

Malaysian Society for Microbiology

THE MALAYSIAN Society for Microbiology

E-BULLETIN

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Editorial Board June, 2023 (Vol. 4)

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From the President's desk..



Welcome to another issue of the MSM Newsletter! The team has been continuously hard at work corroborating and curating top-quality articles from our MSM fraternity and I am sure this initiative has benefited many of our members throughout the country. As we look ahead, we're excited to continue expanding the horizons of this newsletter. We will be featuring more guest contributors, delving deeper into emerging trends in microbiology, and creating interactive experiences that invite you to be an active participant in shaping the direction of our content.

The EXCO through our MSM Outreach Working Group has received more than double the number of submissions for our coveted MSM Outreach Grant initiative. In the coming weeks, peer-evaluations and due diligences towards deriving out next batch of winners will take place. Thank you to all our members who have sent in their proposals, and I wish them all the best! We are also hard at work towards the organization of our annual MSM symposium too – registrations are open so please do join us this year for what will hopefully be another productive convention.

This newsletter has always been more than just a collection of articles; it's a community of curious minds, a platform for thought-provoking discussions, and a source of inspiration. With each edition, we strive to bring you a blend of carefully researched content that spans a multitude of topics, from the latest breakthroughs in science and technology to the timeless wisdom of philosophy and the arts.

As we venture into the better half of the year ahead, I wish all our readers a productive remainder of the calendar. Take care and looking forward to seeing everyone through our MSM activities soon!

MAS JAFFRI MASARUDIN MSM President, 2021/2023

MSM Spotlight

BIODATA OF ACADEMICIAN PROF. DR. SHEILA NATHAN, FASC

Prof. Dr. Sheila Nathan, FASc, is a distinguished scientist in the field of Microbial Genomics and Molecular Biology. Until recently, she held the position of Professor at Universiti Kebangsaan Malaysia (UKM), where she has made significant contributions. With a background in Biochemistry and Molecular Biology from UKM and the University of Sussex, UK, she earned her DPhil in DNA Repair. She specialised in the study of microbial pathogenesis host-microbe interaction. Throughout and her esteemed career, she has garnered numerous awards, including the Fulbright Scholar Award and the Eminent Academic Figure Award. She was also the recipient of MSM Award in 2019. Prof. Sheila has held leadership roles, directed research centers, and managed the Bioinformatics and Biotechnology undergraduate programmes. Her extensive academic and research contributions have earned her Fellowships in distinguished scientific societies and recognition worldwide.

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We were the first in Malaysia to utilize various hosts to study the bacteria's strategy to influence the host's immune

response.



What inspired you to pursue a career in microbiology? And how has your passion evolved over the years?

That has been an interesting journey, indeed. If you look at the early stages of my career, my academic background was centered around biochemistry and molecular biology. My first degree was in biochemistry, followed by a master's in molecular biology and genetic manipulation. My PhD focused on DNA repair in human diseases, particularly skin cancer.

That sounds quite different from the microbiology path you later pursued.

Exactly. After completing my education in the UK, I returned to Malaysia and joined UKM in 1993. The advice I received was to avoid working in isolation and join an existing group. The Biochemistry Department at that time was where I found my place. There, I continued my work with monoclonal antibody secreting hybridoma lines targeting proteins associated with the bacterium *Burkholderia pseudomallei* (*B. pseudomallei*).



How did your journey into microbiology truly begin then?

The marked shift towards microbiology happened when I started exploring host-pathogen interactions. My focus shifted from biochemistry to understanding the interaction between the pathogen and the host's immune response. Although my initial project was not microbiology-intensive, it laid the foundation for working with microbes.

So, what sparked your transition into microbiology research?

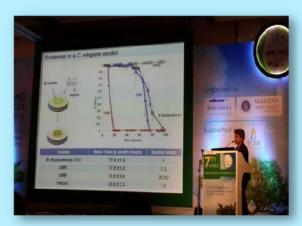
The transition gained momentum when we initiated studies on host-pathogen interactions, particularly *B. pseudomallei* infections. Unlike many groups worldwide that primarily focused on epidemiology or pathogen characterization, we sought to understand the underlying immune responses towards the pathogen. This gap in research prompted us to look into host-pathogen dynamics, and that's where our collaboration with a nematode, *Caenorhabditis elegans* (*C. elegans*) came into play.

Can you elaborate on how your passion for microbiology evolved over the years?

Passion is essential in any field of research, and mine evolved as my projects grew more complex. Initially, my transition into microbiology was guided by necessity—joining a group and working with what was available. However, exploring host-pathogen interactions brought a renewed sense of curiosity. The more we delved into the immune responses triggered by pathogens, the more captivated I became. The realisation that our work could contribute to understanding complex human infectious diseases fuelled my passion for microbiology.

Could you share how your research journey, from biochemistry to microbiology, reflects your commitment to exploring new avenues?

Absolutely. My journey highlights the importance of adaptability and seizing opportunities as they arise. Despite my initial training in biochemistry, my willingness to embrace new directions led me to the fascinating world of microbiology. The satisfaction of uncovering new insights about host-pathogen interactions and contributing to a deeper understanding of infectious diseases has been deeply rewarding.



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Could you please share some of the key milestones or achievements in your career as a microbiologist?

Certainly. My research journey has predominantly revolved around the study of a tropical pathogen. that I mentioned earlier, *B. pseudomallei*, which causes Melioidosis. This disease is quite prevalent in tropical regions, including Malaysia. While the incidence rates might be unofficial due to the non-notifiable status of the disease, my group focused on understanding the pathogen's genomics and its interaction with the host's immune system. We were the first in Malaysia to utilize various hosts to study the bacteria's strategy to influence the host's immune response. Our primary focus was on the innate immune system. We employed the nematode *C. elegans*, as our model for host-pathogen interaction studies. Interestingly, the nematode's innate immune system is about 80% conserved with that of humans, making it an excellent model for bacterial infection studies. This model also allowed us to feed the worms with the pathogen of interest rather than performing invasive procedures as you would with higher animal models.

That's remarkable. Can you elaborate on the significance of this model and its advantages over traditional methods?

Absolutely. Using *C. elegans* as a host has several advantages. For one, its immune system closely resembles that of humans in terms of the innate immune response pathways. Additionally, since *C. elegans* feeds on bacteria, it simplifies the process of introducing pathogens and observing their effects. Through collaboration with researchers at Stanford University and with the support of the Ministry of Science, Technology and Innovation, we established a *C. elegans* research facility at UKM, replicating the facility at Stanford. This facility allowed us to conduct precise studies on host-pathogen interactions.

That's impressive. Could you discuss any challenges you faced in setting up this research facility?

Establishing the *C. elegans* research facility indeed presented its challenges. For instance, the nematodes require a controlled environment for growth. These environmental chambers, resembling large refrigerators, regulate factors like temperature and oxygen circulation. Additionally, we required fluorescence microscopes for visualizing the effects of genes and pathogens on transgenic worms. All these factors contributed to the costs associated with setting up the facility.

It seems like a significant investment. Can you provide an overview of your findings and outcomes from these studies?

Certainly. Our research yielded various insights. For instance, we were able to knock out specific genes in the nematode to understand their roles in the immune response pathways. This allowed us to distinguish between immunocompetent and immuno-incompetent worms. Through our collaborations, we also explored the potential of natural compounds, like Misai Kucing extract, to enhance immune responses. We found that certain compounds could stimulate the MAP Kinase pathway, which contributes to the immune response.

Could these findings potentially lead to new approaches in disease management?

Although our studies provide promising information, translating them into practical applications is complex. For example, enhancing the host's immune response could lead to more robust defences against infections. However, clinical applications often involve various challenges, such as regulatory approval and funding.

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You utilised *C. elegans* model to understand better about Melioidosis caused by *B. pseudomallei*. Can you tell us more about the pathogen?

Absolutely. Most bacterial pathogens like *Pseudomonas* and *Salmonella* use specific secreted factors to cause harm. However, with *B. pseudomallei*, we demonstrated that a secreted protein actually targeted and degraded the host's transcription factor. This transcription factor was vital for initiating expression of the immune response genes. By dismantling this factor, the pathogen effectively suppressed the host's immune response. This discovery shed light on why infected individuals showed reduced antibody production and cytokine responses, which are critical for fighting bacterial infections.

That's indeed a fascinating finding. Could you explain the broader implications of this discovery?

Certainly. This insight highlighted the potential reasons behind the observed weakening of immune responses in infected individuals. The toxic protein identified in the study interferes with the host's ability to activate immune-related genes. Since this transcription factor is also found in humans, extrapolating our findings allows us to infer a similar mechanism could be at play in humans when they get infected. The toxin interferes with the translation process in human cells, effectively halting protein synthesis and leading to cell death. The impact is amplified when numerous cells die, eventually leading to organ or tissue failure and the demise of the infected individual. This raised questions about how to counteract this suppression and whether it's possible to boost immune responses to combat such infections.

Given the toxicity of this protein, what are the potential avenues for counteracting its effects?

That's a critical consideration. Counteracting the effects of such a potent toxin poses challenges. One potential approach could involve finding ways to prevent the bacteria from producing this toxin in the first place. Alternatively, developing a vaccine or antidote against the toxin could provide a defence mechanism. However, these options are not straightforward due to the potency and rapid action of the toxin.

How can these challenges be addressed?



Addressing these challenges requires a deep understanding of the bacterial mechanisms involved and innovative strategies to target the toxin without causing harm. Ensuring the safety of any counter-measures is important. Moreover, diagnosing infections caused by *B. pseudomallei* remains a challenge due to the need for time-consuming culture-based methods. Rapid and accurate diagnosis is crucial for timely interventions, whether it's administering a vaccine, antidote, or other treatments.

Could you explain the factors contributing to an individual's susceptibility to *B. pseudomallei* infections?

Indeed, susceptibility often ties back to comorbidities. Individuals with compromised immune systems, particularly due to secondary issues like diabetes, are more susceptible. Interestingly, diabetes is a common risk factor for those succumbing to Melioidosis infections. Our plan was to advocate for Melioidosis to become a notifiable disease in Malaysia.

Could you share some insights about your international collaborations and their impact on your research?



Certainly. I've had several significant international collaborations that have played a central role in advancing our research. One of the key partnerships was with the Department of Genetics and the Department of Microbiology at Stanford University. This collaboration opened up new avenues for exploring genetic aspects of the pathogens we were studying. Our collaboration with Stanford primarily centered around identifying the limitations in the host response towards the pathogen we were studying. Another collaboration with the King

Abdullah University of Science and Technology in Jeddah looked at identifying the pathogen's set of essential genes. This partnership allowed us to explore deep into the genetic makeup of the pathogen and gain insights into their essential components that would be ideal targets for drug and vaccine design. Collaborating with experts in genetics was instrumental in enhancing our understanding of the molecular mechanisms underlying the bacterial infections.

You also mentioned a collaboration with Sheffield University. Could you shed light on the significance of this partnership?

Absolutely. Our collaboration with Sheffield University, particularly the Department of Molecular Biology and Biochemistry, was focused on unravelling the structural aspects of *B. pseudomallei* toxin. Working with a group of structural biologists from Sheffield enabled us to understand the precise mechanisms through which the toxin interferes with protein synthesis in human cells. This partnership added a structural dimension to our research, enhancing our comprehension of the pathogen's virulence.



Have you engaged in local collaborations as well?

Yes, alongside international partnerships, my extensive collaboration with Prof. Dr. Tan Wen Siang and Prof. Datin Paduka Khatijah Yusof has been particularly impactful. We've worked together for years, significantly enhancing our research endeavors. Our collaboration centered around the use phage display techniques. While I focused on antibody engineering, Prof. Tan's expertise in phage display and peptides complemented our efforts. Notably, this partnership contributed to projects such as Newcastle Disease and hepatitis, where our combined skills addressed complex challenges. Collaborating with Prof. Tan yielded remarkable results. We utilised innovative approaches like phage display, and we expanded our research scope.

What projects or efforts have you been involved in that aim to address health-related issues in the community or healthcare industry?

While my primary focus has been on fundamental research, I've been engaged in a few initiatives related to health and healthcare. One collaboration I'm working on involves antibiotic resistance, where we're partnering with a medical unit to explore this critical issue. We had envisioned a project involving a nationwide epidemiological study in collaboration with universities in Malaysia and institutions in the United States. This initiative aimed to address the challenges surrounding Melioidosis. We aimed to gather data on cases, locations, and provide educational material to the community.



Could you tell us more about Melioidosis now in Malaysia?



Melioidosis is often mistaken for other diseases like leptospirosis or tuberculosis due to its symptoms, which include fever and body aches. It's prevalent in areas with waterlogged soil, affecting rice planters and farmers who might get cuts on their feet while working. The bacterium can enter the body through such wounds, particularly in individuals with diabetes. In Malaysia, the number of cases is likely under-estimated due to misdiagnosis.

Addressing mis-diagnosis and underreporting is crucial. How do you plan to improve the situation?

Our plan was to advocate for Melioidosis to become a notifiable disease in Malaysia. By doing so, hospitals would be required to report confirmed cases, leading to better data collection. Additionally, we aimed to collaborate with medical professionals to educate them about the symptoms and proper diagnostic methods for Melioidosis. However, our efforts were met with challenges, and external funding for the project was not secured.



It's unfortunate that funding became an issue. Do you think this effort can still be pursued in the future?

The project's progress was hindered when external funding from the United States did not materialise. However, given the importance of addressing Melioidosis and enhancing its understanding, I believe it's crucial to continue advocating for improved awareness, diagnosis, and reporting of cases within Malaysia.

Considering the dynamic nature of microbiology, how do you stay updated with the latest advancements and breakthroughs in the field of microbiology, and how you incorporate these findings into your research?

My approach might be seen as a bit unconventional, but it's effective for me. I subscribe to email alerts for the latest publications from various microbiology-related journals, including ASM journals. Additionally, I have subscriptions to reputable journals like Science and Nature.

It sounds like you have a well-structured way of staying informed about new research. How do you then translate these advancements into your ongoing work?

When I come across interesting papers in my subscriptions, I share them with my students. We discuss the implications and potential applications of these findings within our ongoing projects. This process fosters critical thinking and encourages my students to connect the latest discoveries with our research objectives.

It's great to involve your students in these discussions. How do you handle situations, where a new finding might require a deviation from the original research plan?

If a new discovery seems relevant but deviates from our initial plan, I evaluate it based on its potential impact. If incorporating the new information could lead to valuable data that aligns with our overall research objective, I discuss it with the students. We collectively decide if it's worth adjusting our path to accommodate these new insights.

In such cases, do you find students willing to put aside their existing projects to explore these new avenues?

I've been fortunate to have open-minded students who recognise the value of adapting our approach to incorporate new findings. For example, during the *C. elegans* project, we needed to enhance our manuscript based on reviewers' comments. Students from different projects pooled their efforts and expertise, dedicating about six months to this effort. Their willingness to contribute enabled us to enhance the study and secure a swift publication.

I've been fortunate to have open-minded students who recognise the value of adapting our approach to incorporate new findings. Collaborative efforts indeed drive progress. How do you encourage your students to maintain a forward-thinking mindset and engage in continuous learning?

My students and I share a reciprocal flow of information. I provide them with relevant papers, and they know I will inquire about their thoughts and potential applications. This process stimulates their critical thinking and keeps them engaged in the broader field of microbiology. It's a natural way to foster a sense of curiosity and encourage them to think beyond their immediate research tasks.

Could you share some examples of industry collaborations you've initiated or participated in during your career as a microbiologist? How have these collaborations contributed to advancing the field?

I've been involved in a couple of industry collaborations, although it's important to note that collaborations involving pathogens like the ones I work with are not as common. One collaboration was with a bioinformatics company. We worked closely on genomics and transcriptomics projects, analyzing data together and producing joint publications. We partnered with another company, mainly focusing on developing diagnostic methods, such as dipstick assays, and potential vaccine candidates based on those antigens. These collaborations were essential in bridging academic research with practical applications.

It's impressive to see how you've translated your research into practical solutions through industry collaborations.

Collaboration indeed plays a significant role in advancing research and addressing real-world challenges.

As you plan for retirement, how do you envision continuing your involvement in communitybased initiatives or organizations related to microbiology?

Retirement doesn't necessarily mean stepping away completely. I believe there's value in sharing knowledge and experiences with the community and younger generations. I plan to engage in talks, workshops, and perhaps mentorship opportunities. There are numerous avenues to continue contributing to the field, even after retirement.

Your commitment to giving back to the community is truly inspiring. Lastly, what advice or words of wisdom would you give to aspiring microbiologists who aim to make a significant impact in the field?

To aspiring microbiologists, I'd say embrace curiosity and be open to exploring various aspects of microbiology. Don't be afraid to take risks and step into uncharted territories. The field is vast, and there are countless opportunities to make meaningful contributions. Stay persistent, be resilient in the face of challenges, and collaborate with experts from various disciplines. Most importantly, believe in yourself and your ability to make a difference.

That's valuable advice for those embarking on a journey in microbiology. Thank you, Prof. Sheila, for sharing your insights, experiences, and wisdom with us.

It's been my pleasure. I hope my experiences can inspire future generations of microbiologists.



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Don't be afraid to take risks and step into uncharted territories. The field is vast, and there are countless opportunities to make meaningful contributions.

NEWS AND REPORTS JAN - JUNE 2023

Team-up with Invisible Yet Powerful Organism (T-I-N-Y) Initiative: Community Outreach Program in Bukit Gambir, Tangkak, Johor

Dr. Abd Rahman Jabir Mohd Din Innovation Center in Agritechnology, Universiti Teknologi Malaysia

An community outreach program named as Team-up with Invisible Yet Powerful Organism (T-I-N-Y) was organized on 14 and 15th of February 2023 at Universiti Teknologi Malaysia (UTM) Pagoh Campus. The two-day program was held in association with Malaysian Society for Microbiology and Sekolah Menengah Kebangsaan Bukit Gambir Tangkak. This program had 25 participants with 4 accompanying teachers. All the participants were involved in all activities including awareness seminar talk, mini experiments and hands-on practical in making their own local fermented food. On the last day of the program, a microbiology excursion was organised to give a real-time experience of the impact of microbes on life. The ultimate aim of the program was to enhance microbiological literacy through active learning among the students who participated. Led by Dr. Abd Rahman Jabir Mohd Din and Dr. Nor Zalina Othman, this program had successfully promoted knowledge transfer of basic microbiology related to sustainable development and healthy gut.

On day 1, participants attended two seminars on the importance of microorganisms in daily life and probiotic significance in sustaining gut health. The talks were interactive as participants were given meaningful insights on the way to team-up with good microbes to improve individual wellbeing and planetary health. All participants actively engaged in quiz sessions. Before the break, the participants were eager to observe mock agars displaying beneficial microbial strains and fermented products coming from all around the globe. A mini experiment on lactic acid bacteria enumeration was conducted for students, with commercial fermented food used as a sample. Students were asked to quantify the presence of bacteria using newly-prepared De Man, Rogosa and Sharpe (MRS) agar. Before the end of day 1, the students participated in a hands-on practical session, producing their own tempeh and yoghurt, guided by trained facilitators. Starter culture and all needed materials were given to all participants as they divided into several groups. The day 1 program ended by participants enjoying their self-prepared fermented foods, without any fears.



Day 2 was really memorable for the participants as they visited the C&C Mushroom Cultivation Farm. Mushrooms are fungi that are edible and are a good source of protein. All the processes, starting from substrate preparation, followed by inoculum injection, mushroom cultivation and packaging work, were shown to participants. At the end of the program, all participants received a package of oyster mushroom bunch as a souvenir. Through this program, knowledge was transferred, students were enriched, schools were transformed and the community was sustained. This program also helped to strengthen multidisciplinary collaboration by bringing together microbiologists, industry and schools towards a science-enlightened community.





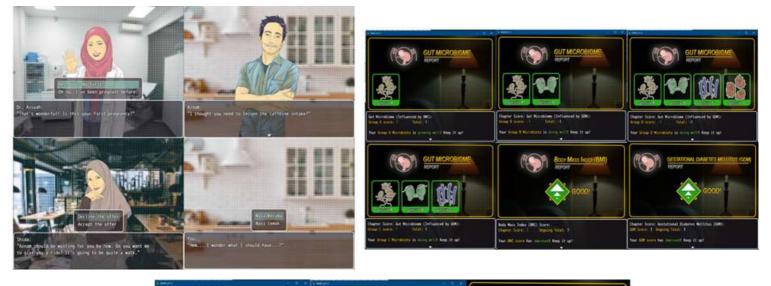
GUTM COMMUNITY OUTRACE TEAM UP WITH INVISIBLE YET POWERFUL ORGANISM (T-I-N-Y) With the students of SMK Bakkt Gambir, Tangkak B 14-16 February 2022 (Tuesday & Wednesday) B 300 am O UTM Kompus Pageh and CaC Mushrooom Cultivation Farm

The Development of 'MoM (Microbiome of Maternity)' Role-Playing Game (RPG) in Educating the Importance of Diet and Lifestyle and Its Interactions with the Gut Microbiota During Pregnancy

Shafiq Aazmi, Mohamad Izwan Ismail, Khalilah Abdul Khalil

Universiti Teknologi MARA (UiTM)

A team of researchers from Universiti Teknologi MARA (UiTM) has developed a role-playing game, called the Microbiome of Maternity or the MoM, intending to educate the public on the importance of diet and lifestyle and its interactions with the gut microbiota during pregnancy. It is a collaboration between the Microbiome of Health and Environment (MiHeaRT) research interest group from the Faculty of Applied Sciences UiTM with the obstetrician and gynaecologists from the Department of Obstetrics and Gynaecology, Faculty of Medicine and Hospital Al-Sultan Abdullah (Hasa), Universiti Teknologi Mara. Changes in antenatal gut microbiota have been associated with the development of gestational diabetes and obesity, which are influenced by diet and lifestyle. Thus, gamification as an educational tool to convey scientific concepts on gut microbiota and health to the public could be explored as part of the interactive health promotion initiatives. We developed an interactive story based on the dietary patterns, lifestyle and gut microbiota profile obtained from pregnant Malaysian women. A branching narrative emphasizing flavour texts with a local flair was developed using 'RPG Maker MV'. The choice-based game narrative revolves around daily diet and lifestyle preferences given in an engaging story throughout pregnancy. Each player will be given a graphical report at predetermined intervals and the end of the story. The report highlights important details on their health and microbiome profile. The MoM effectively assimilates the core values of a well-balanced diet and lifestyle during pregnancy. This improves awareness of gut microbiome health and encourages the public to adopt a healthy lifestyle during pregnancy. The initial knowledge on the introduced health concept were inadequate (Part A score 7.67 ± 2.97), but after a session of role-playing 'MoM', their understanding improved and many were satisfied with the design (Part B score 42.3 ± 6.49). In conclusion, 'MoM' is an effective educational game in promoting healt





ARTICLES FROM MSM MEMBERS

Fermented Ceri Terengganu Beverage: New Therapeutic Agent For Hyporcholesterolemia

Dr. Musaalbakri Abdul Manan

Principal Research Officer (Life Member of Malaysian Society for Microbiology) Food Science and Technology Research Centre Malaysian Agricultural Research and Development Institute (MARDI)

The concept of health-promoting food is not new as 2400 years ago, Hippocrates said, "Let food be thy medicine and medicine be thy food." Consumers' demand for "healthy" food and beverages is considered as a driving force behind the growth of the functional food sector. The production and consumption of functional products have substantially increased because of the health benefits they provide beyond their basic nutritional functions. It has been suggested that fermentation can influence the bio-accessibility and bioavailability of compounds in substrates. Malaysian Agricultural Research and Development Institute (MARDI) has intensified its research to improve the nutritional quality as well as functionality of food and beverages, without compromising the flavour and tastiness of the products. Innovative products are mostly developed from local resources to strengthen our local economy. MARDI has also developed technologies to extend the shelf life of products and to ensure the processed food items remain safe for consumption.



Fermented Ceri Terengganu Beverage is a functional fermented beverage formulated by MARDI using the native underutilised Malaysian fruit "Ceri Terengganu" (*Lepisanthes fruticosa*). It is produced through modern microbial fermentation process using a culture of identified yeast and acetic acid bacteria from MARDI's Collection of Functional Food Cultures. The starter culture symbiotically converts the sugared Ceri Terengganu juice to form a new functional fermented beverage.

The fermentation process affected the physiochemical and sensory properties of the juice. As the fermentation progressed, the taste of the fermented Ceri Terengganu juice changed from sour and tart to a pleasantly sweet and sour, slightly pungent, apple cider-like beverage. Aligned with the goal of producing a product with several health benefits, more bioactive metabolites were also produced to enhance the nutritional value of the original Ceri Terengganu juice. The fermentation process enhanced the levels of antioxidants (2,2-Diphenyl-1-picrylhydrazyl (DPPH), radical scavenging activities, ferric reducing antioxidant power (FRAP), total phenolic content (TPC) and total flavonoid content (TFC), as well as antimicrobial activities of the resulting product. The antioxidant activities were attributed to various biophenolic compounds (gallic, chlorogenic, syringic, 2,5-dihyroxybenzoic, caffeic and ferulic acid) and bioflavanoid compounds such as rutin. The antimicrobial activity of fermented Ceri Terengganu beverage is largely associated with the presence of organic acids, namely, glucuronic, galacturonic, oxalic, tartaric, L-malic, lactic, acetic, citric, succinic, kojic dan ascorbic acid. The tinal product is ultra-filtered to guarantee sparkling clarity and microbial-free product that promotes stability and longer shelf life.

In-vivo studies showed that fermented Ceri Terengganu beverage had no toxic effect. Additionally, fermented Ceri Terengganu beverage could be used as part of a therapeutic regimen to positively influence hypercholesterolemia via its lipid-lowering properties. Based on animal studies, the fermented Ceri Terengganu beverage managed to reduce the blood total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) levels by 33.73% and 65.56%, respectively. The results are comparable to the commercial lipid-lowering medication simvastatin, which managed to reduce TC-C and LDL-C levels in the treated rat by 28.66% and 58.94%, respectively.

Ceri Terengganu has shown promising potential to be used in the development of a functional beverage through fermentation with the consortium of yeast and acetic acid bacteria and should be extensively explored for further utilisation. Microbial fermentation presents an opportunity to accelerate innovation and offer another critical source of production for the food and beverage sector. It involves turning microorganisms into mini factories producing specific enzymes that result in vast quantities of specific ingredients. The results help us create a pathway for new, sustainable, costeffective, and efficient ways to feed the growing population.

A portion of this study revealed that fermented Ceri Terengganu beverage is a good source of several beneficial bioactive compounds, designating it to be a functional beverage. Hence, the data obtained from this work can be useful to both producers and consumers as this functional beverage can be integrated into health food or utilised in the nutraceutical industries. The economic returns from innovative fermented Ceri Terengganu-based products can offer improved opportunities for all members in the supply chain: from raw material producers and processors to retailers.

A glimpse of the study carried out in MARDI revealed that the fermented Ceri Terengganu beverage is a good source of the bioactive compounds which make it as a functional beverage. Among the functional foods, functional fermented beverages could be the most popular functional foods due to their convenience of handling, ease of distribution and storage, and opportunity to incorporate desirable nutrients and bioactive compounds. On the basis of recent developments, it is anticipated that functional fermented beverages will continue to be a significant component within the functional food market. The technology for the production of this product is protected under a Trade Secret (TS 2021/04/096) and has been transferred for commercialisation.









Microbial degradation of plastic: A sustainable solution for plastic contamination

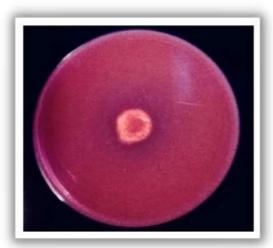
Dr. Pooja Singh Monash University Malaysia

Plastic pollution is ubiquitous in the ecosystem and is of significant concern for all life forms. Global plastic production has increased, achieving 370 million tonnes in 2020. Plastic is an integral part of daily life, having the most desirable characteristics such as flexibility, durability, and resistant properties. With the recent coronavirus disease (COVID-19) outbreak, plastic has played a critical role, especially in manufacturing personal protective equipment (PPE), including face masks, face shields, medical gowns, and gloves. The production of these items uses plastics like polyurethane, polypropylene, polyvinyl chloride, polycarbonate, and low-density polyethylene (LDPE). The natural degradation of plastic, when exposed to heat, ultraviolet rays, and moisture, releases toxic byproducts and forms micro- and nano-plastics, which are easily transported to marine and terrestrial sites, posing a threat to agricultural and human health. Intensive work has been done to search for an alternative, a plastic replacement, but the existing problem of synthetic plastic waste accumulation still requires an effective solution.

In this context, microbial degradation of plastic waste has attracted worldwide attention for being a greener and a more sustainable solution. As part of Professor Adeline's team in Monash University Malaysia, our research is focused on exploring diverse microbes from less polluted to highly polluted environments that can utilize different types of plastics as a carbon source and degrade it. We started our research in 2021 and collected leachate from landfill, soil, plastic debris, plastic mulches from agricultural fields, sediment from mangrove forests, and water samples from different plastic accumulated places in Malaysia. During these two years of research, we have identified novel and diverse microbial species from the genera Firmicutes, Neobacillus, Arthrobactor, Brevundimonas, Priestia, and Dermococcus, which showed potential for biodegradation of plastic. We have successfully tested them for the degradation of three different plastics: low-density polyethylene (LDPE), polyethylene terephthalate (PET), and polystyrene (PS). Hydrolytic enzymes, such as hydrolases, including esterases and lipases, oxidases, such as laccases and oxidoreductases, such as manganese peroxidases, mediated the biodegradation mechanism. The result obtained from our research encouraged us to look outside the box and explore other novel enzymes which might be involved during the degradation. With this, we successfully explained the biodegradation mechanism where microbes colonized the plastic, formed biofilm, and, secreted enzymes, which reduced the hydrophobicity of the plastic surface. The enzymes also played a role in hydrolyzing ester bonds in plastics, which is the main backbone of the polymer chain, while oxidation-reduction reactions initiate free radical activities on the plastic surface. We also used high throughput techniques, such as the Fourier transform infrared spectroscopy (FTIR) and Field emission scanning electron microscopy (FE-SEM), to determine the conformational changes observed on the plastic surfaces and biofilm formation. The by-product released during the biodegradation was determined using Liquid chromatography-mass spectrometry (LC-MS). This showed the presence of compounds such as fatty acids, conjugate acids, alcohol, ester, and amines, which confirmed the oxidation reaction during the biodegradation of LDPE.



In brief, microbial degradation of plastic has emerged as a sustainable solution for plastic waste management. Since the degradation is a critical process specific to the plastic type, screening and identifying new microbes and enzymes can further enhance the overall process. Agricultural and industrial applications of these microbes can provide an eco-friendly approach to overcome the harmful effects of micro-and nano plastic.



Esterase activity by plastic-degrading bacteria indicated by orange flourescence

STUDENT'S COLUMN

Studying Microbiology in China: Perspectives and Experience

Ying-Xian Goh & Yvette Hai Shin Ley

Postgraduate students at State Key Laboratory of Microbial Metabolism, School of Life Sciences & Biotechnology, Shanghai Jiao Tong University.

Ying-Xian Goh secured 3rd place in the Best Oral Presenter Award at MSM Postgraduate Symposium 2022 (MSMPS 2022)

Hello! It is great to meet all of you, and we are excited to share our experiences and perspectives on studying microbiology abroad in China.

A brief background about us. Ying-Xian graduated from Universiti Kebangsaan Malaysia (UKM), with a degree majoring in Biochemistry, while Yvette graduated from Monash University Malaysia with a double degree in Biotechnology and Medical Bioscience. Both of us graduated in 2018. After we completed our undergraduate studies, we were offered a postgraduate position in one of the top universities in China, Shanghai Jiao Tong University.

Yvette's postgraduate research is on environmental microbiology, particularly the biodegradation of pollutants in the marine system and enzymology studies of key enzymes involved in the degradation routes. For example, the microbial degradation of lignin in the marine system. Lignin are major components of plant cell walls and the second most abundance polymer in nature. However, lignin is recalcitrant to degradation. Moreover, lignin polymers are promising raw materials to produce high-value aromatic compounds such as polyhydroxyalkanoates that are used in biomedicine and nanotechnology. In Yvette's study, the lignin degradation pathways of bacteria consortia of shallow marine system were reconstructed and the key enzymes in the possible pathways were identified. Her study helps to better understand lignin involvement in the material transformation and carbon cycling in the ocean.



Yvette at the East entrance, more commonly known as the Temple Gate, of Shanghai Jiao Tong University's Minhang campus.



Ying-Xian and his academic supervisor at Shanghai Jiao Tong University, Prof. Dr. Hong-Yu Ou, attending a seminar in 2019.

For Ying-Xian's, the research focuses on understanding the fundamentals of genes in responding to stress and adaptation. For instance, one of Ying-Xian's projects was to curate a large dataset of mobile genetic elements (MGEs) associated with antibiotic resistance. MGEs are like small vehicles that can carry special genes called antibioticresistant genes (ARGs), which make bacteria resistant to antibiotics. MGEs can help spread ARGs among bacteria, making future bacterial infections harder to treat. The dataset has been published as a supplement to VRprofile2, a web server that predicts bacterial antibiotic resistanceassociated mobilome. This web server was designed to help bench scientists with their technical analysis and provide insights into the relationship between MGEs and ARGs.

Apart from our research, our time studying in China has been enriching and exciting. Firstly, China offers some of the best universities in the world, with highly advanced research facilities, good funding and a strong emphasis on science and technology. For instance, Shanghai has a synchrotron radiation facility called the Shanghai Synchrotron Radiation Facility (SSRF), which could be a blessing for protein crystallographers who rely heavily on X-ray crystallography radiation to determine protein structures. Moreover, our laboratory, the State Key Laboratory of Microbial Metabolism, is one of the best in China. The opportunity to study alongside some of the brightest minds in the field has been invaluable in furthering our knowledge and skills.

The fast pace of the metropolitan city is not only displayed in our day-to-day life but also expressed in the research work. For instance, primer design, gene synthesis and sequencing services can be completed within one working day. Working hours are also extended here, especially for research students. Most would stay in the office till late at night and this would be seen as a norm. Another important aspect about studying in China is the app 'WeChat'. It is the main mode of communication even for official announcements, that would otherwise have been done through emails in Malaysia. Furthermore, we are expected to work on multiple projects simultaneously in China. This is different from Malaysia where, most postgraduate students are only recruited when the supervisor secures funding for a specific project. In China, we were enrolled without knowing the specific project title we would be working on. We were given multiple projects to work on and allowed to experiment to see which project yielded positive outcomes worth pursuing further. The process of discovering and choosing a project title at the initial stage caused anxiety and could be overwhelming. Nevertheless, it ultimately trained us to think critically and independently about our projects since we were the ones seeking the degree, not our advisors.

Additionally, studying in China has allowed us to better understand Chinese culture and have the chance to meet many other international students. Living in China has enabled us to immerse ourselves in a rich and diverse culture, with delicious food (like the mouth-watering Mala hotpot and Xiaolongbao), beautiful scenery, and a rich history. Exploring China during our free time has been an exciting and eye-opening experience, and we have made many lasting memories. Moreover, China is one of the few countries that have everything available on the phone at your convenience, from ordering deliveries to purchasing tickets and many more. Almost all shops in China do not accept cash payments, so those who try to pay with cash may worry about the possibility of the shop not having enough change to give them.

One of the biggest advantages of studying in China is the affordability of education, with many scholarships and funding opportunities available to international students. We both have the support of the Chinese Scholarship Council (CSC), which covers tuition fees, accommodation, and a stipend. Living expenses in China are also relatively low, especially compared to other popular study destinations such as the United States or the United Kingdom. The application for the scholarship is also relatively simple and procedures are present on their official website at https://www.chinesescholarshipcouncil.com/.

Of course, studying in a foreign country also comes with its challenges, especially language-wise. However, thanks to Malaysia's diversity and inclusivity, Mandarin is not unfamiliar to us, and we can adapt well to their system. Furthermore, Chinese universities often have extensive support systems in place for international students, including language classes, cultural activities, and academic advisors. Moreover, there are Malaysian student associations in most of the Chinese universities (MSAC) where you can acquire help prior and during your studies in China (<u>https://msacofficial.com/</u>).



Ying-Xian (third from the left) and his lab mates celebrate a lab member passing her Master's viva examination with some mouthwatering Xinjiang halal cuisine, spicing up the occasion.





Yvette (first row, third from the right) and her lab members, including her advisor Prof. Dr. Ning-Yi Zhou (second row, fifth from the right), attending China's 23rd National Symposium on Environmental Microbiology in Tianjin, China organized by Nankai University.

If you are still unsure but would like to experience studying in China, consider applying to the Shanghai Jiao Tong University Undergraduate Summer Research Internship. This 2–3-month internship aims to promote international research collaboration and offers excellent undergraduate students worldwide the opportunity to conduct research at world-class laboratories during the summer. The program is not limited to life sciences only. It offers a wide range of research topics, including robotic system, intelligent vehicles, clean energy production, and disease diagnostics. Those who are interested can consider applying to the program and learn more at <u>https://global.sjtu.edu.cn/en/studyatSJTU/practice</u>.

Apart from that, young talents or lecturers who are interested in postdoctoral training in China, particularly in Shanghai, can closely follow announcements from the Shanghai Municipal People's Government or the Science and Technology Commission of Shanghai Municipality (STCSM) at <u>https://stcsm.sh.gov.cn/yww/</u>. They regularly announce foreign expert programmes for foreign youth talent. Good luck applying!

Overall, studying in China has been an incredible experience, and we would recommend it to Malaysian students considering pursuing postgraduate studies there. The opportunities for growth and learning are vast, and the cultural and personal experiences gained made studying in China an unforgettable journey.



My Doctoral Journey : A Self-Discovery Journey A Smooth Sea Never Made a Skilled Sailor

Siti Nurul Fazlin Abdul Rahman PhD student, IIUM

Fazlin won 2nd place in the Best Oral Presenter Award at MSM Postgraduate Symposium 2022 (MSMPS 2022)

Hmm where do I start?

I guess we can go back to the beginning of the story. When I was a kid, I was asked by the King himself, Almarhum Sultan Haji Ahmad Shah during his visit to my primary school "What do you want to be when you grow up, dear?" Unlike others who picked the most famous jobs like doctor, engineer, teacher or pilot, I chose to say naively "I want to be a scientist". He widened his eyes, surprised with my answer. I guess it is too much for a kid to say. "Very well then, I hope you can be one. InshaAllah". Little did I know the road to becoming a scientist is not easy. I was not aware of the whole educational system that's needed to get there nor was I groomed to be one because I came from a non-educational background family. I guess you can say that I have a humble beginning.

After SPM, I did matriculation, then I got my first degree from University of Malaya (UM) and a Master's degree from International Islamic University of Malaysia (IIUM). Alhamdulillah these two academic phases were amazingly smooth-sailing experiences. A year later, I decided to pursue my PhD. My PhD journey began when I successfully defended my proposal on June 6th, 2016 and I was starting my engine to embark on this unknown journey. They said a PhD is a journey, not a milestone. A lot of things will change, including expectations. But you will never know what you could be until you try. With these words lingering on my mind, I decided to do this.

My research was about molecular characterization of occult hepatitis C virus from peripheral blood mononuclear cells extracted from dialysis patients. Regularly, I met my supervisor to discuss the research especially on the items to be bought and documentations that needed to be prepared. Since I was dealing with human samples, I had to seek approval from the National Medical Ethics Committee. Once approved, I worked from morning to evening to collect the blood samples from the consenting patients. Exhausting yet exciting. But later that year, life tested me with a tempting option. I got a job offer to be a research officer on a permanent basis but I decided to decline that offer since I was highly motivated to start and finish my PhD research with the similar smooth sailing experience.



This naïve thought apparently hit me the hardest when my proposed method underwent a major failure. I changed the variables hoping for a different outcome yet the results were similar, a major failure. The quote "insanity is doing the same thing, over and over again, expecting different results" kept playing in my head like a broken record. But I did change something, didn't I? The feelings of doubt, regret, pain, agony and anxiety began to creep into my mind. I went into depression mode a couple of times. My religion and family are the only things that keep my sanity grounded. But indeed, there is always light at the end of the tunnel. I had received help from my supervisors as well as the researchers overseas to overcome those hurdles. Sometimes the universe just conspires to make things happen in your life so that you will know how to rectify it later. As the saying goes "This too shall pass".

As a final year PhD student awaiting her VIVA, I can honestly say that my journey was not easy. I bet many of you reading this right now can say the same thing. Common issues that PhD students may encounter include academic writing, procrastination, financial constraint, upgrades, viva preparation and corrections. These are the issues that you may be able to control but sometimes you are tested with something beyond your control. During my journey, I lost my beloved father, which broke me. He was my number one cheerleader and losing him made me want to call it quits. But thankfully, I was surrounded by a supportive environment and all these tests God put me through made me learn the true value of perseverance and resilience.



I share this story that perhaps others may learn for their future journey. Like any personal narrative, take and apply what adds value, leave the rest. Below are some brief reflections on what I found helpful and what I would do differently.

1. The First Year of PhD

It is all about finding your feet as a researcher with a solid ground of financial stability. It is important to get a scholarship prior to embarking on this trip. You will also need to have regular meetings with your supervisor to discuss the tocus on your study as well as to design a plan of action based on your research proposal. Steady discussion with your supervisor will help you to situate your research and ensure your work is original.



This will be the core year since the main focus will be gathering results from the focus will be gamering results from the experiments. You might experience technical difficulties like I did but do remember to ask your supervisor's opinion. They will check with your progress, providing ideas that will ease your ways and also read any drafts you

Once you obtain a solid result, it is a perfect time to think about presenting your work at an academic conference to build your character as a scholar. You can also join workshops on academic writing and biostatistics as it will help you later during thesis and manuscript writing.

3. The Third Year of PhD

Once the data is all there, you are all ready to analyze and write up the results. This is sometimes referred to as the writing phase. Teophrically, it is the final part of your sometimes reterred to as the writing phase. Technically, it is the final part of your doctorate but it is not as easy as it sounds. You will feel stuck at times, staring at your Tou will teel stuck at times, staring at your laptop for hours. My advice is to write a little day by day. Keeping it up as a habit will help you to navigate your writing flow and new ideas it is also necessary to take a break you to having the your writing new and new idea is a break ideas. It is also necessary to take a break once in a while. Finally once your thesis is submitted, it is time for the VIVA VOCE oral exam, a formal discussion and thesis defense with the examiners. If you have passed it, you

My experience with this journey is a very elevating experience. Be it bad or good experience, both are overwhelming experiences for me. If I am to be honest, I did pause my study due to the financial constraint I faced when I lost my father. I had applied for a contract job as a science officer in Hospital Tengku Ampuan Afzan, Kuantan Pahang during the endemic phase. The COVIDI9 samples were immensely high and they urgently needed staff with a molecular background to help them. Apparently, I fit into the criteria they were looking for. Whilst I was at it, I could tell the difference between the diagnostic and research world. And as a postgraduate student myself, I was often trying to improve the protocol, evaluating the reagent kit used and presenting my ideas as well as the findings at local conferences.

It is not easy to juggle both of these worlds at the same time. But I am making the best out of it. Indeed, this journey accelerates my chances of discovering myself. If someone told me years before that I am going to pursue my PhD, submitting my manuscript to be read by other academicians, presenting my findings at conferences and even being crowned as the winner for that, I definitely would not have believed them. PhD is definitely a training ground for you to face more challenges in future. Embrace it as the saying goes "the best view comes after the hardest climb".

Seronegative Occult Hepatitis C Virus Infection (OCI) in a Main Haemodialysis Centre In Pahang, Malaysia

Abdul Rahmen Shi^{er}, Horozofi Ha⁺, Nostajo MA⁺ "Department of Busic Medical Sciences (Nicrobiology), Kulilyyah of Medicine, Internat Waisysta, Bandar Indera Mahota Camput, 25300 Kuantan Pahang

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KCYWORDS: Occult Hepetitis C, Chronic Hepetitis C, Peripherel Mood Word Unit.

INTRODUCTION

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