MONASH University

MALAYSIA

SCHOOL OF SCIENCE CAPABILITIES

MONASH.EDU.MY/SCIENCE

CONTENTS

FOREWORD BY HEAD OF SCHOOL

School of Science is committed to promote active research engagement with industries and our global research partners.

Scientists at Monash University Malaysia are committed to excellence in research. We actively engage with key research partners, industry and government to deliver high-impact and sustainable outcomes in the areas of health sciences, food and plant sciences, genomics and bioinformatics, chemistry and tropical environmental biology. We do not only emphasise on advanced research but also research-led education, internship and career development with our industry and education partners to make significant contribution to the communities.

The School of Science at Monash University Malaysia houses sophisticated research infrastructure such as the Analytical Chemistry, Confocal Microscope, Genomics and Pilot Food Processing Facilities. We aim to provide innovative solutions to global problems with our state-of-the-art technology. I welcome you to collaborate and engage with our experts.

Professor Emily Goh Joo Kheng
Head, School of Science
Monash University Malaysia

RESEARCH AREAS

Our research is supported by well-equipped facilities that meet the demands of academic research and industrial collaborations. We have a dynamic group of experienced full-time academic staff with established research track records in five research areas.

A wordcloud showing the expertise areas of researchers from School of Science.

Chemistry

- Analytical Chemistry
- Hydrogels
- Medicinal Chemistry
- Nanotechnology
- Natural and Bioactive Products

Food and Plant Sciences

- Food Processing
- Food Technology
- Micronutrients
- Oils and Fats
- Product Development

Genomics and Bioinformatics

- Agrigenomics
- Conservation Genomics
- Immunogenomics
- Population Genomics
- Sequencing
- Biostatistics

Health Sciences

- Microbiome
- Microbial Pathogenesis
- Proteomics
- Venom and Toxins

Tropical and Environmental Biology

- Ecology
- Bioremediation
- Biosourcing and Bioprospecting
- Microalgae
- Microbes as Biocontrol Agents

RESEARCH INFRASTRUCTURE

School of Science is well-equipped to meet the demands of industrial collaboration. We have new, state-of-the-art laboratories that focus on chemistry, food and plant sciences, genomics, bioinformatics, health sciences, tropical and environmental biology. The School has approximately **100 PhD**, **MSc** and **Honours students**, giving it a strong research profile.

1
High-Performance Liquid Chromatography (HPLC)

2
Atomic Absorption Spectrometer (AAS)

3
Gas Chromatography (GC)

4
Fourier-Transform Infrared Spectrometers (FTIR)

Analytical Chemistry Facilities

Analytical chemistry facilities are well-equipped for chemical analysis of samples in solid and liquid forms from the following sources:

a) Chemical, Food and pharmaceutical industry – to perform chemical validation – to analyze and quantify chemical compositions

b) Industrial effluents and environment – to measure pollutants

Confocal Microscope Facility

The Confocal Microscope Facility houses an Olympus FluoView FV1000 laser-scanning confocal microscope that allows for high resolution, multi-channel 3-dimensional imaging of fluorescence-labeled or reflective specimens. The advantage over conventional widefield light microscopy is that the optics of the confocal microscope remove scattered light and light originating from outside the focal plane of interest, thus generating a high contrast "optical section." Three -dimensional image reconstruction of serial optical sections as well as quantitative measurements can be performed using the microscope software. In addition, the microscope is equipped with facility for live cell imaging.

5
Illumina MiSeq System - A compact, low to medium throughput benchtop sequencer for rapid and cost effective nucleic acids (DNA/RNA) sequencing.

6
Oxford Nanopore Technology: MinION - The world's only portable and real-time device for DNA and RNA sequencing, providing long reads using the nanopore technology.

Genomics Facility

The Monash University Malaysia Genomics Facility (MUMGF) is a research oriented infrastructure platform under the School of Science that provides high throughput genomics and bioinformatics services to researchers, students and clients worldwide. With compliance to ISO 9001 standards, MUMGF is committed to providing the highest quality of nucleic acids sequencing services using current short- (Illumina MiSeq) or long-read technologies. It is among the first facilities in Southeast Asia to obtain the PacBio Sequel IIe System for highly accurate long-read sequencing. Continuous assessment and improvement of the management system also ensure fast turn-around time with maximum efficiency and consistency.

RESEARCH INFRASTRUCTURE

7

Biomek 4000 Automated Workstation - A compact, low throughput liquid handling system ideal for standardizing small scale daily pipetting routines, while ensuring quality and consistency of sample processing, generating repeatable and reliable results.

8

PacBio Sequel IIe System - Access to high throughput, cost effective, highly accurate long-read sequencing.

7

8

Liquid chromatography – mass spectrometry

The School houses a new ultra performance liquid chromatography coupled triple quadrupole mass spectrometer (UPLC-MS/MS) which provides high levels of reliability, reproducibility and performance. The UPLC-MS/MS system combines the separation resolution of liquid chromatography with the outstanding qualitative and quantitative capabilities of mass spectrometry. The mass spectra obtained from these scan measurements provides molecular mass and structural information for eluted components, which supplements the information based on retention times obtained.

Pilot Food Processing Facility

The pilot food processing facility covers **fruit juice processing** including **pasteurization**, **filtration and bottle filling** to allow batch processing of 5 litre of fruit juice. It is also equipped with a **soft serve maker** and **hard ice cream processing facility** that includes **bath pasteurizer**, **homogenizer**, **scraped surface heat exchanger** and **blast freezer**. **Spray drying** and **supercritical CO_2 extraction** are also available in this facility.

Pasteurizer

The pilot food processing facility comprises of a self-contained miniature scale HTST (high temperature short time) unit/ pasteurizer (MODEL: BP159-A, BRAND: SOLTEQ) that is made up of plates and tubular heat exchanger to accommodate up to 5 litre of sample. Products that can be pasteurised include raw milk, fruit juices, nectar, cream, etc. The unit comes with a mobile cleaning in place unit to clean the pasteurizer.

Juice Filtration Unit

The Juice Filtration Unit (Model: FD16) provides a fast and efficient filtration process mainly to remove solid particles, such as pulp and seeds from raw fruit juices via membrane filters.

Digital Filler

The Digital Filler (Model: FD18) is able to be operated manually or set to automatic filling mode on liquid products/beverages.

High Pressure Homogenizer

The high pressure Panda PLUS homogenizer is a tabletop unit to allow micronization/homogenization on liquid products.

RESEARCH INFRASTRUCTURE

Hard Ice Cream and Soft Serve Processing

The hard ice cream processing line comprises of **bath pasteurizer**, **homogenizer**, **scraped surface heat exchanger** (7 litre capacity) and **blast freezer** (14 trays, -40°C) that allows pilot hard cream processing. The school also has a table top **soft serve ice cream maker** (Taylor, C15240HW00) of 7 litres capacity that allows the production of single flavour soft serve in less than an hour.

Spray Drying Technology

The School of Science houses spray driers (SD-1500, Labquip & B-290 Buchi) that allow spray drying of emulsion/suspension to become powder.

Supercritical CO_2 Extraction Technology

Supercritical CO_2 Extractor (MV10, Waters) is available to provide green solution for extraction of various polar and non-polar compounds.

TROPICAL MEDICINE AND BIOLOGY RESEARCH PLATFORM

The Tropical Medicine and Biology Research Platform (TMB) was set up in 2013 to foster inter-school and inter-disciplinary research at Monash Malaysia, focusing on medical and biological research relevant to the tropics and underwent greater focus. Initially it was a loose aggregation of very diverse interests.

TMB is now an integral part of the School of Science with the aim of promoting cutting-edge multi-disciplinary and multi-school research that is consistent with the strategic research goals of the School of Science and Monash University Malaysia and Monash globally.

Within the approval of the Head of School of Science, TMB is guided by a Director and a team of Senior Research Fellows in setting strategic directions and deciding on projects to be supported with the proviso that they are also consistent with the strategic goals of the School of Science. The current director is Prof Sadequr Rahman and the current fellows are Prof Qasim Ayub (Science), Prof Maude Phipps (Medicine), A/P Sharifah Hassan (Medicine), A/P Chong Chun Wie (Pharmacy), Prof Shaun Lee (Pharmacy), A/P Vineetha Kalavally (Engineering) and A/P Amin Talei (Engineering). More Senior Fellows may be invited later.

TMB facilitates research by providing seed funds that allows teams to coalesce around focus areas and obtain results that allows bids to be mounted for large national and international grants.

The focus of research within the remit of TMB is ‘One Health’. This allows the TMB play its part in the realisation of the Monash research targets in ‘Climate Change’ and ‘Thriving Communities’ with a particular focus on our part of the world. TMB also contributes to the School of Science focus areas: Health Sciences, Chemistry, Tropical and Environmental Biology, Food and Plant Sciences and Genomics and Bioinformatics, consistent with the commitment to the UN Sustainability Goals.

CHEMISTRY

BIOACTIVE COMPOUNDS AND CHEMICAL SENSORS

Dr. Emily Goh Joo Kheng
goh.joo.kheng@monash.edu

Professor and Head of School

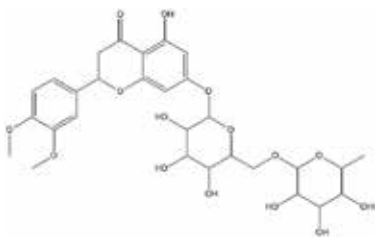
Expertise

- Natural product chemistry
- Chemical sensors
- Biosensors

Professor Emily Goh's research interests include the isolation and purification of bioactive compounds from Malaysian medicinal plants, synthesis of bioactive compounds and the development of chemical or bio-sensors using voltammetric and potentiometric techniques for the application in food, environment and pharmaceutical industries.

Her research group focuses on a bioassay-guided purification method to investigate the antioxidants, antimicrobial, anti-inflammatory and anticancer properties of chemical constituents from traditional and medicinal plants in Southeast Asia. Currently, she is working on isolation of chemical constituents from plants of Acanthaceae family, synthesis of imidazo naphthyridine derivatives as drugs for congestive heart failure and the fabrication of chemical sensors using electrochemical methods to detect the presence of antioxidants and other electroactive species.

Professor Emily Goh's research group is interested to provide expertise in identification of active compounds of interest using spectroscopic analyses such as chromatography and mass analysis. Our group is also able to study corrosion, heavy metals in water and detection of compounds of interest using electroanalytical chemistry techniques.



Flavanoid extracted from Hemigraphis alternata with its attractive violet foliage.

Our group is isolating bioactive compounds from medicinal plants and developing chemical sensors.

POLYMER CHEMISTRY

Dr. Pushpamalar Janarthanan

pushpa.janarthanan@monash.edu

Senior Lecturer and Deputy Director Monash-Industry Palm Oil Education and Research Platform (MIPO)

Expertise

- Plant biomass hydrogels
- Hydrogels
- Metal nanoparticles syntheses
- Nanotechnology
- Biodegradable / Compostable polymers

Our research aims to develop biodegradable polymers for compostable plastics and control release of active agents for various industrial applications such as drug delivery, tissue engineering, antimicrobial medical devices, wastewater treatment and functional food.

Research interests are varied, with a theme of using biopolymers derived from plant waste materials to the value-added products to the industry. She has been producing Green Biodegradable Polymers as targeted drug delivery systems, encapsulating matrix for enzyme and sludge, biomaterial for tissue engineering and wound healing, packaging materials, heavy metal adsorbents in wastewater treatment and fertilizer carriers cum super-absorbents for the agricultural industry, and vaccine and supplements carrier for poultry and aquaculture industries. The only reason for looking into formulating biodegradable polymers is that it could disintegrate into smaller fragments that are non-toxic after use. She is experienced in producing carboxymethylcellulose (CMC) from plant waste and with incorporating other polysaccharides to prepare hydrogels in forms of mono- bi-layered beads, disks, microcapsules, and bi- tri-layered membranes with different properties using various crosslinking methods, including irradiation. These can act as a carrier for active ingredients, or be used in controlled release of drug delivery in the medical area and slow release of fertilizer in agriculture. These polymer carriers could also be utilized to improve wastewater treatment and solid waste management. Different methods could be used to combine different polymers to produce functional biodegradable polymers.

Silver and ferrous nanoparticles syntheses from various methods using plant sources are also being explored and further incorporated into the wound healing biomaterial, drug carriers and adsorbents. Graphene oxide is synthesized from graphite and incorporated into the biomaterial as scaffolds are also being studied. Silver nanoparticles, graphene oxide and bismuth are being explored as antimicrobial polymers as medical devices.

Experienced using active agents such as anticancer drugs, painkillers, antibiotics, antibacterial agents, fertilizers, enzymes, mineral supplements, vaccines, and proteins.

She is the Deputy Director for Monash-Industry Palm Oil Education and Research Platform for the Palm Oil Industry (MIPO) which will serve as a platform for university-industry-government cooperation to improve the competitiveness and sustainability of the palm oil industry in the country. Oil palm waste are manipulated into the polymers that fit into the research area of interest.

METAL CARBENE COMPLEXES AND BIOLOGICAL PROPERTIES

Dr. Cheow Yuen Lin
cheow.yuen.lin@monash.edu

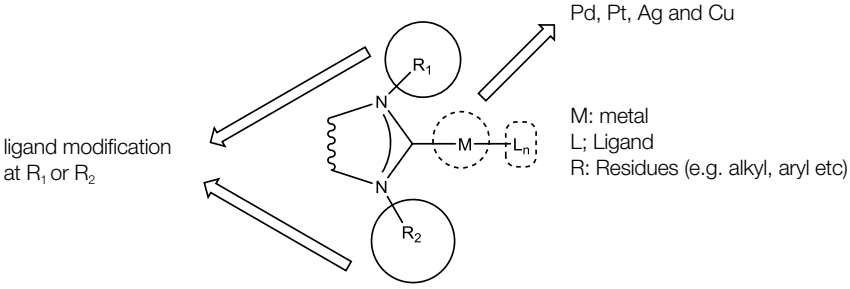
Senior Lecturer

Expertise

- Natural product chemistry
- Organometallic chemistry
- Medicinal chemistry

My research interests focus on the development of Group 10 and coinage metal N-Heterocyclic Carbene (NHC) complexes as potential antimicrobial and anticancer drug candidates. We previously reported a series of pyridine-functionalised bidendate Pd and Pt NHC complexes which displayed substantial antimicrobial activities with minimum inhibitory concentration at micromolar range, and they are cytotoxic towards the MCF7 (breast), HCT116 (colon) and H103 (oral) cancer cell lines tested. A couple of platinum NHC complexes synthesized exhibited antimicrobial activities with MIC as low as 2 μM, which are comparable to silver NHC complexes with renowned antimicrobial profiles. Similarly, upon coordination to the metals, the cytotoxicity effects of the platinum NHC complexes increased significantly as compared to the imidazolium salts. Among all, platinum NHC complex displayed significant cytotoxicities towards the cancer cells with IC50 values that are two to three times lower than that of the anticancer drug cisplatin.

Silver sulfadiazine has been found to be active against numerous gram-positive and gram-negative bacteria and is marketed as a water soluble cream SilvadeneR Cream 1%. It remains as one of the most effective and widely used for topical burn remedy. Therefore, the potent complexes could be potentially further studied as an alternative antiseptic cream. Development of wound dressings impregnated with these complexes, that have antimicrobial properties, could also be explored.



Possible sites for structural modification of metal NHC complexes.

Our lab is studying the synthesis and structural characterisation of Group 10 Metal N-Heterocyclic Carbene (NHC) complexes and its biological activities.

PHYTOCHEMISTRY AND OTHER NATURAL PRODUCTS

Most of my research is centered on polyphenols and their potential applications in human health, with a recent emphasis on circumventing antibiotic resistance. Nevertheless, my work is diverse, with ongoing and completed projects in various other areas, such as antidiabetic and antihypertensive treatments, functional food supplements, and even organic rebar corrosion inhibitors in civil engineering.

In addition to my scholarly publications, postgraduate supervision, and intellectual property output, I have also been principal investigator for several projects involving industrial collaborations. I was the recipient of the PVC Award in Research, and have won research-related awards from the International Invention, Innovation and Technology Exhibit (ITEX) and Pecipta.

I believe that my flexible skillset and adaptability would be well-suited to a wide variety of academic and industry-based collaborations, including (but not limited to), development of food products or herbal supplements, isolation, identification and quantification of substances, biological activity assessment (antimicrobial, antioxidant, anticancer, antihypertensive, etc.), and a comprehensive analysis of products.

Dr. Joash Tan Ban Lee
tan.ban.lee@monash.edu

Senior Lecturer

Expertise

- Polyphenols
- Biologically-active compounds
- Analytical chemistry
- Antibiotic resistance

My research group primarily focuses on identifying and evaluating compounds with potential benefits to mankind.

SUPRAMOLECULAR CHEMISTRY

Dr. Irene Ling
ireneling@monash.edu

Senior Lecturer

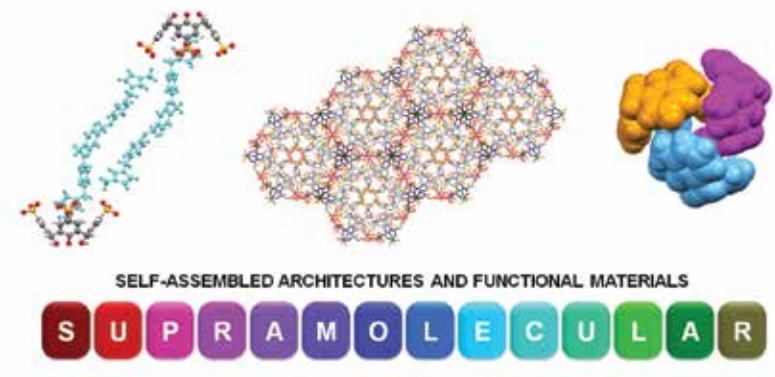
Expertise

- Supramolecular chemistry
- Solid-state chemistry
- Solution chemistry
- Nanomaterials
- Nanodevices
- Computational chemistry

My present research focuses on several key areas including i) cooperative self-assembly involving self-organisation of cavitands that form specific arrays such as tubules, bilayers and spheroidal structures; ii) design and formulation of nanoparticles for drug delivery systems and biosensors; iii) chemical synthetic strategies using green and eco-friendly protocols; iv) metal-organic scaffold for gas and small molecule entrapment/storage and v) computational approaches for predicting physicochemical behavior of novel molecules.

We have established a notable level of predictability involving self-organisation of small molecules into supramolecular assemblies in both solid (nanocrystallines) and in liquid (solutions) states which is essential in developing and advancing functional materials for nanosensors, gas storage and nanocarriers for delivery systems.

We are keen to explore potentials of collaboration with chemical industries and healthcare companies, to develop new research horizons.



Controlling supramolecular assemblies into nanometric structures on the basis of molecular recognition and self-assembly.

MEDICINAL CHEMISTRY

Dr. Yeong Keng Yoon, Ken
yeong.kengyoon@monash.edu

Senior Lecturer

Expertise

- Medicinal chemistry
- Drug design discovery
- Organic synthesis

My primary research interest is to develop small molecules as new treatments for age-related diseases, such as Alzheimer's and cancer. Synthesis of novel small molecules targeting infectious diseases is also of interest. Current research projects includes developing multi-target directed ligand inhibitors for Alzheimer's disease, sirtuin modulators for cancer therapy and novel fluorescent drug molecules with theranostic applications.

Numerous original research and review papers have been published in the area drug design and discovery, covering various diseases such as cancer, Alzheimer's, and tuberculosis. Previous works on novel anticancer compounds targeting sirtuins such as BZD9L1, have also been patented.

Research collaboration with internal and external parties such as University of Queensland, Kyoto Prefectural University, Institut de Recherche Biomédicale des Armées (IRBA), France, University of Northern British Columbia, University of Ankara among others are currently on-going. Any institution and industry keen to collaborate are welcome.

"Transforming chemicals to drugs" - Research focused on organic synthesis of small molecules with medicinal properties.

ANTI-INFECTIVE DRUG DISCOVERY

Dr. Ang Chee Wei
ang.cheewei@monash.edu

Research Fellow

Expertise

- Medicinal chemistry
- Drug discovery in infectious diseases
- Organic synthesis
- ADMET study

As a medicinal chemist, I am always interested in using my chemistry knowledge to find new cures to tackle diseases and extend human life expectancy. I have a strong interest in the field of infectious diseases, including drug-resistant bacterial infections (tuberculosis and ESKAPE pathogens) and neglected tropical diseases (human African trypanosomiasis, Chagas disease and leishmaniasis). My research focuses on the design and synthesis of small molecules to improve their biological profile and to understand their possible modes of action. I also utilise in silico techniques to generate compounds of interest and to predict their drug-like properties. To improve the likelihood of generating viable drug candidates, concept of 'property-based drug design' is incorporated by evaluating and optimising the physicochemical/ pharmacokinetic properties of potential hits. Besides small molecule synthesis, I have recently ventured into metal complexes and natural products as a source of antimicrobials.

Since drug discovery is a multidisciplinary and highly collaborative endeavour, I have been working closely with national and international scientists in microbiology, pharmacology, biochemistry and cell biology to find solutions to the threat of infectious diseases. New collaborations from both academia and pharmaceutical industry are welcomed.

We aim to address unmet medical needs in infectious diseases through medicinal chemistry approach

BIOACTIVE COMPOUNDS AND PEPTIDES

Dr. Chong Yie Kie

yiekie.chong@monash.edu

Research Fellow

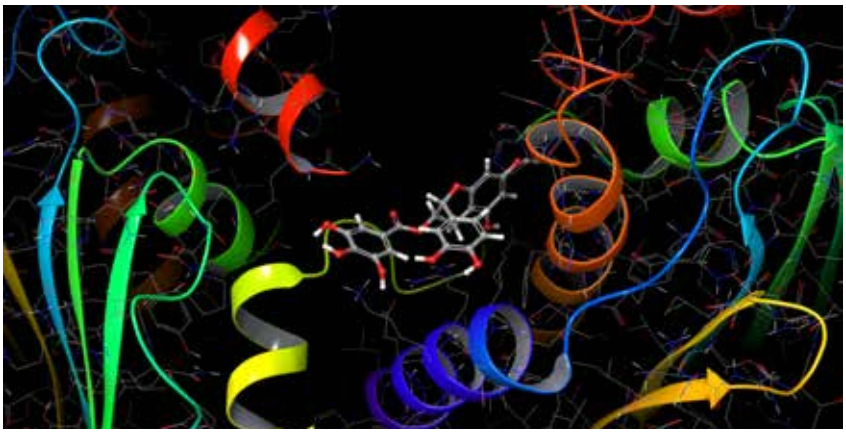
Expertise

- Medicinal chemistry
- Organic synthesis
- Peptide synthesis

The central focus of my research is to design novel antimicrobial agents for infectious disease and antibiotic resistance. I am interested to explore the chemistry and biology of small molecules, peptides and proteins to understand of its mode of actions. Our experimental approach combines the techniques of computational modelling via molecular in-silico molecular docking studies and short molecular dynamic simulations to identify the top ranked binding affinity of a structures or fragments toward the target proteins such as those involved in cell wall synthesis, DNA gyrase, cell division, quorum sensing and folate synthesis. With the aim to look into the possible pathways to inhibit or kill pathogens of interest.

My current investigations in our laboratory is to synthesis of hybrid compounds from cocoa waste extract for antibacterial agents. The best compounds that identify from computational study is hybridized with a small molecule from the antibacterial library in order to turn these structures into highly potent molecules when it is combined.

We welcome any collaborative projects from internal and external parties in areas related to any of our research interest.



The computational modelling and docking of 6M1J (DNA gyrase B ATP binding domain of Pseudomonas Aeruginosa) with epicatechin gallate.

Explore the chemistry and biology of small molecules and peptides with antimicrobial properties

FOOD AND PLANT SCIENCES

FOOD ENCAPSULATION AND PROCESSING

Dr. Siow Lee Fong
siow.lee.fong@monash.edu

Associate Professor and Head, Discipline of Food and Physical Sciences

Expertise

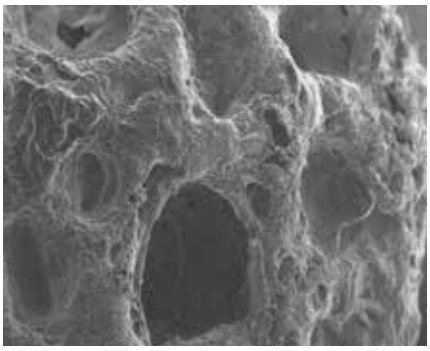
- Microencapsulation
- Fats thermal properties
- Freezing, drying technology
- Food product development

My research strength lies on understanding the thermal and physical properties of fats and oils. We develop cocoa butter alternatives from fats and oils for chocolate and chocolate coating used in confectionery, biscuit or frozen dessert applications. My current research works on sugar alternatives or sugar reduction in food products such as chocolates and ice cream. Our aim is to produce quality food.

My other research strength is on encapsulation and controlled release. Our research interest involves encapsulating bioactive compounds, determining their physicochemical properties and understanding the release kinetics in various food matrices, food model systems or *in vitro*. We use encapsulation techniques such as spray drying, complex coacervation, molecular inclusion and liposomes. Our aims is to protect the bioactive compounds from external environment and to improve their bioaccessibility and bioavailability.

My students have developed palm-based cocoa butter substitutes that can be used in compound chocolates. Both xanthone and catechin have also been successfully encapsulated to improve their bioaccessibility and bioavailability in food matrices. My research has led to a few publications in the area and capacity building of PhD, Master and Honours students.

I would like to work with food industries such as confectionery, frozen food and beverage industries in exploring cocoa butter substitutes or other fat substitutes and low sugar formulations. I am also keen to work with food and pharmaceutical industry to improve the bioaccessibility and bioavailability of bioactive compounds in various matrices for food or pharmaceutical applications.



Frozen matrices (top) and encapsulated catechin (bottom).

We partner with the industry to develop new food products that are safe, nutritious and wholesome.

UNLOCKING THE GENETIC POTENTIAL OF WEEDY RICE

My research mainly employs a combination of next-generation-based genome sequencing, enriched target sequencing and biochemical assays, for assessments of weedy rice ongoing evolution and population genetics.

By determination of quantitative trait loci (QTLs) underlying agronomic traits in weedy rice, this project aims to identify haplotypes that can be used for future rice breeding programs to eventually work towards strengthening productivity of rice farming in Malaysia.

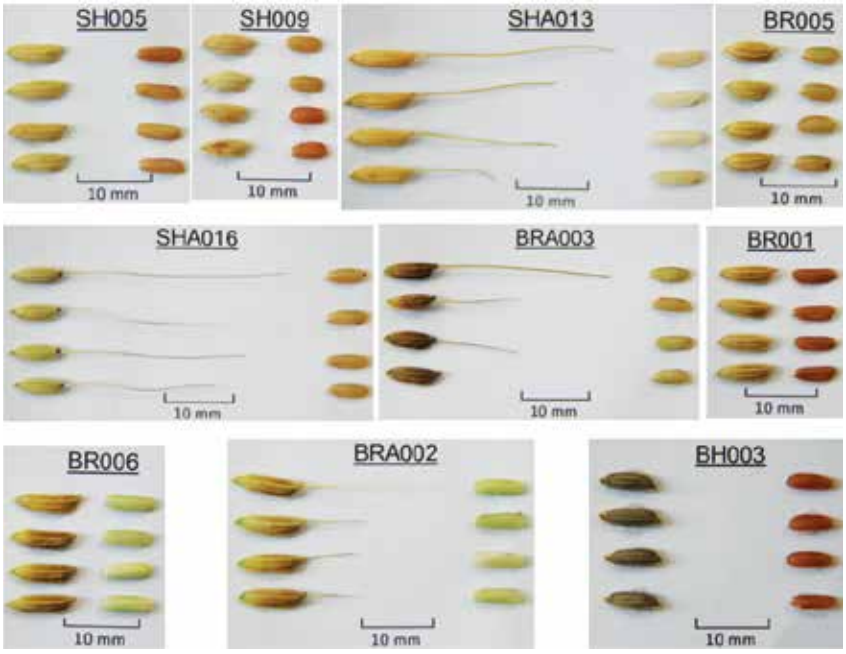
Dr. Song Beng Kah
song.beng.kah@monash.edu

Senior Lecturer

Expertise

- Weedy rice genetics
- Genomics and transcriptomics
- Plant genomics

Using a combination of whole genome sequencing, enriched target sequencing and biochemical assays, we are surveying weedy rice population structure and its ongoing evolution and origin.



Different types of weedy rice classified according to seed morphological features.

BIOACTIVE COMPOUNDS IN FOOD AND FOOD TECHNOLOGY

Dr. Choo Wee Sim
choo.wee.sim@monash.edu

Associate Professor

Expertise

- Foods bioactive compounds
- Phytochemicals
- Probiotics and prebiotics

My research strength is in the area of functional foods which are foods that potentially offer health benefits beyond basic nutrition. My research work focuses on extraction and application of bioactive compounds from food sources, phytochemicals, probiotics and prebiotics.

I am pioneering works on various bioactivities and applications of natural coloured pigments from plant sources, such as betalains and anthocyanins. Betalains contributes to red purple and orange yellow colour while anthocyanins contributes to orange, red, purple and blue colour in foods, such as fruits and vegetables. Bioactivities include antioxidant, antimicrobial, anti-biofilm, anti-infective etc.

I would like to work with industry on formulations and applications of natural bioactive compounds.

Various natural coloured pigments in plants.

Our group aims to extract and apply bioactive compounds from food sources to be used in various industries.

STRUCTURED FAT AND FUNCTIONAL FOODS

Dr. Thoo Yin Yin
thoo.yin.yin@monash.edu

Senior Lecturer

Expertise

- Antioxidant synergy
- Oxidative stability
- Structured materials
- Processing parameters optimization
- Micronutrients
- Food fortification

I am interested in alternative methods of preserving and processing food. My research focuses on the identification and development of alternative methods to provide consumer with healthier food choices as well as to fight food waste by innovative food packaging.

A central aim of my work is utilising oleogelation as an alternative processing method to structure lipid oil without generation of trans-fatty acids. The structured reduced fat spread (oleogel) resembled the texture of commercial spread products. This research utilises a variety of methodological approaches such as Fourier transform infrared (FTIR) spectroscopy, X-Ray diffraction (XRD) analysis, rheology analysis, texture analysis and Disc scanning calorimetry (DSC). My research team is currently exploring the use of oleogel as bioactive compounds delivery vehicle in food matrix.

Another primary area of my work is to develop edible or biodegradable food packaging film using food waste. Along these lines, my research team is investigating the use of food waste as barrier film to extend shelf life by reducing or eliminating oxygen and water vapour permeation.

I collaborate with a diverse group of colleagues across the University. On collaborative research teams, I specialise in product formulation, process optimisation, antioxidant synergy on oxidative stability and material chemistry.

We are utilising organogelation as an alternative processing method to structure lipid oil without generation of trans-fatty acids.

Microstructure of sorbitan monostearate in palm kernel oil based oleogel observed under polarised microscopy (Photo credit: Sheah Yee Ghan, PhD student).

FATS AND OILS MODIFICATION

Dr. Lee Yee Ying
lee.yeeying@monash.edu

Lecturer

Expertise

- Structured lipid
- Fats oil products
- Emulsion

Our research group works on the synthesis of structured lipids from different edible fat and oil sources.

We employed mild and environmentally friendly approach, using an enzyme to modify the structure of conventional fats and oils, to produce structured lipid. Through the modification process, we aim to enhance the functional and nutritional properties of fats and oils. Some of the structured lipids that we are interested in developing include: medium-and long-chain triacylglycerol, diacylglycerol, human milk fat substitute and cocoa butter substitute or equivalent.
Our group also study the substitution of structured lipid in the various food systems. We then evaluate the addition of structured lipids on the physicochemical properties of the fat-based products.

We have succeeded in synthesizing a type of healthful lipid called medium-and long-chain triacylglycerol from palm sources that is able to suppress body fat accumulation to manage obesity.

It is the goal of our research group to increase the nutritional value of the fat-based products without compromising its physical and chemical attributes through the incorporation of structured lipids. We hope that these fats-based products are able to manage certain health-related complications.

Our research group welcome any collaborative projects that work towards fats and oils analysis and development of healthier choice fats and oils- based food products.

Our group design and synthesize functional lipids for food and nutraceutical system.

GENOMICS AND BIOINFORMATICS

GENOMICS AND GENETICS FOR SUSTAINABILITY

Dr. Sadequr Rahman

sadequr.rahman@monash.edu

Professor of Plant Genetics and Director of Tropical Medicine and Biology Multidisciplinary Platform

Expertise

- Molecular biology
- Microbial genomics
- Grain quality

Investigation of organellar genomes: We investigate the genomes and methylomes of organelles for insights into phylogenetics and plant productivity. Our current focus includes rice chloroplasts, rice mitochondria and avian mitochondria.

Investigation of bacterial genomes: Our current research includes analyses of antimicrobial resistant bacteria and investigation of microbiomes from the soil, insects and the community in Segamat.

Investigation of eukaryotic genomes: We are engaged in the sequencing and analysis of nuclear genomes of species selected to answer questions in phylogenetics or plant productivity.

Research in the broad sweep of targets above would not be possible without the involvement and inputs of colleagues in the School, in Monash and beyond. We are particularly grateful to our colleagues in SEACO for enabling us to sample the community in Segamat.

Outputs from our work have provided the first evidence of variation in organellar methylation in rice, the extent of the spread of antimicrobial resistance in the community and detailed insights in to the natural history of crows!

We welcome collaborators from industry in areas related to any of our research interests.

Our research applies a combination of omics, molecular biology and biochemistry to answer questions about sustainability and relationships in the biosphere.

GENOMICS AND BIOINFORMATICS

Dr. Qasim Ayub
qasim.ayub@monash.edu

Professor,
Deputy Head of School (Research) and Director MUM Genomics Facility

My research interests are in human population and evolutionary genomics. I have expertise in current high throughput sequencing technologies, bioinformatics and immunology.
My research is focused on functional characterization of human adaptive variation and understanding genomic variations in iconic local species.
My group would like to understand the genetics of South East Asian populations in health and disease. Variants in genes associated with human host response to certain parasites and pathogens in Orang Asli populations in Malaysia are being identified from sequencing datasets and we aim to characterize their function in human induced pluripotent stem cell derived cells.

Our group also aims to support the Earth BioGenome Project, a world-wide effort that aims to characterize the genomes of all living eukaryotic species on earth, by launching the Malaysian BioGenome Project Consortium involving local expertise and stakeholders. Malaysia is a country that is rich in biodiversity and characterizing the genomic variation underlying this diversity will contribute towards global efforts at bio-conservation, improve our understanding of species diversity, train a core group of local specialists to lead such projects and develop local expertise in high throughput genomics and bioinformatics.

Potential areas for collaborative industrial research include targeted or whole genome sequencing and bioinformatics.

Expertise

- Human genomics
- Population genomics
- Evolutionary genomics
- Conservation genomics
- High throughput sequencing
- Bioinformatics
- Immunology

As part of an international collaborative effort the MUM Genomics Facility aims to characterize the biodiversity within Malaysia and train the next generation of research leaders.

BIOINFORMATICS – THE FUTURE OF SCIENCE ANALYSIS

Dr. Wee Wei Yee
wee.weiyee@monash.edu

Lecturer

Expertise

- Genomics and bioinformatics

My research strength will be my knowledge and skill in handing different kind of bioinformatics analysis. Bioinformatics is an interdisciplinary science involving biology, computer science, statistics, mathematics and engineering. I have been handling sequencing data and have lot of experiences in running whole genome, RNA-seq, exome and metagenomics analysis.

Bioinformatics is the knowledge about science of storing, retrieving and analyzing large amounts of biological data. As current biological data are being produced at a phenomenal rate, bioinformatics has become indispensable for biological research in order to handle the large amount of data and probe the complex dynamics observed in nature.

I can collaborate with any industries that deal with sequencing datasets and require bioinformatics expertise.

Our group is working toward bioinformatics analysis to facilitate biological research.

GENOMICS AND BIOINFORMATICS

Dr. Aswini Leela Loganathan
aswini.leela@monash.edu

Research Fellow

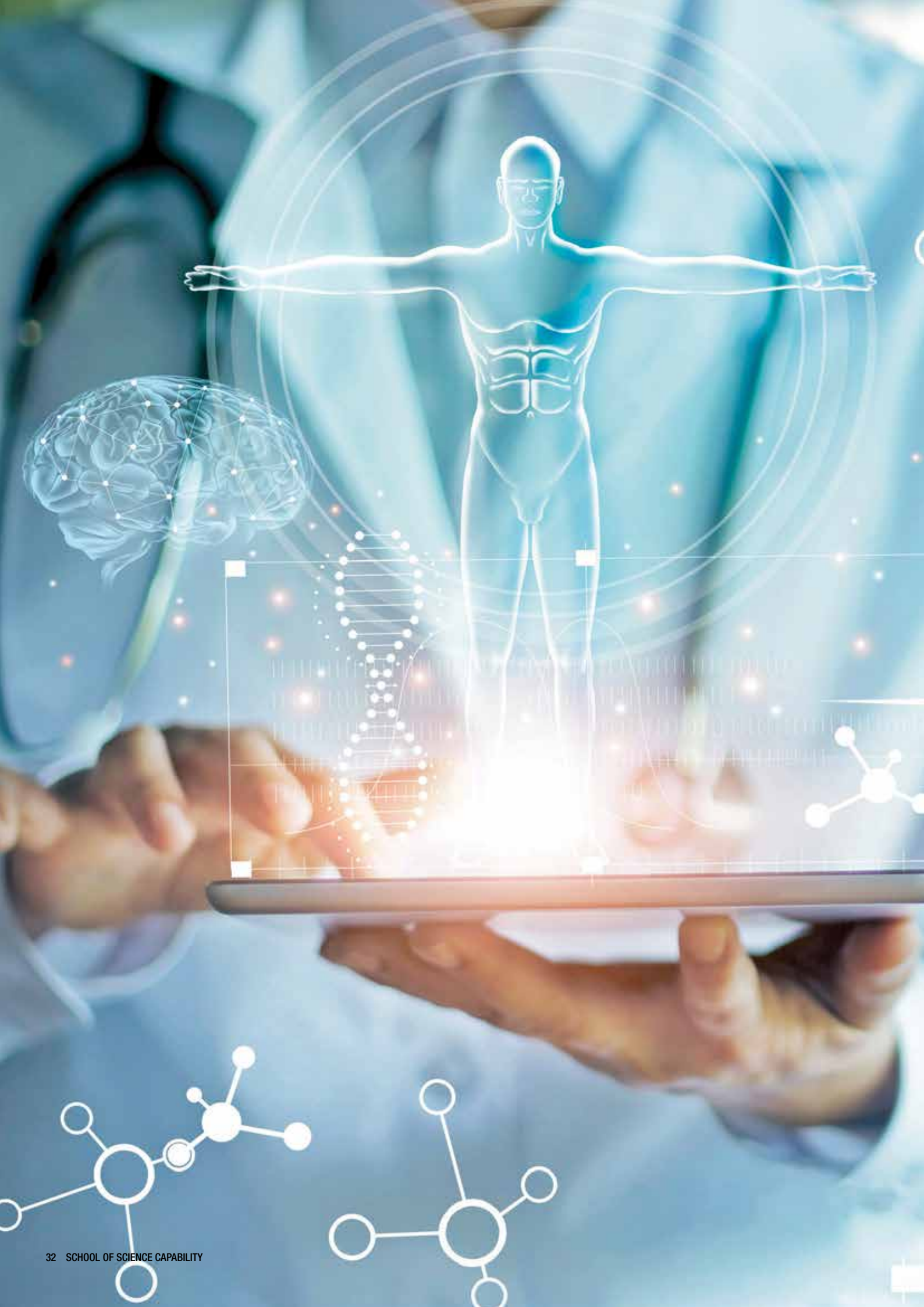
Expertise

- Conservation genomics
- High throughput sequencing
- Bioinformatics

My research is focused on generating high quality reference-genome assemblies using high-throughput sequencing technology. My aim is to draw attention on the conservation of endangered animals in Malaysia through Genomics and contribute towards global efforts at bio-conservation. MUMGF aims to support the Vertebrate Genomes Project (VGP), a project of the G10K Consortium, which aims to generate near error-free reference genome assemblies of ~70,000 extant vertebrate species. MUMGF also aims to support the Earth BioGenome Project, a world-wide effort that aims to characterize the genomes of all living eukaryotic species on earth, by launching the Malaysian BioGenome Project Consortium involving local expertise and stakeholders.

I am currently working on generating high quality reference-genome for sea horses and Irrawaddy dolphin. I am also responsible for generating a generalized bioinformatic pipeline that can be used for genome analysis. My current projects at Monash are carefully aligned to contribute towards the Vertebrate Genome Project (VGP) and the Malaysian BioGenome Project which is geared toward transferring knowledge and create an open and shared collection of genomic data. My research strength will be my expertise in current high throughput sequencing technologies and bioinformatics. I have experience in replicating the VGP assembly pipeline which is used to assemble the genome of the vertebrate species of interest.

Our team aims to expand MUMGFs collaboration with the Vertebrate Genome Project and contribute towards the Earth BioGenome Project and help train the next generation of leaders in the field of conservation genomics and bioinformatics.



HEALTH SCIENCES

IMMUNOTOXICOLOGY

Dr. Chow Sek Chuen

chow.sek.chuen@monash.edu

Professor of Biomedical Science and Head, Discipline of Medical Bioscience

Expertise

- Regulation of apoptosis
- T-lymphocyte biology
- Toxicology
- *Toxoplasma gondii*

Modulation of the immune system by xenobiotics. Disruption of immunity by xenobiotics is known to have profound effects on immune function. My interest lies mainly in the understanding of how xenobiotics modulate the immune system, particularly on T lymphocytes function. This knowledge will provide insights for development of new strategies for therapeutic intervention for some immunological disorders.

Mechanism and regulation of program cell death or apoptosis. Apoptosis plays a fundamental role in the normal development of lymphocytes, cytotoxic T lymphocyte and natural killer cell killing and maintenance of tissue homeostasis following immune responses. Because of this a number of diseases including most autoimmune diseases are the direct result of either immunosuppression, or hyperactivity of the immune system, caused by inappropriate or deregulated apoptosis. Understanding these processes can offer opportunities to advance our knowledge on the molecular basis of infection and diseases in the immune system.

Mechanism of death and extracellular survival of the apicomplexan parasite *T. gondii*. Identification of the death effectors involved in the parasite death pathway can be exploited for anti-parasitic drug development to combat and eliminate parasites that cause widespread infections.

Investigating how the immune system works will provide insights into how some immunological diseases arise and offer opportunities to understand the molecular basis of infection and diseases in the immune system.

PATHOGENIC MECHANISMS OF INFECTIOUS DISEASES

Molecular pathogenesis and epidemiology of periodontal disease. Periodontal disease is a multi-microbial disease caused by anaerobic bacteria such as *Actinobacillus actinomycetemcomitans* and *Porphyromonas gingivalis*. Our group was first to identify introns in *A. actinomycetemcomitans*, which may potentially play a role in the onset of periodontal disease. Our research additionally demonstrated the presence of a toxin gene in *P. gingivalis*, which may interfere with the repair of bone tissue damaged by other oral pathogenic bacteria.

Pathogenesis of *Clostridium difficile*. Another research focus of our lab is to understand the pathogenic mechanisms of pseudomembranous colitis caused by *Clostridium difficile*, which results in inflammatory disease of the colon.

Dr. Song Keang Peng

song.keang.peng@monash.edu

Associate Professor and Deputy Head of School (Education)

Expertise

- Periodontal disease epidemiology
- Molecular pathogenesis
- Bacterial disease
- Bacterial toxin regulation
- Molecular biology

Our group was the first to identify introns in *A. actinomy-cetemcomitans*, which may potentially play a role in the onset of periodontal disease.

GENE DELIVERY AND EXPRESSION IN HUMAN GENETIC DISEASE MODELS

Dr. Kumaran Narayanan

kumaran.narayanan@monash.edu

Associate Professor

Expertise

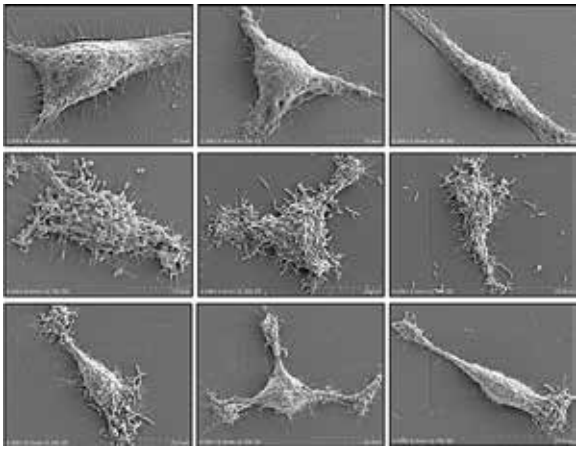
- Gene expression
- Artificial chromosome technology
- Fabry disease

Fabry disease. We are applying bioinformatics, genomics, and molecular biology approaches to obtain fundamental insights to develop intervention strategies for the storage defect of the glycosphingolipid globtriaosylceramide (Gb3) in lysosomes of affected cells.

***E. coli* vector for gene delivery into mammalian cells.**
This nonpathogenic strain has the capacity to deliver chromosome-sized genes into a wide-range of mammalian tissues to permit more accurate expression of a genetic locus. We are interested in understanding this vector's extracellular and intracellular behavior during the invasion process in order to improve its efficiency.

Artificial chromosomes. We are developing improved vectors that can exist as stable independent chromosomes to provide prolonged gene expression in cells. Our work is focused on adapting these vectors to better understand the requirements for long-term gene expression in human and animal cells.

Our group is keen to collaborate on industry projects, including research that seek to express, characterize, and purify proteins in bacterial and mammalian cells.



HeLa cells alone (top row). HeLa with E. coli/lipid complexes displaying diffused and polarized bacterial adherence patterns (middle and bottom rows, respectively) that lead to gene delivery by this vector.

Our lab has had a long-standing interest in developing improved approaches for gene delivery and expression in mammalian cells and applying them to human genetic models.

MOLECULAR AND CELL BIOLOGY OF CANCER

Dr. Lee Wai Leng

lee.wai.leng@monash.edu

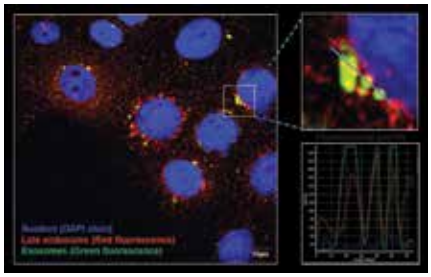
Senior Lecturer

Expertise

- Cancer cell biology
- Proteomics
- Ethnobotany

Among a variety of cell-derived vesicles, exosomes are microvesicles released from various cell types into the extracellular space for intercellular communication. Lately, these vesicles were found to play significant role in cancer development and have emerged as a novel source of non-invasive cancer biomarkers, given that cancer-specific molecules were identified in the exosomes isolated from biological fluids such as urine, saliva, blood and breast milk. In the past few years, we successfully set up the workflow for the study of exosomes from cancer cell culture and urine samples. The established exosome research platform was awarded several grants e.g. FRGS and Monash Strategic Large Grant and attracted collaboration from various institutes for the research on different diseases.

Our proteomic study discovered several exosomal proteins which can potentially be developed as the theranostic markers for the sensitivity of oral cancer patients to cisplatin treatment. This finding is important for development of personalized or precision medicine or theranostics aiming to tailor therapy with the best response and highest safety margin to ensure better patient care.

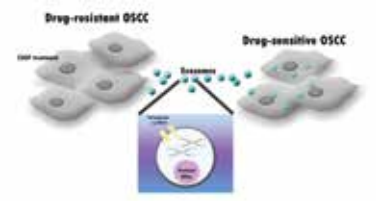


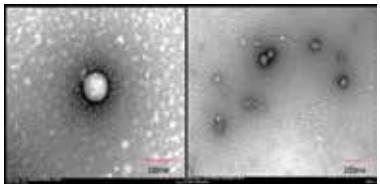
Confocal microscopy.

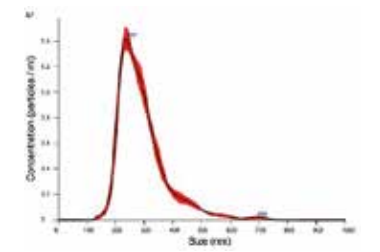
In our laboratory, the potential of exosomes in urine as a marker for detection of prostate cancer was also investigated. In collaboration with The Centre for Biospectroscopy, Monash University, Clayton and Urology Department of UM Medical Center, the exosomes from urines of prostate cancer patients were analyzed using FTIR. The resulting diagnostic classifier for prostate cancer in our pilot study achieved significant levels of sensitivity and specificity.

Together these findings represent a proof-of-concept for the use of exosomes as a test option to strengthen the decision-making of oncologist. However, the conventional method for exosome isolation using ultracentrifuge is time consuming and laborious. While, the current commercial kits for quick exosome isolation are pricy. Therefore, collaboration with industry manufacturing medical devices such as liquid biopsy chip for quick capture of exosomes from various body fluids would be advantageous for further development of exosome-based tests to be used for diagnostics and/or theranostics.

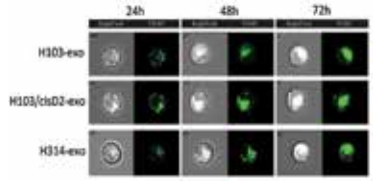
We study extracellular vesicles, including exosomes, for therapy and diagnosis of cancers.







TEM and Particle analysis.



Imaging flow cytometry.

ADVANCED PROTEIN TECHNOLOGY

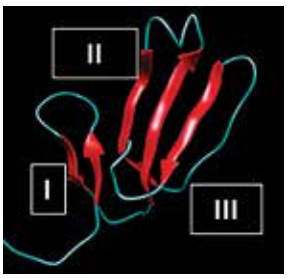
Dr. Michelle Yap
yap.michelle@monash.edu

Senior Lecturer

Expertise

- Venom toxin
- Protein technology
- Proteomics
- Venomics

Protein Technology and Proteomics. Proteomics unravel the complexity of proteins in the path of discovering bioactive proteins from nature and elucidating their potential pharmacological actions. Our group is interested in all aspects of heterologous protein expression, purification, structural and functional analysis of bioactive proteins.



The three-finger cytotoxin from cobra venom as determined from computational modelling. The β -pleated sheets are the main structures of this polypeptide.

Molecular mechanisms of venom toxin using computational and experimental approach. Our group is interested in investigating the dynamics of venom toxin using computational simulation and *in silico* docking analysis. This computational approach provides a better comprehension of the molecular basis of envenomation and pathogenesis.

Venomics. These approaches are toxins-targeted to identify venom toxins of poor immunogenicity and venom toxins for supplementing immunization to improve antivenom efficacy which contributes to the formulation of pan-regional antivenom to overcome regional antivenom crisis. At present, our research group has strong interest to study the role and molecular basis of cytotoxin in dermonecrosis. It is of our interests, to apply protein technology to the development of innovative immunotherapeutics. This well addresses the World Health Organization (WHO) global strategies in combating envenomation as Category A Neglected Tropical Diseases and it is also well aligned with UN Sustainable Development Goals 3.3 and 3.8.

We accept consultancy project from industry, if you have interests in our research, please contact us. Industrial stakeholders are welcomed to initiate discussion with us.

Advanced protein technology (including computational biology) have been powerful tools to unravel the complexity of proteins in the path of discovering bioactive proteins and elucidating their pharmacological actions.

VIRAL IMMUNOLOGY AND AUTOIMMUNITY

Dr. Ng Chen Seng

ng.chenseng@monash.edu

Senior Lecturer

Expertise

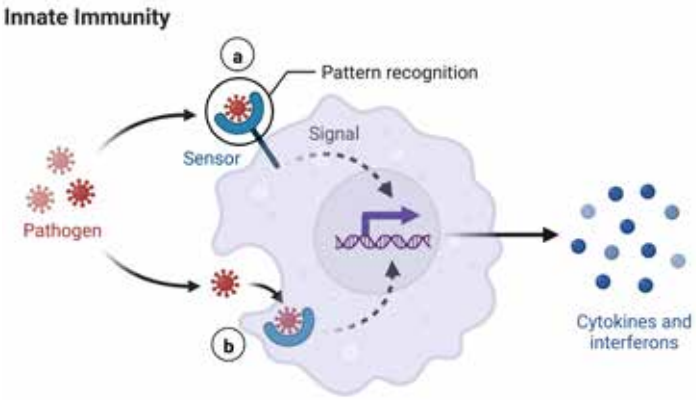
- Innate immunity
- Autoimmune
- Virology

Regulation of nucleic acid sensors in host innate immunity

A common theme in pathogen defense is the recognition of nucleic acids. Most pathogens expose some type of nucleic acid or degradation products thereof at some point during their life cycle (e.g. genomic DNA/RNA or RNA transcripts). To this effect, the host has evolved a number of pathogen recognition receptors that are specialized to sense certain components of non-self-DNAs or RNAs. Using various complementary approaches, our research team are currently trying to understand their molecular mechanisms of activation and we aim at deciphering their functional roles at the cellular and organismic level in health and disease.

Conflicts between viruses and host restriction factors

Restriction factors are proteins of the innate immune system that inhibit the replication of viruses during their life cycle in host cells. These host proteins are dedicated antiviral factors that are often induced by the innate immune response. They are antagonized by viral factors and are rapidly evolving. My team are interested in understanding how viral factors antagonize host immunity.



We are trying to understand what mechanisms are employed by the innate immune system to distinguish self from non-self or harmless from dangerous, respectively, as well as how viruses evolve to bypass host defense system.

QUANTITATIVE RESEARCH IN DIFFERENT DISCIPLINES OF STATISTICS

Dr. Md Zobaer Hasan
mdzobaer.hasan@monash.edu

Lecturer

Expertise

- Applied statistics
- Biostatistics
- Financial statistics
- Public health

I have completed my Ph.D. in Financial Statistics and I want to establish a sound quantitative research in different disciplines of statistics, mainly in the discipline of applied statistics and biostatistics.

During my Ph.D., I focused my research on the Dhaka Stock Exchange (DSE) market of Bangladesh and published my papers in some high impact journals as well as attended some renowned international conferences. After that, I have started to do research on Malaysian stock market as well as the stock markets in developing countries. Currently, I am engaging myself in some public health and biostatistics related research works which will be analyzed using statistical tools.

I would like to work with the following topics: A statistical approach to identify the key risk factors of child malnutrition in Selangor State.

A cross-sectional study of tobacco consumption and its association with education among the university students in Malaysia.

A statistical analysis of multi-drug resistant *Escherichia coli* isolated from drinking water samples in Selangor, Malaysia.

Our research focuses on quantitative research in the discipline of applied statistics and biostatistics.

ANTIMICROBIAL RESISTANCE AND MOLECULAR MICROBIOLOGY

Dr. Tan Hock Siew, Patrick

tan.hocksiew@monash.edu

Lecturer

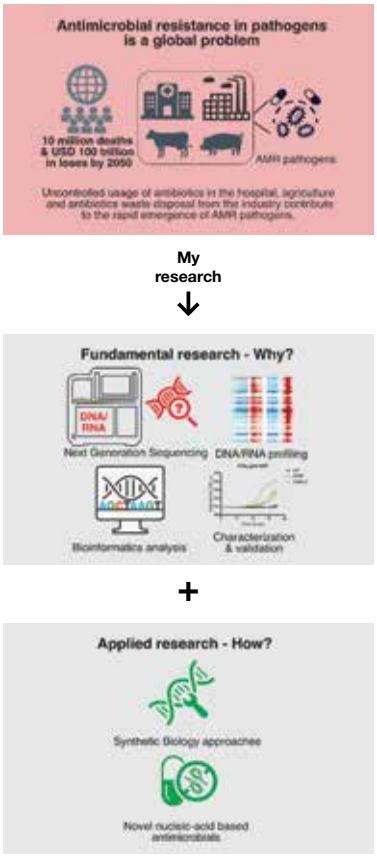
Expertise

- Antimicrobial resistance
- Molecular microbiology
- Synthetic biology

My research expertise focuses on antimicrobial resistance (AMR) of pathogens and the molecular biology of bacteria. The rapid spread of resistance inevitably leads to the shorter clinical lifespan of antibiotics. I am interested to characterize novel regulatory mechanisms that contribute to AMR in clinically relevant pathogens particularly Enterobacteria. My lab studies the spread of AMR genes and pathogens in the environment as well as human populations. We aim to utilize this information to combat AMR pathogens and employ Synthetic Biology approaches to explore the potential to develop nucleic acids as an alternative antimicrobial agent.

In order to develop suitable countermeasures, it is important to understand the dynamics of antimicrobial resistance. The knowledge gained from these research projects may serve as an impetus for the development of new antimicrobial targets or agents in AMR pathogens. My lab strives to develop new approaches to achieve the ultimate goal of producing “evolution proof” antimicrobials. In-line with the Malaysian Action Plan on Antimicrobial Resistance (MyAP-AMR) policy, my research projects aim to strengthen the knowledge of AMR through fundamental and applied researches.

I am interested in consultancy work with the industry or any government body to monitor the prevalence of AMR genes or other bacteria NGS-related projects. I am also keen to collaborate with the pharmaceutical industry to develop nucleic-acid-based antimicrobials or its derivatives.



Combination of fundamental and applied research to address antimicrobial resistance in pathogens.

My lab studies the mechanism and prevalence of antimicrobial resistance in pathogens as well as developing novel nucleic-acid based antimicrobials.

ACTINOBACTERIA IN COMMUNICABLE AND NON-COMMUNICABLE DISEASES

Dr. Adzzie Shazleen Azman
adzzieshazleen.azman@monash.edu

Lecturer

Expertise

- Bacteriology
- Infectious diseases
- Anti-Infectives
- Actinobacteria

Do you like the earthy smell which rises after a light rain? Have you wondered what causes that smell? Well, the earthy smell contains a compound called geosmin, produced by the largest genus Actinobacteria, known as *Streptomyces*.

Actinobacteria produce most of the clinically used antibiotics and a plethora of other natural products with higher pharmacological and commercial interest. Therefore, my primary research interest is to investigate the potential bioactivities and mechanisms of selected compounds from Actinobacteria for prevention, control, and treatment of communicable and non-communicable diseases.

Anti-infectives and its mechanism
The rise and spread of drug resistance had pose new challenges for researchers to discover newer and novel antibiotics that are effective against these drug-resistant microorganisms. Several research projects that I'm focusing now includes investigating selected compounds from Actinobacteria as potential antiviral agents against influenza A (IAV), studying the effect of these compounds on dengue and chikungunya virus replication in *Aedes aegypti*, and screening for their antibacterial activities against nosocomial pathogens.

Insecticidal effect and its mechanism
Mosquitoes are responsible for the transmission of many medically important viruses, which cause serious mosquito-borne diseases such as dengue, zika fever and chikungunya. However, the loss of efficacy of insecticides hinders the control of mosquito-borne diseases and had caused increased disease transmissions. Currently, my research group is interested in identifying the insecticidal mechanism of selected compound from Actinobacteria isolated from forest soil and to develop a novel and environmentally friendly mosquitocides.

Neuroprotective agents
Chronic neurodegenerative diseases which include Alzheimer's disease and Parkinson's disease are characterized by excessive neuronal cell death. Due to limitations of drugs to prevent or cure neurodegenerative disorders, my research group is currently interested to identify the potential neuroprotective agents/compounds from Actinobacteria using in silico, in vitro and in vivo approaches.

Let's explore the world of Actinobacteria and discover their potential use in communicable and non-communicable diseases for a better health and world.

ETHNOPHARMA-COLOGY AND EXPERIMENTAL THERAPEUTICS

Dr. Tan Ji Wei
tan.jiwei@monash.edu

Lecturer

Expertise

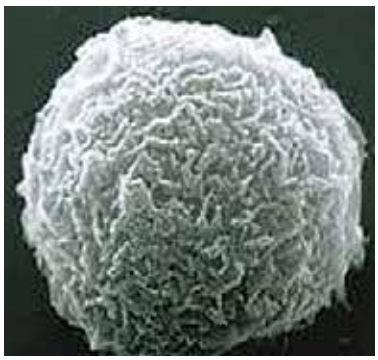
- Anti-inflammation
- Allergy
- Ethnopharmacology
- Molecular signaling pathways

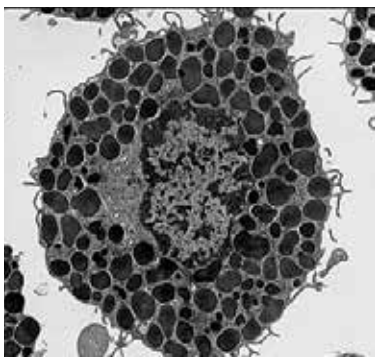
Cellular and molecular signalling is a complex ballet of molecules interacting and stimulating surrounding proteins, lipids, and ions, resulting in cytoskeletal reorganization, modulation of differentiation, and induction of gene expression. The choreography of events in signalling pathways has been a hot topic in the past few years. Our research focus is to explore how a potential therapeutic compound exerts its beneficial effects within a cell by unfolding its role within the complex signalling pathways of a cell.

Over the years, human population have suffered from various diseases as our world progress through evolution of societies, cultures and technologies. These diseases for example allergy, Alzheimer's disease, and cancer have cost millions of lives and money lost every year. Sadly, current modern medicine is mostly palliative by easing the severity of a pain or a disease without removing the cause. Therefore, researches have started to look for other alternatives to combat these diseases. Medicinal plants are gaining renowned interest in scientific communities nowadays due to their reliable pharmacological actions and affordability for common people which makes them effective in control of various diseases. We hope that our research output may contribute significantly in expanding the therapeutic properties of natural products against human diseases, particularly allergic inflammation and neurodegenerative diseases.

We welcome any potential industrial parties that are interested to collaborate with us in expanding the capability of natural resources in promoting human health.

With Malaysia's rich and diverse natural resources, our research focuses on discovering potential phytochemicals against human diseases, and to unfold their capabilities within the cell.





Mast cell, the key player in triggering an allergic reaction (Pictures taken by scanning and transmission electron microscopy).

TROPICAL AND ENVIRONMENTAL BIOLOGY

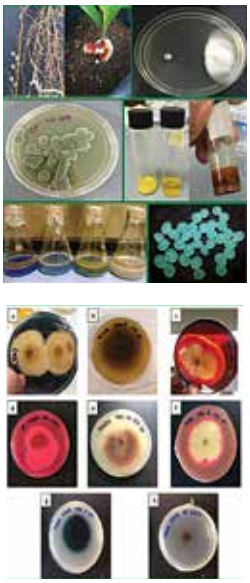
CROP IMPROVEMENT, BIOCONTROL AND BIOREMEDIATION

Dr. Adeline Ting
adeline.ting@monash.edu

Professor and Head, Discipline of Biological Sciences

Expertise

- Applied microbiology
- Plant health
- Crop protection
- Bioremediation
- Biodegradation
- Bio-sourcing valuable compounds
- Microbial derivatives



Harnessing microbes and their compounds as green solutions for various applications.

Our research group finds solutions "from the environment, for the environment", using the best possible approach that is effective, environment-friendly, renewable and sustainable. We use microbes and their natural compounds to mitigate pressing environmental and agricultural issues, providing "green solutions". We work with microbes for development as biofungicides, biofertilizers, bioremediation agents, and biofactories of important valuable compounds.

Our research contributes to the sustainable approaches in managing the environment, agricultural crops and in biosynthesizing of valuable compounds. Microbes are used to remove toxic metal and dye pollutants, to remediate the environment. They are also used for the control of plant diseases and to improve plant growth, in place of synthetic chemicals and fertilizers. Microbes are also sourced as biofactories to produce valuable enzymes and compounds with antitumour, antioxidant and antimicrobial properties.

We welcome any collaboration that would expand our skills in applied microbiology. We strive in working towards discovering green solutions to combat crop diseases, improve crop growth, removal of toxic pollutants, waste management, and in sourcing for novel compounds with pharmaceutical value.

We explore and harness various bacteria and fungi for use as biocontrol or bioremediative agents.

MICROALGAE FOR NUTRACEUTICALS, CARBON CAPTURE AND BIOREMEDIATION

Dr. Foo Su Chern

foo.suchern@monash.edu

Lecturer

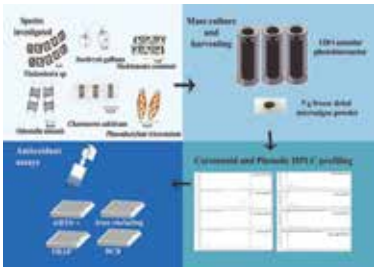
Expertise

- Bioprospecting tropical microalgae
- Bioactive extraction
- Bio-evaluation assays
- Microalgae metagenomics
- Microalgae life cycle
- Photo-bioreactor design
- Green extraction
- Economical harvesting techniques

My research strength includes bioprospecting for secondary metabolites from marine sources, in particular the marine and freshwater microalgae. This endeavour includes isolation, screening (growth rate, total carotenoids, total phenolics), mass culture in photobioreactors, extraction, bioactivities evaluation (antioxidant and anti-cancer) and microencapsulation to protect carotenoids. Besides, my expertise include harmful algal bloom and control with the use of flow cytometry to investigate oxidative stress in *Microcystis aeruginosa* cells.
My current research interest aims to further understand the life cycle of microalgae and their ecological role. As microalgae have fast growth rate and do not compete with land to grow, it can be a potential source of sustainable biomass for diverse applications e.g. bioactive ingredients for food and cosmetics, bioremediation, biofuel and even bioplastics.

One of the significant outputs of my past research was applying simultaneous extraction of carotenoids and phenolic acids for maximal recovery from microalgae biomass. This not only reduced the extraction time, but also saved operating cost. Presently, I aim to document under-discovered tropical microalgae species in Malaysia whilst revealing their benefits to humans. In time, this will enable the promotion of microalgae biomass as one of Malaysia's next generation sustainable biomass source for a low carbon and circular economy.

I look forward to collaboration opportunities with industrial stakeholders, policy makers, NGOs or government agencies. This can come in the form of consultation, services or project collaborations for e.g. sustainability related projects like carbon capture, water conservation, incorporation of bioactives as functional food or feed. At present, I have existing collaboration ties as an educational consultant for the New Sarawak Museum and external examiner for a Master's degree in Sustainability.



Microalgae selection process.

Join my research team in discovering the potentials of microalgae for a sustainable future.

BIODIVERSITY HERITAGE, SPECIES DISCOVERY AND CONSERVATION OF THREATENED TAXA

Dr. Wan Faridah Akmal Jusoh
wanf.ajusoh@monash.edu

Senior Lecturer

Expertise

- Integrative taxonomy and systematics of fireflies
- Digitisation and archival of biodiversity heritage data
- Ecology and conservation of tropical biodiversity
- Conservation assessment of threatened taxa

Biodiversity is our natural heritage. When we do not know what we had in the past, we cannot tell what we have lost now or what we might lose in the future.

I conduct research at the intersection of biodiversity research and historical natural heritage - from studying flashing fireflies to reconstructing timelines of how ecosystems have evolved. I aim to develop a robust taxonomy and a comprehensive species database using combined approaches from field, laboratory, museum, library and archives.

Integrative taxonomy and systematics of fireflies
Firefly beetles (Coleoptera: Lampyridae) comprise over 2000 species globally. The subfamily Luciolinae—all of which are exclusively flashing fireflies—represents a diverse subfamily distributed across Europe, Africa, Asia, Australia, and the Pacific islands. Together with my collaborators, I seek to explore the systematics of fireflies and other bioluminescent beetles of SE Asia and the Australopacific region. We use a broad range of analyses derived from morphological and molecular data, behaviour, and ecology, culminating in taxonomic revisions.

Species as history – towards making the digitised historical and type specimen data accessible
Every creature has a story. I am keen on developing and mobilising species-based digital data from museum collections, particularly material collected from SE Asia held in former colonial museums. In collaboration with historians and museum curators, I explore the history of collections, collectors and taxonomists to digitally 'repatriate' original specimens (historical and type specimens) collected from Singapore, Malaysia and other countries in SE Asia.

Global and national assessments of fireflies
I am currently working with International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC) – Firefly Specialist Group to assess the conservation status of fireflies in SE Asia. I am also a contributor to the assessment of fireflies' conservation status for Singapore's Red Data Book 3rd edition.

What is your species' story? I welcome any potential institution, NGOs, industries and individuals interested in collaborating with my research lab to accelerate research efforts into understanding biodiversity from the past, present and future.

PLANT AND SOIL HEALTH IMPROVEMENT

Dr. Pooja Singh

pooja.singh@monash.edu

Research Fellow

Expertise

- Plant stress
- Plant-microbe interaction
- Applied microbiology

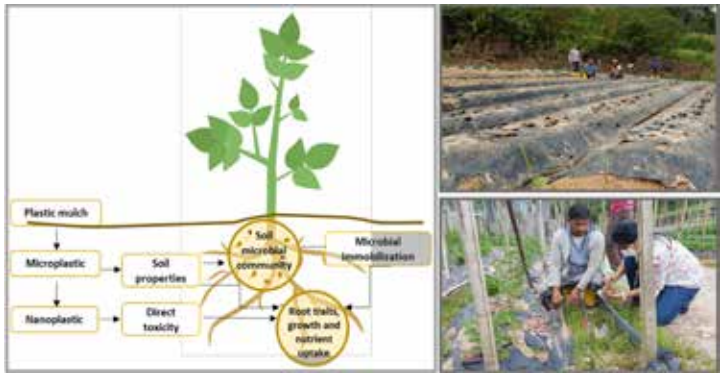
Improving soil properties on plastic mulched agricultural soil

Improper removal of plastic mulches after use generates tones of plastic waste which get buried in the soil and damages soil properties, microbiome and disrupts plant's cellular function. My research is to evaluate the impact of plastic mulching in agricultural soil and plant health, to understand the biodegradation process of plastic mulches and to develop a low-cost microbial consortium to improve the soil properties in heavy plastic mulched areas.

Abiotic and biotic stress in plants

My research interest is also focused on understanding the dynamics of plant diseases caused by soil borne pathogens and abiotic stresses such as salinity in monocot plants. Genomics, proteomics and transcriptomics approach is utilized to explore the control measures.
I focus on translational research and strongly believe to take my findings from 'lab to land'. I sincerely welcome potential collaborations from agriculturists, farmers, industries and scientists.

My research interest is to explore different stress-related factors which affect plant growth and soil microbiota.



Impact of plastic mulching on plant and soil health

METABOLOMIC STUDIES OF THE OIL PALM-GANODERMA INTERACTION

Dr. Krystle Angelique A. Santiago
krystle.santiago1@monash.edu

Research Fellow

Expertise

- Applied mycology
- Natural products

My research interest focuses on the identification of fungal biomarkers, particularly of the fungus *Ganoderma boninense*, to understand the nature of the basal stem rot (BSR) disease in oil palm. My work involves a metabolomics approach to analyze the chemical and biological interactions between the fungus and its host plant. In order to develop an effective strategy of reducing, and hopefully eliminating, BSR disease, it is necessary to understand the metabolites involved before, during and after the exposure of oil palm to the pathogen. Since Malaysia is considered as a giant oil palm producer worldwide, studying the major players involved in the most destructive and devastating problem in oil palm plantations is relevant.

I collaborate with the Advanced Agriecological Research Sdn. Bhd. (AAR) to explore the metabolomic profiles of oil palm-*Ganoderma* interactions. The outcomes of this project will provide an in-depth understanding of the nature and control of BSR disease and physiology of *Ganoderma boninense*. New preventive measures can then be implemented to ensure improved crop quality and yield, which would save cost and time in the long run.

We use a high-throughput method for the improvement of the Malaysian oil palm industry.

MONASH University

MALAYSIA

RESEARCH CONTACTS

Professor Emily Goh
Head of School
T +603 5514 6108
E goh.joo.kheng@monash.edu

Professor Qasim Ayub
Deputy Head of School (Research)
T +603 5514 6106
E qasim.ayub@monash.edu

Dr Tan Wooi Boon
Research Manager
T +603 5514 6121
E tan.wooiboon@monash.edu

monash.edu.my

monashmalaysia

School of Science
Monash University Malaysia
Jalan Lagoon Selatan
47500 Bandar Sunway
Selangor Darul Ehsan
Malaysia

Produced by School of Science,
Monash University Malaysia
DULN002(B)

Co. No. 458601-U
(Date of establishment: 20 March 2000)