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MALAYSIA

KNOWLEDGE AND PRACTICES OF MEDICATION USAGE, STORAGE AND DISPOSAL AMONG OUTPATIENTS IN A MALAYSIAN TEACHING HOSPITAL: A QUALITATIVE STUDY.

(ABSTRACT ID: OP-CP-01)

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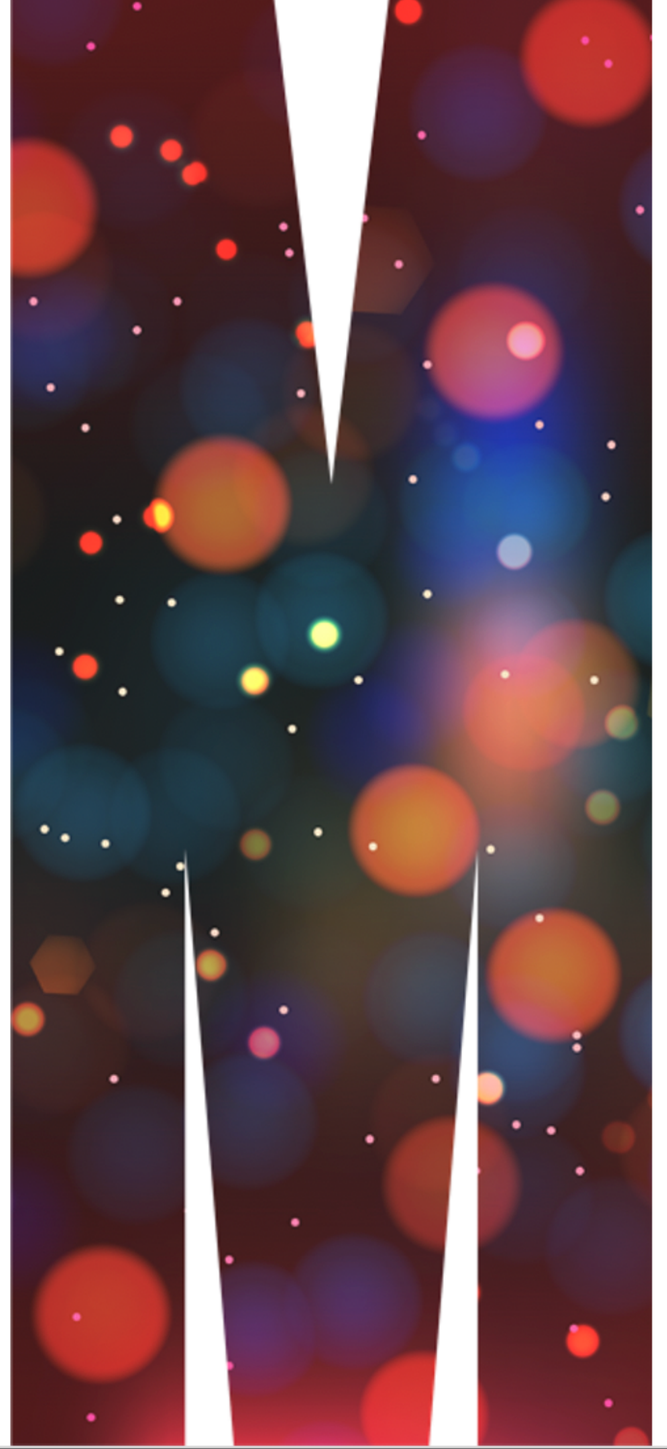

INTRODUCTION AND BACKGROUND

- Most preferred place to store medications (Pankajkumar et al., 2016):

Bathroom

Bedroom

Kitchen

- Method of medication disposal:

Throwing into the dustbin

Flushing into the toilet bowl

Return to the pharmacy

(AlAzmi et al., 2017; Kassahum & Tesfaye, 2020)

(AlAzmi et al., 2017)

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INTRODUCTION AND BACKGROUND (CONT'D)

- Effect
  - Hinder sustainable development goals (United Nations, 2016)

  - Health
    - Poor health outcomes (Gebremariam et al., 2019)
    - Adverse drug reactions (Koopaie & Abdollahi, 2017)
  - Economy
    - Medication wastage/ financial burden (About-Auda, 2003)
  - Environment
    - Water pollution (Muhammad, 2014)

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OBJECTIVES

- To explore the experiences, challenges, and reflections regarding factors affecting the management of medication usage, storage and disposal among the outpatients at a teaching hospital in Malaysia.

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METHODOLOGY

Study Design	One-on-one interview, phenomenology
Sampling Method	Convenience sampling
Sampling Size	20 participants
Inclusion criteria	Patients or caregivers of patients who were males and females, aged above 18 years old, returned unused medications to the outpatient pharmacy at a teaching hospital, Sultan Ahmad Shah Medical Centre (SASMEC) @IIUM, and understand English or Malay languages.
Exclusion criteria	Patients or caregivers under 18 years old, did not consent/withdraw from the study, cannot communicate well
Study Setting	Outpatient pharmacy in SASMEC @IIUM

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OVERVIEW OF INTERVIEW

INTERVIEW DATA COLLECTION

- 20 participants were interviewed
- The interview with the participants was mostly conducted at the counselling room of the outpatient pharmacy at SASMEC @IIUM
- Due to movement control order (MCO), telephone interviews had to be conducted for 17 patients
- Audio recording were then transcribed
- Important concepts in individuals transcripts were identified
- Common themes in all transcript were identified
- Transcripts were compared to each other to observe similarities and differences in answers

GENERAL GUIDE INTERVIEW

GENERAL INTERVIEW GUIDE: SEMI-STRUCTURED INTERVIEW

Study title: Qualitative Exploration on Medication Storage and Disposal practices among Outpatients as SASMEC @IIUM.

Study Objectives:

1. To investigate the experiences, challenges and reflection perceived by patients at SASMEC @IIUM regarding medication storage and disposal.
2. To explore the perceptions on effectiveness of current approaches and methods addressing good medication storage and disposal practices.
3. To identify the gaps, barriers and challenges in the strategies to improve practices medication storage and disposal.

The semi-structured interview was aimed to answer the study objectives. The semi-structured interview guide had the following domains:

Table 1: Semi-structured interview guide

1.	Demographic data	Gender, age, ethnicity, level of education, occupation, living status and monthly household income
2.	Perception towards medicine labelling	1. How was your experience when you are supplied with medicines? What types of medicines did you take? Could you please give the names of your medications? When travelling, did you remove the medications from the packaging for your convenience?

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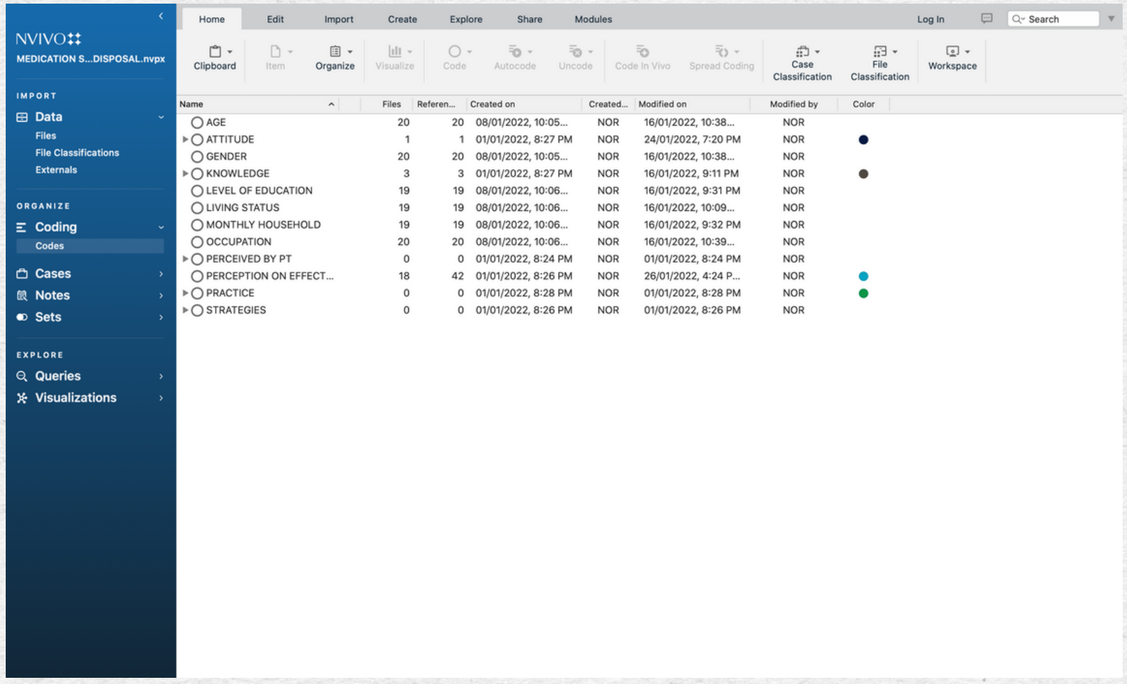
OVERVIEW OF INTERVIEW (CONT'D)

CODES (N VIVO SOFTWARE)



General backgrounds	Knowledge, Attitude and Practice on Medication Storage and Disposal	Challenges of medication storage and disposal	Experience of medication storage and disposal	Reflection towards medication storage and disposal	Perception of effectiveness of current method	Suggestion to improve practice of medication storage and disposal
Age Level of education Living status Occupation Monthly household	Attitude Knowledge Practice	Challenges to have good practice on medication storage and disposal	Method regarding medicines stored and disposed at home	Reflection towards good practice Perception towards own opinion	Barriers of current strategies Challenges of current strategies Gaps of current Perception regarding Current methods	Suggestions of new strategies

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OVERVIEW OF INTERVIEW (CONT'D)

COMMON THEMES

- Incomplete labelling and instruction
  - "we rarely see the expiry date especially if the medications were filled in the plastic envelope. We do not know what is the expiry date" (P12)
- Sceptism about returning unused medications
  - "..for some of people, they feel shy to return the medication" (P7)
- Lack of knowledge with varying practices for usage, storage and disposal
  - "I would not throw away the medication's packaging so that I can refer the fine printed label on the bottles... I will keep medications for future use" (P6)

RESULTS

- Patients stored their medications in random places such as::
  - cabinet
  - desk drawer
  - plastic container
  - cupboard
  - unused insulin were kept outside the fridge

- Participants disposed their medications through various ways such as:
  - throwing into rubbish bin
  - flushing into the toilet bowl
  - burying under the ground
  - little of them returned to pharmacy

RESULTS (CONT'D)

- Participants had expressed aspects that they encountered about returning unused/expired medications:
  - Incomplete labelling and instruction
  - Lack assesibility to return unused medications

- Participants had expressed that they have:
  - Sceptism about returning unused medications
  - Poor knowledge and practice on medication storage and disposal
  - Shared or reused the medications

- Participants agreed that:
  - Pharmacist needs to play role in improving medication literacy
  - Needs of educational programmes/campaigns
  - Information on medication price is needed

DISCUSSION

- Patients did not know regarding correct medication disposal & not aware of the service provided.
  - 90%< of patients never had any information on medication disposal or heard of the drug take back programme (Modasiya & Patel, 2012; AlAzmi et al., 2017).
  - Suggestions to improve public literacy included such information on medication labels (Atinafu et al., 2014).
- Many respondents in the present study were elderly, and some were illiterate or visually impaired.
  - People with age-related factors may require different approaches (Zhi-Han et al., 2017).
- Patients did not return the medications since there were no known benefits & they thought disposal in the landfill was the correct method.
  - It reflected the lack of disseminated information regarding the pollution caused by poor practices
- Challenges to returning medication including difficulty travelling.
  - The hindrances to partake in the programme including lack of accessibility; lack of transportation (Kearney et al., 2019).
  - 50%< unwilling to take part in 'Take-back´ programme (TBP) as they needed to drive far away (Stoddard et al., 2017).

DISCUSSION (CONT'D)

- The grounds for storing medication depend on the frequency of administration, visual reminders, & the patient's daily routines (Mishra & Bhattacharjya; 2011; Vlieland et al., 2019)
    - They tend to choose places that were appropriate for them (Faisal et al., 2022).

- All healthcare professionals should provide patients with adequate knowledge about medication management (Naser et al., 2021).
    - Electronic media such as radio as primary source is recommended (Zhi-Han et al., 2017).
    - In Sweden, there is advice to keep unused medications in a special bag (Gupta et al., 2021).

- Patients perceived that the medication price information can improve practices among the public.

    - In the UK, displaying medication costs was a strategy to mitigate medication wastage (Yemm et al., 2017).

TRUSTWORTHINESS

- Researcher received research training at International Islamic University Malaysia (IIUM).
- Licoln and Guba's principled was applied (Lincoln & Guba, 1986) to achieve:
  - Credibility
  - Transferability
  - Dependability
  - Confirmability

- Member checking
  - The codes, categories and themes were discussed through team discussions.
  - Realistic considerations and the purpose of the analysis were discussed with the team to achieve mutual agreement

CONCLUSION

- To further understand the reasons of the practice at patient level, a qualitative study had found that it was related to:
  - Poor knowledge, awareness and practice regarding good medication disposal and storage
  - Lack accessibility to return the unused medications
- It is important to note that patients did not practice correct medication disposal nor utilise the Medication Return Programme despite knowing it owing to limited time & resources.
- Further studies may investigate on the factors of medication management, storage and disposal quantitatively

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THANK YOU!

QUESTIONS OR COMMENTS?

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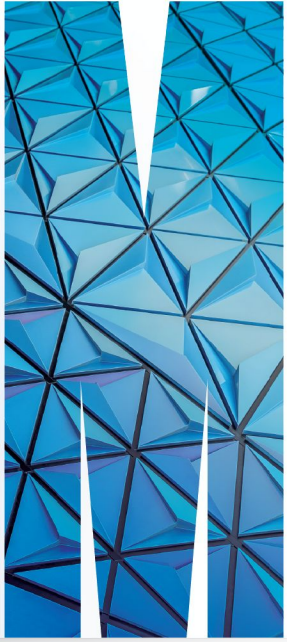

Certificate of Participation

This certificate is awarded to

Nor Akilah Binti Jamalud-din

from International Islamic University Malaysia

for the oral presentation entitled ***"Knowledge and Practices of Medication Usage, Storage and Disposal Among Outpatients in a Malaysian Teaching Hospital: A Qualitative Study"*** at **MONASH INITIATE 2022,** Monash International Health Science & Technology Conference

on 27th - 28th September 2022

Professor Gan Siew Hua

Head of School, School of Pharmacy

Monash University Malaysia

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MPS-CPD: 6 POINTS | **MMA-CPD:** 16 POINTS | **MBOT-CPD:** 6 POINTS | **RSB-CPD:** 42 CREDITS

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MALAYSIA

MONASH INITIATE 2022

Bench to Bedside: Future proofing healthcare with research and technology

27 & 28 September 2022

WELCOME MESSAGE

PRESIDENT AND PRO VICE-CHANCELLOR (INTERIM)

On behalf of Monash University Malaysia, I would like to extend the warmest welcome to all participants of the Inaugural Monash International Health Science and Technology Conference (Monash Initiate 2022).

The theme of the conference is “Bench to Bedside: Future-proofing Healthcare with Research and Technology”, highlighting the rapid technological and scientific advances in this domain. By sharing and learning from one another, we can further accelerate this field of science. We will do this by socialising the work done by those on every step of the career continuum - from those just starting out to the very senior.

I would like to take this opportunity to thank the organising committee for their dedication to making this conference possible. Their commitment, enthusiasm and passion has seen them go the extra mile in putting together such a stimulating conference amidst the pandemic. Furthermore, my heartfelt gratitude also goes to the sponsors and their efforts in making this conference an outstanding success.

Finally, I would like to express my appreciation to the speakers at this conference, for not only offering their time, knowledge, and expertise to all our participants, but also for their dedication to awakening and inspiring young scientists globally. I believe the Monash Initiate Conference will live up to all of the Monash University goals - to be excellent, to be international, to be enterprising, and to be inclusive. I wish you all the best and a great time at this conference.

Professor Matthew Nicholson
President and Pro Vice-Chancellor (Interim)
Monash University Malaysia

WELCOME MESSAGE

HEAD OF SCHOOL

Welcome to the second Monash International Health Science and Technology Conference (MINIT) 2022 hosted by the School of Pharmacy, Monash University Malaysia with the theme “Bench to Bedside: Future-proofing Healthcare with Research and Technology”.

This conference serves as a learning and networking platform amongst students and scientists around the world to foster scientific advancement as well as collaboration. We are very fortunate to have imminent speakers from Monash University Australia, University of Cambridge, University of Reading, Yale University, Universiti Sains Malaysia and many more who are experts in their field to share their experiences and findings for everyone’s benefit.

I hope that you will enjoy the programme we have lined up for you and will leave after the two days with new research ideas and new research collaborations from the high impact papers presented by participants from all over the world including India, Italy and the Philippines, to name a few.

Lastly, thank you all for joining us. This conference will not be possible without your support. Before I end, on behalf of the School of Pharmacy, I would like to extend my gratitude to the organising committee for their tremendous effort to make this conference a success as well as to our sponsors.

Enjoy & thank you!

Professor Gan Siew Hua
Head, School of Pharmacy
Monash University Malaysia

WELCOME MESSAGE

FOUNDING ADVISOR

Honoured participants, distinguished speakers, my dear colleagues and scientific co-workers, I would like to extend a warm welcome to all of you in joining Monash Initiate 2022. It is a great pleasure meeting all of you here in this virtual space! In view of the global pandemic, this has been our second time hosting this annual event in a virtual mode. We are pleased to be able to continually host this conference amidst this challenging time to provide an avenue for researchers, academics and postgraduate students from our home country and around the globe to communicate their research findings.

While all social and economic fields are still progressively recovering from the impact of the sudden blow of the COVID-19 crisis, we, the scientific community, are also working hard to contribute our parts. Irrefutably, this untoward pandemic has brought us a deep and heartfelt realisation of the importance of research and technology particularly in healthcare. The global crisis has helped us realise the high purpose of pursuing scientific knowledge and appreciate its timely integration and translation to the healthcare settings.

Monash INITIATE is an event distinguished by its broad international perspective. Let us look forward to the insightful addresses by the keynotes and plenary speakers renowned in their fields, and the cutting-edge research and findings shared by participants both locally and internationally. I certainly trust that meaningful exchanges as such will help to inspire one another and spur us to greater heights.

Science is a gift to humanity. I believe that our true significance lies in our ability and our desire to understand and explore the beauty of our universe. By acquiring these understandings, we are able to reap them for the benefit of mankind. I hope that all of you will have an enjoyable and enriching learning experience during these two days. All the best!

Thank you.

“Harnessing wisdom and knowledge, enriching the lives of others”- B.H. Goh

Associate Professor Ts. Dr. Goh Bey Hing
Biofunctional Molecule Exploratory Research Group (BMEX)
School of Pharmacy
Monash University Malaysia

WELCOME MESSAGE

CONFERENCE ADVISOR

Welcome to the 2nd Monash INITIATE 2022 conference. The pandemic has opened a widely accepted virtual platform for all of us to gather and communicate the research we have done all over the world. For this, I would like to thank everyone who has taken the time to present or participate in this conference.

We have 100 plus participants from around the globe participating in the conference. Let me also thank the organising committee and judges who have worked tirelessly to ensure the smoothness of the conference. Monash INITIATE is curated to cover a wide range of topics, from fundamental to translational research, from microbiology, drug discovery to pharmacoeconomics; not forgetting our post-conference workshop. With the theme of the conference being “Bench to Bedside: Future-proofing Healthcare with Research and Technology”, this conference provides the opportunity for various fields of researchers within the healthcare umbrella to come together to celebrate the great things that are going on and inspirational efforts so many researchers are making in their fields for the benefit of mankind.

This conference is made possible by the keynote and plenary speakers who will be sharing their research works with us these two days. I wish everyone would benefit from this conference and we hope you will also be able to network with participants from different parts of the world this coming two days. I hope you have an enjoyable and stimulating conference.

Dr. Nafees Ahemad, Senior Lecturer (Medicinal Chemistry)
School of Pharmacy
Monash University Malaysia

WELCOME MESSAGE

ORGANISING CHAIRPERSON

Firstly, I would like to warmly welcome all delegates to the Inaugural Monash International Health Science and Technology Conference (Monash INITIATE 2022). Thank you for choosing to spend the next two days with us. It is with great honour that the PhD students of the School of Pharmacy have the chance to organise this conference once again this year. The committee has worked very hard to ensure this event runs as smoothly as possible.

We truly believe that science is a field that constantly evolves due to rapid developments and new discoveries. This conference will provide opportunities for us to reflect upon past achievements and discuss future advances that will further enhance the industry that we are in.

I am incredibly appreciative of the team who have worked endlessly for months to ensure this event's success and smooth running. There are no words to express how thankful and blessed I am to have had the honour of working with this young, talented, hardworking group of students on the committee. In addition, I would also like to thank the lecturers and staff from the School of Pharmacy for their support, dedication and guidance throughout. Not forgetting our judges and speakers from all over the world, who have taken time off their busy schedules to contribute to our event. My utmost appreciation goes to you. Your work and contribution to this event will not go unnoticed. This event was also made possible by our sponsors, to whom I would like to extend my gratitude for their support and belief in our event. This event would not have been possible without our sponsors' support.

Lastly, to all participants, thank you for showing immense support towards this conference, and we hope you are able to learn and network on this platform. I am wishing everyone an incredible and fruitful conference.

Alene Yong Sze Jing
PhD Candidate, School of Pharmacy
Monash University Malaysia

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AGENDA

Time (MYT)	DAY 1 - 27 SEPTEMBER 2022, TUESDAY		
8:30 AM	Event Lobby Opened		
8:50 AM	Start of Event		
9:10 AM	Opening Ceremony : **Professor Matthew Nicholson** *President and Pro Vice-Chancellor (Interim)* *Monash University Malaysia*		
9:15 AM	Welcome Address: **Professor Gan Siew Hua** *Head, School of Pharmacy* *Monash University Malaysia*		
9:20 AM	Keynote Speaker 1: **Professor William Gerwick** *Skaggs School of Pharmacy and Pharmaceutical Sciences*		
10:00 AM	Plenary Speaker: **Assistant Professor Yuan Lu** *Yale University*		
10:40 AM	Breakout Room Transition		
	Oral Presentation		
	Clinical Pharmacy & Pharmacy Practice	**Life Science**	**Drug Discovery & Synthesis**
10:45 AM	OP-CP-01	OP-LS-01	OP-DDS-01
11:00 AM	OP-CP-02	OP-LS-02	OP-DDS-02
11:15 AM	OP-CP-03	OP-LS-03	OP-DDS-03
11:30 AM	OP-CP-04	OP-LS-04	-
11:45 AM	OP-CP-05	OP-LS-05	-
12:00 PM	Lunch Break		

subject to changes

AGENDA

Time (MYT)	DAY 1 - 27 SEPTEMBER 2022, TUESDAY		
12:00 PM	Lunch Break		
1:00 PM	Keynote Speaker 2: **Professor Christopher Porter** *Monash University Australia*		
1:40 PM	Plenary Speaker: **Professor Syed Azhar** *Universiti Sains Malaysia*		
2:20 PM	Mini Break		
	Oral & Poster Presentation		
	Clinical Pharmacy & Pharmacy Practice, Public Health & Others	**Life Science**	**Drug Discovery & Synthesis**
2:30 PM	OP-CP-06	OP-LS-06	PP-DDS-01
2:40 PM	-	-	PP-DDS-02
2:45 PM	OP-CP-07	OP-LS-07	-
2:50 PM	-	-	PP-DDS-03
3:00 PM	OP-CP-08	OP-LS-08	PP-DDS-04
3:10 PM	-	-	PP-DDS-05
3:15 PM	OP-CP-09	-	-
3:20 PM	-	PP-LS-01	PP-DDS-06
3:30 PM	OP-PH-01	PP-LS-02	PP-DDS-07
3:40 PM	-	PP-LS-03	PP-DDS-08
3:45 PM	OP-PH-02	-	-
3:50 PM	-	PP-LS-04	PP-DDS-09
4:00 PM	OP-OT-01	PP-LS-05	-
4:15 PM	OP-OT-02	-	-
4:30 PM	End of Day 1		*subject to changes*

AGENDA

Time (MYT)	DAY 2 - 28 SEPTEMBER 2022, WEDNESDAY		
8:30 AM	Lobby Opened		
8:50 AM	Start of Event		
9:00 AM	Plenary Speaker: **Professor Hanry Yu** *National University of Singapore*		
9:40 AM	Plenary Speaker: **Professor Sok Ching Cheong, FASc** *Cancer Research Malaysia*		
10:20 AM	Mini Break		
10:30 AM	Breakout Room Transition		
	Oral & Poster Presentation		
	Drug Delivery	**Life Science**	**Digital Health & Big Data, Food Science, Public Health & Others**
10:40 AM	OP-DD-01	OP-LS-09	OP-DB-01
10:55 AM	OP-DD-03	OP-LS-10	OP-FS-01
11:10 AM	-	OP-LS-11	PP-DB-01
11:20 AM	-	-	PP-PH-01
11:30 AM	-	-	PP-PH-02
11:40 AM	-	-	PP-OT-01
11:50 AM	-	-	PP-OT-02
12:00 PM	Lunch Break		

subject to changes

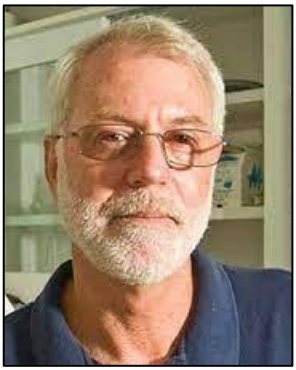
AGENDA

Time (MYT)	DAY 2 - 28 SEPTEMBER 2022, WEDNESDAY		
12:00 PM	Lunch Break		
	Poster Presentation		
	Drug Delivery	**Clinical Pharmacy & Pharmacy Practice**	**Stem Cell & Tissue Engineering**
1:10 PM	PP-DD-02	PP-CP-02	PP-ST-01
1:20 PM	PP-DD-03	PP-CP-03	PP-ST-02
1:30 PM	PP-DD-04	PP-CP-04	PP-ST-03
1:40 PM	PP-DD-05	PP-CP-05	PP-ST-04
1:50 PM	PP-DD-06	PP-CP-06	-
2:00 PM	-	PP-CP-07	-
2:10 PM	Mini Break		
2:30 PM	Sponsor Talk		
3:00 PM	Keynote Speaker 3: **Professor Nick Wareham** *University of Cambridge*		
3:40 PM	Mini Break		
3:50 PM	Plenary Speaker: **Professor Julie Lovegrove** *University of Reading, UK*		
4:30 PM	Prize Giving Ceremony		
5:00 PM	End of Event		

subject to changes

SPEAKERS PROFILE

KEYNOTE SPEAKER



Professor William Gerwick
Distinguished Professor
Skaggs School of Pharmacy and Pharmaceutical Sciences
Scripps Institution of Oceanography

Bill Gerwick's research focuses on the bioactive natural products of marine algae and cyanobacteria, their application in biomedicine, and their biosynthesis using genomic approaches (BS at UC Davis, PhD at Scripps/UCSD, and postdoctoral at U Connecticut). He was a professor for 21 years at the Oregon State University College of Pharmacy. In 2005, he returned to Scripps and is Distinguished Professor of Oceanography and Pharmaceutical Sciences. He was president of the American Society of Pharmacognosy (ASP) and is a Society Fellow of the ASP and AAAS. His research group has published nearly 500 scientific papers and 25 US patents.

Applications of Artificial Intelligence and other Innovations in Marine Natural Products Drug Discovery

The exploration of marine organisms for their useful biomedical products has been highly successful with more than 23 marine natural products now in use in clinical medicine. Our research group has focused on the unique chemistry of marine algae and cyanobacteria. But new innovations are needed to accelerate the development of these resources. To this end, we have developed artificial intelligence-based tools to help in the identification of new products, have explored the heterologous expression of bioactive compounds, and employed synthetic medicinal chemistry to develop an especially promising group of molecules for their antimalarial activity.

PLENARY SPEAKER

Assistant Professor Yuan Lu
Cardiovascular Medicine
School of Medicine
Yale University

Yuan Lu, ScD is an Assistant Professor of Cardiovascular Medicine at the Yale School of Medicine. As an epidemiologist and implementation scientist, her research interests focus on improving care and outcomes for patients with cardiovascular diseases. She is particularly committed to bringing together big data to produce actionable insights into cardiovascular disease performance and fuel efforts for digital therapeutic strategies to improve care and outcomes, and address disparities. Yuan has authored over 90 peer-reviewed publications, including over 30 first-authored articles in leading journals such as The Lancet, JAMA, BMJ, and Circulation, and her work has been cited more than 40,000 times.

Leveraging digital technology to reduce risk of cardiovascular disease and health disparities

The digital transformation of health care data provides an opportunity to leverage data within electronic health records for population health surveillance and to support quality improvement. At the Yale Center for Outcomes Research and Evaluation, we aim to bring a technology-based approach that integrates advanced analytics, digital health, and implementation science to improve cardiovascular care, outcomes, and equity. Using hypertension as a use case, this talk will focus on how we leverage digital data from electronic health records to identify barriers to prevention, diagnosis, treatment, and control of hypertension, as well as develop and implement technology-based interventions to address these barriers, through partnership with providers, patients, and communities.

KEYNOTE SPEAKER

Professor Christopher Porter
Director, Monash Institute of Pharmaceutical Sciences
Monash University Australia

Chris Porter is Director of the Monash Institute of Pharmaceutical Sciences (MIPS) at Monash University. His research interests include improving the absorption of poorly water-soluble drugs, the role of the lymphatic system in drug absorption and the potential utility of dendrimers and other nanomaterials as drug delivery systems. Chris has published more than 250 peer reviewed papers (>25,000 citations, h-index 83) and is an inventor on >20 separate patent families, many of which are the subject of licencing/assignment deals. The most significant of these are with Starpharma (Melbourne) to develop the DEP® dendrimer-based targeted delivery system (currently in Phase 2 clinical trial) and with PureTech Health (Boston) to develop the Glyph®, lymphatic targeting technology (currently in Phase 1 clinical trial).

Targeting the lymphatics for enhanced drug delivery outcomes

After oral administration, the majority of nutrients and drugs are absorbed and drain via the hepatic portal vein, through the liver to the systemic circulation. In contrast, dietary triglycerides are trafficked through the mesenteric lymph nodes and lymphatic system, bypassing this ‘first pass’ through the liver. One focus of my laboratory is the design of prodrugs that ‘piggyback’ onto these lipid absorption/lymphatic transport pathways, delivering them specifically to the lymphatics that drain the small intestine. This presentation will discuss our recent work in this area, including studies with our partner PureTech Health that have resulted in the development of an oral prodrug of natural allopregnanolone that has recently entered Phase 1 clinical trial.

PLENARY SPEAKER

Professor Hanry Yu
Professor of Physiology & Mechanobiology
National University of Singapore
IBB, A*STAR

Prof Yu is a cell biologist turned tissue engineer studying ways to control cells and microenvironment to engineering better cell-based models, focusing on developing solutions for industry. His innovations were heavily supported by pharmaceutical companies, and resulted in multiple tech spin-offs. He published >200 papers in leading journals, delivered many talks and consults for many organizations and agencies. He is appointed at the National University of Singapore, and taught at several top institutions in the US and Asia.

Engineering Mechanochemical Niche for Cell-based Models

Cell-based models such as organoids, assembloids and organs on chip have become fashionable. While these recapitulate important in vivo organ features, their complexity and heterogeneity hinder applications such as in vitro diagnostic and drug testing. I would discuss a few approaches to zoom into the critical attributes to build simpler and more robust models for applications.

PLENARY SPEAKER

Professor Sok Ching Cheong, FASc
Head, Translational Cancer Biology Research Unit
Cancer Research Malaysia

Professor Cheong leads the Translational Cancer Biology and Digital Health Research Units at Cancer Research Malaysia. She is also the Deputy Chief Scientific Officer at Cancer Research Malaysia (CRMY) and the current Dr Siti Hasmah Mohd Ali Professorial Chair at University of Malaya, Kuala Lumpur. Her work aims to improve the management and survival of cancer patients through the understanding of the underlying molecular changes, and through the development of novel treatment approaches, focusing on head and neck cancers. Professor Cheong has received grants and awards from national and international most recently the President's Award by the International Association of Oral Maxillofacial Pathologist (IAOP).

Identification of therapeutic targets in oral squamous cell carcinoma

One way of identifying potential therapeutic targets in cancer is to understand the genetic vulnerabilities within a cancer cell. CRISPR/Cas is a versatile gene-editing tool that has enabled easy and robust manipulation of the genome. Using high-throughput CRISPR/Cas9 screens, we identified the genetic vulnerabilities of oral squamous cell carcinoma using unique Asian oral cancer cell lines. I will share our findings on oral cancer essential genes with different degrees of tractability. Combining this with high-throughput drug response data on the same cell lines, we identified candidate drugs for drug repurposing for oral squamous cell carcinoma.

KEYNOTE SPEAKER

Professor Nick Wareham
Director, MRC Epidemiology Unit
University of Cambridge
School of Clinical Medicine

Professor Nick Wareham is the Director of the MRC Epidemiology Unit, Co-Director of the Institute of Metabolic Science, Honorary Consultant at Addenbrooke's Hospital and Professor of Epidemiology at the University of Cambridge, England. He studied Medicine at St Thomas' Hospital Medical School and Epidemiology at the London School of Hygiene and Tropical Medicine and Cambridge University, England. In 1992-3 he was a Harkness Fellow at the Harvard School of Public Health. After research fellowships at the University of Cambridge, he took up the Directorship of the MRC Epidemiology Unit when it was founded in 2003. He is principal investigator of the EPIC-Norfolk study, the EPIC-InterAct project, the Fenland cohort and the ADDITION trial. His main research interests are in understanding the aetiology of type 2 diabetes, particularly in generating understanding about the interplay between genetic, developmental and behavioural risk factors. He also researches strategies for the early detection and prevention of diabetes, including individual and societal level interventions. He is the Director of the UKCRC Centre for Diet and Activity Research (CEDAR) and the NIHR Global Health Group on Diet and Activity Research (GDAR).

The future of personalized diabetes prevention

Clinical trials have shown that the risk of progression from prediabetes to type 2 diabetes can be halved by behavioural interventions. This talk discusses the degree to which existing interventions are personalised and outlines how greater personalisation could be achieved through better identification of those vat high risk, division of type 2 diabetes into specific subgroups and, above all, more individualisation of the behavioural targets for preventive action. Future personalised preventive approaches will need to be complementary to the roll out of existing effective individual-level interventions and will synergise with efforts to develop and implement strategies that impact on type 2 diabetes risk at the societal level.

PLENARY SPEAKER

Professor Julie Lovegrove
Director, Hugh Sinclair Unit of Human Nutrition and Deputy Director, Institute for Cardiovascular and Metabolic Research
University of Reading, UK

Professor Julie Lovegrove is Director of the Hugh Sinclair Unit of Human Nutrition, Deputy Director of the Institute for Cardiovascular and Metabolic Research, University of Reading, President of the Nutrition Society, UK and Ireland, Deputy Chair of the UK Government's Scientific Advisory Committee for Nutrition and a board member of the Medical Research Council's Populations and Systems Medical Board. She was also Vice President for the Association for Nutrition (AfN) Council (2016-2019). She is internationally recognised for her expertise in the role of nutrition on cardiovascular disease risk factors and was awarded Fellow of the AfN in 2014.

Dietary Dilemmas – Fats and Cardiovascular Disease

Cardiovascular diseases (CVD) are the greatest cause of death globally. High intakes of saturated fatty acids (SFA) are linked to an increased risk of cardiovascular events and their reduction forms the backbone of dietary guidelines to prevent CVD. However, there is controversy associated with this recommendation and which macronutrient should replace SFA in the diet. Furthermore, different dietary sources of SFA, including dairy, meat and plants have distinct associations with CVD risk. The associations between SFA, foods containing these fats and CVD risk will be discussed, and potential mechanistic links explored.

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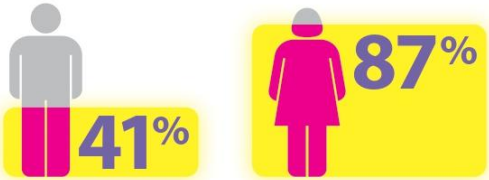
MALAYSIA HAS A HIGH PREVALENCE OF VITAMIN D_3 INSUFFICIENCY[1]



Approximately **41%** and **87%** of males and females respectively had insufficient levels of Vitamin D.[1]

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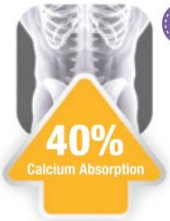
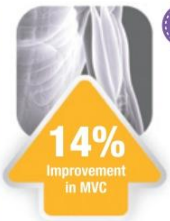
HALEON

CLINICAL BENEFITS OF HIGHER VITAMIN D IN THE BODY



1 PROMOTES CALCIUM ABSORPTION[4]

Increase calcium absorption up to 40% from pre-treatment levels[4]



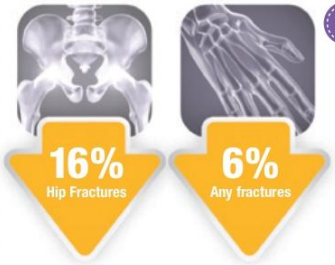
2 IMPROVES MUSCLE STRENGTH[5]

14% improvement in maximal voluntary contractions (MVC) with Vitamin D_3 treatment.[5]

Daily Vitamin D_3 supplementation of 800-1000IU demonstrates beneficial effects on muscle strength and balance.[6]

3 REDUCES RISK OF FALLS AND FRACTURES[7]

More than 30% decreased incidence of falls and fractures with calcium and vitamin D.*



4 REDUCES RISK OF FRACTURES[8]

6% reduced risk of any fracture and 16% reduced rate of hip fracture with calcium and vitamin D.**

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Calcium (Elemental) Ca	600 mg	600 mg	600mg	350 mg	600mg	298 mg	600mg
Vitamin D_3 D_3	500 IU	500 IU	200IU	500 IU	200 IU	100 IU	500IU
Magnesium Mg	-	50 mg	60mg	-	50 mg	125 mg	-
Zinc Zn	-	7.5 mg	9mg	-	-	0.3 mg	-
Manganese Mn	-	1.75 mg	1mg	-	-	1.5 mg	-
Copper Cu	-	0.5 mg	0.5mg	-	-	-	-

Read the label prior use. If symptoms persist, consult your doctor.

*Randomized, placebo-controlled double-blind multicenter study in 60 hostels & 89 nursing homes across Australia with Vitamin D 10,000IU/weekly and 1,000IU daily or placebo for 2 years. **Observational studies involving >200 fracture cases and RCTs at least 500 participants and reporting at least 10 incident fractures.

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PRESENTERS CLINICAL PHARMACY & PHARMACY PRACTICE

Oral Presenters		
Date: 27 September 2022 (Tuesday)		
ID	**Presenters**	**Time**
OP-CP-01	**Nor Akilah Jamalud-din** Knowledge and Practices of Medication Usage, Storage and Disposal among Outpatients in a Malaysian Teaching Hospital: A Qualitative Study	10:45 AM
OP-CP-02	**Farida Islahudin** Development of a Tool to Predict Herbal Medicine Use among Malaysian Women	11:00 AM
OP-CP-03	**Jit-Kai Loh** The Study of Lung Cancer Cell under Stroma Environment through iMSC Model	11:15 AM
OP-CP-04	**Adliah Mhd Ali** The Influence of Social Media on Patients' Medication Adherence	11:30 AM
OP-CP-05	**Advani Md Redzuan** Assessment of Serum Digoxin Concentration Measurement in Patients With Heart Failure & Atrial Fibrillation	11:45 PM

Oral Presenters		
Date: 27 September 2022 (Tuesday)		
ID	**Presenters**	**Time**
OP-CP-06	**Dewi Atmaja** Detection Tools for Prediction and Identification of Adverse Drug Reactions in Older Patients: A Systematic Review and Meta-Analysis	2:30 PM
OP-CP-07	**Angela M. Pagaran** Confidence Level in Pharmaceutical Care Skills and Experiences Using MyDispense® Virtual Simulation among Pharmacy Students in the Philippines	2:45 PM
OP-CP-08	**Christine Daril Delos Santos** Algorithm on Antibiotic Dispensing: Improvement of Patient Compliance on Antibiotic Therapy	3:00 PM
OP-CP-09	**Suharjono** Profile and Drug Related Problems in Ambulatory Patient of Pulmonary Arterial Hypertension at Dr Soetomo General Hospital Surabaya	3:15 PM

Knowledge and Practices of Medication Usage, Storage and Disposal among Outpatients in a Malaysian Teaching Hospital: A Qualitative Study

Nor Akilah Jamalud-din[1], Tengku Karmila Tengku Mohd. Kamil[2], Mery Hu Wei Ying[3], Mohamed Hassan Elnaem[2], Abdulkareem Mohamed Ahmed[2], Nor Ilyani Mohamed Nazar[2], Nor Hidayah Mohd Taufek[2]

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Introduction: Improper storage and disposal of medications can cause pollution in the environment. Developing effective interventions tailored to local practices is important to reduce pharmaceutical wastage. Little is known concerning how Malaysian outpatients use, store, and dispose medicines. This study aimed to explore the experiences, challenges, and reflections perceived by outpatients addressing these issues. **Materials and methods**: A qualitative methodology was adopted by using a semi-structured interview guide to explore patients' experiences related to their knowledge and practices of medication usage, storage, and disposal. A total of 15 patients and five caregivers were recruited at a teaching hospital in Kuantan, Pahang, for in-depth interview sessions. Each interview was recorded, transcribed verbatim, and translated into English. Data were sorted and coded using NVivo Release 1.5.1 software and subjected to thematic analysis. **Results**: The following themes were identified from the interviews, which were 1) incomplete labelling and instructions 2) scepticism about returning unused medications 3) lack of knowledge with varying practices 4) role of pharmacists to improve patient's medication literacy 5) lack of accessibility to return unused medications, 6) needs of educational programmes /campaigns 7) required information on medicine prices. **Conclusion**: Management of medication usage, storage, and disposal seems to be multifactorial. Therefore, it is important to develop contextual strategies and effective interventions to improve patients' knowledge and practices regarding medication usage, storage, and disposal. Future research is needed to develop and test the intervention of these components to reduce pharmaceutical wastage in the environment through best practices at all levels.

Keywords: Medication disposal; Storage; Usage; Practices; Outpatients

Development of a Tool to Predict Herbal Medicine Use among Malaysian Women

Farida Islahudin[1], Tengku Azlan Shah Tengku Mohamad[1], Lay Yan Ling[1], Jamia Azdina Jamal[1], Malina Jasamai[1]

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Introduction: Herbal medicine is gaining popularity especially among women to manage and maintain health. Despite this, many are still reluctant to disclose herbal medicine use to their healthcare professionals. With the lack of disclosure, appropriate herbal counselling by health care professionals remains challenging. **Objectives:** Therefore, the current work aims to develop a tool to predict high risk herbal users among adult Malaysian women. **Methodology:** The questionnaire-based study was performed among the public and assessed sociodemographic and characteristics of herbs used. Incomplete questionnaires were excluded. To develop the model a simple and multiple logistic regression was performed on two-thirds of the data. Score-values were then assigned based on significant factors. Score-values of two-thirds of the data were compared to the remaining one-third of the data for validation. **Results:** A total of 1435 respondents were included into the study. Majority were Malay (n=1036, 72.2%) and those with a tertiary education (n=1112, 77.5%). The most common herbal medicines used were raw herbs (n=439, 65.4%), followed by commercial herbs (n=220, 32.8%). The developed model based on two-thirds of the data (n=957, 66.7%) demonstrated that Malays, married women, employed and a monthly income of less than RM 3000 was associated with herbal use (χ^2=235.9, df=6, p<0.001). The developed score-values of the significant factors demonstrated an area under the receiving operator curve (ROC) of 0.751. The area under the ROC of one-third of the validation data (n=478, 33.3%) was 0.765. It was demonstrated there was no significant difference between the two models (p=0.302), demonstrating that the model was acceptable. **Conclusion:** The developed tool predicts high risk herbal users among Malaysian women. The tool may also aid healthcare professionals in providing appropriate education to herbal users to facilitate better coordination of care, reduce unwanted adverse effects and lead to better patient outcomes.

Keywords: Herbs; Medicine; Tool; Women

The Study of Lung Cancer Cell under Stroma Environment through iMSC Model

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Introduction: Mesenchymal stem cells (MSCs) have been intensively studied for the use of therapeutic treatment in anti-inflammation, cancer treatment, cell regeneration and drug delivery treatment. The studies from past research have shown that MSCs usage in cancer treatment have both promoting and suppressing effects against cancer cell. Some studies show promoting in malignancy and hypoxia occurrence when cancer cell interact with MSCs, however, several studies show controversial results through suppression and inhibition of metastasis. However, the use of MSCs for cancer treatment are limited by inability to obtain high amount of homologous MSCs for treatment or research study. **Objective:** This can be overcome using induced pluripotent stem (iPS) cell technology that can be used to produce an induced MSCs (iMSCs). **Methodology and Result:** In this study, iMSCs were derived from iPSCs and validated following International Society of Cellular Therapy (ISCT) criteria. Our finding found that H1975 lung cancer cell treated with iMSC conditioned medium (iMSC-CM) show changes in both morphology and RNA level. Our RNA-NGS data suggested that there are potential apoptotic and inflammation event due to releasing paracrine factors from the iMSC-CM. **Conclusion:** Both biological and physiological similarities between iMSCs and MSCs are nearly identical, suggesting a new platform for MSCs study using iMSCs as alternative for future study in therapeutic treatment.

Keywords: Mesenchymal stem cell; Induced pluripotent stem cell; Lung cancer; Cancer cell; Treatment

The Influence of Social Media on Patients' Medication Adherence

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Introduction: Previous literatures in Malaysia reported that medication adherence among chronic disease patients in the primary care setting were less than 50%. According to the global digital 2019 report, Malaysia was ranked among the top global users of social media. It is unknown whether the information obtained via internet especially social media influenced patients' belief and adherence towards their medications. **Objectives**: The aim of this study was to investigate the exposure to social media in affecting patients' medication belief and adherence. **Method:** An online survey was distributed via social media platforms such as Facebook, Instagram and WhatsApp. Adults (aged over 18 years old) diagnosed with chronic disease were invited to participate in this study. The first part of the survey focuses on participant's demographic characteristics, the second part on usage of social media for health information seeking, the third part on belief about medications and the fourth part on medication adherence. **Results:** A total of 387 respondents were enrolled in this study. This study found that 91% of the respondents were avid users of social media. Generally, only 29% of the respondents adhered to their medications although 70% of them were found to have positive belief in medicine. It was found that social media users who were exposed to health-related information seeking have better adherence to their medications ($p<0.001$). Significant relationship was found between demographic characteristics, belief about medicines, medication regimen adherence and the usage of social media for health information seeking ($p<0.001$). Age, educational level and gender were also found to affect their adherence. **Conclusion:** The findings of this study provided valuable insight on how social media usage affects patients' belief and their adherence towards medication.

Keywords: Social media usage; Belief on medicines; Medication adherence

Assessment of Serum Digoxin Concentration Measurement in Patients With Heart Failure & Atrial Fibrillation

Adyani Md Redzuan[1], Aisyah Nuha Binti Mohd Sor[1], Farida Hanim Islahudin[1], Shamin Mohd Saffian[1], Siti Azdiah Abdul Aziz[1], Mohd Makmor Bakry[1], Lau Chee Lan[2], Yin Mei Kuen[2]

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Introduction: The use of digoxin is limited due to its narrow therapeutic index. Malaysian guidelines for the management of heart failure and atrial fibrillation recommend targeting a serum digoxin concentration (SDC) between 0.5 to 0.8 mcg/L and 0.8 to 2.0 mcg/L, respectively**. Objectives:** The aim of the study was to retrospectively investigate the proportion of patients achieving therapeutic target SDC in patients taking digoxin. **Methodology:** SDCs recorded in the therapeutic drug monitoring (TDM) form at the hospital Pharmacy Department between January 2013 and December 2021 were analysed according to gender, age, BMI and indication of digoxin. **Results:** Data from 120 patients (45% female, mean age 66.37 ± 13.69 years) were recruited. SDCs from 68.3% and 59.5% of patients with heart failure and atrial fibrillation respectively, were identified as out-of-range. Only 48 patients can be further analysed in terms of the association between SDCs and BMI (n=48) due to the incomplete data. There was no significant association found between SDC, gender, age and BMI ($p > 0.05$). Patients with both atrial fibrillation and heart failure tend to have poor outcomes level of serum digoxin, either above the upper limit or below the target range. **Conclusion**: Further study should be conducted with larger samples and more detailed clinical information such as electrolyte levels, renal functions, comorbidities and concomitant medications as these may contribute to the confounding factors affecting therapeutic SDCs.

Keywords: Digoxin; Heart failure; Atrial fibrillation; Serum digoxin concentration

Detection Tools for Prediction and Identification of Adverse Drug Reactions in Older Patients: A Systematic Review and Meta-Analysis

Dewi Atmaja[1,2], Yulistiani[3], Suharjono[3], Elida Zairina[3,4,5]
[1]Doctoral Program of Pharmaceutical Science, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia; [2]Department of Pharmacy, Faculty of Health, Universitas Sari Mulia, Banjarmasin, Indonesia; [3]Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia; [4]Innovative Pharmacy Practice and Integrated Outcome Research (INACORE) Group, Universitas Airlangga, Surabaya, Indonesia; [5]Center for Patient Safety Research, Universitas Airlangga, Surabaya, Indonesia
Correspondence: Dewi Susanti Atmaja (email: dewisusantiatmaja@unism.ac.id)

Introduction: Tools to accurately predict and detect adverse drug reactions (ADR) in elderly patients have not been developed. **Objective:** We aimed to identify and evaluate reports on tools that predict and detect ADR in elderly patients (≥ 60 years). **Methodology:** In this review, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. Databases were searched until January 2022 using key terms "elderly," "adverse drug reaction," and "detection instruments." We included CCT- or RCT-based original research/studies published in English and Indonesian that enrolled elderly patients with morbidity and on polypharmacy as respondents, and hospitals, homes for elderly individuals, and communities with public and private healthcare systems as research settings. We excluded the following studies from the review, studies on patients with COVID-19, and studies investigating specific parameters (e.g., HbA1c control, blood glucose, or dementia) that did not involve elderly patients. Additionally, we excluded research protocols whose results had not been published or were not available in the database and for which only abstracts were available for analysis. **Results:** Eighteen studies met the inclusion criteria, and they examined assorted interventions: STOPP/START version 1/2 (n=10), Beers Criteria 2012 or 2015 (n=4), Systematic Tool to Reduce Inappropriate Prescribing (STRIP) (n=2), Tool to Reduce Inappropriate Medications (TRIM) (n=1), Medication Risk Score (MERIS) (n=1), Computerized alert systems (n=1), and Norwegian General Practice-Nursing Home criteria (n=1). The interventions affected the number of potential prescription omissions (OR, 0.50 [0.37–0.69]; p<0.0001; four studies). No apparent reduction in the number of drug interactions within 2 months (OR, 0.84 [0.70–1.02]; p=0.08; two studies) and mortality (OR, 0.92 [0.76–1.12]; p=0.41; three studies) was observed. **Conclusion:** There is no definitive and validated assessment tool for detecting and predicting ADR in elderly patients. Thus, more research on refining existing tools or developing new ones is warranted.

Keywords: Adverse drug reaction; Geriatrics; Patient safety

Confidence Level in Pharmaceutical Care Skills and Experiences Using MyDispense® Virtual Simulation among Pharmacy Students in the Philippines

Angela M. Pagaran, Brittney Lynn E. Omargas, Exa Mae S. Matute,Grace L. Agad, Kara Sezzie D. Salutillo, Maria Angelika S. Dabon, Vincent Ray A. Dungog, Erwin M. Faller

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Introduction: MyDispense®, developed by the Faculty of Pharmacy and Pharmaceutical Sciences at Monash University, aims to provide accessible learning and drug dispensing practice to students. Virtual simulation has become a widely used technology, especially while the educational sector is slowly recovering from the pandemic. **Objectives:** This study aims to determine the confidence level in pharmaceutical care skills and experiences using MyDispense® on prescription handling and patient counseling. **Methodology:** This research utilized Quali-Quanti Sequential Exploratory mixed methods among pharmacy students in the Philippines enrolled in a MyDispense® curriculum. 324 students completed the two-part survey analyzed with frequency, percentage, and a chi-square test. Eight students located in different parts of the Philippines participated in the interview, which was analyzed using thematic analysis to determine the advantages, barriers, challenges, and recommendations. **Results:** The results showed that the respondents mainly were third-year students (40.4%), completed 10 and above MyDispense® cases (49.7%), resided in region XI (48.8%), and utilized laptops in accessing the virtual simulation (67.9%). A high level of confidence in pharmaceutical care skills was expressed in the mean values of prescription handling skills (4.31) and patient counseling skills (4.31) revealing that MyDispense®is an essential pharmacy simulation tool. The qualitative results showed that MyDispense® provided experiential learning beneficial for work-based education. It gave the students confidence in their prescription handling skills by activating their critical thinking through delivering patient-centered care in a timely manner. For patient counseling skills, it enhanced the students' own communication style in written form which gave them confidence in interacting with virtual patients. Students encountered various challenges, such as technical and language barriers, which led to the suggestion of a customizable dispensing system. **Conclusion:** Thus, MyDispense®is a viable platform for practicing pharmaceutical care that provides meaningful features for the growth of students as confident future pharmacists.

Keywords: Pharmacy students; Level of confidence; Virtual simulation; MyDispense®; Philippines

Algorithm on Antibiotic Dispensing: Improvement of Patient Compliance on Antibiotic Therapy

Bryan M. Antiza, Pia Alessandra P. Ballos, Christine Daril Delos Santos, Michael Jan Leornas, Kyle Daryl Macaraeg, Hanz Brian M Ordanel, Ivy Glory B. Pontillo, Justine Angelou R. Sapalaran

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Introduction: Antibiotic non-adherence has long been a problem worldwide. Using a pharmaceutical care algorithm as an approach to improve patient medication adherence to antibiotic therapy could be a promising start toward reducing the growing number of non-adherent patients on antibiotic therapy. **Objectives:** This study aimed to determine how efficient an algorithm on antibiotic dispensing was in keeping patients adherent to their prescribed antibiotic therapy. **Methodology:** This research used a quantitative quasi-experimental and interventional research design. A random sampling technique was used to select 48 patients from PolyHealth Clinic in Santo Tomas, Davao del Sur. The patients were divided into two groups, the intervention group and the control group. The research tools used for data collection were urinalysis tests and the Patient Medication Adherence Instrument (PMAI) questionnaire. To analyze the data, the dependent t-test and the independent t-test were used. **Results:** The results of the study showed that after the antibiotic treatment of those in the intervention group, 17 patients had successfully recovered, while 4 patients were still UTI-positive. On the other hand, the control group only had 5 patients that fully recovered, while 18 patients still UTI. The intervention group had a higher recovery rate (81%) as compared to the control group (21.7%) In terms of medication adherence, the level of adherence in the experimental group was found to be relatively high at a mean value of 4.50 as compared with the control group with a mean value of 3.18. **Conclusion:** Based on the results of the study, the researchers conclude an algorithm on antibiotic dispensing has significantly improved the medication adherence of patients with UTI. In conclusion, addressing the factors that affect medication non-adherence by the use of an algorithm had significantly improved the medication adherence of the patients, and overall improve their recovery from urinary tract infection.

Keywords: Antibiotic dispensing; Urinary tract infection; Medication adherence; Antibiotic algorithm

Profile and Drug Related Problems in Ambulatory Patient of Pulmonary Arterial Hypertension at Dr Soetomo General Hospital Surabaya

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Introduction: Pulmonary hypertension (PH) is a life threatening disease caused by increased blood pressure in the arteries lungs especially at the right side of the heart. PH can cause many symptoms such as shortness of breath, dizziness, and can reduce heart function that leads to heart failure. One type of pulmonary hypertension is pulmonary arterial hypertension (PAH) which known as an idiopathic disease. Management of PAH patients includes pharmacological therapy (supportive therapy and specific therapy) and invasive therapy. **Objectives:** This study aims to observe the drug utilization, because PAH patients require long-term use of drugs and the available drugs are very expensive so that they become a burden on the patient or insurance and drug-related problems in outpatient PAH at SMF (Staff Medic Functional) Cardiology and Vascular Medicine Dr. Soetomo General Hospital Surabaya from March 2021 to April 2021. **Methods:** This study was a prospective observational study with a sampling method of time-limited sampling during the period of March 2021 to April 2021. **Results:** The results of 35 patients showed that the drug utilization that was often used in PAH patients included specific therapy, such as sildenafil was 34 patients (97.1%) and beraprost was 31 patients (88.6%), these two drugs are very expensive. Supportive therapy include bisoprolol 62.9% and furosemide 51.4%. Drug-related problems that found in this study were actual side effects (headache, nausea, vomiting, shortness of breath and feeling tired), potential drug interactions, and some inappropriate doses compared to the guidelines. **Conclusions:** The conclusion of this study showed the profile of specific and supportive drug therapy were mostly appropriate but there were still PAH patients who had severe PASP (pulmonary artery systolic pressure) and experience side effects.

Keywords: Profile drugs; Pulmonary arterial hypertension; DRP's

Poster Presenters		
Date: 28 September 2022 (Wednesday)		
ID	**Presenters**	**Time**
PP-CP-02	**Jamuna Rani Appalasamy** Exploring a Mixed-mode Virtual Workshop Strategy on Smoking Cessation Training for Pharmacists	1:10 PM
PP-CP-03	**Nirmala Jagan** Use of a Mobile Health Application to Optimise Oral Anticoagulant Therapy Among Patients with Concurrent Atrial Fibrillation and Heart Failure: Who Thinks What?	1:20 PM
PP-CP-04	**Yogendra Shrestha** The Rise in Antimicrobial Resistance: An Obscure Issue in COVID-19 Treatment	1:30 PM
PP-CP-05	**Elida Zairina** Evaluation of Medication Error in the Public Hospital in South Borneo Indonesia	1:40 PM
PP-CP-06	**Diana Lyrawati** Efficacy of Calcium Channel Blockers in the Management of Hypertension in Patients with Ischemic Heart Disease	1:50 PM
PP-CP-07	**Mareta Rindang Andarsari** Antibiotic Consumption Study in Internal Medicine Department of Secondary teaching Hospital using ATC/DDD Methods	2:00 PM

Exploring a Mixed-mode Virtual Workshop Strategy on Smoking Cessation Training for Pharmacists

Jamuna Rani Appalasamy[1], Krisanahari Siva[2], Jay Keshan Mahandran[3], Wesley Chung Sheng Zhi[1], Juman Abdulelah Dujaili[1], Amutha Selvaraj[1], Shazwani Shaharuddin[1], Dinesh Sangarran Ramachandram[1], Kow Chia Siang[4], Tan Cheau Huey[5], Mohd Faiz Md Tahir[6], Uthayakumar Selbong[7]

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Introduction: The pandemic has accelerated the need for smoking cessation among tobacco smokers, thus, pharmacists have been the public's primary reference point for health care advice and support. Pharmacists continue to lack the competency in behavioral modifying techniques such as motivational interviewing strategies for smoking cessation services. It is currently uncertain which learning platform can translate into higher effectiveness of the services. **Objectives**: This study aimed to explore the feasibility and acceptance of a virtual workshop on motivational interviewing technique among practicing pharmacists in Malaysia. **Methodology:** This half-day workshop applied interactive strategy including a video narrative, virtual presentations and discussions using case guides. Each strategy targeted separate learning objectives, and the virtual deliverance enabled use of digital multimedia and interactive applications such as 'kahoot. Pre and post workshop responses on the knowledge and perception of participants were assessed. **Results:** More than 40 participants attended the virtual workshop. However, only 26 of them completed the pre and post feedback survey. Participants were aged between 20 and 50 years old. Most of them were practicing pharmacists of more than four years and received smoking cessation services training (>90%). Nevertheless, many of them (>40%) indicated inadequate behavioral modifying skills and the need for readiness to counsel patients using motivational techniques. The technicalities and conduct of the workshop were carried out with minimal challenge and adequate satisfaction. The post-workshop findings showed significant improvement ($p<0.005$) in several areas associated to motivation skills such as counselling for tobacco addiction, to help ex-smokers learn how to cope with relapse back to smoking and to express empathy during an interview. These findings paralleled with several positive feedback and participants satisfaction on the content and delivery of the workshop. **Conclusion**: In short, online learning platforms has the potential approach and modalities to deliver professional development training.

Keywords: Smoking cessation; Virtual workshop; Motivational interviewing; Pharmacist

Use of a Mobile Health Application to Optimise Oral Anticoagulant Therapy Among Patients with Concurrent Atrial Fibrillation and Heart Failure: Who Thinks What?

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Introduction: Use of a mobile health application (MHA) that empowers patients to optimise oral anticoagulant (OAC) use has shown to improve patient outcomes. One study reported that most Malaysians were not familiar with MHA, but were receptive towards it. **Objective:** Hence, we aimed to explore the perceptions of patients with concurrent atrial fibrillation and heart failure who are on OAC, as well as doctors and pharmacists on the use of a MHA to optimise OAC use. **Methodology:** This qualitative study was conducted at Hospital Kuala Lumpur from March to April 2021. Semi-structured in-depth interviews with patients prescribed with OAC for at least three months, as well as doctors and pharmacists who have managed patients on OAC for at least three months, were conducted. Data were analyzed using an exploratory content thematic analysis approach. **Results:** Thirty participants were recruited: patients (n=9), doctors (n=12), and pharmacists (n=9). Three themes emerged: attitude, social support and perceived behavior control towards MHA use. Most participants were receptive towards the use of a MHA, as they perceived that the MHA would decrease patient-healthcare professionals consultation time since information would be available at the fingertip, and patients can self-manage their condition. All participants would use a MHA if they received social support from their colleagues and/or family. However, some reservations reported were: ability to use the MHA, affordability to purchase a smartphone, also privacy and confidentiality issues. **Conclusion:** Patients, doctors and pharmacists were receptive towards the use of MHA to optimise OAC use.

Keywords: Oral anticoagulation; Mobile health application; Atrial fibrillation; Heart failure

The Rise in Antimicrobial Resistance: An Obscure Issue in COVID-19 Treatment

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Introduction: A saturated health care system with a lack of evidence-based antiviral medicine and ignorance of antimicrobial stewardship during pandemics has prompted clinicians to prescribe a broad-spectrum antibiotic more often. **Objectives:** The aim of the study is to gain insight into antibiotic prescribing practices and their impact on antimicrobial resistance. **Methodology:** A prospective, cross-sectional study was conducted in the COVID-infected patients diagnosed using the diagnostic method reverse transcription- polymerase chain reaction (RT-PCR admitted to the COVID wards between August 1st and November 30th, 2021. Relevant information was gleaned from the patient's case report and antibiotic susceptibility test was performed using the disc diffusion method. **Results:** 318 patients met the study's inclusion criteria, with a mean age of 46 years and 55% (175) of them being males. Antibiotics were prescribed for 93.72% (209) of mild COVID, 92.45% (49) of moderate COVID, 96.15% (25) of severe COVID, and 100% (16) of critical COVID. A total of 95 samples were sent in for culture and antibiotic sensitivity testing, with 58.95% (56) confirming growth. The majority of the growth was found to contain *E. coli* (14). In 54.9% of cases, antibiotics with less than 50% sensitivity to curing bacterial infection were detected. **Conclusions:** In the study, we found that antibiotics were being used unnecessarily in excessive quantities and that more than half of the antibiotics were less sensitive to isolated bacteria.

Keywords: Antimicrobial resistance; Antimicrobial stewardship; COVID-19 treatment; Multi-drug resistance organism; Inappropriate antibiotic

Evaluation of Medication Error in the Public Hospital in South Borneo Indonesia

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Introduction: In hospitals, incidents of medication errors still occur, especially in developing countries like Indonesia. However, most of those incidents can be prevented to avoid harming patients. **Objective:** Evaluating medication errors in prescribing inpatient and outpatient at hospitals based on pharmacists' reporting of medical errors. **Methodology:** Retrospective study from January to December 2021. Pharmacists analyze medication errors report based on age and sex, name list or medicine quantity in the medical record or prescription-related to medication errors report, and length of hospital stays. Analysis of drug interaction and the factors that affect the potential drug interactions is carried out. **Results:** About 338 medication errors from 251,491 prescriptions were reported by pharmacists across departments in 2021. The age of patients with medication errors ranges from newborn to 86 years old, with an average of 40.9 years old (mean±21.03). The most common types of medication errors are prescribing errors were 184 (54.4%), followed wrong label preparation errors were 79 (23.4%), dose preparation errors were 39 (11.5%), inappropriate drug preparation errors were 29 (8.6%), administration errors were 3 (0.9%), other errors were 3 (0.9%) and omission error were 1 (0.3%). The average length of hospital stays is 11.35 days (mean±10.36). The total of 557 potential drug interactions were found in 182 (53.85%) prescriptions. The number of medicines per prescription is the most important factor impacting potential drug interactions (sig. 0.000; β 0.729). **Conclusion:** The number of incidents of medication errors reported in this research is 0.13 per 100 prescriptions, and most of these medication errors did not affect patients, so they did not have a harmful effect. However, further prospective research is needed to analyze whole medication error reports by collaborating with all hospital healthcare professionals.

Keywords: Medication error; Pharmacist; Prescription

Efficacy of Calcium Channel Blockers in the Management of Hypertension in Patients with Ischemic Heart Disease

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Introduction: Antihypertensive is one of the therapies given to patients with ischemic heart disease (IHD). The recommended blood pressure (BP) target is <140/90 mmHg to reduce risk of ischemic heart disease. Little is known regarding the antihypertension drugs used and their efficacy in IHD in Indonesia. One of the most prescribed antihypertension drugs in Indonesia is calcium channel blockers. **Objectives:** The purpose of this study was to evaluate the efficacy of calcium channel blockers compared to other antihypertensive classes in the management of hypertension in IHD. **Methodology:** This study was conducted retrospectively at one of hospitals in Sidoarjo, Indonesia. Inclusion criteria were in-patients diagnosed with IHD, admitted at and discharged from hospital during January 2018- December 2020. Antihypertensive drugs used, BP and pertinents data were collected from patients' medical records. Statistical analysis using Mann-Whitney, Wilcoxon, linear and logistic regression, where appropriate, were employed to evaluate blood pressure decrease and attainment of BP target. **Results:** Included in this study, 55 patients with CCBs, and 36 using drugs other than CCBs. The most common drugs used were angiotensin receptor blockers (86%) and CCBs (82%). Ninety percent patients used combination of antihypertensive drugs. Combination containing CCBs were as effective as with other drugs at achieving BP target, 98.2% and 100% of patients achieved BP<140/90 mm Hg (130.18 ± 9,12 mmHg/83,09 ± 6,34 mmHg and 128.06 ±10.64 mmHg/81.94±9.20 mmHg, respectively). CCBs decreased systolic (SBP) and diastolic blood pressure (DBP), whether in combination of 2, 3, 4 or 5 drugs ($p<0.05$). CCBs in a combination of 4 drugs decreased more SBP (50±16.4 mm Hg) than without CCBs (32.5±17.52) adjusted p=0.022, and in combination of 5 drugs (55±5.6 mm Hg) than without CCB (20±10 mm Hg), adjusted p=0.014. **Conclusion:** CCBs in combination with other antihypertensive drugs were effective at decreasing BP and achieving BP target in patients with IHD.

Keywords: IHD; CCB; BP; Decrease; Target

Antibiotic Consumption Study in Internal Medicine Department of Secondary teaching Hospital using ATC/DDD Methods

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Introduction: Antimicrobial resistance has become a global health issue, with antibiotic overuse being one of the main factors. The government through the Program Pengendalian Resistensi Antimroba (PPRA) conducts a quantitative analysis using the defined daily dose (DDD)/100 patient-days method. The DDD value acquired can be used as an evaluation tool and compared to DDD values from other hospitals or other health facilities. **Objectives:** To measure the defined daily dose of antibiotic use for certain indication in adults in Internal Disease Department of Universitas Airlangga Teaching Hospital. **Methodology:** The DDD analysis conducted at the Universitas Airlangga Teaching Hospital which was carried out retrospectively using the medical records of inpatients at Department of Internal Disease from January 2019 to December 2020, it was found that a total of 3326 patients who met the inclusion criteria were performed, then simple random sampling was carried out until samples were selected. There were 421 patients who met the inclusion and exclusion criteria. **Results:** The total value of DDD/100 patient-days of antibiotics in the 2019 period is 76.45 and in the 2020 period it is 80.21. The use of ceftriaxone has the largest percentage with results in 2019 being 44.92 DDD/100 patient-days and an increase in 2020 to 51.11 DDD/100 patient-days. **Conclusion:** Ceftriaxone is the most used antibiotic in between January 2019 until December 2020 with dosage 1 gram, twice daily intravenously.

Keywords: Antibiotics; Consumption; Defined daily dose (DDD); Internal Medicine Departments

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PRESENTERS DRUG DISCOVERY & SYNTHESIS

Oral Presenters		
Date: 27 September 2022 (Tuesday)		
ID	**Presenters**	**Time**
OP-DDS-01	**Shadreen Fairuz** Synthesis of Imidazo Naphthyridine Derivatives and Evaluation of Its Bioassay Activities	10:45 AM
OP-DDS-02	**Ekta Rathi** Novel 1,3,5-Triazin-2-yl Analogs as Vascular Endothelial Growth Factor Receptor 2 Inhibitors for Colorectal Cancer	11:00 AM
OP-DDS-03	**Yamunna Paramaswaran** Therapeutic Investigation of Palm Oil Mill Effluent Derived Beta-carotene Action in Streptozotocin-induced Diabetic Retinopathy	11:15 AM

Synthesis of Imidazo Naphthyridine Derivatives and Evaluation of Its Bioassay Activities

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Introduction: Heart failure is a chronic condition whereby the heart muscle is unable to pump blood sufficiently, due to damage from various cardiovascular diseases. With rise in congestive heart failure incidences globally and issues of existing medications upon long-term use, research on new drugs is important. Hence, this project focuses on synthesis of novel imidazo naphthyridine derivatives arising from imidazole and naphthyridine scaffolds, both of which have shown positive inotropic action comparable to those of cardiac glycosides and calcium on myocardial muscle. Thus, the new derivatives are hypothesized to improve the heart's contractility primarily by increasing calcium concentration in cardiomyocytes while having low or no toxicity. **Objectives:** 1. To synthesize and characterize imidazo naphthyridine compounds; 2. To evaluate cytotoxicity of the compounds on rat cardiomyocytes (H9c2(2-1)); 3. To investigate positive inotropic effect of the compounds on H9c2(2-1) cells via investigation of Na^+/K^+ ATPase activity and Ca^{2+} concentrations. **Methodology:** Imidazo naphthyridines were synthesized using a three-step reaction followed by purification and analysis. Then they were docked with potential Na^+/K^+ ATPase (PDB 3n23) and phosphodiesterase protein (PDB 1SO2), using AutoDock Tools 1.5.6 for preliminarily checking their binding affinities. Their interactions were visualized using BIOVIA Discovery Studio 2021. MTS assay is ongoing to evaluate cytotoxicity of each compound, which will be followed by positive inotropic activity evaluation. **Results and Discussion:** Six compounds (S5-S10) were synthesized. S6 showed good binding affinity with both the docked proteins while S8 had comparable binding affinity to control dock of phosphodiesterase enzyme, all at the active sites of known protein inhibitors. Thus, proving these compounds have potential for showing positive inotropic effect by inhibiting the proteins. **Conclusion:** Synthesis of pure compounds and their *in-silico* results gave us a basis for carrying out assays to confirm the positive inotropic activity of all six compounds.

Keywords: Imidazo naphthyridine; Positive inotropy

Novel 1,3,5-Triazin-2-yl Analogs as Vascular Endothelial Growth Factor Receptor 2 Inhibitors for Colorectal Cancer

Ekta Rathi[1], Runali Sankhe[2], Avinash Kumar[1], Suman Manandhar[2], Sreedhara R. Pai K[2], Anoop Kishore[2], Raghu Chandrashekar H[3], Suvarna G. Kini[1]

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Introduction: VEGF-A is a crucial member of the VEGF family to regulate angiogenesis in physiological and pathological conditions. VEGF-A mediates its biological function through the VEGFR2 receptor. Therefore, targeting a VEGF-A mediated VEGFR2 signaling pathway could be the most promising approach to suppress tumor growth in colorectal cancer (CRC) by angiogenesis repression. **Objectives:** Design and development of novel compounds for CRC by targeting VEGFR2. **Methodology:** A novel series of 1,3,5-triazin-2-yl analogs were designed based on the fragment-based approach against VEGFR2 protein (PDB ID: 4ASD). Synthesized and characterized molecules were taken up for cytotoxicity study against CRC cell lines (HCT-116 and HT-29) employing SRB assay. Later, molecules were subjected to Chorioallantoic Membrane (CAM) assay to compute the antiangiogenic effect. Further, the anti-VEGFR2 activity of selected compounds was performed using a KDR kinase assay kit. Western blot analysis was performed to predict the VEGFR2, VEGFR1 and VEGF-A expression in presence of selected compounds. **Result and Conclusion:** Designed 1,3,5-triazin-2-yl analogs had shown all the crucial interactions (ASP1046, GLU885, and CYS919) with 4ASD VEGFR2 protein. IC_{50} values of six best compounds (1F, 4F, 5F, 9F, 10F and 14F) in HCT-116 and HT-29 cell lines were found to be 14.98±4.974μM and 7.684±3.878μM; 17.06±3.450μM and 11.46±3.217μM; 11.82 ±1.122μM 5.404±4.341μM; 17.61±2.102μM and 10.68±6.081μM; 12.95±1.672μM and 15.56±5.332μM; 8.786±3.120μM and 5.912±2.321μM, respectively in comparison of sorafenib tosylate (4.356±3.728μM and 9.887±3.868μM). CAM assay was performed at 12.5μM and 6.25μM for 48h for all the selected compounds and the best results were obtained for 14F (51.49±4.931 & 38.42±3.629) and 5F(45.92±4.342 & 34.23 ±4.507) in comparison of standard (44.75±0.6833 & 42.04±6.223) and normal control(-63.12±1.892) in the form of mean±SEM (% inhibition of blood vessel lengths) at p-value <0.0001. 14F and 5F were further analyzed by western-blot technique and KDR kinase assay kit. Hence, 14F and 5F were found to be potential VEGFR2 inhibitors.

Keywords: VEGF-A; CRC; VEGFR2; CAM; HCT-116; HT-29

Therapeutic Investigation of Palm Oil Mill Effluent Derived Beta-carotene Action in Streptozotocin-induced Diabetic Retinopathy

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Introduction: Chronic diabetes causes the progression of diabetic retinopathy (DR) via macular degeneration of the retinal layer of the eyes. Globally, the burden of DR raises to 93 million people, and the prevalence rate of DR is higher every year. In Malaysia, the prevalence rate of DR rate is 28.1%; and the macular degeneration rate is 26.7%. The clear pathophysiology of DR remains mainly unexplored yet. **Objectives**: The present study is designed to investigate the therapeutic potential of palm oil mill effluent-derived beta-carotene (PBC) for the management of DR in mice. **Methodology**: Diabetic Mellitus was induced by a single intraperitoneal injection of streptozotocin (STZ; 35 mg/kg) to mice. The elevated fasting blood glucose levels were assessed by a glucometer. The acceleration of DR was made on the 7th day of diabetic mice by intravitreal injection of STZ (20 µl of 7 % w/v of STZ stock solution). The test compounds i.e., PBC (50 and 100 mg/kg; *p.o.*) and dexamethasone (DEX, 10 mg/kg; *p.o.*) were administered for 21 consecutive days (from day 8) in DR animals. Thereafter, behavioural response, *i.e.,* optomotor response (OMR), was assessed on 0, 7, 14, and 21 days. Besides, biomarkers like reduced glutathione (GSH), thiobarbituric acid reactive substances (TBARS), and catalase activity levels were also estimated in retinal tissue samples. **Results**: The elevated fasting blood glucose levels (> 150 mg/dl (8.3 mmol / Liter) in mice were observed with STZ treatment. DR progression was observed in mice as an indication of visual impairments of OMR responses along with changes in retinal GSH, TBARS contents, and catalase enzymatic activity levels. **Conclusion**: PBC possesses the potential ameliorative action against STZ-associated diabetic complications (*i.e.,* DR) via regulation of the blood-retinal barrier layer and vascular functions. Further, it is also evidenced to produce anti-diabetic and anti-oxidative potential actions.

Keywords: Catalase; Dexamethasone; Macular degeneration; Optomotor response; Oxidative stress; Reduced glutathione

Poster Presenters		
Date: 27 September 2022 (Tuesday)		
ID	**Presenters**	**Time**
PP-DDS-01	**Janice Sue Wen Chan** *Zingiber zerumbet* (L.) Roscoe ex Sm.: A Scoping Review of Medicinal Properties	2:30 PM
PP-DDS-02	**Suvarna G. Kini** Development of Novel 2-(Benzylideneamino)-4*H*-chromen-4-one Derivatives as Anti-cervical Cancer Agents	2:40 PM
PP-DDS-03	**Venkatesh Sellamuthu** *Caenorhabditis Elegans* as a Model Organism for the Evaluation of Anti-Hyperlipidemic Activity of Ethanolic Extract of *Impatiens Balsamina* Seeds	2:50 PM
PP-DDS-04	**Lakshya Moukthika Chilamkoti** Design, Synthesis and Evaluation of Novel Coumarin Derivatives as Anti-Cancer Agents Using Structure-Based Drug Design	3:00 PM
PP-DDS-05	**K. Poojita** Design, In-silico Studies, Synthesis & Biological Evaluations of Novel Benzothiazole Derivatives as Selective PI3Kγ Inhibitors for the Treatment of Breast Cancer	3:10 PM
PP-DDS-06	**Gayathri Rajamanickam** Effect of Niruriflavone on Neuronal Viability in Aluminium Chloride-Induced Alzheimer's Disease Rats	3:20 PM

Poster Presenters		
Date: 27 September 2022 (Tuesday)		
ID	**Presenters**	**Time**
PP-DDS-07	**Suciati Suciati** Cholinesterase Inhibitory Activities and Metabolites Profiles of Extract and Fractions of Marine Sponge *Aaptos suberitoides*	3:30 PM
PP-DDS-08	**Jia Hui Lai** Repositioning of FDA-approved Drugs as Inhibitors of *Porphyromonas Gingivalis* Gingipain K, A Causative Agent for Alzheimer's Disease: *In Silico* and Biological Evaluation	3:40 PM
PP-DDS-09	**Melanny Ika Sulistyowaty** Enantioselective Synthesis of A Neotropical Poison-Frog Alkaloid, 5-*epi*-Pumiliotoxin C from *R*-phenylglycinol	3:50 PM

Zingiber zerumbet (L.) Roscoe ex Sm.: A Scoping Review of Medicinal Properties

Janice Sue Wen Chan[1], Xin Yi Lim[1], Norfarahana Japri[1], Ida Farah Ahmad[1], Terence Yew Chin Tan[1]

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Introduction: *Zingiber zerumbet (L.)* Roscoe ex Sm., a native medicinal plant commonly found in tropical and subtropical Asia, is gaining in popularity for its potential health benefits. **Objectives:** We conducted a scoping review to map the available scientific evidence literature on the efficacy, safety, as well as mechanisms of actions of *Z. zerumbet* and its main phytoconstituents. **Methodology:** A systematic search on four electronic databases (PubMed, LILACS, Google Scholar, CENTRAL) was conducted using predetermined keywords. Inclusion criteria are relevant clinical and preclinical animal studies that report on the health benefits and pharmacological properties of *Z. zerumbet* and its main phytoconstituents, as a single active ingredient in any formulation. **Results:** Fifty-two animal studies were included while no clinical studies were identified. In preclinical studies, *Z. zerumbet* demonstrated several pharmacological properties, most abundantly analgesic and anti-inflammatory effects. *Z. zerumbet* and its main bioactive phytoconstituent, zerumbone, exhibit analgesic activities through several pathways including inhibition of inflammatory mediators and agonistic activities on the opioid, cannabinoid, and serotonergic receptors. Animal safety studies reported that an ethanolic extract of *Z. zerumbet* was well tolerated for up to 28 days with no safety-related concerns. **Conclusion:** *Z. zerumbet* has the potential to be further investigated as an analgesic agent with anti-inflammatory properties for various types of pain. Improved reporting on quality and standardisation of *Z. zerumbet* extracts as a herbal test-item in preclinical studies is needed for better consolidation of information and translation of safe and effective doses for future clinical studies.

Keywords: Zingiber zerumbet; Pinecone ginger; Botanical medicine; Herbal medicine; Phytomedicine

Development of Novel 2-(Benzylideneamino)-4*H*-chromen-4-one Derivatives as Anti-cervical Cancer Agents

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Introduction: Globally, human cervical cancer (CC) is the second most prevalent cancer among women with a mortality rate of around 50%. Strains of high-risk human papilloma virus (HPV) have been reported to be associated with more than 95% of CC cases. The tandemly linked HPV E6 and E7 genes are usually integrated into the host cell genome and are constitutively expressed in HPV-positive CC cells. Hence we selected E6 as the target protein for designing our compounds. As the chromone ring system has been widely explored for its anti-cancer potential we selected this system as our scaffold. **Objectives:** Rational design of novel E6 oncoprotein inhibitors using chromone ring by employing computational tools, their synthesis, characterization and screening of anti-cervical cancer activity of the synthesized compounds. **Methodology:** The methodology involves e-pharmacophore-based virtual screening of chromone library and subsequent derivatization of the top hits to design potent E6 inhibitors and then determining their molecular docking and molecular dynamics (MD) simulation studies which arrived at the best 10 compounds. After the synthesis and characterization of these 10 designed compounds, MTT-based cytotoxicity test of the compounds against E6-positive (HeLa & SiHa) and E6-negative CC-cell lines was performed followed by the E6-mediated degradation assay of p53 protein. **Result:** *In-silico* studies suggested that these compounds might form a stable complex with E6 protein. The ADME studies suggested most of them possess drug-like properties. The compound (E)-2-((2,4-dihydroxybenzylidene)amino)-4*H*-chromen-4-one (B10) was the most potent compound. It showed an IC_{50} value of 21.1±2.4 µM, 19.9±3.8 µM, 37.5±8.3 µM against HeLa, SiHa and C33A cell lines respectively. It also showed dose-dependent E6-mediated rescue of p53 protein with an IC_{50} value of 124.1±22 µM. **Conclusion:** Compound B10 showed potent cytotoxic activity against CC-cell lines with selectivity towards E6-positive cell lines. Hence, it can be further taken up for optimization to design potent E6 inhibitors.

Keywords: HPV; Cervical cancer; E6 and E7 oncoprotein

Caenorhabditis Elegans as a Model Organism for the Evaluation of Anti-Hyperlipidemic Activity of Ethanolic Extract of *Impatiens Balsamina* Seeds

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Introduction and Objectives: The main objective of the present study was to evaluate the anti-hyperlipidemic activity of ethanolic extract of *Impatiens balsamina* seeds using *Caenorhabditis elegans* as a model organism. The dried seeds of *I. balsamina* were ground into a fine powder and were extracted with ethanol by the cold maceration technique. The extract was then subjected to preliminary phytochemical analysis which showed the presence of alkaloids, flavonoids, tannins, phenols, terpenoids and saponins. **Methodology:** In-vivo Anti-hyperlipidemic activity was evaluated qualitatively (lipid staining technique) and quantitatively (spectrophotometrically). The *C. elegans* were incubated with normal cholesterol (5 ppm) and high cholesterol (10 ppm) media containing standard orlistat (6 µg/mL) and another group containing various concentrations of the seed extract. **Results and Conclusion:** Anti-hyperlipidemic activity of the extract at different concentrations (10 ppm, 25 ppm, 50 ppm, 100 ppm) was compared to standard olive oil. The absorbance of standards and sample mixtures were measured at 525 nm using spectrophotometer. A change in the percent of inhibition of lipid accumulation with respect to concentration was compared. Incubation of the *C. elegans* with a higher concentration of cholesterol (10 ppm) in the medium increased the total cellular lipid, compared to those incubated with standard cholesterol concentration. Sudan black B staining showed no substantial difference in the fat stores of *C. elegans* incubated with a normal medium, when cultured on a high lipid medium. However, the nematodes were seen to accumulate excess lipid as shown by the appearance of a higher number of dark-stained lipid droplets. Lipid accumulation was higher in high cholesterol-fed (1 0ppm) *C. elegans* than in those treated with the extract. Visually, the lipid droplets in the high lipid control of wild-type N2 were more noticeable than the others. The results obtained from the study indicate that the *I. balsamina* extract possesses anti-hyperlipidemic activity, which may be due to the presence of flavonoids and other constituents.

Keywords: *Impatiens balsamina*; Anti-hyperlipidemic activity; *Caenorhabditis elegans*

Design, Synthesis and Evaluation of Novel Coumarin Derivatives as Anti-Cancer Agents Using Structure-Based Drug Design

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Introduction: Besides genetic abnormalities, cancer can be caused by dysfunctional signal transduction pathways and changes in normal cell processes that govern gene expression. Protein kinases and phosphatases have been identified as feasible options for the development of novel targeted cancer therapies due to their relevance as master regulators of cell signalling and the function of mutant kinases in human carcinogenesis. Therefore, mTOR kinase was chosen as a target. The method for developing selective mTOR inhibitors was based on structure-based drug design. **Objective:** To design, synthesize and evaluate cytotoxic activity of novel compounds as potential mTOR inhibitors. **Methodology:** Structure-based drug designing approach was used to develop a series of compounds targeting the receptor site of rapamycin in the ternary complex of FKBP-rapamycin-FRB domain in mTOR kinase protein (PDB ID: 4DRJ). A library of heterocyclic compounds was prepared for screening against the developed e-pharmacophore model of receptor site to sort the compounds which can show better docking scores. The compound with the highest docking score was modified to improve interactions with the binding pocket and was studied further for MMGBSA and molecular dynamics. The synthesised compounds were screened for cytotoxic activity against MCF-7 cell lines by SRB assay. **Results and conclusion:** The compounds were subjected to an ADME investigation, which revealed that they had higher oral bioavailability and lower hERG toxicity. Compound 4c demonstrated the best dose-dependent cytotoxicity against the MCF-7 cell line in the SRB assay with IC_{50} value of 9.57 µg/ml. This molecule has a docking score of -10.6 kcal/mol with significant interactions with PHE2039, LYS121, PHE130, and TYR57. SER118, ASP68, LEU128, TYR113, PHE130, and TYR57. Furthermore, this compound may be extensively investigated for drug-like characteristics.

Keywords: mTOR inhibitors; Structure-based drug design; MMGBSA; Molecular dynamics; MCF-7 cell line

Design, In-silico Studies, Synthesis & Biological Evaluations of Novel Benzothiazole Derivatives as Selective PI3Kγ Inhibitors for the Treatment of Breast Cancer

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Introduction: Phosphoinositide 3-kinase gamma (PI3Kγ) is a transferase enzyme that belongs to the lipid kinase family and is responsible for the phosphorylation of phosphatidylinositol-4,5-biphosphate to phosphatidylinositol-3,4,5-triphosphate, the latter responsible for cell proliferation and growth functions. Overexpression of this enzyme leads to almost 50% of malignancies and tumor growth. Hence this enzyme has been identified as a potential target for the treatment of breast cancer. **Objective:** To design and synthesize potent selective PI3Kγ inhibitors with the benzothiazole scaffold. **Methodology:** Based on the combination of rational drug design and *in silico* studies, novel molecules with benzothiazole scaffold were designed, synthesized, and evaluated for cytotoxic activity against MCF-7 cell line. Two derivatives with the best cytotoxic activity will further be evaluated for cell apoptotic studies and PI3Kγ enzyme inhibition assay. **Results and Conclusion:** The design, synthesis, and spectral characterization of the novel benzothiazole derivatives were carried out. The induced fit docking showed promising results, the compound BT5 was found to be the best derivative with a docking score of -12.554 kcal/mol with known prominent interactions such as hydrogen bonding with Val882 and Trp812, π-π stacking with Tyr867 and Trp812 for PI3Kγ selectivity. All the derivatives were screened for cytotoxic activity against the MCF-7 breast cancer cell line. The derivatives BT5 and BT13 with IC_{50} values of 5.198±1.780 µM and 12.26 ±2.739 µM respectively were found to have the best cytotoxic activity and are currently evaluated further for cell apoptotic activity and PI3Kγ selective inhibition assay. This research is an attempt to provide an *in-silico* approach for the design and development of more selective PI3Kγ inhibitors for treating breast cancer.

Keywords: PI3Kγ selective inhibition; Breast cancer; Benzothiazole

Effect of Niruriflavone on Neuronal Viability in Aluminium Chloride-Induced Alzheimer's Disease Rats

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Introduction: Alzheimer's disease (AD) is the most common cause of dementia worldwide. It leads to cognitive and behavioral decline in elderly people. Aluminum is a neurotoxin and plays a vital role in the pathogenesis of AD. Neuropathological, behavioral, and neurochemical alterations have been linked to chronic Aluminium exposure. Niruriflavone (NF), a flavone sulfonic acid is extracted from Phyllanthus niruri Linn. It exhibited potent antioxidant properties and inhibition of acetylcholinesterase and 5-lipoxygenase which are beneficial for the treatment of AD. **Objectives:** This study aimed to investigate the effects of NF treatment on *in-vitro* cytotoxicity, aluminum levels, and neuropathological alterations in the Aluminium chloride ($AlCl_3$) -induced AD rat brain. **Methodology:** NF was tested for cytotoxicity against the human neuroblastoma cell line SH-SY5Y investigation, and cell viability was measured using the MTT assay. AD in adult Wistar rats was induced by oral administration of 100 mg/kg $AlCl_3$ in distilled water at a dosage of 0.5 ml/100 g body weight for 42 days. NF was given at 0.125 mg/kg/body weight dosage orally after AD induction. The levels of aluminum in the cortex and hippocampus of rats were measured by atomic absorption spectrophotometer. Brain sections were stained with Cresyl violet for histopathological studies. **Results:** The *in-vitro* cytotoxicity analysis showed nontoxic concentrations of the NF to be 25 and 250 µg/mL. It showed neuroprotective activity by maintaining the cell viability at around 80%. $AlCl_3$-treated rats showed neuronal loss in the hippocampal region in the histological study. NF prevented the neuronal loss caused by $AlCl_3$, which is comparable to the rivastigmine treated group. Aluminium level in NF treated group is significantly lower than in the non-treated group. **Conclusion**: Niruriflavone mitigated the neuronal degeneration caused by $AlCl_3$. This study evident the discovery of a neuroprotective agent that could benefit the population afflicted by AD.

Keywords: Alzheimer's disease; Cytotoxicity; Aluminium; Niruriflavone

Cholinesterase Inhibitory Activities and Metabolites Profiles of Extract and Fractions of Marine Sponge *Aaptos suberitoides*

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Introduction: Alzheimer's disease (AD) is an age dependent neurodegenerative disorder that characterized by impairments of memory and cognitive function. It is the most common form of dementia, and affecting more than 50 million people worldwide. One of the strategies for the treatment of AD is the use of cholinesterase inhibitors. Marine natural products have been the source of many bioactive metabolites, including cholinesterase inhibitors. **Objectives:** To investigate the potency of marine sponge extract and fractions *Aaptos suberitoides* as cholinesterase inhibitors as well as to identify metabolites in the active fractions. **Methodology:** Fresh sponge was extracted with methanol, followed by fractionation with n-hexane and ethyl acetate. The cholinesterase inhibitory screening was carried out against two enzymes, acetylcholinesterase (AChE) and butyrylcholinesterase (BChE), according to the modified Ellman's method. The chemistry of the active fractions was studied by LC-MS/MS. **Results:** The methanolic extract of *A. suberitoides* showed stronger inhibition against AChE enzyme, with IC_{50} value of 9.12 µg/mL compared to BChE with IC_{50} value of 90.12 µg/mL. Investigation on the *n*-hexane and ethyl acetate fractions showed that the *n*-hexane fraction gave higher inhibitory activity against AChE enzyme compared to the ethyl acetate fraction with IC_{50} values of 4.76 and 13.42 µg/mL, respectively. The n-hexane fraction also demonstrated stronger inhibition against BChE with IC_{50} value of 6.79 µg/mL compared to the ethyl acetate fraction with IC_{50} value of 30.91 µg/mL. Based on the LC-MS/MS data, there are 14 and 16 compounds identified in the n-hexane and ethyl acetate, respectively. The n-hexane fraction contain alkaloid aaptamine and demethyloxyaaptamine, while the ethyl acetate fraction contain aaptamine, demethylaaptamine, isoaaptamine and 8,9,9-trimethoxy-9H-benzo[de][1,6]naphthyridine. **Conclusion:** The extract and fractions of *A. suberitoides* exhibited significant cholinesterase inhibitory activity. The presence of alkaloid compounds in *A. suberitoides* may responsible for higher potency of the samples as cholinesterase inhibitor.

Keywords: Alzheimer's disease; Cholinesterase inhibitor; Marine sponge; *Aaptos suberitoides* alkaloid

Repositioning of FDA-approved Drugs as Inhibitors of *Porphyromonas Gingivalis* Gingipain K, A Causative Agent for Alzheimer's Disease: *In Silico* and Biological Evaluation

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Introduction: *P. gingivalis* is a Gram-negative, anaerobic bacterium that has been implicated as a keystone pathogen in periodontitis. There is mounting evidence indicating the role of *P. gingivalis* in Alzheimer's disease (AD) pathogenesis. Inhibition of gingipain K secreted by such bacterium has been considered as a potential strategy in treating AD, especially for individuals with concomitant periodontitis. To date, only a few inhibitors of the gingipain K have been reported. Thus, drug repositioning approach is adopted in present project to discover potential gingipain K inhibitors. **Objectives**: To screen and evaluate the binding interactions of 300 FDA-approved drugs in the active site of gingipain K, and to determine the inhibitory activity of selected compounds against gingipain K. **Methodology**: Structure-based virtual screening of a set of 300 FDA-approved drugs was performed on the gingipain K protein. Top ten compounds with the highest docking scores were selected for subsequent biological screening to evaluate their inhibitory activities against gingipain K *via* the gingipain K enzymatic assay. **Results**: In docking studies, carbonyl, amino, amido and hydroxyl groups as well as aromatic rings in the top ten compounds were found essential for engaging binding interactions with residues in the active site. The compounds formed primarily hydrogen bonding, π-π stacking, salt bridge and π-cation interactions with surrounding residues, namely Trp391, His444, Gly445, Cys477, Trp513, Tyr512 and His575. From enzymatic assay, olsalazine was shown to exert substantial reduction in the gingipain K activity. **Conclusion**: The presence of specific functional groups in the ligands have contributed to various binding interactions with nearby residues, which are deemed important towards binding in the active site of gingipain K and inhibitory activities against such protease. Through *in silico* and biological screening, olsalazine has been identified as the top hit compound. It can be further structurally optimized and developed as gingipain K inhibitor for the treatment of AD.

Keywords: *Porphyromonas gingivalis* gingipain K; Alzheimer's disease; Drug repositioning; *In silico* study; Biological evaluation

Enantioselective Synthesis of A Neotropical Poison-Frog Alkaloid, 5-*epi*-Pumiliotoxin C from *R*-phenylglycinol

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Introduction: Pumiliotoxin C is a member of *cis*-decahydroquinoline alkaloids, isolated from Dendrobates spp, which has bioactive as nonselective antagonist of nicotinic acetylcholine receptor. The difficulty in isolating and its unique *cis*-perhydroquinoline structure, made this compound attractive for total synthesis. **Objectives:** On previous works revealed that the diastereoselective addition of organometallic reagents to the 1,3-oxazolidines proceeded in highly diastereoselectivity manner. For expanding the application of it, We'd like to synthesize 5-epi-Pumiliotoxin C by key step an ene-yne-ene ring closing metathesis (RCM) through 1,3-oxazolidine as important intermediates. **Methodology:** It was started with allylation of chiral oxazolidines using indium-mediated asymmetric Barbier-type, provided single diastereomer product. The second diastereoselective addition of acetylenic Grignard reagents to the 1,3-oxazolidines, produced RCM precursors in good yields and also high diastereoselectivity results. The formation of the decahydroquinoline skeleton by RCM with 1st Grubbs catalyst and then followed by hydrogenation to produce 5-epi Pumiotoxin C and its derivatives. **Results:** By changing the reaction step,5-diepimeric Pumiliotoxin C would also be produced by using *R* - phenylglycinol as starting material. **Conclusion:** We obtained 5-epi-pumiliotoxin C in a total yield of 32% And also (+)-trans-195A was obtained in total yield 21%.

Keywords: Pumiliotoxin C; Total synthesis; Oxazolidine; RCM; Stereoselective

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Oral Presenters		
Date: 28 September 2022 (Wednesday)		
ID	**Presenters**	**Time**
OP-DD-01	**Avneet Kour** Peptide/Amino Acid Templated Metallic Nano Therapeutics for Combating Protein Aggregation Diseases	10:40 AM
OP-DD-03	**Md. Emranul Karim** PEGylated Strontium Sulfite Nanoparticles for Restricting Off-target Distribution and Augmenting Antitumor Efficacy of EGFR siRNA against Breast Cancer Cells	10:55 AM

Peptide/Amino Acid Templated Metallic Nano Therapeutics for Combating Protein Aggregation Diseases

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Introduction: The phenomenon of proteins/peptide assembly into amyloid fibrils is associated with various protein aggregating pathologies. Inhibition of the aggregation behavior of amyloidogenic peptides/proteins or disruption of the pre-formed aggregates is a viable therapeutic option to control the progression of various protein aggregation related disorders such as cataract and Alzheimer's disease (AD). **Objective:** We tried to explore the disruption as well as inhibition of the intact α-crystallin protein and α-crystallin derived model peptide aggregates in cataract by levodopa functionalized gold nanoroses/microroses (GNR/GMR) as modulators. We also investigated both the amyloid disaggregation proclivity of levodopa functionalized gold nanoroses (GNR) and amphipathic dipeptide nano vesicle templated selenium nanoparticles (RΔF-SeNPs) against various peptide based amyloid models, including the amyloid beta peptides, Aβ (1-42) and Aβ (1-40) the dipeptide, phenylalanine-phenylalanine (FF), tau assocaited hexapeptide Ac-PHF6 ($(_{306}$VQIVYK$_{311})$ in AD. **Methodology:** Nanoparticles were formed via process of self assembly and characterized using spectroscopic and microscopic techniques. The anti amyloid activity of these nanoparticles against fibrils was assessed by quantitative and microscopic methods. **Results:** Results revealed anti-amyloidogenic potential of the GNR, GMR and RΔF-Se NPs, towards amyloid fibrils. The peptides depicted a change in their fiber-like morphology and a decrease in ThT fluorescence after being co-incubated with the modulators. **Discussion and Conclusion**: Overall, these findings further support the potency of the modulators as a promising platform for combating various protein/peptide aggregating disease.

Keywords: Amyloid; Nanotherapeutics; Cataract; Alzheimer's disease

PEGylated Strontium Sulfite Nanoparticles for Restricting Off-target Distribution and Augmenting Antitumor Efficacy of EGFR siRNA against Breast Cancer Cells

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Introduction: Small interfering RNAs (siRNAs) are very efficient in selectively silencing the overexpressed genes responsible for cancer development. The application of siRNAs in a clinical setting is often hindered by their susceptibility to opsonin-mediated clearance, poor biological stability, ineffectual targeting and undesirable effects on healthy cells. To surmount these shortcomings, an ideal RNAi transporter having an extended half-life in systemic circulation and tumor-selective delivery is indispensable for establishing a clinically viable delivery system. In line with that, we have developed a novel nanocarrier based on strontium sulfite nanoparticles (SSNs) modified with a hydrophilic coating material, PEG to improve the blood circulation time and tumor targetability and reduce systemic toxicity. **Methodology:** The surface modification of SSNs with PEG was done using the simplest nanoprecipitation method. Synthesized PEGylated SSNs were characterized and a triple quadrupole liquid chromatography-mass spectrometry (LC-MS) was deployed to identify the proteins entrapped onto the SSNs. Finally, the potential of these particles in intracellular delivery of EGFR-1-specific siRNAs was investigated through assessment of cytotoxicity in breast cancer cells, biodistribution study and tumor regression in a synergetic mouse model of breast cancer. **Results:** PEGylation of SSNs led to the generation of small and uniformly distributed particles with a significant affinity towards siRNAs and enhanced cellular internalization, resulting in higher cytotoxicity of EGFR-1-siRNA-loaded PEGylated NPs against breast cancer cell lines. The LC-MS study revealed that PEG provides a steric hindrance against protein opsonization in the blood by reducing protein adsorption on the surface of NPs. The bio distribution and tumor regression study of PEGylated SSNs with loaded EGFR-1 siRNA demonstrated reduced off-target drug distribution, extended blood circulation time, improved tumor accumulation and augmented anti-tumor efficacy. **Conclusion:** PEGylated SSNs led to prolonged circulation time, augmented tumor uptake, and superior therapeutic outcome in anti tumor activity, thus opening up a new avenue for tumor-selective efficient delivery of siRNAs in managing breast cancer.

Keywords: siRNAs; SSNs; LC-MS; Protein corona; Breast cancer

Poster Presenters		
Date: 28 September 2022 (Wednesday)		
ID	**Presenters**	**Time**
PP-DD-02	**Haslina Ahmad** Monodisperse Mesoporous Silica Nanoparticles as Vehicle for Cytotoxic Ruthenium(II) Polypyridyl Complex	1:10 PM
PP-DD-03	**Muhamad Israq Amir Mohd Ali** Impact of Low Frequency Pulsed Ultrasound on the Formation and Stability of Pickering Emulsions Stabilized by β-cyclodextrin	1:20 PM
PP-DD-04	**San San Wai** Effect of Superdisintegrant on Pharmaceutical Characters of Candesartan Orodispersible Tablet	1:30 PM
PP-DD-05	**Wut Yi Aung** Optimization of Paediatric Paracetamol Colloidal Suspension Using Different Suspending Agents	1:40 PM
PP-DD-06	**Yong Sze Ong** A Systematic Review of the Emerging 5-fluorouracil Nanotheranostic Agents for Cancer Treatment	1:50 PM

Monodisperse Mesoporous Silica Nanoparticles as Vehicle for Cytotoxic Ruthenium(II) Polypyridyl Complex

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Background: Previous work has shown that the DNA metallo-intercalator $[Ru(dppz)_2PIP]^{2+}$, Ru-PIP (dppz = dipyridophenazine, PIP = (2-(phenyl)-imidazo[4,5-f][1,10]phenanthroline, binds DNA with high affinity and inhibits cell proliferation of cancer cells by stalling DNA replication forks. However, this complex is hydrophobic, which makes it problematic to prepare a higher concentration of the complex in small volume of aqueous media, and thus a drug delivery agent would be a useful approach to overcome its limited bioavailability. **Objective:** The aim of the present study was to utilize the mesoporous silica nanoparticles (MSNs) as drug delivery system for Ru-PIP. **Methods:** MSNs were synthesized via a co-condensation method by using a phenanthrolinium salt (Phen-C16) as the template. MSNs with different particle sizes were synthesized by controlling the reaction temperature, amount of triethanolamine (TEA) and mass of template used by using a Box–Behnken Design (BBD). **Results:** Optimization of the synthesis conditions by BBD generated MSNs of sizes smaller than 100 nm, with high surface area response at 833.9 m^2g^{-1}. Ru-PIP was effectively entrapped in MSNs at 18.84%. Drug release profile analysis showed that Ru-PIP is gradually released, with a cumulative release percentage of approximately 50% at 72 h. The release kinetic profile implied that Ru-PIP was released from MSN by diffusion. The in vitro cytotoxicity of Ru-PIP, both free and MSN-encapsulated, was studied in Hela, A549, and T24 cancer cell lines. While treatment of Ru-PIP alone is moderately cytotoxic, encapsulated Ru-PIP exerted significant cytotoxicity upon all the cell lines, with half maximal inhibitory concentration (IC50) values determined by MTT assay at 48 h exposure substantially decreasing from >30 μM to <10 μM as a result of MSN encapsulation. **Conclusion:** The findings indicate that MSNs are promising drug delivery agent, as it is able to sustainably release Ru-PIP by diffusion in a prolonged treatment period.

Keywords: Mesoporous silica nanoparticles; Drug delivery; Ruthenium polypyridyl

Impact of Low Frequency Pulsed Ultrasound on the Formation and Stability of Pickering Emulsions Stabilized by β-cyclodextrin

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Introduction: Emulsions are thermodynamically unstable systems consisting of two immiscible liquids. When mixtures of these liquids are stabilized by solid particles at the liquid-liquid interface, they are termed Pickering emulsions (PEs). Such surfactant-free emulsions are stable against droplet coalescence and Ostwald ripening. In recent years, PEs stabilized by natural polymers have gained increasing interests as attractive sustained delivery systems for encapsulating lipophilic substances for food and nutraceutical applications. β-cyclodextrin (β-CD) particles are highly promising as food-grade stabilizers for Pickering emulsions due to their sustainability, biodegradability and good biocompatibility. **Objectives:** The aim of the present work was to evaluate the influence of low frequency pulsed ultrasound (20 kHz) on the properties of oil-in-water PEs stabilized by β-CD. **Methodology:** In this study, the β-CD-based emulsions was carried out at varying ultrasonic amplitude and irradiation times. The emulsion droplet size, size distribution, zeta potential and the apparent viscosity of ultrasonically induced PEs were determined. **Results:** It was found that increasing ultrasonic amplitude from 20% to 40% resulted in smaller droplet size of emulsions. A similar reduction trend in droplet size when the irradiation time was increased. The β-CD-stabilized emulsions generated by ultrasound showed good physical stability and homogeneity, and narrow droplet size distribution**.** A lower apparent viscosity was observed in the emulsions treated with high amplitude level of ultrasound. **Conclusion:** Our results demonstrated that low frequency ultrasound can effectively produce stable food-grade emulsions with small droplet size and improved their storage stability, which can be useful in functional food applications.

Keywords: Low frequency; Ultrasound; Pickering emulsions; β-cyclodextrin; Functional food

Effect of Superdisintegrant on Pharmaceutical Characters of Candesartan Orodispersible Tablet

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Introduction: Orodispersible tablets (ODT) are solid unit dosage forms like conventional tablets but consist of superdisintegrants to dissolve it within a minute in the mouth without any difficulty of swallowing. **Objectives:** Aim of this study is to investigate the effect of superdisintegrant on pharmaceutical characters of candesartan orodispersible tablet. **Methodology:** Six formulations of ODT (F_1, F_2, F_3, F_4, F_5, F_6) and conventional tablet (CT) of candesartan cilexetil were formulated and moisture content, apparent density, flowability, particle size distribution of powder blend were assessed. Those were compressed by direct compression method and evaluated according to pharmacopoeial and non pharmacopoeial tests. Accelerated stability testing of tablets in sealed HDPE bottles was carried out. **Results:** Wetting time of F_1, F_2, F_3, F_4, F_5, F_6 and CT were 26.33 sec, 35.66 sec, 68.33 sec, 48.66 sec, 67 sec, 55.66 sec, 94.66 sec respectively (p <0.05). Disintegration time were 16.33 sec, 25.83 sec, 33.5 sec, 44 sec, 40.33 sec, 48.83 sec, 280 sec respectively and statistically significant different among groups (p <0.05). The wetting and disintegration time of all formulations of ODT were shorter than those of CT due to the presence of superdisintegrant. Among six different formulations, the shortest wetting and disintegration time were observed in F_1 containing 5% of crosspovidone (p = 0.002). The highest percentage of drug release from F_1 at 5 minutes and 15 minutes were 61.38% and 78.96%. After stability testing, ODT lost their content up to 7.02% and their crushing strength was reduced up to 3.53 Kg/cm^2. The percentage of drug release was also decreased up to 18.62%. Thus why, F_1 may be the best formulation and so helpful to increase the bioavailability of the drug and enhance patient compliance. It was shown that superdisintegrant affected the potency, crushing strength, wetting, disintegration, dissolution and stability of ODT. **Conclusion:** In conclusion, crosspovidone (up to 5%) can be useful as the best superdisintegrant to develop ODT.

Keywords: Superdisintegrants; Orodispersible tablet; Disintegration; Drug Release; Potency

Optimization of Paediatric Paracetamol Colloidal Suspension Using Different Suspending Agents

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Introduction: Paediatric paracetamol colloidal suspensions (PCS) are oral liquid dosage forms which were prepared to keep its homogeneity on prolonged storage without shaking. **Objective:** This study purposed to optimize the formulation of PCS among those with different suspending agents. **Methodology:** Nine different formulations were prepared by mixing and milling method. In FA_1, FA_2 and FA_3, colloidal silicon dioxide (CSD) was added as a suspending agent. CSD and tragacanth gum were used in FB_1, FB_2 and FB_3 while FC_1, FC_2 and FC_3 included CSD and xanthan gum. Their pharmaceutical qualities were evaluated by various parameters. **Results:** All formulations were within the acceptable range of pH and drug content. But the viscosity and flow rate were statistically significant different ($p<0.05$) among formulations. Weight per mL was also $p<0.05$ except between FA_1 and FA_2. The sedimentation volume of FA_1, FA_2 and FA_3 was less than 1 and FB_1, FB_2 and FB_3 occurred phase separation inconsistently after 7 days. Sedimentation volume of FC_1, FC_2 and FC_3 were maximum and equal to 1. So, they were chosen and then conducted to accelerated stability study. They were exposed to 40±2℃ and 75±5% RH for 6 months according to ICH guideline to optimize the formulation. The viscosity and weight per mL were increased, thereby decreasing the flow rate. Even though pH and drug content of those formulations were within the acceptable limits, sedimentation volume of FC_1 and FC_2 were less than 1 while that of FC_3 was equal to 1. **Conclusion:** Even on prolonged storage, FC_3 could maintain its homogeneity without shaking and give uniform dosage in administration. Therefore, FC_3 was found to be the optimum formulation due to the combination of CSD and xanthan gum. This study may have the benefits for providing the drug delivery of essential medicine to promote health.

Keywords: Stable colloidal suspension; Pharmaceutical quality; Different suspending agents

A Systematic Review of the Emerging 5-fluorouracil Nanotheranostic Agents for Cancer Treatment

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Introduction: The use of nanocarriers to deliver chemotherapeutic drugs is advanced via the accommodation of additional diagnostic capability. The combination of both therapeutic and diagnostic agents, also known as nanotheranostic agents (NTAs), acts as a multi-functional platform that allows monitoring of cancer progression. As an emerging area of interest under the umbrella of nanomedicine, the applications of NTAs are highly envisioned **Objective:** Due to the diverse materials used to construct NTAs, their safety, effectiveness, and diagnostic accuracy could vary substantially. This systematic review was conducted to consolidate current NTAs incorporating 5-fluorouracil (5FU) and elucidate their toxicity, anticancer efficacy, and imaging capability. **Methodology:** Medline and Embase databases were searched up to 18th March 2022, with the original research paper (n=9) involving 5FU in the preparation of nanoparticles which reported their efficacy, toxicity and diagnostic capability in animal cancer models, were recruited. **Results:** Six studies used 5FU-NTAs that were functionalized to illicit various modes of treatments: (i) active targeting only (50.0%), (ii) thermal ablation only (33.3%) and (iii) combination of both (ii) and (iii) (16.67%). Overall, these functionalized NTA were more efficacious (over 40% tumour volume reduction as compared to negative control) than the non-functionalized nanoparticles. **Conclusion:** The NTAs, which are composed of tumour-targeting ligands, hold promises for further development. Based on the input of current NTA research on cancer, this review proposed a checklist of parameters (PICANT) to recommend researchers for their future NTA testing in animal cancer studies.

Keywords: Nanoparticles; Cancer; Thermal ablation; Tumour-targeting; *In vivo*

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- ***Gases Accessories** : Liquefied Gases Containers, Compressed Gas Cylinder, Gas Regulator, Gases Detector, Gases Generator, flowmeter.*

PRESENTERS LIFE SCIENCES

Oral Presenters		
Date: 27 September 2022 (Tuesday)		
ID	**Presenters**	**Time**
OP-LS-01	**Benedict Anak Samling** Antimicrobial, Antioxidant and Cytotoxic Activities of Essential Oils from *Cynometra cauliflora*	10:45 AM
OP-LS-02	**Rekha R. Shenoy** Dehydrozingerone for Accelerating Wound Healing in Diabetic Foot Ulcer in High Fat Diet Fed Wistar Rats	11:00 AM
OP-LS-03	**Jaya Kumar** The Effects of Okra Seed Powder on High-fat Diet-induced Cognitive Impairments and Hypercholesteremia in C57BL/6J Mice	11:15 AM
OP-LS-04	**Sakunie Sawai** HepG2 Tumourspheres Exhibit Proliferative and Survival Features in Prolonged Hypoxic Serum-free Culture Condition	11:30 AM
OP-LS-05	**Chun Ren Lim** Development and Validation of Blood-based Predictive Biomarkers for Response to PD-(L)-1 Checkpoint Inhibitors: Evidence of a Universal Systemic Core of 3D Immunogenetic Profiling Across Multiple Oncological Indications	11:45 PM

Oral Presenters		
Date: 27 September 2022 (Tuesday)		
ID	**Presenters**	**Time**
OP-LS-06	**Boon Hee Goh** Geraniin Improves Hypertension in Rats with High-fat Diet-induced Obesity through Alleviation of Excessive Vasoconstriction and Vascular Oxidative Stress Level in the Blood Vessels	2:30 PM
OP-LS-07	**Shubhangi Raskar** Identification of Quorum Sensing Inhibitors from the Fruits of *Embelia ribes* Burm f.	2:45 PM
OP-LS-08	**Runali Sankhe** In silico and In vitro Assessment of Neprilysin Signalling in Rat C6 Glioblastoma Cell Line	3:00 PM

Date: 28 September 2022 (Wednesday)		
ID	**Presenters**	**Time**
OP-LS-09	**Jayasutha Jayram** Characterization of *Acalypha indica* Impregnated Biofabricate for Wound Dressing Applications	10:40 AM
OP-LS-10	**Meyammai Shanmugham** Time Dependent Activation of TMAO Induced Apoptosis and Inflammation on Human Microvascular Endothelial Cells	10:55 AM
OP-LS-11	**Jian Sheng Loh** Identifying the Neuroprotective Mechanisms of Zerumbone in Neurodegenerative Diseases by Network Pharmacology	11:10 AM

Antimicrobial, Antioxidant and Cytotoxic Activities of Essential Oils from *Cynometra cauliflora*

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Introduction: *Cynometra cauliflora* is an indigenous fruit tree in Malaysia belonging to the Fabaceae family. The plant is known as "*nam-nam*" or "*katak puru*" locally. *C. cauliflora* is used by locals in traditional medicine. **Objective:** This study aimed to identify the essential oils (EOs) composition from the leaf, twig and fruit of *C. cauliflora* and evaluate their antimicrobial, antioxidant and cytotoxic activities. **Methodology:** Hydrodistillation was performed to isolate the EOs from *C. cauliflora*. The obtained EOs were identified using gas chromatography-flame ionization detector (GC-FID) and gas chromatography-mass spectrometry (GC-MS). Antimicrobial assay was conducted using disc diffusion and broth microdilution assays. DPPH radical scavenging activity was used to assess the antioxidant activity while MTT assay was performed on human breast cancer MCF-7 cells for cytotoxicity test. **Result:** Terpenoids were the major constituents found in the EOs. Antioxidant activity revealed twig oil had the highest DPPH radical scavenging activity compared to the leaf and fruit EOs. Twig oil inhibited most of the microorganisms in antimicrobial assay. Cytotoxicity assay showed that twig oil exhibited anti-proliferative effects on MCF-7 cells. **Conclusion:** Twig oil from *C. cauliflora* showed promising bioactivity and warranted for further study.

Keywords: *Cynometra cauliflora;* Essential oils*;* Antimicrobial; Antioxidant; Cytotoxicity

Dehydrozingerone for Accelerating Wound Healing in Diabetic Foot Ulcer in High Fat Diet Fed Wistar Rats

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Introduction: Diabetic foot ulcers (DFUs) are one of the major factors affecting the diabetic patient's quality of life. Currently, limited options are available to deal with diabetic foot ulcers as the current alternatives are expensive for a common man to afford. Impairment in healing is due to disturbed and overlapping proliferative and inflammatory phases involved. Dehydrozingerone, has been known for its anti-inflammatory, antioxidant, and wound healing properties. **Objectives:** To find out the effect of dehydrozingerone (DHZ) and compare its local and systemic effects and to analyze its effect on various phases of healing in conditions like diabetic foot ulcer. **Methodology:** Dehydrozingerone was synthesized and prepared in two forms i.e., for systemic effect (DHZ oral dose 100mg/kg) and for local effect (DHZ gel 100mg/kg). Three months high fat diet-fed low dose streptozotocin-induced type-II diabetic foot ulcer model was used to evaluate the effectiveness of dehydrozingerone. IL-1β, TNF-α levels were estimated using ELISA, along with antioxidant parameters like lipid peroxidation, glutathione reductase using colorimetry. Immunoblotting was performed to investigate DHZ effect on the expression of JNK, HSP, P38, SIRT-1, SMA, VEGF, MMP-9 in foot ulcer tissue. H&E and Masson's Trichrome staining were performed for analyzing DHZ effect on granulation tissue formation, migration of fibroblasts, epithelial tissue formation, inflammatory cells infiltration, angiogenesis, and collagen deposition. **Results**: DHZ decreased the levels of lipid peroxidation, TNF-α, IL-1β, & increased glutathione levels in wound tissue. Western blotting results suggested that DHZ activated MAPK signaling, increased expression of HSP-27, VEGF, MMP-9, SMA thus facilitating the migration and proliferation of fibroblasts, angiogenesis, and decreased inflammation. Masson Trichrome & Histopathology showed increase in collagen, epithelial & granulation tissue formation. **Conclusion:** Results suggest that DHZ both in systemic and local form significantly accelerates the healing in diabetic foot ulcers by repairing the altered stages of wound healing in diabetic condition.

Keywords: Diabetic foot ulcer; Dehydrozingerone; Wound healing; Cellular mechanisms; MAPK Signaling

The Effects of Okra Seed Powder on High-fat Diet-induced Cognitive Impairments and Hypercholesteremia in C57BL/6J Mice

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Introduction: Okra is well known for its antioxidant and potential neuroprotective effects. **Objectives:** The present study aimed to evaluate whether okra seed powder able to alleviate HFD-induced cognitive detriment and hypercholesteremia. **Methodology:** We randomly divided thirty-six C57BL/6J male mice into six groups: (i) control, mice fed with a diet containing normal fat level; (ii) HFD, mice fed with HFD; (iii) HFD-SIM, mice fed with HFD and given simvastatin (20 mg/kg/day); (iv) HFD-OS1; (v) HFD-OS2; (vi) HFD-OS3, mice fed with HFD and okra seed powder (200, 400, or 800 mg/kg/day, respectively). The mice' food intake, weekly average body weight, blood lipid profiles were recorded during 12 weeks of treatment. Almost 10 weeks following the treatment, the mice were exposed to episodic-like memory test (EMT) and Morris water maze (MWM). **Results:** All animals gradually weighed more, particularly the mice fed with HFD gained more weight and recorded significantly higher total and LDL cholesterol levels. For the EMT, the control animals performed better than the HFD group. The HFD-induced cognitive impairment was more prominent in the MWM test, where the control animals learned and retrieved spatial reference memory more significantly compared to the HFD group. The okra seed powder did not produce any notable effects in the EMT. On the contrary, the mice treated with okra performed better than the HFD group during four days of acquisition trials in MWM test. During the probe trial, only the mice fed with the highest dose of okra spent significantly more time and produced higher number of entries into the platform zone, hence indicating the significant retention of spatial reference memory. **Conclusion:** Despite significantly improving the spatial learning and memory retention, we recommend okra-related future studies to test different components of cognition to have a clear understanding on the neuroprotective effects of okra.

Keywords: Okra; High-fat diet; Episodic memory; Spatial memory; Morris water

HepG2 Tumourspheres Exhibit Proliferative and Survival Features in Prolonged Hypoxic Serum-free Culture Condition

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Introduction: Hypoxia is a common feature of the tumor microenvironment (TME) of nearly all solid tumors including hepatocellular carcinoma (HCC). When a hypoxic TME is formed, cancer cells undergo cellular and molecular switches to adapt to the harsh TME, promoting the formation of aggressive and resistant phenotypes, the leading cause of tumour relapse and therapeutic failure. However, cellular and molecular features associated with the tumorigenesis of HepG2 tumourspheres in hypoxia remains to be uncovered. **Objectives:** This study aims to characterise the cellular and molecular features associated with hypoxia-regulated tumorigenesis of HepG2 tumoursphere model in hypoxic culture condition. **Methodology:** HepG2 tumoursphere model is used in this study for *in vitro* evaluation of the cellular responses that resembles the native TME of HCC. HepG2 tumourspheres were cultured using ultra-low attachment plates in normoxia (20-21% oxygen, serum-supplemented culture) and hypoxia (1% oxygen, serum-free culture) conditions for 15 days, in which morphology was assessed daily. The viability and proliferation profiles of the tumourspheres were examined using CellTiter-Glo 3D viability assay, tryphan blue exclusion assay and LIVE/DEAD 3D fluorescent assay at every 2-day interval. **Results:** As the tumoursphere formation progressed, HepG2 cells rapidly proliferated in normoxia which peaked on Day 13, while the rate decreased by half in hypoxia on Day 7-13 and increased sharply on Day 15. Similarly, the morphology and fluorescent assay revealed that the size of the tumourspheres in hypoxia decreased by approximately 0.7-fold from Day 7 onwards, leading to lower accumulation of dead cells in the core as compared to normoxia. **Conclusion:** Low oxygen and serum-free condition slowed the rate of proliferation of HepG2 cells. This could be potentially mediated via the alteration of genes associated with hypoxia, cell cycle, apoptosis, metabolism and stemness. Therefore, we will further characterise these features and identify the potential regulators.

Keywords: Hypoxia; Hepatocellular carcinoma; HepG2 tumoursphere; Viability; Proliferation

Development and Validation of Blood-based Predictive Biomarkers for Response to PD-(L)-1 Checkpoint Inhibitors: Evidence of a Universal Systemic Core of 3D Immunogenetic Profiling Across Multiple Oncological Indications

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Introduction: Unprecedented advantages in cancer treatments with immune checkpoint inhibitors (ICI) remain limited to a subset of patients, with high demands for development of better biomarkers to access likely clinical response in advance of ICI therapeutic interventions. 3D genomics has emerged as a novel molecular biomarker modality with strong functional correlation to clinical outcomes. The last few years have seen 3D genomics applications in patient stratifications, offered solutions in symptomatic and pre-symptomatic diagnosi and prediction of response to therapeutic interventions. EpiSwitch® is a 3D genomic platform for the discovery of 3D genomic blood-based biomarkers in a variety of immune-related and oncological diseases. **Objectives:** To develop and validate blood-based predictive 3D genomic biomarkers for response to PD-(L)-1 checkpoint inhibitors. **Methodology:** To conduct a genome-wide analyses of the regulatory 3D genome architecture linked to epigenetics and immunogenetic controls associated with tumour immune evasion. Several independent cancer patient cohorts treated with Pembrolizumab, Atezolizumab, Durvalumab, in over 15 diverse oncological indications were analyzed using EpiSwitch®. **Results:** A clinical blood assay based on 8 markers - Checkpoint Inhibitor Response Test (CiRT) - has been developed to predict response to ICI from over 30 million data points. The predictive 8 biomarker set is based on an observational clinical trial and several retrospective cohorts, representing all together 229 treatments of diverse oncological indications, i.e. melanoma, lung, urethral, hepatocellular, bladder, prostate, head and neck, colon, breast, bone, brain, lymphoma, larynx. CiRT has demonstrated high accuracy up to 85%, sensitivity of 93% and specificity of 82%. **Conclusion:** This study demonstrates that a 3D genomic approach could be successfully utilized for development of a non-invasive predictive clinical assay for response to ICI in cancer patients. CiRT can assist in treatment decisions, help improve patient selection for optimized treatment, utilize alternative effective treatments, minimize unnecessary toxicity, and efficiently manage the costs.

Keywords: Immune checkpoint inhibitors; 3D genomics; Biomarkers; Blood assay

Geraniin Improves Hypertension in Rats with High-fat Diet-induced Obesity through Alleviation of Excessive Vasoconstriction and Vascular Oxidative Stress Level in the Blood Vessels

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Introduction: Increasing studies indicate that obesity is strongly associated with the prevalence of hypertension, the latter of which is a significant risk factor of cardiovascular disease worldwide. Our previous study showed that geraniin, an ellagitannin abundantly presents in the rind of rambutan fruit (*Nephelium lappaceum*), possessed a promising anti-hypertensive effect whilst effectively ameliorating various metabolic perturbations in Sprague-Dawley (SD) rats with high-fat diet (HFD)-induced obesity. **Objective**: This project aimed to elucidate the underlying mechanism by which geraniin ameliorates obesity-induced hypertension. **Methodology**: Hypertension was induced in SD rats on an HFD for 8 weeks, followed by oral geraniin intervention (25 mg/kg/day) for 4 weeks. Body weight and blood pressure was examined weekly. At the end of treatment, blood plasma, aorta, and visceral adipose tissue (VAT) were collected for biochemical and molecular analyses. The outcomes of geraniin-treated rats were compared with those of untreated rats on either a control diet or an HFD and with hypertensive rats treated with 40 mg/kg/day captopril (positive control). **Results**: Geraniin supplementation markedly ameliorated various vascular changes induced by HFD, including hypertension, enhanced vasoconstriction response, increased thickness of blood vessels wall, and exacerbated oxidative stress and inflammatory response in the blood vessels, and the effect was comparable to captopril treatment. However, both interventions did not significantly improve the body weight gain of HFD-fed rats. Transcriptome profiling of VAT reveals that geraniin upregulated the expression of genes related to UDP-glucuronosyltransferase (UGT) enzymes, potentially encouraging the clearance of lipid species that are involved in the induction of vascular damage; ultimately recovering the ability of blood vessels to regulate blood pressure level. **Conclusion**: Geraniin mitigated vascular anomalies in rats with obesity-induced hypertension and the implicated mechanism might be related to the enhanced elimination of excessive lipid species, making it an attractive drug candidate for further investigation.

Keywords: High blood pressure; Ellagitannin; Antioxidant; Vasoactive substances; Transcriptomics

Identification of Quorum Sensing Inhibitors from the Fruits of *Embelia ribes* Burm f.

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Introduction: *Embelia ribes Burm f.* (Embelia) is an important medicinal plant extensively used in traditional and complementary medicine as an antimicrobial, antihelminthic, antipyretic, ant carminative, antioxidant, etc. agent. Although extensively studied for its antimicrobial properties it has not been explored for quorum quenching abilities. Here we report the potential of Embelia fruit extracts as an inhibitor of biofilm formation in *Agrobacterium tumefaciens*, a bacterium causing galls in plants using quorum sensing as a proliferation and virulence mechanism. **Objective:** Identification of novel compound against bacterial quorum sensing from the fruits of Embelia. **Methodology:** Mature and dried Embelia fruits were extracted with different solvents namely, methanol, dichloromethane (DCM), and n-Hexane, and were screened for biofilm inhibition of *Agrobacterium tumefaciens*. To determine the quorum quenching abilities of the extracts, microscopic observation and microtiter plate assays were conducted. Extracts with activity were fractionated in High performance liquid chromatography and the active fraction was subjected to liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS) to identify the quorum sensing inhibitor compounds. **Results:** Methanolic extracts exhibited maximum biofilm inhibition than DCM and n-Hexane extracts. LC-MS/MS-based analysis of the active fraction identified in 10 glycosylated flavonoids (GFlv), out of which 4 are keampherol derivatives, 2 quercetin derivatives, D-Erythroascorbic acid 1'-a-D-glucoside, Dihydroisorhamnetin, guaijaverin, and Isoquercitrin. Most of these compounds are identified newly from Embelia, except the quercetin derivatives and isoquercetrin. **Conclusion:** GFlvs are known quorum quenchers in bacteria that inhibit acyl-homoserine lactone-mediated quorum sensing. Therefore, newly identified GLFvs from Embelia are the potential quorum quenchers that can be explored against pathogenic bacteria. Being originated from a plant, harnessing these compounds is easy and non-hazardous.

Keywords: Acyl-homoserine lactone; Glycosylated flavonoids; Quorum quenching; Quorum sensing

In silico and In vitro Assessment of Neprilysin Signalling in Rat C6 Glioblastoma Cell Line

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Introduction: Neprilysin is a neutral endopeptidase and cell-surface peptidase that negatively regulates various cancer cells. The upregulation of neprilysin expression has been reported to retard cancer growth in different studies. Neprilysin is abundantly expressed in various parts of brain and is synthesized in endosomes of astrocytes. Despite extensive research on functions of neprilysin in various neuronal diseases, the association of neprilysin in glioblastoma is still far from being understood. Hence, the current study focussed mainly on identification of neprilysin upregulators and evaluation of neprilysin upregulation in rat C6 glioblastoma cell line. **Objectives:** 1. To perform *in silico* molecular docking and dynamics studies to identify neprilysin upregulators**,** 2. Screening of selected neprilysin upregulators in rat C6 cell line, using different in vitro assays. **Methodology:** The crystal structure of human neprilysin (RCSB PDB ID: 6GID) with resolution 1.9 Å was used to perform molecular docking and dynamic studies. Twenty-five known neprilysin upregulators were screened against neprilysin protein, and top 3 drugs were identified. Selected drugs were further screened in rat C6 glioblastoma cell line. Sulforhodamine B assay was performed to obtain IC50 values of selected drugs. Further AO/EB, cell invasion, neprilysin activity assays were performed with few concentrations of each drug. To evaluate the effect of selected drugs on neprilysin signalling, western blot analysis of different proteins involved in neprilysin signalling was carried out. **Results:** Based on results obtained from in silico studies imatinib, epigallocatechin gallate and resveratrol, were selected for screening of neprilysin upregulation in C6 cell line. The imatinib, epigallocatechin gallate and resveratrol showed IC50 value 15.79 ±3.54, 19.55±3.73, and 28.51±3.14 respectively. Western blot analysis of neprilysin upregulation in C6 cell line showed promising anti-cancer effect in rat C6 cell line. **Conclusion**: Study findings suggest that selected drugs showed anti-cancer activity in rat C6 cell line via upregulation of neprilysin signalling.

Keywords: Glioblastoma; Neprilysin; Rat; C6 cell line; In silico

Characterization of *Acalypha indica* Impregnated Biofabricate for Wound Dressing Applications

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Background: Current wound management fails to address all aspects/types of wounds despite the availability of scores of traditional and modern, investigational products. Traditional medicine drugs of wound healing repute validated to target multiple biological pathways and key events in the mammalian wound healing cascade, reportedly affecting wound healing phases. **Objectives:** In this study, we undertook characterization of wound dressing thin film based on natural polymer impregnated with *Acalypha indica* extract for suitability as wound dressing material. **Methodology:** Polymer blend thin film (PBTF) and PBTF with *Acalypha indica* (PBTFAI) were prepared using solvent casting techniques and was subjected to the assessment of Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy, swelling study, protein adsorption study, tensile strength, thermogravimetric analysis and differential scanning calorimertry, antimicrobial study and human Dermal Fibroblast (HDF) proliferation study. **Results:** FTIR spectroscopic frequencies of PBTFAI ascertained ample polymer/*Acalypha indica* blending. It had morphological features along with good exudate absorbing capability, thermal stability, tensile strength and elastic modulus. Anti-microbial assay established its anti-bacterial activity against the tested Gram - positive and Gram - negative bacterial strains. The proliferation of HDF cells on PBTFAI significantly increased on successive days when compared to PBTF without *Acalypha indica.* The increase in the proliferation implied that *Acalypha indica* incorporation has brought cell augmentation and the developed dressings were less cytotoxic. **Conclusion:** PBTFAI proved to be a suitable dressing for wounds and it can surely be developed as an ethical plant bioactive-based wound healant.

Keywords: *Acalypha indica*; Wound dressing; Biofabricate

Time Dependent Activation of TMAO Induced Apoptosis and Inflammation on Human Microvascular Endothelial Cells

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Introduction: Cardiovascular diseases (CVD) are the leading cause of death worldwide. Endothelial dysfunction is recognised as critical and initiating contributing factor for CVD. Trimethylamine N-oxide (TMAO), a gut microbiome derived metabolite is involved in the pathogenesis of CVD. However, the underlying molecular mechanisms involved in the pathogenesis of TMAO in endothelial cells remains unclear. **Objectives:** The aim of this study was to investigate the time-dependent molecular signatures of TMAO treatment on human microvascular endothelial cells (HMEC-1). **Methodology:** HMEC-1 cells were treated with TMAO (50μM) for 24H or 48H. At the end of treatment duration, cells were harvested and subjected to RNA sequencing analysis. Differentially expressed genes and their enrichment pathway was used to determine the molecular pathways. Quantitative real-time PCR was also used to validate the expression of key genes that were associated with apoptotic or inflammatory pathways. Furthermore, subsequent experiments were used to determine cell viability (prestoblue) or reactive oxygen species generation using fluorometry (DCFDA). **Results:** Treatment of TMAO (50μM) for 24H showed that 80 genes were differentially expressed. Specifically, 2 genes were upregulated, and 78 genes were downregulated, which were mainly enriched in metabolic and apoptotic pathways. However, 542 and 663 genes were upregulated and downregulated respectively after the cells were treated with TMAO (50μM) for 48H. Differentially expressed genes were enriched in upregulated pathways such as oxidative stress and inflammation. Pathways like structural organisation of extracellular matrix, endothelial cell proliferation, migration and differentiation, and metabolic processes were downregulated. Despite unique differential gene expression profile between TMAO treatment duration, reduced cell viability and increased oxidative stress were observed in both treatment time points. **Conclusion:** This study demonstrated that TMAO-induced endothelial dysfunction is mediated by the activation of molecular genes signatures involving in oxidative stress and inflammation, leading to endothelial cell remodelling and apoptosis.

Keywords: Cardiovascular diseases; Trimethylamine N-oxide; Apoptosis; Inflammation

Identifying the Neuroprotective Mechanisms of Zerumbone in Neurodegenerative Diseases by Network Pharmacology

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Introduction: Complex diseases, including neurodegenerative diseases (NDs), involve the disruption of many proteins and biological networks. Contrary to the "one gene, one drug, one disease" paradigm, network pharmacology rationalises complex diseases at systems level and discovers agents that act on multiple targets. Zerumbone is a sesquiterpenoid present abundantly in the rhizomes of ginger with a wide spectrum of pharmacological activities. **Objectives:** To investigate the neuroprotective mechanisms of zerumbone in NDs by network pharmacology. **Methodology**: The NDs-related targets were obtained from DisGeNET and GeneCards databases. The protein-protein interaction (PPI) network of NDs was constructed using STRING database, analysed using centrality measures (degree, betweenness, eigenvector), clustered using ClusterONE and characterised with gene ontology (GO) enrichment analysis using Metascape. The target proteins of zerumbone were obtained using PharmMapper, STITCH and SwissTargetPrediction database. The overlapped targets between zerumbone and NDs were determined and verified by performing molecular docking using AutoDock Vina. **Results:** A total of 1987 NDs-related targets were obtained, which forms a vast PPI network consisting of 1260 genes interconnected by 27288 interactions. 29 key NDs-related targets were identified by applying degree, betweenness and eigenvector centrality. As biologically and functionally similar proteins interact with each other in modules, we next clustered the vast PPI network into 57 statistically significant modules. 270 potential targets of zerumbone were obtained, among which 4 proteins (*AKT1*, *CASP3*, *IL6* and *HSP90AA1*) overlapped with the 29 key NDs-related targets identified. *HSP90AA1*, *AKT1*, *CASP3* and *IL6* were involved in 9, 38, 38, and 40 modules, respectively. These modules are significantly enriched with GO terms related to neuroinflammation, oxidative stress and apoptosis. Molecular docking shows that zerumbone has strong binding interactions with the key proteins, with binding affinity ranging between -6.1 and -6.9 kcal mol^{-1}. **Conclusion:** These results suggest that zerumbone targets NDs primarily via modulation of neuroinflammation, oxidative stress and apoptosis.

Keywords: Network pharmacology; Network analysis; Module analysis; Neurodegenerative diseases; Zerumbone

Poster Presenters		
Date: 27 September 2022 (Tuesday)		
ID	**Presenters**	**Time**
PP-LS-01	**Noor Azleen Mohamad** Isobologram Analysis of Hydroxychavicol and 5-Fluorouracil Combined Therapy against HT-29 and DLD-1 Colorectal Cancer Cell Lines	3:20 PM
PP-LS-02	**Serene Ng** Plasma Hyaluronic Acid Concentration in Individuals with Liver Diseases	3:30 PM
PP-LS-03	**Dexter Hoi Long Leung** Predicting Potential Long Non-coding RNAs in Glioblastoma Cell-invasion through Bioinformatic Databases	3:40 PM
PP-LS-04	**Shin Jie Yong** Neuroprotective Potential of Lactoferrin and Human β-defensin 3 in Rotenone-induced Cell Model of Parkinson's Disease	3:50 PM
PP-LS-05	**Ling Li Yeoh** Avocado - Superfood for Skin: A Systematic Review	4:00 PM

Isobologram Analysis of Hydroxychavicol and 5-Fluorouracil Combined Therapy against HT-29 and DLD-1 Colorectal Cancer Cell Lines

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Introduction: Drug combination research for cancer cells has lately expanded, as most cancer cells such as colorectal cancer have developed resistance to chemotherapeutic drugs such as 5-fluorouracil (5-FU). Hydroxychavicol is a phenolic compound isolated from the *Piper betle* shown to have promising anticancer properties. **Objective:** To determine the isobologram interaction of the hydroxychavicol and 5-FU combination treatment. **Methodology:** HT-29 and DLD-1 were cultured in 96-well plates and treated for 24 and 48h with 50, 70, 100, 150, and 300 µM HC combined with 5-FU (40, 55, and 75 µM). The cell viability was determined using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) assay. The Chou-Talalay equation was then used to analyse the combination index. **Results:** Cell viability of HT-29 and DLD-1 treated with HC+5FU for 24h and 48h ranged between 44%-65% and 40%-65% respectively. The inhibitory concentration at 50% (IC_{50}) of HC combined with 40, 55 and 75 µM 5-FU on HT-29 and DLD-1 at 24h ranged between 146.4 - 311.4 µM and 152.6 - 262.3 µM respectively. Meanwhile, the IC_{50} of HC combined with 40, 55 and 75 µM 5-FU treated on HT-29 and DLD-1 after 48h ranged between 126.9 - 327.7 µM and 72.7 - 96.3 µM respectively. The combination index of HC+5-FU treated on HT-29 and DLD-1 at 24h and 48h is 0.49 and 0.77; 1.11 and 1.08. The most effective concentration of 5-FU (55 µM) was chosen for the subsequent experiments. **Conclusion:** The HC+5-FU treatments exhibited synergistic interaction when given for 24h, however, the IC_{50} interaction became additive after 48h. The action of the combination therapy will be investigated further to determine whether it affects the purine metabolism of HT-29 and DLD-1.

Keywords: Hydroxychavicol; 5-Fluorouracil; Colorectal cancer; Cell viability; Isobologram

Plasma Hyaluronic Acid Concentration in Individuals with Liver Diseases

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Introduction: Non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steatohepatitis (NASH) are compelling hepatic diseases in the Asia-Pacific region, with a prevalence of 30% and 3% respectively. NAFLD/NASH are not amicably diagnosed due to diagnostic challenges which involve invasive liver biopsy procedure and expensive imaging tests, and also misconception of the life-threatening consequences the diseases cause. Presently, multiple-marker assays such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST) are employed to clinically diagnose and stage the diseases. In several studies, hyaluronic acid (HA) has been proposed to be a more specific and reliable diagnostic marker for fibrosis. **Objectives:** 1. To determine and compare the plasma HA concentration of individuals with and without liver diseases, 2. To investigate the correlation between factors such as age, gender or severity of liver disease and plasma HA concentration. **Methodology:** Plasma was collected from 216 subjects recruited under our observational study approved by MREC (NMRR ID: NMRR-19-1408-48521). Plasma HA concentration was determined using Hyaluronan Quantikine® ELISA kit (R&D Systems; Catalog No.: DHYAL0). **Results:** Statistical analysis showed that regardless of the presence or severity of liver diseases, the concentration of plasma HA in younger individuals (below 50 years old) was significantly lower ($p = 2.7^{-10}$). Meanwhile, it was found that plasma HA concentration corresponds to the severity of NASH. Investigation is currently underway to examine the concentration of plasma HA in individuals with NAFLD. On the other hand, there was no association between gender and plasma HA concentration ($p = 0.20$). **Conclusion**: Our preliminary results suggested that plasma HA concentration increases as one ages. Noteworthily, plasma HA is positively correlated to the severity of liver diseases. We postulate that the disruption of HA metabolism in response to hepatic injury such as inflammation and cirrhosis causes pronounced levels of HA in individuals with severe liver diseases.

Keywords: Non-alcoholic fatty liver disease; Non-alcoholic steatohepatitis; Hyaluronic acid

Predicting Potential Long Non-coding RNAs in Glioblastoma Cell-invasion through Bioinformatic Databases

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Introduction: Glioblastoma (GBM) is the most malignant type of CNS tumours and have a poor prognosis due to the highly invasive characteristics which renders surgical intervention ineffective. Long non-coding RNAs (lncRNAs) in recent years have been deliberated within cancer-related pathways such as cell-invasion through a sponging mechanism with microRNAs (miRNAs), which are both collectively known as competing endogenous RNA (ceRNA), which can regulate gene expression through transcriptional and translational silencing. Processes such as angiogenesis and EMT are associated with cell-invasion. Hence, identifying lncRNAs which regulates these processes in GBM could potentially facilitate future development of therapeutic strategies in managing the disease. **Objectives:** To predict potential lncRNA candidates involve in cell-invasion processes in GBM through bioinformatic databases. **Methodology:** Microarray was performed to obtained differentially expressed transcripts from LN18 (GBM) cells and Normal Human Astrocytes (NHA) cells. These transcripts were filtered for differentially expressed (DE) lncRNAs. A series of bioinformatic analysis was performed through various bioinformatic databases to obtain both lncRNA-miRNA and lncRNA-protein interactions associated with the DE-lncRNAs identified through microarray, these interaction were then utilised to predict lncRNA function based on the function of their targets based on the ceRNA mechanisms through performing gene set enrichment analysis of target proteins by Gene Ontologies (GO). Potential lncRNAs were then chosen to be validated through qRT-PCR in GBM cell lines. **Results:** Four lncRNA, LINC00221, LINC00265, LINC001564, and LOC100240735 were predicted to promote GBM cell invasion based on enrichment analysis which observed protein targets of these lncRNAs to be enriched by cell-invasion related GO annotations. Novel lncRNA-miRNA-mRNA interacting networks involving three lncRNA, NEAT1, CRNDE, and SNHG1 were also predicted. Finally, LINC00221 and LINC01564 were validated to be upregulated in GBM cell lines through qRT-PCR. **Conclusion:** LncRNAs are of an uprising research subject in cancer research, although lacking in GBM. This study has utilized both microarray and bioinformatics databases to predict upregulated lncRNA which can regulate invasion processes in GBM based on the target protein they interact with.

Keywords: Glioblastoma; Invasion; Non-coding RNA; Bioinformatics

Neuroprotective Potential of Lactoferrin and Human β-defensin 3 in Rotenone-induced Cell Model of Parkinson's Disease

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Introduction: Parkinson's disease (PD), the second leading neurodegenerative disease, is a motor disorder stemming from degenerated dopaminergic neurons in the substantia nigra pars compacta. Interestingly, certain antimicrobial peptides (AMPs) have been found to exhibit neuroprotection *in vitro* and *in vivo*. Hence, AMPs such as lactoferrin and human β-defensin 3 (hBD-3) may be promising therapeutic candidates against PD. To model PD *in vitro*, rotenone toxin is used to induce PD-related pathogenesis in differentiated SH-SY5Y cells. **Objectives**: We aim to examine the potential neuroprotective effects of exogenous lactoferrin and hBD-3 pre-treatment in rotenone-treated differentiated SH-SY5Y cells. **Methodology**: Immunocytochemistry for β-tubulin III (neuronal marker) and tyrosine hydroxylase (TH, dopaminergic marker) was performed to validate the retinoic acid (RA)-treated SH-SY5Y cell differentiation. RA-differentiated SH-SY5Y cells were then pre-treated with lactoferrin (1-10 μg/ml) or hBD-3 (0.1-1 μg/ml), followed by rotenone (1-5 μM) exposure to evaluate the neuroprotective effects of AMPs using cell viability assays. The optimal concentrations of AMPs and rotenone were further used to determine the roles of these AMPs in modulating mitochondrial membrane potential (MMP), oxidative stress, and apoptotic activities in rotenone-treated SH-SY5Y cells. **Results**: RA-differentiated SH-SY5Y cells exhibited 57% and 23% increased expression of β-tubulin III and TH, respectively, compared to undifferentiated SH-SY5Y cells ($P < .001$). Lactoferrin (10 μg/ml) pre-treatment further attenuated rotenone (5 μM)-induced cell viability loss by 14% ($P < .001$), MMP impairment by 18% ($P < .001$), reactive oxygen species generation by 1.4-fold ($P < .05$), nuclear condensation by 14% ($P < .001$), and caspase activation by 1.6-fold ($P < .01$) in differentiated SH-SY5Y cells. However, hBD-3 pre-treatment did not protect against rotenone-induced cell viability and MMP loss. **Conclusion**: These results suggest that lactoferrin exhibits potential neuroprotective effects in attenuating the rotenone-induced toxicity related to PD pathogenesis in SH-SY5Y cells.

Keywords: Parkinson's disease; SH-SY5Y; Neuroprotection; Antimicrobial peptides; Lactoferrin

Avocado - Superfood for Skin: A Systematic Review

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Introduction: The cosmeceutical industry has been blooming over the years, necessitating a demand for safe and effective options. Avocado (*Persea americana* Mill.) is a good source of safe phytonutrients and bioactive compounds, especially when the fruit and oil are generally regarded as safe (GRAS). Scientific data reported that bioactive compounds of Avocado could enhance skin complexion and thus a promising potential in the cosmeceuticals industry. **Objective:** The objective of this study was to appraise recent studies evaluating the use of avocado for cosmeceutical applications. **Methodology:** This systematic review investigated bioactive compounds of Avocado reported to possess activities on skin. Published data between December 2021 till February 2022 were extracted from Ovid Medline, Scopus, Pubmed, SciFinder and Web of Science. Search terms “avocado” OR “Persea Americana “AND “skin” AND “cosmetics' were used. A total of 307 published articles were identified using the search terms and 31 articles were selected for this review. **Results:** Avocado has phenolic acid, procyanidins, flavonols, hydroxybenzoic, hydroxycinnamic acids and condensed tannins which are bioactive compounds that has shown many cosmeceutical activities such as antioxidant, antimicrobial, anti-inflammatory, anti-aging, anti-tyrosinase and wound healing properties. **Conclusion:** This systematic review provides a comprehensive collection of evidence and critically appraises recent literature on avocado and its bioactive compounds in cosmeceutical application.

Keywords: Avocado; Bioactive compounds; Cosmeceutical

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Poster Presenters		
Date: 28 September 2022 (Wednesday)		
ID	**Presenters**	**Time**
PP-ST-01	**Irshika Suthakar** Unleashing Potential Applications of Xenobots in the Medical World of the Future	1:10 PM
PP-ST-02	**Hong Hao Chan** Spray-drying Preserves the Biological Content of Small Extracellular Vesicles Derived from Human Umbilical Cord-derived Mesenchymal Stem Cells	1:20 PM
PP-ST-03	**Jit-Kai Loh** The Development of Induced Cardiomyocytes Cell Sheet for Cardiovascular Treatment	1:30 PM
PP-ST-04	**Andang Miatmoko** Transfersomes for Delivering Amniotic Mesenchymal Stem Cells Metabolite Products as Skin Antiaging	1:40 PM

Unleashing Potential Applications of Xenobots in the Medical World of the Future

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Introduction: Xenobot is the first "living robot" made from the stem cells of African clawed frogs (Xenopus laevis). Unlike typical robots, a xenobot is composed entirely of cells but it can sense, compute and execute specific tasks with little or no human intervention including moving, self-healing, and spontaneously piling up the debris. However, considering that xenobot is still in its early stage of development, there is a significant lack of information about the application of xenobots in the biomedical field. **Objectives:** Therefore, this study aims to explore the potential biomedical applications of xenobots, especially in regenerative medicine, drug delivery systems, and cancer therapy. **Methodology:** A literature search was conducted using the keywords "xenobots," "regenerative medicine," "drug delivery system" and "chemotherapy" from PubMed, Ovid, and Scopus to obtain relevant research articles. **Results:** Xenobot demonstrates promising characteristics of self-repairing, which may contribute to regenerative medicine in repairing damaged or diseased tissue and organs in the future. Secondly, the minuscule size of the xenobot and its ability to carry out self-locomotion allow the xenobot to reach confined spaces in the human body. This characteristic enables a xenobot to contribute to arteriosclerosis treatment, as xenobot may be able to travel in arteries to scrape out the plaque. In addition, this characteristic of xenobot can also further be exploited to enhance targeted drug delivery systems to increase therapeutic effectiveness, reduce dose frequency, and prevent avoidable adverse effects on non-target cells. Lastly, the xenobot, which can move toward a target and pick up a payload, may play a role in cancer therapy by trapping the potentially harmful toxins or abnormal cell mass in the body. **Conclusion**: We envision that xenobot will be a promising model in future biomedical applications based on the available studies on the characteristics of xenobots.

Keywords: Xenobot; Regenerative medicine; Drug delivery system; Cancer therapy; Biomedical applications

Spray-drying Preserves the Biological Content of Small Extracellular Vesicles Derived from Human Umbilical Cord-derived Mesenchymal Stem Cells

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Introduction: Mesenchymal stem cells (MSCs) are adult stem cells that can differentiate into multiple lineages and play a vital role in tissue engineering and regenerative medicine. Recent findings suggest that the efficacy of MSCs is attributed to the paracrine secretion of small extracellular vesicles (sEVs). sEVs are nano-sized vesicles ranging from 30-200 nm, consist of DNA, RNA, proteins, and other biological substances, and have potent biological activities. Many efforts have been documented to explore the potential of sEVs for therapeutic intervention, drug delivery, and disease detection. However, their storage stability is poor even with the cold chain, and hence there is a need to determine an appropriate drying condition that enables the storage of sEVs. **Objectives:** In this study, the spray-drying approach was used to preserve the integrity and biological content of sEVs in a dried-powder state. **Methods:** The sEVs were isolated from human umbilical cord-derived mesenchymal stem cells by ultrafiltration and characterised by nanoparticle tracking analysis (NTA), immunoblotting, and transmission electron microscopy (TEM). **Results:** sEVs co-spray dried with sucrose and trehalose could preserve the protein content of sEVs up to 90% and 98%, respectively. However, an increase in particle size of the spray-dried sEVs was observed even in the presence of excipient. **Conclusion:** The current study shows that spray-drying of sEVs with sucrose and trehalose could preserve the sEVs and may serve as an alternative storage condition for sEVs for future applications.

Keywords: Mesenchymal stem cells; Small extracellular vesicles; Spray-drying; Excipient

The Development of Induced Cardiomyocytes Cell Sheet for Cardiovascular Treatment

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Introduction: The human heart is a complex vital organ that is composed of mainly cardiac fibroblasts, cardiomyocytes (CMs), smooth muscle cells, and endothelial cells. Intensive study has been conducted for treatment against cardiovascular disease (CVD), however, the use of drug treatment, micro-surgery and standard surgical procedure against CVD are unable to provide effective treatment. Based on previous research, use of CMs cell sheet for in vivo on myocardial infarct or ischemia mice have shown improvement on cardiac function. **Objective:** The use of stem cell technology was chosen to identify a more effective methods for CVD treatment. **Methodology and Result:** In our study, we derived CMs from induced pluripotent stem cells (iPSCs) and grow the induced CMs (iCMs) on thermo-responsive culture dish to create iCMs cell sheet. Our preliminary results show the success differentiation of a functional beating iCMs from iPSCs. Upon cell sheet formation, observation can be made on the presence of mature iCMs on the cell sheet by cardiac troponin T markers and with cell sheet thickness estimated of 50 μm. **Conclusion:** Therefore, we aim to use iCMs as a platform for therapeutic purposes and potential clinical trial candidate through in vivo test research.

Keywords: Induced pluripotent stem cell; Cardiomyocytes; Cell sheet; Cardiovascular disease; Theraupeutic

Transfersomes for Delivering Amniotic Mesenchymal Stem Cells Metabolite Products as Skin Antiaging

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Introduction: Amniotic Mesenchymal Stem Cells Metabolite Products (AMSC-MP) contain many growth hormones that are beneficial for overcoming the deficiency of collagen during skin aging. However, macromolecules >500 Da are difficult to penetrate the skin. **Objectives:** This study evaluates Transfersomes as delivery carriers to reach the dermis as the target tissues. **Methodology:** Transfersomes were composed of the mixtures of L-α phosphatidylcholine with three different surfactants, namely Sodium Cholate (SC), Tween 80 (TW), and stearylamine (SA), then the transfersomes were made by a thin layer method. The lipid film layer formed was then hydrated with AMSC-MP. **Results:** Using SC as the surfactant resulted in smaller particle size, a more uniform polydispersity index, and a negative zeta potential than those of SA and TW. In the antiaging efficacy study, Transfersome-SC produced the highest collagen density compared to Transfersome-TW and Transfersome-SA. Moreover, the safety evaluation through skin irritation test showed that AMSC-MP did not induce skin irritation while Transfersomes indicated very mild skin irritation, possibly due to the nature of the SC or other surfactants. **Conclusion:** The transfersomes successfully increased the antiaging efficacy of AMSC-MP providing future potential use for skin care products.

Keywords: Amniotic mesenchymal stem cells metabolite products; Skin aging; Transfersomes; Collagen; Skin penetration

PRESENTERS DIGITAL HEALTH & BIG DATA

Oral Presenters		
Date: 28 September 2022 (Wednesday)		
ID	**Presenters**	**Time**
OP-DB-01	**Khim Boon Tee** Application of Metformin Pharmacometabolomics in Early Phase Clinical Trials for Multifaceted Pharmacological Effects Revolutionized Clinical Drug Development	10:40 AM

Poster Presenters		
Date: 28 September 2022 (Wednesday)		
ID	**Presenters**	**Time**
PP-DB-01	**Nor Asyikin Mohd Tahir** Trends of Pharmacogenomic Studies in Malaysia: A Systematic Review	11:10 AM

Application of Metformin Pharmacometabolomics in Early Phase Clinical Trials for Multifaceted Pharmacological Effects Revolutionized Clinical Drug Development

Khim Boon Tee[1,2], Luqman Ibrahim[3], Najihah Mohd Hashim[4,5], Mohd Zuwairi Saiman[5,6,7], Zaril Harza Zakaria[2] and Hasniza Zaman Huri[1,8]

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Introduction: Pharmacometabolomics (PMx) analyzed the metabolic profiles of a subject respond to a drug treatment. The individual metabolic profiles between baseline and treatment data potential reveals the multifaceted drug pharmacological effects in therapeutics and adverse drug reactions. Application of the emerging PMx studies in small and short early-phase clinical trials under controlled environment reduced the subjects' variabilities for identification of phenotypic pharmacodynamic effects. Metformin is the first-line anti-diabetic agent that has been used for decades but the mechanism of action remains inconclusive. **Objectives:** This proof-of-concept study integrating personalized pharmacokinetics and PMx study to determine the provisional predictive pharmacodynamic response from dysregulated human metabolic pathways of metformin. **Methodology:** Seventeen healthy subjects were given single dose metformin 1000mg, 15 sampling time-points were collected and analyzed using the validated bioanalytical LCMS method. The individualized peak-concentration plasma (Cmax) samples were further analyzed with pre-dose plasma samples using untargeted metabolomic approach. PMx data processing and statistical analysis was performed using MetaboAnalyst with functional meta-analysis peaks-to-pathway approach to identify dysregulated human metabolic pathways. **Results:** The metformin Cmax was 1248 (IQR 849-1391) ng/ml and Tmax was 2.5 hours. The individualized Cmax pharmacokinetics guided untargeted PMx of metformin suggests a series of provisional predictive biomarkers and dysregulated human metabolic pathways which include arginine and proline metabolism, branch chain amino acid metabolism and other that associates with metformin pharmacological effects of increase insulin sensitivity and lipid metabolism. This study has the advantage of reducing study populations variability in controlled environment and aid to identify surrogate drug response pathways, increase prediction of responders for dose selection in phase II trials which can lower the cost and shorten the drug development process. **Conclusion**: Application of PMx in metformin aid to identify multifaceted dysregulated human metabolomic pathways associated with the insulin sensitivity and lipid metabolism pharmacological effects.

Keywords: Pharmacokinetics; Pharmacometabolomics; Metformin; Clinical trials

Trends of Pharmacogenomic Studies in Malaysia: A Systematic Review

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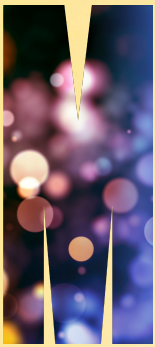
Introduction: Early pharmacogenomic studies were mostly conducted in the Western population. Recently, there has been a noticeable increase in the number of such studies conducted in Malaysia. However, a systematic review examining the trends of pharmacogenomic studies in Malaysia has not been carried out thus far. **Objectives:** To identify trends and potential research gaps through a systematic review of all pharmacogenomic studies in Malaysia published before 2022. **Methodology:** In order to find all relevant papers reporting the association between the presence of single nucleotide polymorphisms and any particular drug, a systematic search was conducted in three databases (PubMed, Web of Science, and Scopus). Inclusion criteria were as follows; drug and gene polymorphism mentioned, an association study, conducted in Malaysia, original article, included human participants, and written in English language. **Results:** This study found an increasing trend of pharmacogenomic articles published in Malaysia up until 2017, and a decreasing trend between the year 2018-2021. The most studied gene category is related to enzyme metabolism (39%), drug transporter (33%) and receptor binding (28%). Other than that, it was found that the *ABCB1* is the most studied gene in pharmacogenomic studies conducted in Malaysia. Trends according to anatomical therapeutic classification and study outcome showed the highest number of studies involving drugs acting on the central nervous system. **Conclusion:** In conclusion, Malaysia's significant rise in pharmacogenomic association study is encouraging. This systematic review provides the latest finding on the most studied genes and their association with a certain drug as well as the potential genes and drugs yet to be widely explored. Lastly, although some of these studies provided a few examples of clinical application, it is still falling behind Western countries. Thus, more collaborative research will potentially speed up the process to implement pharmacogenomics in clinical settings, as an effort toward precision medicine.

Keywords: Pharmacogenomic; Pharmacogenetic; Precision medicine



PRESENTERS FOOD SCIENCE

Oral Presenters		
Date: 28 September 2022 (Wednesday)		
ID	**Presenters**	**Time**
OP-FS-01	**Shobita Sree Gunasegaran** Low-Intensity Ultrasound for Improving the Post-harvest Quality and Shelf Life of Jaboticaba (*Myrciaria Cauliflora*) Fruits	10:55 AM

Low-Intensity Ultrasound for Improving the Post-harvest Quality and Shelf Life of Jaboticaba (*Myrciaria Cauliflora*) Fruits

Shobita Sree Gunasegaran[1], Darren Yi Sern Low[1], Bey Hing Goh[2,3], Siah Ying Tang[1,4]

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Introduction: Jaboticaba (*Myrciaria Cauliflora*) is a fascinating Brazil grapefruit with high concentration of bioactive compounds and is commercially cultivated in large scale in Malaysia. Jaboticaba berries are known as tropical superfruit with various health benefits. Due to its remarkably high antioxidant and nutritional content, Jaboticaba fruits are mostly consumed both fresh and industrially processed in the form of juices, jellies, jam, wine, and vinegar. However, the Jaboticaba fruits have a very short postharvest life ~ 4 days, mainly due to the rapid loss of water results in deterioration of fruit texture. Thus, appropriate yet effective technology for postharvest and harvesting are critical for extending the shelf life of Brazilian grapefruits. **Objectives:** The goal of present study was to investigate the impact of low-intensity ultrasound (US, 40kHz, 60W) application on the postharvest attributes of Jaboticaba fruits during storage. **Methodology:** The effect of US treatment on fruit quality parameters such as peel colour, firmness, fresh weight loss (FWL), total soluble solids (TSS), pH, decay, and antioxidant capacity were assessed over an 8-day storage period. **Results:** The results revealed that the use of low intensity US significantly reduced FWL and decay incidence while maintaining a high level of firmness, peel colour, and antioxidant. No significant effect of US on TSS content was observed due to its non-climacteric nature of Jaboticaba grapefruits. Amongst all the experimental groups, the grapefruits treated with 5 min US presented the highest fresh weight (96.38%), firmness (92.75%), pH (93.42%), and peel colour (99.07%), with a much longer shelf life ~ 8 days. The antioxidant content was higher in the grapefruits treated with 5 min than those treated ultrasonically with 10, 20, 30 and 40 min and untreated control group. **Conclusion:** Our findings suggested that low intensity US was a promising approach in preserving the quality and extending the shelf life of commercial Brazilian grapefruits.

Keywords: Ultrasound; Jaboticaba; *Myrciaria Cauliflora*; Postharvest; Shelf life

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PRESENTERS PUBLIC HEALTH & OTHERS

Oral Presenters		
Date: 27 September 2022 (Tuesday)		
ID	**Presenters**	**Time**
OP-PH-01	**Raja Muhammad Iqbal Raja Yahya** Implication of Insomnia and Depression among Malaysian Undergraduate Health Science University Students in UPM during Covid-19/Movement Control Order	3:30 PM
OP-PH-02	**Janarthanan Supramaniam** Novel Self-healing Rubber Glove for Enhancing Worker Safety and Health Protection	3:45 PM
OP-OT-01	**Althea Julianne S. Libed** Ready Intern One: The Experiences of Students on Virtual Pharmacy Internship During COVID-19 Pandemic in the Philippines Topic type: Virtual Pharmacy Internship	4:00 PM
OP-OT-02	**Hammad Ullah** Effect of Food Supplement Containing S-adenosylmethionine and Probiotics on Mood: A Randomized, Double Blind, Placebo Controlled, Cross Over Clinical Trial Topic type: Food Supplement	4:15 PM

Implication of Insomnia and Depression among Malaysian Undergraduate Health Science University Students in UPM during Covid-19/Movement Control Order

Raja Muhammad Iqbal Raja Yahya[1], Hasni Idayu Saidi[1], Seri Narti Edayu Sarchio[1] and Sharifah Sakinah Syed Alwi[1]

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Introduction: The movement control order (MCO) was implemented during the pandemic crisis to reduce the rise in Covid-19 infections. Some people may find it easy to adjust to this "new norm" brought about by MCO, but others may find it difficult to switch from their previous habits and routines to the new ones. This could result in more frequent insomnia and depression, which would subsequently have an impact on their mental health. **Objective:** To investigate the implication of insomnia and depression levels among Malaysian undergraduate health sciences students in Faculty of Medicine and Health Sciences, UPM during Covid-19 Pandemic and Movement Control Order. **Methodology:** This quantitative study used random sampling method with consideration of inclusion and exclusion criteria. Instrument packages such as Patient Health Questionnaire-9 (PHQ-9) and Insomnia Severity Index (ISI) were used in this study. The questionnaire was distributed through an online platform. **Results:** Severity level of insomnia was found to be associated with depression (p-value < 0.001) among health sciences university students in UPM via chi-square analysis. The sample size was N=472, 34% of 1,385 total undergraduate student population in in FMHS, the percentage of students suffering from depression (54.9%) and insomnia (33.9%) was relatively high during MCO. **Conclusion:** Therefore, this confirmed the association between severity of Insomnia and severity of depression among health science university students in UPM. which occurred at a time when the number of Covid-19 cases in Malaysia was high. These finding provide a need to address the general decline in mental health status that can be attributed to both depressive and insomniac symptoms in university students.

Keywords: Mental health; Movement Control Order (MCO); Depression; Insomnia

Novel Self-healing Rubber Glove for Enhancing Worker Safety and Health Protection

Janarthanan Supramaniam[1], See Kiat Wong[1], Darren Yi Sern Low[1], Bey Fen Leo[2,3], Bey Hing Goh[4,5,6], Siah Ying Tang[1,7]

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Introduction: Occupational safety and health in industries have become an area of increasing concern for many countries across the globe. It is estimated that more than 13 million workers in the United States are potentially exposed to chemicals through the dermal route. It is essential that workers use gloves to protect their hands from hazardous chemicals. However, rubber gloves are generally prone to tearing after repeated or prolonged use. The frequent glove changing increases the glove wastes arise environmental threats. Self-healing technology promises increased product durability and shelf life of gloves which appears to be a feasible solution to address these issues. **Objectives:** The goal of the present work was to develop a new self-healing rubber glove (SH glove) that possessed self-repairing capability with good resistance to hazardous chemicals. **Methodology:** The SH glove product was fabricated via the conventional dipping method. Permeation breakthrough time analysis was performed to determine the SH glove's chemical resistance performance compared to four commercial gloves at different temperatures. The self-healing ability was accessed by introducing a small cut on the glove surface. The cut surface was physically attached and allowed to heal in an oven at a temperature of 70 - 80℃ for 1 hour. The healed glove was subjected to the permeation breakthrough time analysis. **Results:** The findings of our study demonstrated that the SH glove was able to self-heal upon damage caused by cut and tear under heat accelerated conditions. Using malathion as a model pesticide, the results showed that the SH glove presented chemical resistance ability comparable to those reusable gloves made with nitrile and NR latex at room temperature and 37°C. The self-healing test revealed that the healed glove maintained the desired chemical resistance ability close to its pre-cut value. **Conclusion:** We envisaged that such SH rubber glove invention could be the next-generation glove solution to safeguard the wearers' workplace safety and health whilst addressing the environmental issues induced by extensive glove use.

Keywords: Self-healing glove; Nanocellulose; Chemical protection; Dermal exposure; Occupational health and safety

Ready Intern One: The Experiences of Students on Virtual Pharmacy Internship During COVID-19 Pandemic in the Philippines

Rian Yvonne A. Castro, Althea Julianne S. Libed, Corrine D. Benjamin, Maria Johannie Viv E. Guadalupe, Maria Leirina Patria P. Canda, Mona Lisa A. Lomarda, Nhemia Mariz G. Dolojo, Rohaniah L. Noor, Erwin M. Faller

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Introduction: The COVID-19 pandemic disrupted education worldwide that forced academic institutions to online modalities including pharmacy internship. **Objectives:** The research aims to determine interns' experiences, barriers and challenges, ways of overcoming and future reforms on virtual pharmacy internships. **Methodology:** A qualitative study of conventional content analysis type was conducted in 2022 at selected Schools of Pharmacy in the Philippines. Purposive sampling technique was used to include 13 participants in a semi-structured virtual interview. Data were analyzed using thematic analysis. **Results:** From the analysis of interviews, 16 themes were identified. Ample time for self-learning, utilizing innovative learning methods and strategies, and developing essential knowledge and skills for pharmacy practice were the interns' experiences. However, they also revealed insufficient experiential learning and application of theoretical knowledge. Moreover, the interns struggled with personal distress towards their well-being, heavy academic workload clashing in hectic schedule, difficulties in academic adaptability, poor social communications and feedback, and an unconducive learning environment and online resources issues. Interns were able to overcome such barriers and challenges through self-support and motivation. Interns recommended proper scheduling and communication, affective preceptor and eclectic teaching, constructive evaluation and sharing of experiences and feedback for the improvement of virtual pharmacy internships. **Conclusion:** The interns encountered challenges like difficulty in academic adaptability during their virtual pharmacy internship but despite that, there were also positive experiences such as developing self-autonomy due to having ample time to learn knowledge and skills for pharmacy practice. Moreover, self-sufficiency and various forms of support enabled the interns to overcome the challenges and barriers. Finally, the interns gave recommendations that may help in the enhancement of virtual pharmacy internships. Therefore, the findings of this study will be beneficial in adding new perspectives and improving the delivery of virtual pharmacy internships in the future.

Keywords: Virtual pharmacy internship; Experiences of pharmacy interns; Pharmacy interns; Virtual internship; E-learning

Effect of Food Supplement Containing S-adenosylmethionine and Probiotics on Mood: A Randomized, Double Blind, Placebo Controlled, Cross Over Clinical Trial

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Introduction: Depression is a common psycho-emotional disease whose marked and persistent symptoms can have severe negative impact on the quality of life of the affected subjects. Subthreshold depression (SD) may increase the risk for the development of major depression. Besides occurrence of adverse effects, conventional antidepressants showed no significant advantage in the treatment of SD as compared to placebo in a meta-analysis report. **Objective**: The present clinical study was conducted to demonstrate the efficacy of the food supplement based on S-adenosylmethionine (SAMe), *Lactobacillus helveticus* and *Bifidobacterium longum* in maintaining normal mood and reducing SD as a risk factor for major depression. **Methods**: A monocentric, randomised, double-blind, placebo-controlled, cross-over clinical trial was designed to evaluate the efficacy of a food supplement on mood. Subjects with a slightly altered mood tone were recruited in 38-weeks clinical study, taking food supplement or placebo as stick-pack orosoluble granulate daily for three months. Subsequently, after three months of treatment, one month wash-out period and a follow-up period were planned. The efficacy of the food supplement was measured by administering to the recruited subjects the validated "*Patient Health Questionnaire-9*" (PHQ-9) and "*Hamilton Depression Rating Scale"* (HAM-D). Random intercept linear mixed model (LMM) was used as the most suitable tool for statistical analysis. **Results**: The LMM analysis showed a significant decrease of PHQ-9 and HAM-D scores resulting in improvement of mood with the intake of food supplement as compared to placebo. **Conclusion**: Based on the results of this clinical study, it can be concluded that daily intake of food supplement based on SAMe and probiotic strains for a period of three months may allow an improvement in slightly altered mood.

Keywords: Food supplement; S-adenosylmethionine; Probiotic strains; Subthreshold depression

Poster Presenters		
Date: 28 September 2022 (Wednesday)		
ID	**Presenters**	**Time**
PP-PH-01	**Aniwat Limsuvech** The Distribution of *HLA* Alleles Related with Severity of COVID-19 among Healthy Thai Population	11:20 AM
PP-PH-02	**Napon Kanokslip** The Distribution of *HLA-A*11:01* Allele in Thailand: As a Risk Factor for Severe COVID-19	11:30 AM
PP-OT-01	**Dr. Priyia Pusparajah** Perception of Medical Students in an Integrated Curriculum Regarding Relevance of Laboratory Sciences to Clinical Practice Topic type: Medical Education	11:40 AM
PP-OT-02	**Yasodha Sivasothy** Acylphenols and Dimeric Acylphenols from *Myristica maxima* Warb Topic type: Natural Products	11:50 AM

The Distribution of *HLA* Alleles Related with Severity of COVID-19 among Healthy Thai Population

Aniwat Limsuvech & Patompong Satapornpong
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Introduction: COVID-19 or the Corona Virus Disease 2019, is the virus that has been spreading since the end of 2019. It has the ability to infect humans to human which makes it a global concern. Moreover, COVID-19 infection is severe life-threatening and associated with approximately a 2% mortality rate worldwide. The *human leukocyte antigen* (*HLA*) gene on chromosome 6 is associated with the human immune system. A previous study in the Caucasian population reported a relationship between specific *HLA* alleles and severity of COVID-19 ; *HLA-A*01:01*, *HLA-A*02:01* and *HLA-A*03:01* (*p*-value = 2.15×10^{-4}, 0.0146, and 7.54×10^{-3}, respectively). **Objectives:** To investigate the distribution of *HLA-A*01:01, HLA-A*02:01,* and *HLA-A*03:01* alleles in Thais, which are associated with biomarkers of severe COVID-19 infection. **Methodology**: Two hundred unrelated healthy Thai volunteers from the College of Pharmacy, Rangsit University were recruited in this study. Blood DNA samples were isolate using the Genomic DNA Mini Kit (manufacturer). *HLA-A* alleles were genotyped using the Lifecodes HLA SSO typing kits. **Results:** The distribution of *HLA-A* alleles and their frequencies were *HLA-A*11:01* (27.50%), *HLA-A*24:02* (11.50%), *HLA-A*02:03* (11.00%), *HLA-A*33:03* (10.75%), and *HLA-A*02:07* (7.50%), respectively. Distribution of biomarkers associated with severe COVID-19 infection were 2.50% of *HLA-A*01:01*, 4.75% of *HLA-A*02:01*, and 0.75% of *HLA-A*03:01*. The *HLA-A*01:01* allele showed a significant difference (*p*-value = 0.0289) -when compared with South and North-East population. In addition, the frequencies of *HLA-A*01:01, -A*02:01* and *-A*03:01* were similar among Thai population and Asian population (*p*-value > 0.05) and lower than Caucasians (*p*-value < 0.01). **Conclusion:** *HLA-A* alleles were associated with biomarkers for COVID-19 infection, which is population specific. This study's findings can be used to develop biomarkers for screening for severe COVID-19 infection among the Thai population.

Keywords: COVID-19; *HLA* allele; Haplotype; Biomarkers; Thais

The Distribution of *HLA-A*11:01* Allele in Thailand: As a Risk Factor for Severe COVID-19

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Introduction: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV2), a zoonotic virus which generates respiratory disease, is known to caused global public health and economic crisis. Recent studies show that the average mortality rate of COVID-19 is about 2-3% worldwide. Human leukocyte antigen (HLA) is a significant component of the viral antigen pathway and plays crucial roles in the immune response. A study conducted in China indicates how *HLA-A*11:01* (*p*-value = 0.0085, OR = 2.33) are common in severe COVID-19 patients and could be identified as a marker of the severity of patients. However, the frequency of *HLA-A* alleles in the Thai population has yet to be study. **Objective:** We investigated the distribution of *HLA-A* alleles which related to COVID-19 infection in the Thai population. **Methodology:** This study, we recruited 180 unrelated healthy Thai individuals. *HLA-A* alleles were genotyped using the Lifecodes HLA SSO typing kits (Immucor, West Avenue, Stamford, USA). **Results:** The allele distribution of *HLA-A* and their frequencies in Thailand were *HLA-A*11:01*(28.33%), *HLA-A*24:02* (11.94%), *HLA-A*33:03* (10.83%), *HLA-A*02:03* (10.56%), *HLA-A*02:07*(6.94%), *HLA-A*02:01* (4.72%), *HLA-A*24:07* (3.89%), *HLA-A*30:01* (3.06%), *HLA-A*01:01* (2.50%) and *HLA-A*11:02*(1.94%), respectively. The *HLA-A*11:01* allele was observed with 28.33% (102/180) of the general Thai samples which was the most frequent in four regions of Thailand. By comparing the difference of the *HLA-A*11:01* allele frequencies between Thais (28.33%) with African Americans (2.38%), Caucasians (6.98%), Hispanics (5.77%), and North American (2.67%), we found that the *HLA-A*11:01* showed a significant differentiation with *p*-value < 0.01. Moreover, the frequency of *HLA-A*11:01* was similar among Thai samples and the Asian population (*p*-value > 0.05). **Conclusion:** Therefore, the distribution of *HLA-A*11:01* allele was identified as a marker of ethnic-specific genetic variation in Thai and Asian population which might associated with marker to severe COVID-19. However, this study might need to be confirmed before clinical interpretation and usage with the inclusion of larger sample sizes in further researches.

Keywords: *HLA-A*11:01*; Severe COVID-19; Thai population; Ethnic-specific

Perception of Medical Students in an Integrated Curriculum Regarding Relevance of Laboratory Sciences to Clinical Practice

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Introduction: The practice of clinical medicine today depends heavily on an array of diagnostic tests and treatment modalities developed through symbiotic integration of basic laboratory sciences with clinical sciences. Future progress in medicine optimally requires clinician scientists: clinical specialists with strong basic science foundations and research skills. Fostering such a mindset is challenging without a strongly integrated curriculum all through medical school emphasizing the correlation between the basic and clinical sciences. However, most medical programs tend to teach the two arms in isolation. The Monash program is an integrated, spiral curriculum including research modules; but overall is still significantly weighted to the clinical sciences in the advanced years of the course. **Objectives:** To evaluate the perceptions of medical students in an integrated curriculum regarding the role of learning basic sciences with regard to improved patient management and fostering an interest in research. **Methodology:** An online survey was conducted among students from Year 1 to fresh graduates of Monash University Malaysia. *This project was approved by the Monash University Human Research Ethics Committee; approval no: 31771. **Results:** In total, 112 responses were received: 66.1% aim to pursue a pure specialist clinician pathway, while 28.9% want to be clinician scientists; 90.2% agreed that learning the basic sciences promotes an inquiry based approach to medicine and develops an interest in research while 92% agreed that knowledge of laboratory based sciences led to better understanding of disease processes and improved clinical reasoning. Participants also indicated they would prefer more basic science teaching in the advanced clinical years compared to what is currently practiced. **Conclusion:** A curriculum model integrating basic and clinical sciences can pave the way to fostering a community of clinician scientists ideally positioned to combine benchwork with bedside expertise to drive meaningful advances in the practice of medicine.

Keywords: Medical education; Integrated curriculum; Basic sciences

Acylphenols and Dimeric Acylphenols from *Myristica maxima* Warb

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Introduction: Phytochemical studies have revealed that the genus *Myristica* is a rich source of acylphenols and dimeric acylphenols which exhibit a wide range of biological activities. However, to date, acylphenols and dimeric acylphenols have never been investigated for their cytotoxicity against prostate cancer. **Objectives:** With regard to the above, the cytoxicity of the acylphenols and dimeric acylphenols isolated and characterized from the bark of *Myristica maxima* Warb against PC3 cell lines were evaluated. **Methodology:** The acylphenols and dimeric acylphenols from the dichloromethane extract of the bark of *M. maxima* were isolated and characterized using a combination of various chromatographic and spectroscopic techniques. MTT assay was subsequently performed to determine the cytotoxicity of these compounds on PC3 cell lines. **Results:** Giganteone E (**1**), a new dimeric acylphenol was isolated as a minor constituent from the bark of *M. maxima*. The structure of **1** was established on the basis of 1D and 2D NMR techniques and LCMS-IT-TOF analysis. Malabaricones A–C (**2**–**4**), giganteones A and C (**5** and **6**), maingayones A and B (**7** and **8**), and maingayic acid B (**9**) were also characterized in this plant for the first time. Compounds **2** and **5** were active against human prostate cancer cell lines thus making this the first report on the prostate cancer inhibiting potential of acylphenols and dimeric acylphenols. **Conclusion**: The cytotoxicity of malabaricone A (**2**) and giganteone A (**5**) towards the PC3 cell lines provided scientific evidence for the possible usage of the bark of *M. maxima* as traditional medicine in the treatment and prevention of cancer.

Keywords: *Myristica maxima* Warb.; Myristicaceae; Dimeric acylphenols; Acylphenols; Prostate cancer

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