage, decontamination, disposal and transportation of GMOs, and Risk Assessment and Risk Management.

Group photo of Biosafety Awareness Workshop participants.

Presenters of the Biosafety Awareness Workshop. From L-R: Prof Jeff Tan, Dr. Kavita Reginald, Prof. Peter Heard, Pn. Azareena Yahya (JBK), Dr. Adiratna (GMAC), Dr. Mohd Faiz (GMAC).

4. **Lab visit by a visitor from Harvard Medical School Centre**
   Date: 22nd February 2019
   The DBS research labs were visited by Prof Salmaan Keshavjee, Director of the Harvard Medical School Centre for Global Health Delivery. Prof. Jeff and Dr. Babu facilitated this lab visit.

Prof. Salmaan Keshavjee, Dr. Babu Ramanathan and Prof. Jeff Tan in the Biological Research Lab 1.

--UPCOMING EVENT--

5. **3rd Cambridge-Oxford-Sunway Biomedical Symposium (COSS)**
   The theme of the conference is DIABETES: Disarming the Silent Killer.
   Date: 26th – 27th March 2019
   Venue: SunMed Convention Centre at Sunway Medical Centre, Bandar Sunway, Malaysia.

Courses offered this Semester

BIO1252 Histology and Histopathology Techniques (Dr Kavita Reginald)
- Offered to BSc Biomedicine students

BIS2205 (MU32414) Social and Professional Responsibilities
- Tutorials for BSc Medical Biotechnology and BSc Biology with Psychology students conducted by Prof. Abhi

MU4 2413 Community Service (Prof Ruqaiyyah)
- Offered to BSc Medical Biotechnology and BSc Biology with Psychology students

SSM5013 Earth's Climate System (Dr Chen Jit Ern)
- Offered to Master in Sustainable Development Management students in the Jeffery Sachs Center on Sustainable Development

Other News

Hello from Hong Kong! By Dr Audrey Lim

Dr Audrey Lim from the Department of Biological Sciences, Sunway University is currently a Visiting Lecturer at the School of Biomedical Sciences, Li Ka Shing Faculty of Medicine, The University of Hong Kong (HKU). Upon receiving the International Brain Research Organisation - Asia Pacific Regional Committee (IBRO-APRC) Exchange Fellowship award in 2018, she had the opportunity to travel to HKU for a laboratory exchange experience from January 2019 – June 2019. During her stay at the HKU, she will be learning various research techniques in the area of neuroscience and conducting collaborative research projects with Dr Anthony Lim Lee Wei.