International Seminar on Biosciences & Medical Engineering (ISBME) 2018

"Towards Innovation New Technology and Ideas in Research Information between Collaboration in Multidisclipinary Fields"

April 15th 2018

Organised by

FACULTY OF BIOSCIENCES & MEDICAL ENGINEERING (FBME)

First Edition 2018

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Faculty of Biosciences and Medical Engineering International Seminar on Biosciences & Medical Engineering 2018/Chief Editor Fahrul Zaman Huyop

ISBN 978-967-2171-22-5

Chief Editor: Fahrul Zaman Huyop
Diatur Huruf/*Type set: Zul Hilmi Sulaiman*
Nor Raudah Mohd Ridzuan

Diterbitkan di Malaysia oleh/*Published in Malaysia by*

FACULTY OF BIOSCIENCES & MEDICAL ENGINEERING
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor, Malaysia

Dicetak di Malaysia oleh/*Printed in Malaysia by*

ISBME 2018
Faculty of Biosciences and Medical Engineering

CONTENTS

ISBME 2018
Faculty of Biosciences and Medical Engineering

CONTENTS

FOREWORD BY PROGRAMME CHAIR

PROFESSOR FAHRUL ZAMAN HUYOP

My gratitude to Allah S.W.T, with his consent the **International Seminar on Biosciences and Medical Engineering (ISBME) 2018** has been a successful one. I would like to extend my utmost appreciation to the committee members who has prepared this seminar and also to all FBME staff who either directly or indirectly contributed to this effort.

An international seminar as such is of importance because it capable of keeping the students updated with the technologies. This seminar will provide at least the latest information about the research of interest conducted by our professors and lecturers in the faculties whether in UTM or in other institutions of higher learning. Students cannot just improve their knowledge from the textbooks alone. Therefore, students in this faculty are all invited to attend this prestigious event.

Finally, I hope that, compilation of ISBME 2018 research summary report can be utilized as an informational reference to all and will be a routine activity in the near future.

Thank You.

Sunday 15 April 2018-Blok T02 Main Seminar Room
8 am to 4 pm | Faculty of Biosciences & Medical Engineering | UTM

"Towards Innovation New Technology and Ideas in Research Information between Collaboration in Multi-Disciplinary Fields"

Speakers
Keynote
Prof. Dr. Fahrul Zaman Huyop | Introduction by Moderator *"Towards Innovation New Technology and Ideas in Research Information between Collaboration in Multi-disciplinary Fields"*
Prof. Dato' Ir. Dr. Mohammed Rafiq bin Dato' Abdul Kadir | Keynote 1 *Opening by the Dean of the Faculty - "Higher Education Science & Engineering by 2020"*
Prof. Datin Dr. Zaharah Ibrahim | Keynote 1 *"Sustainable Development of Beneficial Microbes for the Environment"*
Prof. Madya Dr. Naznin Sultana (Bangladesh) | Keynote 2 *"3-D Tissue Engineering for Biomedical Applications: Current Trends and Future Directions"*
Dr. Naji Mahat (Malaysia) | Keynote 3 *"When the maggot whispers" the overlooked clues in forensic death investigations.*
Dr. Siti Fairuz binti Che Othman | Plenary Lecture 1 *"Merging Colloidal Technology in the Enhancement of Natural Product Research"*
Dr. Aliyu Adamu (Nigeria) | Plenary Lecture 2 *"Computational Molecular Modeling for Improving Bioremediation Efficiency- Currents Trends"*
Dr. Azzmer Azzar bin Abdul Hamid | Plenary Lecture 3 *"Molecular Docking and Dynamic Simulation of Potential Proteins Related Diseases"*
Dr. Mohd Farizal bin Ahmad Kamaroddin | Plenary Lecture 4 *"The Challenges of Microalgal Biodiesel: Energy Efficient Downstream Processes"*
Dr. Mohd. Azrul Naim bin Mohamad | Plenary Lecture 5 *"From Sea to Terrestrial Environment : multifacet Approach of Understanding Natural Biomes"*
Dr. Nur Firdaus binti Isa | Plenary Lecture 6 *"Medical Biotechnology: Prospects in Malaysia"*
Dr. Nik Ahmad Nizam | Plenary Lecture 7 *"An Over View of Bench to Market"*












Sustainable Development of Beneficial Microbes for the Environment

Zaharah Ibrahim
Faculty of Biosciences and Medical Engineering, Universiti Teknologi Malaysia

Harnessing microbes for sustainable environment explores the potential applications of microorganisms in maintaining our ecosystem. For the management and recycling of materials and wastes, microorganisms play critical roles; successful biological treatment however, depends on the development and maintenance of highly acclimatised, mixed microbial population in the system. Their abilities to survive in wastewater containing toxic organic pollutants can be utilized for the breakdown of highly complex organic compounds into simpler degradable compounds or even mineralization for safety discharge of the effluent. Versatile groups of microorganisms were selected and applied as free-floating, biofilms and biogranules for the treatment process. Intensive research on the biological treatment process led to the development of highly adaptable group of bacteria able to treat real wastewater that is highly coloured, recalcitrant organic pollutants and toxic heavy metals. The diversity of their metabolic activities can also be utilized to produce renewable energy such as biohydrogen, bioelectricity, biofuel and value-added renewable materials such as bacterial nanocellulose and bioplastics. Bioinformatics was further studied to intensify fundamental research on the biocatalysts (enzymes) and genes having major roles in the treatment process. Having developed effective treatment process will contribute significantly to an overall treatment process that is eco-friendly, innovative and sustainable

3-D Tissue Engineering Scaffolds and Membrane for Biomedical Applications: Current Trends and future directions

Naznin Sultana
Faculty of Biosciences and Medical Engineering & Advanced Membrane Technology research Center, Universiti Teknologi Malaysia

Biomaterials based 3-D scaffolds using phase separation/lyoplillization technique and membranes fabricated from electrospinning technique with suitable properties are highly desired in pharmaceuticals and medicine applications particularly in tissue engineering. In tissue engineering, cells are seeded on a porous three-dimensional scaffold or membrane that will provide supports and guide cells towards the growth of new tissue-like structures. The membrane can provide a platform for the delivery of growth factors release, drug delivery etc. under controlled condition. The efficacious construction of scaffolds for tissue engineering applications is essential. Scaffolds must possess certain properties. Among the properties, mechanical and biological properties are very important to be served as tissue engineering scaffolds. Firstly, this presentation addresses general principles of tissue engineering, properties of membranes to be used as scaffolds for tissue engineering, some of the biomaterials that are commonly used to fabricate scaffolds and describes their suitable properties. Secondly, this presentation will cover illustrated examples, structure and mechanical properties of scaffolds, cellular interactions of scaffolds, drug incorporation and antibacterial properties of drug loaded scaffolds. Characterization of membrane or scaffold using scanning electron microscopy (SEM), field emission scanning electron microscopy (FESEM), water contact angle (WCA), attenuated total reflectance (ATR), and atomic force microscopy (AFM) will be presented. Results on cell viability using MTT assay, cell attachment and cell proliferation will be reported. Results of antibacterial evaluation proving that tetracycline hydrochloride (TCH)-coated membrane possess antibacterial properties will be shown. In conclusion, the properties of membranes are crucial in designing tissue engineering scaffolds. Cell attachment, proliferation, differentiation and migration in order to regenerate damaged tissue depend on membrane microstructure and porosity. Surface modification can be promising by using peptides or conductive polymers to improve the scaffold's ability to support cell growth and cell migration into the scaffolds. Future trends in developing new scaffolds include new surface modified and drug releasing ability, biomolecules or growth factor incorporated scaffold, using less toxic solvents in the fabrication techniques to retain bioactivity of bioactive molecules and drugs. Smart composite membrane using conductive polymers and biomolecules can be potential for the development of next generation of membrane scaffolds with enhanced properties.

“When the Maggot Whispers” the Overlooked Clues in Forensic Death Investigations

Naji A. Mahat
Chemistry Department, Faculty of Science, Universiti Teknologi Malaysia

Utilization of maggot (a soft-bodied legless larva of a fly or other insect) recoveredfrom decomposing human body is commonplace in death investigations. Within 72 hours of death pathological indicators e.g. the decreasing pattern of body temperature may provide reliable information for estimating the time since death. However, beyond such period their evidential values appear unreliable. In this context, insect evidence (the maggot) may prove useful for providing important information relating to the estimated time since death, possible cause of death, relocation of bodies after death, as well as identity of the deceased. Such aspects will be discussed briefly in the talk.

Merging Colloidal Technology in the Enhancement of Natural Product Research

Siti Fairuz Che Othman

Kulliyyah of Science, Department of Biotechnology, International Islamic University Malaysia, Kuantan, Malaysia.

Looking into the historical timeline on the oriental and Asian medicinal practices, traditional medicine practitioners used wide varieties and diverse medicinal extract from various natural resources. Lewington (1993) wrote in his review, more than 35,000 of plant species were utilised as medicinal agents to treat various ailments and the numbers could be higher. Malaysian known to possess strong background and foundation on these traditional medicinal practices, as we are recognized to be homes to thousands of natural resources both in peninsula and East of Malaysia. According Jantan (2004), not less than 1,300 plants from the Peninsula Malaysia alone were employed as traditional medicine. Traditional methodologies enabled a vast array of bioactive secondary metabolites from terrestrial and marine sources to be discovered. Many recent advancement on the methods of extraction and isolation are inspired by these traditional practices. Recent advancement extended beyond the extraction and now most of these biologically active secondary metabolites has been purified and characterised. The blue print of this secondary metabolites allows some compound to be synthetically produced as potent drugs in the pharmaceutical industries. Most these secondary metabolites are known to have, antioxidant, anti-inflammatory and inhibitory properties towards diseases. The development on the extraction method have experience constant re-assessment and many evident continuous effort on optimising the methodologies of extraction, isolation and characterisation of these biologically active secondary metabolites. Looking into the colloidal technology development, most of colloidal matter are seen to play a significant role in the natural product industry. Colloidal matter serve as an encapsulating agent, creating a protective layer, increasing shelf-life of the secondary metabolites. Aside that, modification on the properties of the encapsulated layer might increase the efficacy on the delivery of the secondary metabolites directly to the targeted area. Firstly the presentation will illustrate the conventional extraction techniques which are commonly used in the extraction method as well as the newly improved techniques currently used by the pharmaceutical industries. Secondly, this presentation will introduced the general principles on colloidal technology and most current development in the pharmaceutical industries. Colloidal technology demonstrate rapidly development in recent decades; where its wide application could be observed in the food and pharmaceutical industries. Most of these colloidal material are found in many natural resources, either terrestrial or marine origins. These colloidal matter derived from the natural resources has proven safe to be used, non-toxic and does not cause any inflammatory to the human body. Another advantages of the colloidal matters, that it has the ability to encapsulate and maintain the stability of the encapsulated drugs or secondary metabolites. In conclusions, combining the natural product research with the emerging colloidal technology proven to be beneficial in the food, pharmaceutical, medical and cosmetics industries. The addition of natural products in the food and cosmetics to give an added values to the products is a current popular trends. Customers nowadays are more well-educated and informed on the benefits of the natural product. Colloidal technology allows this to happen, furthermore helps with the stability and shelf life of the natural product extract.

Computationalmolecular modeling of a haloacid dehalogenase (DehL): Towards improving bioremediation efficiency.

Aliyu Adamu

Faculty of Science, Department of Microbiology, Kaduna State University, Tafawa Balewa way, Kaduna PMB 2339, Nigeria

Dehalogenases are of high interest due to their potential applications in bioremediation and in synthesis of various industrial products. DehL is an L-2-haloacid dehalogenase (EC 3.8.1.2) from *Rhizobium* sp. RC1 that catalyses the specific removal of halide ion from L-2-halocarboxylic acids to produce the corresponding D-2-hydroxycarboxylic acids. Besides DehL, *Rhizobium* sp. RC1 also produces two other dehalogenases, DehD and DehE, which have been previously characterised. Although, DehL utilises the same substrates as other reported L-2-haloacid dehalogenases, its deduced amino acid sequence is substantially different (< 25 %) from those of the rest L-2-haloacid dehalogenases. Determination of three-dimensional structure of a protein molecule is key to the understanding of its mechanism of function; and it is dependent primary on the sequence of the protein. To date, the molecular structutre of DehL is neither determined experimentally nor predicted by any computational method, hence the full details of its molecular reaction mechanism is not yet elucidated. This limits our ability to enhance its efficiency and utility for environmental and industrial applications. In this talk, I will describe various computational techniques used in protein modeling, presenting as case studies our recent works that: predict the first comparative-based model of DehL and defined its active site; predict the catalytic residues of DehL and propose its catalytic mechanism; and delineate DehL enantiospecificity. These techniques are extensible to other systems. At the end of this presentation, attendees will be familiar with protein three-dimensional structure prediction techniques, modeling and validating molecular integrations, as well as using theoretical data to suggest reaction mechanism.

"Molecular Docking and Dynamic Simulation of Potential Proteins Related Diseases"

Azzmer Azzar Abdul Hamid
Department of Biotechnology, Kulliyyah of Science, International Islamic University of Malaysia, Jalan Sultan Haji Ahmad Shah, 25200 Kuantan, Pahang

Computational modeling and simulation techniques namely homology modeling, molecular docking and molecular dynamics (MD) simulation have been extensively used to study a wide range of biological systems. MD simulations provide a picture of the time-dependant evolution of protein structural dynamics on nanoseconds to microsecond timescales. MD simulations have been a valuable tool to study protein dynamics using experimentally determined structures or model structures generated using homology-modeling technique. Whereas, molecular docking simulations allow prediction of potential binding sites which may lead to discovery or engineering of new molecules that could bind to a known site. Our research interest is to use the aforementioned techniques to study the dynamics of biomolecules specifically functional protein in, around and outside membrane. In one of our research project, we performed coarse-grained molecular dynamics simulations to study the interaction between Ebola VP40 and phosphatidylinositol 4,5-bisphosphate (PIP_2) as well as other lipids in a plasma membrane model. Coarse-grained is a simplified representation of all atom system in which 3-4 atoms grouped into one bead/particle. This allows simulation of bigger system over longer timescales. We studied the effect of mutations on a number of key residues on the protein-membrane binding. Our simulations revealed that the interaction between VP40 and the plasma membrane is mediated by the cationic patch residues. This led to the clustering of PIP_2 around the protein in the inner leaflet as a result of interactions between some cationic residues including R52, K127, K221, K224, K225, K256, K270, K274, K275 and K279and PIP_2 lipids via electrostatic interactions. Mutation of the cationic patch or hydrophobic loop amino acids caused the protein to bind at the inner leaflet of the plasma membrane in a different orientation, where no significant clustering of PIP_2 was observed around the mutated protein. This study provides basic understanding ofthe interaction of the VP40 monomer and its mutants with the plasma membrane.

The Challenges of Microalgal Biodiesel: Energy Efficient Downstream Processes

Mohd Farizal Ahmad Kamaroddin

Department of Biotechnology and Medical Engineering, Faculty of Biosciences and Medical Engineering, Universiti Teknologi Malaysia

Over the past decade, the majority of the research on sustainable, environmentally friendly energy sources has focused on microalgal biodiesel. The production of biodiesel and their associated co-products from microalgae basically consists of three main unit operations: culturing (including sterilisation), harvesting (including dewatering) and lipid extraction. All of these operations are largely uneconomical due to the high energy cost of processing. For microalgal biodiesel to be sustainable, current practices must seek to increase the production efficiency of all key unit processes especially on the downstream processes (algal harvesting and lipid extraction). Harvesting and extracting lipids from the microalgal biomass are the most expensive processes. The cost of harvesting itself contributes up to 30% of the cost of the entire process. The process of microalgal biomass harvesting through centrifugation and press filtration, requires 90% and 79% of the total energy gained from the biofuel production, while lipid extraction through supercritical CO_2 and ultrasonication requires 66% and 110%. It is economically acceptable if the extracted compounds were high value and low volume products (pharmaceutical industry). However, it is not sustainable if the compounds (lipids) are solely extracted for biodiesel production. Therefore, a more energy efficient algal lipid extraction method should be conducted in order to make the algal biodiesel economically sustainable. Previously we managed to reduce the cost of algal lipid extraction by using ozonolysis method. However, further studies should be conducted on microalgae containing tougher cell walls such as *Chlorella* sp., *Chlorococcum* sp.,*Botryococcus* sp. and *Scenedesmus* sp. in order to fairly compare the energy consumption and cost estimation for the cell disruption and algal lipid extraction for each microalgae.

From Sea to Terrestrial Environment: Multifaceted Approach of Understanding Natural Biomes

Mohd Azrul Naim Mohamad

Department of Biotechnology, Kulliyyah of Science, International Islamic University of Malaysia, Jalan Sultan Haji Ahmad Shah, 25200 Kuantan, Pahang

A biome can be defined as community of plants and animals sharing common characteristics for the environment they exist in where it can be found over a range of continents. Biome" is a broader term than "habitat" because any biome can comprise a variety of habitats. Although a biome can cover large areas, a microbiome is a mix of organisms that coexist in a defined space on a much smaller scale. For example, the sponge microbiome is the collection of bacteria, viruses, and other microorganisms that are associated with sponges. Marine sponges, seaweed and corals are examples of important holobiont with prolific bioactive producers. Some of the bioactive compounds are halogenated which almost often associated with bacteria and fungi from the host. This sparks research interest using culture-dependent and culture-independent approach to understand the microbial diversity from the marine holobiont and the halogenase production pathway. For example, specific group of bacteria and fungi with different function inhabit sponges, coral and seaweed, which contribute to the proper functioning of the host. Comparative genomics of *Pseudovibrio* spp. associated with marine sponges for example highlights the extensive adaptation of the symbionts. In contrast, halogenated compounds mainly from agricultural run-off, motor oil spills and pharmaceutical waste had sparked research interests on biosurfactant, dehalogenase, monoxygenase, dioxygenase and antibiotic resistance microbes. Subsequently, the extent of microbial diversity from terrestrial environment such as mangrove area, peatland and mining areas have yet to be fully characterized. For instance, microbes capable of producing cellulase and xylanase are important in understanding biomass degradation in peatland area. Actinomycetes isolated from mangrove area capable of producing wide range of secondary metabolites. Novel culture-dependent approach also had been shown to improve recovery of novel bacteria such as rare actinomycetes. In addition, the increasing demand for precious metals such as palladium and gold for downstream industrial applications has led to the exploration of sustainable environmental-friendly technologies to capture and recycle these metals from mine wastes. Such example is phytomining technology that makes use of the ability of plants to extract and accumulate metals from soil and water. Biomass degradation pathway on food waste and fish waste are also of our particular interest. The complete picture of waste degradation via fungi and bacteria is one of the frontiers in biomass degradation, mainly because of the waste heterogeneity. Last but not least, the issue of environmental health focusing on indoor air quality for school children such as “Building Sickness and Building Related Illnesses” is also our focus interest. An assessment on toxicology aspect was studied based on airborne Particulate Matter (PM) oxidative potential via novel synthetic respiratory lining fluid (RTLF) as well as microorganisms indoor. Future outlook should focus on functional analysis of microbes and plant identified from different environment and their biotechnological application. For instance, microbes isolated from marine sponges can be tested for their secondary metabolites production, microbes from biodegradation study can be formulated to speed up the biodegradation process and utilizing plant to mine for precious metals from contaminated areas. In conclusion, natural biomes hold endless possibilities and it is up to us to discover them.

Medical Biotechnology: Prospects in Malaysia

Nur Firdaus Isa

Department of Biotechnology, Kulliyyah of Science, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, 25200 Kuantan, Pahang.

The blooming interdisciplinary research in Science, Technology, Engineering and Mathematics (STEM) is well-received by scientists who perceived this as a massive opportunity to the great era of medical biotechnology. In Malaysia, tropical diseases, vector borne diseases, and endemic infectious diseases are commonly associated with our population, but its pathogenesis and how we address it at the molecular level is still lacking. Our current team consists of medical biotechnologists working on structural biology, molecular pathology and biomaterial science, allowing to gain insights into health and diseases that would not have been possible by sticking to one approach. We work across a range of different areas of human disease associated with our population such as melioidosis, pneumococcal disease, and sexually-transmitted infection. Collectively, our work help bridging the knowledge gap on how biological molecules work on the molecular scale and how they contribute to biological functions and disease development. Our aim is to explore molecular and cellular mechanisms responsible for human health and disease, and to develop integrated strategies to address common diseases. The work we undertake may provide direct and measurable impact on the successful launch of novel therapies across a wide range of disease areas, with the ultimate aim of improving the lives and wellness of individuals suffering from illnesses. More onto our ongoing work addressing issues in selected disease in our population, challenges faced in our research and strategies to bring about changes that will benefit science and medical research in Malaysia, will be discussed further.

An Overview from Bench to Market

Nik Ahmad Nizam Nik Malek
Faculty of Biosciences and Medical Engineering & Centre for Sustainable Nanomaterials (CSNano), UniversitiTeknologi Malaysia

Innovation is a term use for any activities or process or action that could create new or improved idea or product. Bugs Tan who is renowned Malaysian innovator and inventor wrote the book "Turning Idea into Innovation" said that there are 7 typical steps to realize the idea into the invention and finally, placing it in the market shelf. A successful invention is not just stated in the form of documentation such as in patent, scientific article, thesis, proceeding, book etc. but, it must be realized into tangible product or intangible service for the benefit of community and environment. Two inventions that have been developed by our researchers which are (1) controlled released fertilizer NPK-Organo-Zeolite in tea-bag and, (2) DUAL-ANTIBAX compact powder for antibacterial wound healing agent, are the results from our research projects. The prototype of these inventions has been developed and the process of making them has been filed for patent and copyright and also, they won medals in innovation exhibition. They are currently at stage 6 (Valuation of invention) and then, stage 7 (Commercialization) according to the 7 steps of turning ideas into innovation by Bugs Tan. There are many efforts need to be implemented before our findings from the research can be commercialized such as filing an intellectual properties right (IPR) for examples patent, utility innovation, copyright, industrial design etc., developing a working prototype, calculating the financial projection, profit and return on investment (ROI), preparing business proposal, participating in invention exhibition, working together with various experts including expert in business and marketing areas, collaborating with related companies, learning how to pitch your invention, applying pre-commercialization project and documenting any processes related to the inventionFurthermore, we need to have the ability of thinking like entrepreneur where they are very determine to take any risks (especially financial risk) to ensure that the product or their business making profits. Thus, knowledge related to business and market must also be understood by the researcher to ensure our invention can be successfully commercialized. As a summary, in ensuring our invention from research can be marketed and commercialized, a researcher must have innovative and entrepreneurial thinking and also must think about commercialization before starts implementing the idea.

Biodata of Contributors

Professor Datin Dr. Zaharah Ibrahim

My primary contribution and main research interest is in the area of environmental biotechnology, focusing on the bioremediation of inorganic compounds (toxic heavy metals), naturally occurring organic and man-made (xenobiotic) compounds. These include bioremediation of toxic heavy metals such as silver, copper and cadmium, biodegadation of xenobiotic compounds such as azo dyes, styrene and petroleum based intermediates. My collaborators include researchers from environmental engineering, chemical engineering, mechanical engineering, chemistry and geotechnical engineering, mining engineering and geoinformation. I work in a team with my research collaborators and related industries to minimise/solve problems related to the environment such as contamination of organic pollutants that are naturally occuring and man-made (xenobiotics) and more recently microbial corrosion, mitigating climatic change involving microorganisms and renewable energy. Intensive and innovative research has been emphasised on developing biological treatment processes involving the application of acclimatised/adapted microbial cells in suspension and immobilised, able to treat real industrial wastewater such as textile wastewater that is highly contaminated with azo dyes, organic solvents, bleaches, detergents and heavy metals. Together with the research team consisting of environmental and chemical engineer, chemists and molecular biologist, pilot scale processes were carried out for effective treatment of textile wastewater for safety discharge of the effluent.

At present, demo scale treatment plant processes are being developed on-site at the textile industry using innovative bioreactor system under Technofund (TF0409B071) to treat 150,000 L (150 m^3) using only bioaugmented decolurising bacteria without the addition of chemicals. Having developed treatment of effective biological processes will contribute to an overall effective biological process that is economical and ecofriendly. This will significantly improve the overall treatment processes which over the last 10 years or so have proven to be ineffective. Research is in progress to develop molecular tools (DNA probes) for real time monitoring of wastewater treatment process. Bioinformatics study is also under way for intensive study on the biocatalysts (enzymes) responsible for the treatment process and mechanisms related to complete degradation. Other on-going research include bioconversion of wastes to useful biomaterials, in addition, macrocomposites are being developed from local materials to house microorganisms for improved and effective treatment of wastwater. As a project leader and researcher, funding were obtained from national awarding bodies such as MOSTI (Ministry of Science, Technology and Innovation), MOHE (Ministry of Higher Education) and University Research Grant (GUP), currently totalling up to RM 7.447 million. Up to RM 2 million in funding was obtained from the UTM-MTDC symbiosis programme for the setting up of a company called MicroClear Sdn Bhd. My main role as the inventor/' technical director' is to continuously contribute actively to the development of scale up process for the production of specialised microbes for effective treatment of coloured wastewater. Besides producing microbes for Demo plant application (TF0409B071) on site at Ramatex Textiles Sdn Bhd with a capacity of 150,000 L (150 m^3), the future plan is to work towards bigger production of microbes using facilities provided by Johor Biotech (MOU and MOA since 2012). Research findings have been translated into research articles and were

published in national and international journals with impact factor/scopus/ISI. In addition 10 patents have been filed for specific products and processes related to research findings, with one receiving patent grant. Research results were presented as oral and posters at national and international conferences. I have also participated in scientific exhibitions at the national and international levels such as INATEX, ITEX, MTE, BIS (United Kingdom) and SIIF (Korea) with great success. My greatest challenge for the future is to develop viable research at the laboratory scale and to successfully apply them in the real environment. It has been a hard 30 years, but it is always my pleasure to be part of a team, to serve and contribute towards the university's affluent ambition and the nation's wealth.

Associate Professor Dr. Naznin Sultana

Her primary area of expertise is Biomaterials and tissue engineering. Her research interests include fabricating tissue engineering scaffolds using lyophilization technique and membranes for bone and skin grafts, polymer composite electrospun membranes for drug delivery, antibacterial coating, cell-biomaterials interaction, structure-property of functional materials/assemblies, nano sized hydroxyapatite, conductive polymer coated smart membrane, diffusion study in scaffolds, controlled release of biomolecules/drugs, biodegradable membranes for the removal of heavy metals in drinking water etc. She is a Chartered Engineer (CEng), Chartered Scientist (CSci) and a professional member of Institute of Materials, Minerals and Mining (IOM3, UK). She is the author of over 60 indexed journals and her current H-index is 12 (Scopus). Some of research grants/Projects undertaken as a project leader are:

• Surface modification and biocompatibility of biopolymer based nanofibrous membranes
•Pre-clinical evaluation of conductive polymer-based electrospun membrane for tissue engineering applications
• Surface modification and protein adsorption study of polymer and composite scaffolds
•Development of biodegradable electrospun membrane for controlled release drug delivery and tissue engineering.
•Fabrication and characterization of biodegradable polymer based tissue engineering scaffolds using emulsion freezing/freeze-drying process
• Absorption and diffusion characteristics of biomedical polymer-based porous three dimensional tissue substrates.
•Effects of polymer solution rheology and diffusion characteristics of biodegradable polymer/bioceramics-based composite electrospun membranes

Dr. Naji A. Mahat

Naji A. Mahat obtained his Bachelor of Biomedical Science and PhD in Forensic Biology from Universiti Kebangsaan Malaysia and Universiti Sains Malaysia, respectively. He is currently the Head of MSc (Forensic Science) Programme at the Faculty of Science, Universiti Teknologi Malaysia. He is a fellow of the Institute of Biomedical Science (United Kingdom), a member of American Chemical Society, Forensic Science Society of Malaysia and Malaysian Society of Parasitology and Tropical Medicine, as well as an exco member for Biomedical Sciences Society of Malaysia. He sits in the National Technical Committee on Forensic Sciences, Standard Development Agency,Malaysia Institute of Chemistry as well as in the editorial board of Malaysian Journal of Health Sciences. He is also an international advisory board member for the International Journal of Biology Research. His areas of expertise include forensic sciences, forensic biology, biomedical sciences and biotechnology. He also actively published books and journals with higher impact factor.

Dr. Siti Fairuz Che Othman

Dr. Siti Fairuz Che Othman is an Assistant Professor at the International Islamic University Malaysia. Her primary of expertise involve from Food biotechnology, food product development, food colloids and processing, food oral processing and sensory studies. Her current research focus on the characterisation on hydrocolloids/hydrogels used in targeted drug delivery. Some of her popular publications are:

- Ibrahim, J. (2004) Medicinal Plant Research in Malaysia: Scientific Interests and Advances, *Jurnal Sains Kesihatan Malaysia*. 2(2), 27-46.

- Lewington, A. (1993) *Medicinal plants and plant extracts: A review of their importation into Europe*. Cambridge, United Kingdom, Traffic International.

Dr. Siti Fairuz actively involves in many research and headed some of the national grants which entitle Rheological and Physical Properties characterization of nanoparticles-hydrogel for topical oral drug of oral cancer (targeted drug delivery) and Formulation of 5-Fluorouracil-loaded EGFR Targeted Hydrogel-Nanocapsule Hybrids for Oral Squamous Cell Carcinoma Therapy. Other publications and conferences attended as listed:

Publications

- Che Othman, S. F., Noor Aziah, A.A., and Ahmad, R. (2012) Effects of jackfruit puree supplementation on lactic acid bacteria (*Lactobacillus acidophilus* FTDC 1295) in terms of viability and chemical compositions of dadih, International Food Research Journal 19(4), 1687-1697

- Siti Fairuz Che Othman, Syed Zahir Idid, Mustapha Suleiman Koya, 'Aisyah Mohamed Rehanand Kamarul Rahim Kamarudin(2011)Antioxidant Study of Garlic and Red Onion: A Comparative Study Pertanika J. Trop. Agric. Sci.,34 (2): 253 – 261

- Muhammad Nor Omar, C.O. Siti-Fairuz, M.T. Hasan, M.N. Nor-Nazuha[1], M.N. Nor-Dalilah[1] And Y. Kamaruzzaman (2010) Study on -fatty acids from Malaysian giant mudskipper (Periophthalmodon schlosseri) fish oil, Oriental Journal of Chemistry, 26(3), 861-86

Conference

- Poster Presentation and Flash Presentation for the 4th Food Oral Processing Conference (2016) – Siti Fairuz C. O., Murray, B., Ettelaie, R., Dynamics of Food Flavour Release

from Gel Systems (3-6 July 2016, SwissTech Convention Center Lausanne, Switzerland)

- Poster Presentation for the 26th Scientific Conference and Annual General Meeting of the Nature Society Malaysia (2011) – Che Othman, SF, Noor Aziah, A. A., Ahmad, R., Incorporation of Jackfruit Puree and Lactobacillus in Malaysian Dadih (24-25 March 2011, Crowne Plaza Mutiara Hotel, Kuala Lumpur).

- Siti Fairuz C. O., Mustafa S. K., Syed Z. I., Aisyah M. R. and Kamarul R. K. (2008) A comparative study on the Antioxidant activity in Garlic (Allium sativum) and Shallot (Allium cepa) In Proceeding 2nd International Conference on Advancement in Science & Technology (iCAST 2008), 13th – 15th June 2008, Kulliyyah of Science, Kuantan Campus, Pahang.

Dr. Aliyu Adamu

Dr. Aliyu Adamu freshly graduated from UTM (2018) and is a lecturer and researcher at the Department of Microbiology, Kaduna State University, Kaduna, Nigeria. After receiving his B.Sc. (Hons 2:1) in Microbiology from Bayero University Kano, Nigeria in 2010, Dr. Aliyu proceeded to the University of Aberdeen, Scotland, UK to obtain his M.Sc. in Medical Molecular Microbiology and Immunology. He carried out his M.Sc. project under the supervision of Dr. Karen P. Scott with whom he successfully determined an alternative way of detecting mosaic tetracycline resistant genes under a project entitled "alternative methods to differentiate tetracycline resistance genes in gut microorganisms", and graduated with commendation in 2014. Dr. Aliyu did his Ph.D. at Universiti Teknologi Malaysia, under the supervision of Prof. Fahrul Huyop, where they computationally characterised at molecular level, an L-2-haloacid dehalogenase (DehL). Dr. Aliyu has over five years research experience in Computational Biology and Bioinformatics and he authored over ten peer-reviewed reports in world class reputable journals that include Journal of Biomolecular Structure & Dynamics, Future Microbiology, Computational Biology and Chemistry, and SpringerPlus. Currently Dr. Aliyu is working on novel antimicrobial drug targets.

Dr. Azzmer Azzar Abdul Hamid

Azzmer Azzar Abdul Hamid obtained his Ph.D from IIUM in Biotechnology and upon completion of his Ph.D, he was appointed as a lecturer at the Department of Biotechnology, Kuliyyah of Science, IIUM Kuantan Campus. He started his career as a tutor at Open University Malaysia, Johor Bahru. He had taught many Biology courses including Eukaryotic Diversity, Basic Genetics, Current Issues in Science and Plant Physiology. In Research and Development (R&D), he had gained experiences as a research assistant and also a research officer at the Faculty of Bioscience and Medical Engineering, UTM, Johor. Presently, Dr Azzmer is an Assistant Professor at the Department of Biotechnology, Kulliyyah of Science, International Islamic University Malaysia (IIUM) Kuantan Campus. His research work is towards the dehalogenation of toxic compounds by microbial enzyme. He received an endowment grant as a principal researcher and fundamental research scheme grant (FRGS) as a co-researcher. He has published some articles regarding protein modeling, rational design, molecular biology and enzyme kinetics in several high impact journals. Apart from that, he served the Ministry of Education as an examiner for Matriculation programme and also as a reviewer for Journal of Molecular Modeling. At the faculty level, he has been actively participating in many programmes including International Conference on Advancement in Science and Technology (iCAST), Forum of Religious Scientific Discourse (ForsD), Kulliyyah of Science Integration Month (KOSIM), Ibadah Camp, Community Service Programme (Kosmate) and a workshop series on natural products (SOLPINAR).

Dr. Mohd Farizal Ahmad Kamaroddin

Dr. Farizal expertise are in, Microalgae, Photobioreactor, Algal Biofuel. At the moment he is a senior lecturer in the faculty teaching subjects, Food Microbiology, Ecology and Biological Control. He actively participate in many conferences and presented many papers, for example, Enzymatic Degradation of Oil Palm Empty Fruit Bunch (OPEFB) by Crude lignocellulase Produced by EFB1 and commercial Cellulase for Production of Polyoses. 30th Symposium of Malaysian Society for Microbiology, Kuantan, 16th-19th August 2008, 3rd Annual Miniturisation Event "Miniaturisation – Micro Scale Bioprocess Development" at the Stevenage Biosciences Catalyst, Gunnels Wood Road, Stevenage, UK on 14th November 2012, Algae Biotechnology Sheffield Network First Annual Conference Research in Algae Biotechnology at the University of Sheffield on 11th July 2013, Algae Biotechnology Sheffield Network Annual Conference Research in Algae Biotechnology at the University of Sheffield on 11th July 2013, IChemE Biochemical Engineering Young Researchers Meeting, 29th August 2014, Engineering Graduate School Pam Liversage, Sir Federick Mappin Street Sheffield and Algae around the World Symposium, at The Sainsbury Laboratory on 23rd March 2015, organized by the University of Cambridge, Bateman Street, Cambridge CB2 1LR, United Kingdom. Dr. Farizal also published several papers in high impact journals/proceedings as listed:

- Ahmad Kamaroddin, Mohd Farizal and Ng, Pui Yian and Md. Salleh, Madihah, 2008. *Enzymatic degradation of oil palm empty fruit bunch (OPEFB) by crude lignocellulase produced by efb 1 and commercial cellulase for production of polyoses.* In: Proceedings 30th Symposium of Malaysian Society for Microbiology, 2008, Hyatt Regency Resort Kuantan, Pahang.

- Md. Salleh, Madihah and Kamaroddin, Mohd. Farizal Ahmad, 2008. Direct utilization of tapioca starch by aspergillus flavus for production of kojic acid in batch andfed-batch culture. In: Advances in Biosciences and Bioengineering. Penerbit UTM, Johor, pp. 19-32. ISBN 978-983-52-0553-8

- Farizal Kamaroddin, James Hanotu, J, Gilmour, William B. Zimmerman, 2015. An Energy Efficeint Method of Disinfection, Harvesting and Lipid Extraction of Microalgae in Novel Plasma Microbubble Bioreactor, Algae around the World Symposium. The Sainsbury Laboratory. University of Cambridge, Bateman Street, Cambridge CB2 1LR, United Kingdom, 20 March 2015.

- Kamaroddin, M. F., Hanotu, J., Gilmour, D. J. and Zimmerman, W. B. (2016). Insitu disinfection and a new downstream processing scheme from algal harvesting to lipid extraction using ozonerich microbubbles for biofuel production. ALGAL RESEARCH 17, 217–226. (Q1, IF 5.01)

Dr. Azrul Naim Mohamad

Terengganu born Mohd Azrul Naim Mohamad had his secondary education at Malay College Kuala Kangsar. Then, he started his BSc studies in Biotechnology at the International Islamic University Malaysia (IIUM), with specialization in Environmental Biotechnology and graduated in 2006. In 2008, he continued with the MSc in Biotechnology at Wageningen University specializing in Marine Biotechnology and obtained his MSc in 2010. His MSc thesis entitled "Biodiversity of Sponge Associated Microbial Communities of The Dutch Coast" was under the supervision of Dr J. A. M. Perez. In 2010, he started his Ph.D at the Laboratory of Microbiology, Wageningen University under the supervision of Prof. Hauke Smidt and Dr. Ir. Detmer Sipkema. The Ph.D thesis 'Exploring Microbial Diversity of Marine Sponges by Culture-Dependent and Molecular Approaches' was successfully defended on April 30, 2015. Since February 2015 he started working as a lecturer at Kulliyyah of Science.

Dr. Nur Firdaus Isa

Dr Nur Firdaus Isa completed her DPhil in Pathology (now known as DPhil in Molecular Cell Biology in Health and Disease) from University of Oxford in 2017. During her DPhil, she carried out studies on the effect of viral proteins (Herpes Simplex Virus and HIV) and small molecule inhibitors on the regulation of host gene expression at the level of transcription. She found motivation to study gene expression after obtaining her MSc in Molecular Nutrition in 2012 from Universiti Sains Malaysia where she investigated the association of single nucleotide polymorphisms in a human gene and susceptibility to metabolic syndrome. She obtained her BSc in Biotechnology from Monash University Malaysia in 2008. Dr Nur Firdaus Isa is currently an Assistant Professor in Department of Biotechnology, Kulliyyah of Science, IIUM. She teaches Cells and Molecular Biology and Medical Biotechnology. Her current research work involves combination of molecular biology and bioinformatic techniques to study sexually-transmitted human viruses and host gene expression.

Recent journal articles:

1. **Nur Firdaus Isa**, Laila Ruwaida Mohd Zainuddin, Wan Manan Wan Muda, Hamid Jan Jan Mohamed (2017). Association of serum adiponectin levels with metabolic syndrome risk factors in Malay adults. World Nutrition Journal, 1 (1). 0 pp. 17-22.
2. Justyna Zaborowska, **Nur Firdaus Isa**, Shona Murphy (2016). P-TEFb goes viral. Bioessays, 38. 0 pp. S75-S85. ISSN 0265-9247.
3. Clélia Laitem, Justyna Zaborowska, **Nur Firdaus Isa**, Johann Kufs, Martin Dienstbier, Shona Murphy (2015). CDK9 inhibitors define elongation checkpoints at both ends of RNA polymerase II-transcribed genes. Nature Structural & Molecular Biology, 22 (5). 0 pp. 396-403. ISSN 1545-9993.
4. Wan Abdul Manan Wm, **Nur Firdaus Isa**, Siti Fatimah S, Siti Norazlin Mn, Fasiah W, Safiah Md. Yusof, Siti Haslinda Md, Norimah Abdul Karim (2012). Meal patterns of Malaysian adults: Findings from the Malaysian adults nutrition survey (MANS). Malaysian Journal of Nutrition, 18 (2), 0 pp. 221-230. ISSN 1394-035X.
5. Laila Ruwaida Mohd Zainuddin, **Nur Firdaus Isa**, Wan Manan Wan Muda, Hamid Jan Jan Mohamed (2011). The prevalence of metabolic syndrome according to various definitions and hypertriglyceridemic-waist in Malaysian adults. International Journal of Preventive Medicine, 2 (4), 0 pp. 229-237. ISSN 2008-7802.
6. Hamid Jan Jm, Hafidah Z, Laila Ruwaida Mohd Zainuddin, **Nur Firdaus Isa**, Jayah Kp, Wan Manan Wm (2011). The association between visceral fat and blood pressure in adults. Health and the Environment Journal, 2 (2), 0 pp. 15-22. ISSN 2180-1126.

Associate Professor Dr. Nik Ahmad Nizam Nik Malek

Dr Nik Ahmad Nizam Nik Malek is a senior lecturer and Head of Department, Department of Biotechnology and Medical Engineering, Faculty of Biosciences and Medical Engineering, UniversitiTeknologi Malaysia. He is also a chartered chemist (CChem) and registered chemist under Malaysian Institute of Chemistry (MMIC). His primary expertise is applied materials science especially the application of materials in biological and medical area. From his research, he has two innovative products ready for commercialization stage. The products are (1) NPK-Organo-Zeolite and, (2) DUAL-ANTIBAX. NPK-Organo-Zeolite is an advanced controlled release fertilizer where all of major plant elements (N, P and K) are loaded onto zeolite. The NPK-Organo-Zeolite can be inserted in the bag and it can be re-generated and recycled again. Whereas, DUAL-ANTIBAX is anantibacterial wound healing agent in a compact powder form. His other current research includes biomaterial, biosorbent, peat substrate and antibacterial agents. He is the author of 36 indexed journals, project leader for 12 research grant and his current H-index is 7 (Scopus).

Research grants/Projects undertaken as Project leader are:

- Preparation and Characterization of Chlorhexidine Loaded Zinc-Kaolinite as Antimicrobial Agent
- Silver-Zeolite Composite with Layered Double Hydroxide (LDH) as Versatile Adsorbent and Antibacterial Agent
- Synthesis and Characterization of Aminoglycoside Antibiotic Loaded Organo-Silver-Kaolinite as Biocompatible Antimicrobial Agent
- Re-Generated NPK-Organo-Zeolite as Repeated Controlled Release Fertilizer for Mulberry Plant
- Synthesis and Characterization of Hydroxyapatite Encapsulated Silica Nanospheres as Novel Bioactive Material.
- Prototype Development of DUAL-ANTIBAX (Organo-Metal-Clay as Antimicrobial Agent)
- Development of Organo-Zeolite as Advanced Controlled Release Fertilizer

Some of his popular Book chapters and journal's publications are:

- **Malek, N.A.N.N.**,Hamzah, N.S., Abdullah, H.,Dzkulfli, N.H. (2017). Surfactant Modified Natural Zeolite Loaded with Ammonium, Potassium and Phosphate as a controlled Release Fertilizer. In Advances in Biosciences (Plant Related Science) (pp. 27-52). Johor Bahru: Penerbit UTM Press.
- Ghazi, N.A.,**Malek, N.A.N.N.**,Hamdan, S. (2017). Zeolite as a Potential Alternative Adjuvant Therapy for Cancer. In Zeolites: Synthesis, Characterisation & Practices (pp. 8-25). Ideal International E-Publication Pvt. Ltd., India.

Selected Journal Articles

- Hanim, S.A.M.,**Malek, N.A.N.N.,** Ibrahim, Z. (2017). Analyses of Surface Area, Porosity, Silver Release and Antibacterial Activity of Amine-Functionalized, Silver-Exchanged Zeolite NaY. Vacuum, 143:344-347 (Elsevier, Indexed in WoS, IF: 1.530).
- Sani, N.S.,**Malek, N.A.N.N**.,Jemon, K.,Kadir, M.R.A.,Hamdan, H. (2017). Effect of mass concentration on bioactivity and cell viability of calcined silica aerogel synthesized from rice husk ash as silica source. Journal of Sol-Gel Science and Technology, 82:120-132 (Springer Nature, Indexed in WoS, Q1, IF: 1.473)
- Nasirmahaleh, H.H., Safi, S.Z., Sazegar, M.R., Qvist, R., Ismail, I.S.B., Ashraf, M.A., **Malek, N.A.N.N**. (2016). Adsorption of amoxicillin on surfactant modified zeolites and their antibacterial activity. Research Journal of Biotechnology, 11: 75-78 (World Research Journals, Indexed in WoS, Q4, IF: 0.242).
- Daud, N.M., Bahri, I.F.S., **Malek, N.A.N.N**., Hermawan, H., Saidin, S. (2016). Immobilization of antibacterial chlorhexidine on stainless steel using crosslinking polydopamine film: Towards infection resistant medical devices. Colloids and Surfaces B: Biointerfaces, 145: 130-139. (Elsevier, Indexed in WoS, Q1, IF: 3.902)
- Lou, S.K, **Malek, N.A.N.N.**(2016). Characterization and Antibacterial Activity of Chlorhexidine Loaded Silver-Kaolinite. Applied Clay Science, 127-128: 1-9 (Elsevier, Indexed in WoS, Q1, IF: 2.586)

EDITORIAL BOARD MEMBERS

Towards Innovation New Technology and Ideas in Research Information between Collaboration in Multidisclipinary Fields

ISBN 978-967-2171-22-5