ISMM

ABSTRACT BOOK 2025

29th International Symposium on Molecular Medicine & 2nd Eurasian Conference

October 17–19, 2025
Le Méridien Hotel IOI Mall Putrajaya

https://ismm.org.my/

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THE SYMPOSIUM

Introduction

The 29th International Symposium on Molecular Medicine & 2nd Eurasian Conference (ISMM29), organized by Spandidos Publications, builds upon the success of its previous 28 editions and continues to exert significant influence in the global field of molecular medicine. Since 1992, Spandidos Publications has organized over 20 academic exchange events worldwide, fostering scientific exchange and international collaboration, and establishing itself as a renowned academic event in molecular medicine.

Established in 1992, Spandidos Publications is a leading publishing group in the biomedical sciences, dedicated to maintaining originality and quality through rigorous peer-review and plagiarism detection. This professionalism has laid the foundation for the continued success of the International Symposium on Molecular Medicine.

ISMM29 will bring together top experts globally, focusing on the latest research outcomes and cutting-edge technologies in molecular medicine. The symposium will continue its tradition of integrating Eastern and Western medical practices, advancing precision treatment, and fostering innovation in combining traditional Chinese medicine with molecular approaches, contributing to global health development.

Ismm Co-Host

The symposium is jointly hosted by Zibeline International, Universiti Sains Malaysia, Spandidos Publications Ltd and Volksonpress. This collaboration merges expertise in scholarly publishing and academic events to provide a high-impact platform for researchers, clinicians, and industry professionals to exchange knowledge, foster interdisciplinary collaboration, and drive innovation in biomedical sciences.

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VENUE

Le Méridien Putrajaya offers a lush escape with superb service, modern rooms, and inspired amenities. Situated near IOI City Mall, corporate offices, and the Putrajaya International Convention Centre, we're also just a short drive from Kuala Lumpur International Airport. We offer an outdoor and children's pool, a 24-hour gym, and a variety of local and international cuisines at our restaurants. With 19 event venues—from boardrooms to ballrooms—supported by expert catering and advanced audiovisual technology, we're ideal for any gathering. After exploring IOI City Mall, unwind in rooms with hypoallergenic bedding, marble bathrooms, large desks, free Wi-Fi, and floor-to-ceiling windows overlooking the golf course. Club-level rooms and suites include exclusive Club access, while our suites offer extra space for entertaining or relaxing with family in Putrajaya. IOI City Hotel Sdn. Bhd. (CO.NO.201201029565) with respect to Le Meridien Putrajaya.

Address

Le Méridien Putrajaya, Lebuh IRC, IOI Resort City, Sepang, Putrajaya, Malaysia, 62502.

Room Reservation

List of hotels	Telephone Number
Le Méridien	+60 3-86896888
Moxy Putrajaya	+60 3-83281111
Putrajaya Marriott Hotel	+60 3-89498888
Palm Garden Hotel, Putrajaya, a Tribute Portfolio Hotel	+60 3-89432233

Official Website: https://ismm.org.my

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The Medic & Public Health Association Malaysia (MPHAM):
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Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

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Alisha Anushri Chantru
Bachelor Medical Biotechnology Graduate & Master of public health

Syeda Nusrat Jahan Nafisa
Passionate Biologist

Dr. Nurul Nadiah Binti Abd Razak
Office of The Executive Director, Centre for Foundation Studies in Science University Malaya

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Special Guest Speakers - Distinguished Guests

Professor Demetrios A. Spandidos
Founder and Editor in Chief of Spandidos Publications

Vasiliki E. Georgakopoulou
Department of Pathophysiology-Department of Infectious Diseases, Laiko Hospital, National and Kapodistrian University of Athens, Greece

Assoc. Prof. Iioannis Michalopoulos
Division of Cryobiology of Stem Cells, BRFAA (Biomedical Research Foundation, Academy of Athens)

Vassilios Zoumpourlis
Research Director, Biomedical Applications Unit, NHRF

Prof. Russel Reiter
Department of Cellular & Structural Biology, University of Texas, Health Science Center, San Antonio

Prof. Adel El Naggar
Department of Anatomical Pathology, Division of Pathology-Lab Medicine Div

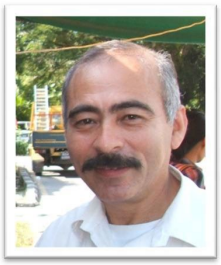
Lee Wenn Chyau
Department of Parasitology, Faculty of Medicine, Universiti Malaya

Prof. Bin Huang
Fujian University of Traditional Chinese Medicine

Conference Speakers

Dr. Rimsha Khan
Bachelor of Surgery, Fauji Foundation University

Dr. Bartlomiej E. Krazinski
School of Medicine, University of Warmia and Mazury in Olsztyn



Dr. Octavio Carvajal Zarrabal
University of Veracruz, Member of the National System of Researchers

Dr. Nur Akmarina binti Mohd Said
Department of Pharmaceutical Life Sciences, Faculty of Pharmacy, Universiti Malaya.

Dr. Zakiyyah Munirah binti Mohd Zaki
Postdoctoral Research Fellow, Research and Innovation Centre, KPJ Healthcare University

Dr. Muhammad Fattah Fazel
PhD Pharmacy (Neuro-Pharmacology)

Dr. Sher Zaman Safi
Associate Professor, Faculty of Medicine, MAHSA University Malaysia

Dr. Jo Ann Galvan
Former Impact Lab DHMA director

Prof. Tatiana Ruksha
Krasnoyarsk State Medical University

Huang Qing
Faculty of Sports and Exercise Science, Universiti Malaya, Kuala Lumpur 50603, Malaysia.

Assoc. Prof. Dr. Jamal Houssaini
Department of Medical Microbiology and Parasitology, Faculty of Medicine, Sungai Buloh Campus, Universiti Teknologi MARA (UiTM), 47000 Sungai Buloh Selangor, MALAYSIA.

TENTATIVE CONFERENCE PROGRAM

Thursday, 16th October 2025	
TIME	**DESCRIPTION**
2:00 PM-5:30 PM	**Check-in Hotel** La Merident Putrajaya Hotel Lobby (Lebuh IRC, IOI Resort City, 62502 Putrajaya, Sepang, Selangor, Malaysia)
5:30 PM-8:30 PM	**Registration Desk Opening** La Merident Putrajaya Hotel Lobby (Lebuh IRC, IOI Resort City, 62502 Putrajaya, Sepang, Selangor, Malaysia)
Friday, 17h October 2025	
TIME	**DESCRIPTION**
8:00-8:30 AM	**ISMM29 Registration & Participants Arrival** Poolside, Level 3
8:30:900 AM	**Opening Ceremony Atelier Hall, Level 3** **Professor Demetrios A. Spandidos** Spandidos Publications
9:00-9.30 AM	**Photo Session ISSM29 Participants** Poolside, Level 3
9:30-10.00 AM	**Special Invited Guest I** **Vasiliki E. Georgakopoulou** Department of Pathophysiology-Department of Infectious Diseases, Laiko Hospital, National and Kapodistrian University of Athens, Greece
10:00-10.30 AM	**Special Invited Guest II** **Prof. Russel Reiter** Dual Sources of Melatonin and Evidence for Their Different Functions
10:30-11:00 AM	**Special Invited Guest III** **Prof. Adel El Naggar** Department of Anatomical Pathology, Division of Pathology-Lab Medicine Div
11.00-11.30 AM	**Coffee Break & Discussion**
KEYNOTE LECTURES	

11:30-11:50 AM	**Dr. Rimsha Khan** Bachelor of Surgery, Fauji Foundation University
11:50 -12.10 PM	**Dr. Bartlomiej E. Krazinski** Katedra Anatolii i Histologii, Wydzia ł Lekarski
12:10 -12.30 PM	**Dr. Octavio Carvajal Zarrabal** University of Veracruz, Member of the National System of Researchers
12:30-12:50PM	**Dr. Jo Ann Andoy Galvan** Taylor's University, Faculty of Health and Medical Sciences
12:50-1:20PM	**Dr Huang Qing** Faculty of Sports and Exercise Science, Universiti Malaya, Kuala Lumpur 50603, Malaysia
1:30-3:00 PM	**Lunch Break**
ORAL PRESENTATIONS	
3:00-3:15 PM	**Mitochondrial Dna Copy Number As A Molecular Biomarker: Translating Insights Into Next-Generation Infertility Therapies** Mohamed Afiq Hidayat Zailani, Fazilah Abdul Hamid, Azantee Yazmie Abdul Wahab, Reena Rahayu Md Zin, Raja Zahratul Azma Raja Sabudin, Abdul Kadir Abdul Karim
3:15-3:30 PM	**Tumor Immune Cells Density, Budding Status And Lymphoid Follicles In Crc** Katarzyna Guzińska-Ustymowicz, Anna J. Markowska, Wiktoria Romańczyk, Anna Pryczynicz, Adam R. Markowski
3:30-3:45 PM	**Short-Term Synbiotic Applications In Tilapia Aquaculture: Effects On Growth, Water Quality And Microbial Dynamics** Zhu Yuxing, Wan Syaidatul Aqma Wan Mohd Noor, Nor Hidayu Abu Bakar, Nur Husna Mohamad, Mohd Fareed Mohd Sairi, Nur Hidayah Jamar
3:45-4:00 PM	**Peri-Implantation Sexual Abstinence Improves Placental Health By Reducing Oxidative Stress And Enhancing Angiogenesis: A Randomized Controlled Trial** Abubakar Ibrahima, Martina Irwan Khoob, Engku Husna Engku Ismaila, Nik Hazlina Nik Hussaina, Anani Aila Mat Zinc, Liza Noordind, Sarimah Abdullahe, Zaleha Abdullah Mahdyf, Nik Ahmad Zuky Nik Laha
4:00-4:30 PM	**Coffee Break & Discussion**
4:30-4:45 PM	**Bariatric Surgery in Malaysia Delivers Sustained Clinical Benefits and Cost Savings in Type 2 Diabetes: Evidence from a 10-Year Retrospective Analysis**

	Jo Ann Andoy Galvan, Nik Ritza Kosai Mahmood, Karuthan Chinna, Ruslin bin Nordin, Kenneth Kwing-Chin Lee , Guo Hou Loo, Yeong Chai Hong
4:45-5:00PM	**Rutin As A Natural Alpha-Glucosidase Inhibitor For Diabetes Therapy** Nurul Nadiah Abd Razaka, Mohamed Zuhair Fathima Amnab, Izni Fathima Amirab, Kaamini Muniandyb, Ubaidah Naim Taraq Naem Ziab, Aimi Syamima Abdul Manapc
5:00-5:30 PM	**POSTER SESSION**
Saturday, 18th October 2025	
TIME	**DESCRIPTION**
8:00-8:30 AM	**ISMM29 Registration & Participants Arrival** Poolside, Level 3
8:30:900 AM	**Special Invited Guest I** **Assoc. Prof. Iioannis Michalopoulos** Division of Cryobiology of Stem Cells, BRFAA (Biomedical Research Foundation, Academy of Athens)
9:00-9.30 AM	**Special Invited Guest II** **Research Director Vassilios Zoumpourlis** Research Director, Biomedical Applications Unit, NHRF
9:30-10.00 AM	**Special Invited Guest III** **Assoc. Prof. Dr. Jamal Houssaini** Department of Medical Microbiology and Parasitology, Faculty of Medicine, Sungai Buloh Campus, Universiti Teknologi MARA
10:00-10.30 AM	**Special Invited Guest IV** **Senior Lecturer Lee Wenn Chyau** Research Management Unit (RMU), Faculty of Medicine, Universiti Malaya
10:30-11:00 AM	**Special Invited Guest V** **Prof. Bin Huang** Faculty of Sports and Exercise Science, Universiti Malaya, Kuala Lumpur 50603, Malaysia
11.00-11.30 AM	**Coffee Break & Discussion**
KEYNOTE LECTURES	
11:30-11:50 AM	**Dr. Nur Akmarina binti Mohd Said**

	Department of Pharmaceutical Life Sciences, Faculty of Pharmacy, Universiti Malaya
11:50 -12.10 PM	**Dr. Zakiyyah Munirah binti Mohd Zaki** Postdoctoral Research Fellow, Research and Innovation Centre, KPJ Healthcare University
12:10 -12.30 PM	**Dr. Muhammad Fattah Fazel** Research Manager, KPJ Healthcare University
12:20-12:50PM	**Dr. Sher Zaman Safi** Associate Professor, Faculty of Medicine, MAHSA University Malaysia
12:50-1:20PM	**Prof. Tatiana Ruksha** Krasnoyarsk State Medical University, Russia
1:20-3:00 PM	**Lunch Break**
ORAL PRESENTATIONS	
3:00-3:15 PM	**Troxerutin's Cytotoxicity Against The Escc Kyse-150 Cell Line** Charisse Low, Maverick Yap, Yuan Seng Wu
3:15-3:30 PM	**Presentation Of An Autopsy Case Of Sudden Death With Cardiac Infarction As The Direct Cause** Melo-Santiesteban Ga Camacho-Hernández JCb, Denis-Rodríguez PBc, J. Denis- Rodríguez Ed, López Balderas Ne, Carvajal-Zarrabal Octaviof
3:30-3:45 PM	**Biochemical And Histopathological Studies Of Anthurium Schlechtendalii Kunth (Stone Root) Extract On Adenine-Induced Renal Damage In Wistar Rats** Patricia Beatriz Denis-Rodríguez, Noé López-Amador, Octavio Carvajal-Zarrabal
3:45-4:00 PM	**The Role Of Microbiomes In Endometriosis And Endometrial Cancer** Nur Atiqah Imani Mohamad Tazilan, Lim Wern Eeu, Ho Zhi Wei Wayne, Nurin Adlina Shaharuddin, Ong Shi Jia, Arashidatul Akmar Ismail, Nurul Nadiah Abd Razak and Ubaidah Naim Taraq Naem Zia
4:00-4:30 PM	**Coffee Break & Discussion**
4:30-4:45 PM	**Thermodynamic And Fluorescence Characterisation Of Malabaricone-C-Hsa Complex In The Context Of Cancer Therapeutics** Alisha Anushri Chantru, Salanee Kandandapanib, Adyani Azizzah Abd Halim, Ahmad Fadhlurrahman Ahmad Hidayat, Nurul Nadiah Abd Razak

4:45-5:00 PM	**Promoter Hypermethylation of a Panel of Tumor Suppressor Genes as a Biomarker for Early Detection of Colorectal Cancer** Sultan Mohammed Alanazi, Emad Aljohani, Saleh A.S. Al Abdulhadi
5:00-5:30 PM	**POSTER SESSION**
5:30-6:00 PM	**Coffee Break & Discussion**
6:00-6:30 PM	**Closing Ceremony & Prize Distribution**
6:30-7:30PM	**Break and Change of Dress**
7:30-8:30PM	**GALA DINNER for ISMM29 Participants**
Monday, 18th August 2025	
TIME	**DESCRIPTION**
9:00 AM-5:30 PM	**Conference Tour (**KL & Putrajaya)
9:00 AM	Bus Depart from La Merident Putrajaya (Lebuh IRC, IOI Resort City, 62502 Putrajaya, Sepang, Selangor, Malaysia)
5:30 PM	Bus Return to La Merident Putrajaya (Lebuh IRC, IOI Resort City, 62502 Putrajaya, Sepang, Selangor, Malaysia)

Monday 19th October 2025

One Day Tour – Kuala Lumpur & Putrajaya

All participants who want to join the tour should confirm names with **Ms. Rozalaidah**. Only paid participants can join the trip freely other participants need to pay 50$ for the tour. Its not includes lunch. All participants should assemble in the hall of Le Meridien Putrajaya at 8:30 AM.

The tour bus will get back to hotel at around 8:00 PM.

09.00 AM	Pick up from Le Meridien Putrajaya
09.45 AM	Putrajaya Tour: Putra Mosque, Prime Minister office photostop, passby Government buildings
12.00 PM	Lunch at a local restaurant at own expenses
13.30 PM – 17.00 PM	KL Sightseeing Tour: King Palace photostop, Central Market, River of Life, National Mosque, Sultan Abdul Samad Buiding, Independence Square, Tugu Negara, KLCC
17.00 PM	Return to Le Meridien Putrajaya

Tour Coordinator

☛ Ms. Rozalaidah
📞+60 198583794

ISMM_29 2025

ABSTRACTS FOR ORAL PRESENTATION – KEYNOTE SPEAKER

Speaker 1

DUAL SOURCES OF MELATONIN AND EVIDENCE FOR THEIR DIFFERENT FUNCTIONS

Prof. Russel Reiter

Department of Cellular & Structural Biology, University of Texas, Health Science Center, San Antonio

ABSTRACT

Historically, melatonin is known as a secretory product of the pineal gland where its synthesis exhibits a circadian rhythm with high levels produced at night and low levels during the day. The circadian fluctuation in circulating melatonin serves as a cue for the master circadian regulator, the suprachiasmatic nucleus, in and basal hypothalamus. Melatonin is also now believed to be produced in the mitochondria of every cell in the organism. The melatonin synthesized in mitochondria is not released into the circulation but functions locally as a potent radical scavenger in this organelle where free radical generation is elevated, especially during pathologies such as cancer, due to leakage of electrons for the electron transport chain; this results in the chemical reduction of ground state oxygen to the superoxide anion radical which generates additional highly destructive species. The molecular damage caused by free radicals is referred to as oxidative stress. This damage is a component of many diseases and because melatonin production diminishes with age, its level becomes inadequate to protect against the persistently accumulating oxidative stress which, in turn, contributes to diseases and signs of aging. Both sources, i.e., that released from the pineal gland and that synthesized for local use in mitochondria, are key elements of melatonin's multifunctional beneficial actions.

Keywords: cardiovascular disease; neurodegeneration, aging; mitochondria; oxidative stress; free radicals

Speaker 2

THE STICKY BUSINESS OF PLASMODIUM: A DIVE INTO MALARIA IMMUNO-PATHOBIOLOGY

Wenn-Chyau LEE

[a] *Senior lecturer, Department of Parasitology, Faculty of Medicine, Universiti Malaya, Malaysia.*
[b] *Adjunct investigator, A*STAR Infectious Diseases Labs, Agency for Science, Technology and Research (A*STAR), Singapore.*

ABSTRACT

Malaria remains a major global healthcare burden, despite decades of effort invested to eliminate the infection from human population. The pathogenesis of severe malaria revolves around the altered cytoadherence properties of infected red blood cells (IRBC), following the expression of certain parasite-derived ligands on the surface of IRBC. Over the past two decades, various studies have unraveled how the malaria parasites employ this altered cytoadherence phenotype as a multi-faceted strategy to enhance their survival within the human host.

EXPLORING THE ROLE OF GATA4 GENE IN CONGENITAL HEART DEFECTS (CHDs): MUTATIONAL PROFILING AND CLINICAL SIGNIFICANCE

Rimsha Khan[a,b]*, Sadia Nawaz[a]

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**Corresponding Author Email: rimsha.khan@kcl.ac.uk*

ABSTRACT

Congenital heart defects (CHDs) are diverse set of structural heart abnormalities that have substantial effect on mortality and morbidity. A key transcription factor in cardiac development, the GATA4 gene has been linked to the pathophysiology of CHDs. In a group of patients with a range of congenital cardiac abnormalities this study aims to investigate the role of GATA4 gene mutations by conducting a comprehensive analysis of genetic variations within exons 4 and 5. The study explores potential functional impact of identified mutations, examines genotype-phenotype correlations and intricate molecular pathways. Methods: Blood samples were collected from a diverse group of CHDs patients exhibiting a range of symptoms. Advanced sequencing methods were employed to scrutinize the coding and regulatory domains of the GATA4 gene. Bioinformatics analyses were applied. Genotype phenotype associations were investigated to elucidate specific GATA4 variants' correlation with distinct clinical manifestations of CHDs. Results: Preliminary findings reveal a spectrum of GATA4 mutations within the study cohort, suggesting the involvement of this transcription factor in the genetics of CHDs. Several mutations located in non-coding intronic areas were linked to specific cardiac abnormalities, providing crucial insights into the molecular pathways contributing to CHD pathophysiology. Conclusions: This study underscores the significance of GATA4 as a key player in understanding the complex genetic landscape of CHDs. GATA4 gene play potential regulatory roles in CHDs development. The identified mutations in non-coding regions offer new perspectives for individualized treatment strategies and genetic counseling. These findings contribute to clinical diagnostics and advancing our comprehension of the genetic basis of congenital heart defects.

Keywords: Congenital Heart Defects, GATA4 gene, Mutational investigation, Genotype Phenotype correlation, Genetics

Speaker 4

ISOFORM-SPECIFIC EFFECTS OF THE TRANSCRIPTION FACTOR PLAGL1 ON CANCER-RELATED GENE NETWORKS AND CELL PROLIFERATION IN RENAL CARCINOMA CELL LINES WITH DIFFERENT VHL GENE STATUS

Bartłomiej E. Krazinski, Janusz Godlewski, Anna E. Kowalczyk, Jacek Kieżun, Zbigniew Kmieć

Department of Anatomy and Histology, School of Medicine, Collegium Medicum, University of Warmia and Mazury in Olsztyn, Poland

**Corresponding Author E-mail: bartlomiej.krazinski@uwm.edu.pl*

ABSTRACT

PLAGL1 is a zinc finger DNA-binding transcription factor, a regulator of cell cycle progression and apoptosis, and has been implicated in several human tumors. Through multiple promoter usage and alternative splicing, PLAGL1 gives rise to two predominant isoforms: the longer isoform-2 and the shorter isoform-1. These isoforms differ in their biological activity and may exert distinct effects depending on the physiological or pathological context. Shifts or imbalances in their relative expression have been suggested to impact cellular homeostasis and may contribute to tumorigenesis, as supported by our previous findings in a cohort of Polish patients with clear cell renal cell carcinoma (ccRCC), where elevated expression of isoform-2 was associated with tumor progression and shorter overall survival. These observations were independently validated using the publicly available TCGA-KIRC dataset. In the present study, we extended this investigation using two ccRCC cell lines, Caki-1 and 786-O, to examine the effects of selective knockdown of individual PLAGL1 isoforms by siRNA lipofection on the expression of cancer-related genes and cell proliferation. Silencing of individual PLAGL1 isoforms produced opposing effects on VEGFA mRNA levels: knockdown of isoform-2 led to VEGFA downregulation in 786-O, while silencing of isoform 1 resulted in VEGFA upregulation in Caki-1 cells. In both cell lines, PLAGL1 knockdown reduced proliferation, but the effect was isoform-specific and consistent with the VEGFA response, as it was dependent on isoform-2 in 786-O and on isoform-1 in Caki-1 cells. Changes in the levels of mRNAs coding for BAX, BCL2, p21, p27, E-cadherin, N-cadherin, vimentin, PTEN, as well as changes in miR-21 expression, were also associated with shifts in the balance between isoform-2 and isoform-1 expression following isoform-specific PLAGL1 knockdown. Our current findings support a complex and potentially significant role of PLAGL1 isoforms in ccRCC, as evidenced primarily by their differential impact on VEGFA expression and cancer cell proliferation. PLAGL1 isoform-2 appears to exert pro-angiogenic and pro-proliferative effects in VHL-deficient cells highlighting its potential oncogenic role, consistent with our previous observations in patients with ccRCC. These results suggest that PLAGL1 isoform-2 may serve as a potential therapeutic target, particularly in ccRCC tumors driven by dysregulated VHL/HIF signaling pathway.

Speaker 5

THERAPEUTIC POTENTIAL OF ANTHURIUM SCHLECHTENDALII KUNTH IN CHRONIC KIDNEY DISEASE: AN ETHNOPHARMACOLOGICAL, PHYTOCHEMICAL, AND PHARMACOLOGICAL REVIEW

Octavio Carvajal-Zarrabal*[a] Patricia Beatriz Denis-Rodríguez[b], Noé López-Amador[b]

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[b] Forensic Medicine Institute, Clinical and Forensic Medicine Department. Veracruz University. Juan Pablo II s/n, 94294 Boca del Río, Ver., México.

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ABSTRACT

Alternative medicine, particularly herbal medicine, has been an important source of bioactive compounds with therapeutic applications in various diseases, including renal pathologies. Several plant species have traditionally been used for the management of kidney disorders, and some studies have begun to elucidate their possible mechanisms of action, with an emphasis on identifying alternatives that present minimal adverse effects. Nevertheless, the scientific evidence supporting these traditional uses remains limited and, in many cases, fragmented. A comprehensive review of the scientific literature was conducted using specialized databases (including Mexican literature, Science Direct, Elsevier, PubMed, Scopus, and Medline) with the aim of exploring the ethnobotanical applications of medicinal plants in the treatment of chronic kidney disease (CKD). This review focused particularly on the species *Anthurium schlechtendalii Kunth*, a plant widely used in traditional Mexican medicine for the treatment of kidney disorders. While its empirical use in local communities is well recognized, the available information regarding its phytochemical, pharmacological, and ethnopharmacological properties is scarce. To date, no preclinical or clinical studies have been found that robustly confirm the efficacy, safety, or tolerability of extracts from this plant in the context of human kidney diseases. Similarly, there is a notable lack of research aimed at identifying the bioactive compounds present in polar extracts or purified fractions and their possible relationship to nephroprotective activities. This review aims to compile and critically analyze the existing literature on the phytochemical and pharmacological aspects of *A. schlechtendalii Kunth* in order to assess its therapeutic potential in the prevention and treatment of CKD. Furthermore, the urgent need to develop future research is emphasized, with the goal of establishing the efficacy, safety, and mechanisms of action of this species, thereby contributing to the validation of its traditional use under rigorous scientific standards.

Keywords: *Anthurium schlechtendalii* Kunth, chronic kidney disease, ethnopharmacology, phytochemistry, nephroprotection, Medicinal plants of Mexico.

Speaker 6

DECODING TUMOR MICROENVIRONMENT CROSSTALK: MICRORNAS AND METABOLIC REPROGRAMMING

Nur Akmarina binti Mohd Said

Department of Pharmaceutical Life Sciences, Faculty of Pharmacy, Universiti Malaya
**Corresponding Author Email: nur_akmarina@um.edu.my*

ABSTRACT

Despite remarkable advances in cancer therapeutics, treatment resistance and disease recurrence remain formidable challenges. Mounting evidence underscores that these outcomes are not dictated by malignant cells alone, but emerge from the dynamic interplay between cancer, stromal, and immune components within the tumor microenvironment. Our lab seeks to decode this crosstalk by focusing on how epigenetic and metabolic reprogramming shape tumor–stroma–immune interactions. Our work reveals that microRNAs act as powerful regulators at this interface. For example, we discovered that miR-146b-5p drives bladder cancer chemoresistance by rewiring cholesterol biosynthesis, while simultaneously directing macrophages toward tumor-promoting phenotypes. Complementing these insights, our lipidomic and spectroscopic studies demonstrate that cisplatin-resistant tumors harbor distinct cholesterol-associated metabolic signatures, positioning cholesterol metabolism as a central node in therapeutic escape. We are now extending these findings to explore how fibroblast signaling and obesity-related metabolic shifts further contribute to cancer progression, highlighting the TME as both an accomplice in resistance and a source of therapeutic vulnerability. This keynote will chart a path from microRNA discovery to metabolic reprogramming and stromal immune crosstalk, emphasizing how an integrated understanding of the tumor microenvironment can reveal actionable strategies to overcome chemoresistance. By bridging molecular mechanisms with translational opportunities, our aim is to illuminate new directions for precision medicine in bladder, colorectal, and endometrial cancers.

Speaker 7

DEPLETION OF TRANSIT AMPLIFYING CELLS IN ADULT BRAIN DOES NOT AFFECT THE QUIESCENT NEURAL STEM CELL POOL SIZE

Dr. Zakiyyah Munirah Mohd Zaki

Postdoctoral Research Fellow, Research and Innovation Centre, KPJ Healthcare University, Lot PT17010 Kota Seriemas, Nilai, Negeri Sembilan.

ABSTRACT

Neural stem cells (NSCs) are maintained in the adult mammalian brain throughout the animal's lifespan. NSCs in the subependymal zone infrequently divide and generate transit amplifying cells, which are destined to become olfactory bulb neurons. When transit amplifying cells are depleted, they are replenished by the quiescent NSC pool. However, the cellular basis for this recovery process remains largely unknown. In this study, we traced NSCs and their progeny after transit amplifying cells were eliminated by intraventricular infusion of cytosine β-D-arabinofuranoside. We found that although the number of neurosphere-forming NSCs decreased shortly after the treatment, they were restored to normal levels 3 weeks after the cessation of treatment. More importantly, the depletion of transit amplifying cells did not induce a significant expansion of the NSC pool by symmetric divisions. Our data suggest that the size of the NSC pool is hardly affected by brain damage due to antimitotic drug treatment.

Speaker 8

PHILANTHOTOXIN (PHTX)-343 AS A NEUROPROTECTIVE AGENT AGAINST NMDA-INDUCED RETINAL AND OPTIC NERVE INJURY IN RATS

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ABSTRACT

Retinal ganglion cell (RGC) loss and optic neuropathy, key hallmarks of glaucoma, are strongly associated with N-methyl-D-aspartate (NMDA) receptor-mediated excitotoxicity. Current therapeutic approaches primarily target intraocular pressure (IOP) reduction but fail to adequately prevent RGC death or optic nerve degeneration. Philanthotoxin-343 (PhTX-343), a potent NMDA receptor blocker, offers potential as a neuroprotective treatment for glaucoma. This study evaluated the ability of PhTX-343 to protect against retinal injury by inhibiting NMDA receptor-mediated excitotoxicity and mitigating associated visual deficits. Male Sprague-Dawley rats (200–250 g) were divided into three groups: phosphate-buffered saline (PBS) control, NMDA-induced injury group (160 nM), and PhTX-343 pre-treatment group (160 nM, administered 24 hours prior to NMDA induction). Visual behavior was assessed seven days post-treatment, followed by histological evaluation using hematoxylin and eosin (H&E) for retinal tissues and toluidine blue staining for optic nerves. H&E-stained sections revealed significant retinal cell loss in the NMDA group, whereas PhTX-343 pre-treatment preserved retinal morphology comparable to controls. Quantitative analysis showed markedly fewer nuclei within the ganglion cell layer in NMDA-treated rats compared to PhTX-343 and control groups ($p<0.05$). Similarly, optic nerve degeneration, characterized by vacuolation, was evident in NMDA rats but significantly reduced in PhTX-343 and control groups ($p<0.05$). Behavioral assays demonstrated visual impairments in NMDA rats, including increased exploratory activity and poor object recognition, while PhTX-343–treated rats performed comparably to controls ($p>0.05$). Overall, PhTX-343 pre-treatment effectively prevented NMDA-induced retinal degeneration, optic nerve damage, and vision-related behavioral deficits, highlighting its potential as a novel neuroprotective therapy for glaucoma.

MOLECULAR CROSSTALK IN THE PATHOPHYSIOLOGY OF DIABETES: FROM RECEPTOR REPROGRAMMING TO OXIDATIVE DAMAGE

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ABSTRACT

Diabetes is a multifactorial disorder driven by complex molecular interactions linking hyperglycemia, oxidative stress, and receptor-mediated signaling. Our investigations reveal that β-adrenergic receptors (β-ARs) play a pivotal regulatory role across multiple diabetic cell models, including endothelial, retinal, neuronal, and pancreatic systems. In hyperglycemic environments, aberrant methylation and expression of β-AR subtypes correlate with increased oxidative stress and apoptosis, suggesting that receptor epigenetic modulation is a critical determinant of cellular resilience. β-AR stimulation by agonists such as isoproterenol enhances the expression of pro-survival mediators, including RAF-1, PDX-1, CREB, and BDNF, while suppressing cytochrome c release, caspase-3 activation, and reactive oxygen species accumulation. In vascular cells, β-AR activation mitigates NF-κB and IκBα phosphorylation, thereby attenuating inflammation and apoptosis. Collectively, these findings highlight a unifying mechanism in which β-adrenergic receptor reprogramming integrates epigenetic, redox, and inflammatory signaling to dictate cell fate under diabetic stress. Understanding this receptor-centered molecular crosstalk offers new perspectives for targeting oxidative damage and restoring cellular homeostasis in diabetes and its complications.

Keywordsr eceptor reprogramming; oxidative stress; epigenetic modulation; NF-κB signaling; RAF-1; PDX-1; BDNF; CREB; apoptosis; hyperglycemia; diabetic pathophysiology

Speaker 10

TRANSLATING MOLECULAR KNOWLEDGE INTO PUBLIC HEALTH INITIATIVES FOR RESILIENCE IN A CHANGING CLIMATE

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ABSTRACT

This paper presents one component of the Malaysia B.O.L.E.H. Project (B40 communities Organizing Local solutions for Environmental Health)—a community-based intervention specifically targeting the dengue problem in low-income residential areas. Anchored on the Ottawa Charter for Health Promotion, the intervention integrates environmental management, health education, and innovation. A baseline Knowledge, Attitude, and Practice (KAP) survey conducted among residents of Program Perumahan Rakyat (PPR) or the People's Housing Projects (PPR) in Lembah Pantai, Kuala Lumpur, revealed that 76.7% of residents had poor knowledge of dengue and 83.1% held negative attitudes, even though 66.7% reported practicing preventive measures (Galvan et al., 2024). To address this gap, a six-month health education program was implemented to strengthen the community's understanding of dengue transmission—highlighting that Aedes eggs, often overlooked in control efforts, are the true culprits behind repeated outbreaks. These eggs can survive desiccation during dry seasons and hatch rapidly once in contact with water during rains. The program was complemented by community mobilization activities, where residents removed junk and stagnant materials that had accumulated along housing corridors, serving as potential breeding grounds for Aedes eggs. KAP surveys were conducted at three time points—baseline, after six months, and after one year—to assess changes in community awareness and behavior. Using Generalized Estimating Equation (GEE) analysis, results revealed a steady and statistically significant improvement in knowledge scores over time (Mean ± 95% CI: 14.75 [14.38–15.13] at baseline, 15.19 [14.78–15.61] after six months, and 15.60 [15.18–16.02] after one year; p < 0.001). The Malaysia B.O.L.E.H. Project underscores that while resource reduction through gotong-royong, or community clean-up drives, remains vital for dengue prevention, it is equally important for communities to understand why these practices matter.

Keywords: Aedes eggs, dengue, gotong-royong, dengue KAP, BOLEH

Speaker 11

FOCAL ADHESION IN MELANOMA CELL CANCER RESISTANCE

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ABSTRACT

Drug resistance remains challenging in cancer therapy. Recent studies highlighted cancer cell reversible transfer in a G0 phase of a cell cycle as a mechanism to evade anticancer therapy. Indeed, anticancer agents mostly target rapidly proliferating cells and are ineffective against G0-positive cells referred as quiescent/senescent cells.[1] Approximately 50% of malignant melanomas harbor activating mutations in *BRAF* oncogene making BRAF-inhibitors an attractive treatment strategy.[2] However, tumor cells develop resistance to BRAF inhibitors via several pathways. Work from our laboratory indicates that both apoptotic events and acquiring senescent phenotype may occur in BRAF inhibitor Vemurafenib treated melanoma cells. An increase in the proportion of G0-positive senescent melanoma cells harboring BRAF mutation was observed corresponding to an increase of cell adhesive capacities. Consistent with this, the adhesion of BRAF-positive A375 melanoma cells to extracellular matrix protein fibronectin was increased in 1.87 times. Cancer cells interact with fibronectin via integrins – ITGAV, ITGA5, ITGB1, ITGB3. Therefore, the expression levels of aforementioned integrins were identified. Indeed, vemurafenib treatment resulted in ITGAV, ITGA5, and ITGB3 overexpression whereas ITGB1 and ITGB3 expression levels were diminished. Senescence was considered as permanent cell cycle arrest leading to apoptosis. However, recent studies has been found that senescence can be reversible state.[3] This is in good agreement with our observation that melanoma cells resistant to the proapoptotic effect of vemurafenib are characterized by a diminishing in proliferation with increased galactosidase-beta activity that is characteristic feature of senescent phenotype. Fibronectin as extracellular matrix component has been implicated in the premetastatic niche formation, tumor progression and drug resistance.[4] Thus, senescent melanoma cells exhibited elevated adhesive features and increased binding to fibronetin that can be mediated by ITGAV. Revealed alterations may be a part of phenotypic mode of drug-resistant or non-proliferating cancer cells interaction with extracellular matrix. Targeting senescent cells via focal adhesion proteins can be considered as future treatment option to overcome cancer cell resistance.

Keywords: focal adhesion, melanoma, senescence

Speaker 12

A COMPREHENSIVE CANCER ANALYSIS INVESTIGATING THE ONCOGENIC ROLE OF ZINC FINGER PROTEIN 36 (ZFP36) IN HUMAN TUMORS

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ABSTRACT

ZFP36 is implicated in the development and progression of various malignant tumors. To elucidate the role of ZFP36 expression and explore novel therapeutic approaches for tumors and cancers, we conducted an extensive pan-cancer analysis of ZFP36. Methods: Utilizing datasets from TCGA, GEO, GTEx, HPA, CPTAC, GEPIA2, TIMER2, cBioPortal, and STRING, we employed bioinformatics methods to investigate the potential carcinogenic properties of ZFP36. This included examining correlations between ZFP36 and gene expression, prognosis, gene mutation, immunohistochemistry staining, immune cell infiltration, and constructing an interaction network of 50 ZFP36-binding proteins. Additionally, we performed enrichment analysis of ZFP36-related partners. Results: ZFP36 expression was found to be higher in most tumor tissues compared to normal tissues. Furthermore, ZFP36 demonstrated early diagnostic value across 33 types of tumors and showed varying associations with prognosis depending on the tumor type. ZFP36 was also significantly associated with most immune-infiltrating cells in pan-cancer analyses. High ZFP36 expression was linked to pathways related to tumor progression. Conclusions: This study is the first to identify and validate the potential application of ZFP36 in cancer detection through pan-cancer analysis. The differential expression levels of ZFP36 between various tumors and normal tissues, alongside its role in tumorigenesis and tumor immunity, support its use as a diagnostic and prognostic 2 48 marker. ZFP36 exhibits high specificity and sensitivity in cancer detection, making it a valuable auxiliary index for initial tumor diagnosis and a prognostic marker across multiple tumor types.

Keywords: ZFP36; pan-cancer; survival; prognosis; bioinformatics; immunologica

Speaker 13

EVOLUTION AND DIVERSITY OF SALIVARY GLAND TUMORS: ETIOLOGY, CLASSIFICATION, GENOMIC, AND BIOLOGY

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ABSTRACT

Salivary glands develop from the 1st and 2nd pharyngeal pouches in early fetal stages through the well-coordinated branching morphogenesis leading to multi-segment ductal acinar unit. Neoplastic evolution and diversity of the multitude of tumor subtypes are intimately linked to their segment of origin. Tumors arising from the distal duct segment are formed of dual cellular composition and generally of low grade malignancy and those arising from other ductal segment are, generally intermediate to high grade carcinoma. The management of all tumor types remained primarily surgical with and without post operative X-RAT. Patients with advanced primary, recurrent and metastatic disease have limited therapeutic options. The biology, genomics, and biomarkers of relevance to management will be discussed in the presentations.

Speaker 14

MICROBIAL AND INVERTEBRATE ECOLOGY ACROSS DIVERSE BIOMES: FROM POLAR ECOSYSTEMS TO INDIGENOUS HUMAN POPULATIONS

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ABSTRACT

Microbial communities are central to ecological function, driving decomposition, nutrient cycling, and soil fertility. This study integrates three independent but thematically linked investigations exploring microbial ecosystems in contrasting environments, Antarctica and Malaysia. The Antarctic studies examined penguin carcass decomposition to characterize necrobiome communities (bacteria, fungi, arthropods, nematodes) and associated changes in soil chemistry and bone density under extreme conditions. Using 16S rRNA and ITS sequencing, dominant taxa included *Proteobacteria*, *Clostridium estertheticum*, and *Mrakia frigida*, with no significant variation in microbial diversity across decomposition stages or penguin species, suggesting strong environmental stabilization of community structure. Arthropod and nematode abundance peaked during dry decomposition stages, indicating carcasses act as localized biodiversity hotspots. The Malaysian study, conducted among the Temuan Orang Asli, assessed soil and water microbiomes using 16S rRNA sequencing. Soil samples exhibited higher microbial diversity, dominated by *Proteobacteria* and *Firmicutes*, with all water samples meeting Class II quality standards. Comparative analysis revealed that both polar and tropical microbiomes are primarily structured by environmental filters, temperature, nutrient availability, and substrate quality, rather than random processes. These findings advance understanding of microbial ecology in extreme and traditional environments, highlighting universal drivers of microbiome assembly and their implications for conservation, climate resilience, and environmental sustainability.

Keywords: Necrobiome, Antarctic microbiome, environmental microbiology, Temuan Orang Asli, decomposition ecology.

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ABSTRACTS FOR ONLINE - KEYNOTE

CHRONIC PSYCHOLOGICAL STRESS IN ONCOGENESIS: MULTISYSTEM CROSSTALK AND MULTIMODAL INTERVENTIONS

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ABSTRACT

Malignant tumors constitute a major global public health burden. Chronic psychological stress (CPS) manifests as sustained dysregulation arising from prolonged adaptive responses to chronic endogenous and exogenous stimuli. Clinical evidence indicates that CPS significantly influences cancer progression, with most oncology patients developing detectable stress-related psychological disorders during disease management. This review synthesizes recent advances in understanding CPS-mediated oncogenic mechanisms and evaluates current intervention approaches. Mechanistically, CPS compromises immune surveillance through neuroendocrine-mediated hormonal dysregulation, impairing malignant cell recognition and clearance. Concurrently, CPS hormones promote tumor metabolic adaptation via hypothalamic-pituitary-adrenal axis-driven metabolic reprogramming, enhancing glycolytic flux to support uncontrolled proliferation. CPS further accelerates tumor progression through reactive oxygen species–induced mitochondrial impairment, DNA damage accumulation, and inflammatory cascades. Notably, CPS induces gut microbiota perturbations that reciprocally amplify tumorigenic processes through microbial metabolite disturbances and neuroimmune crosstalk, creating a self-perpetuating pathogenic loop. Therapeutic strategies to address cancer related–CPS that encompass pharmacological agents targeting neuroendocrine pathways, psychosomatic behavioral interventions, social environment adjustments, and evidence-based traditional Chinese medicine formulations, demonstrate potential in cancer prevention, treatment, and outcome optimization. However, challenges remain in achieving precise neuromodulation and minimizing intervention side effects, underscoring the need for mechanism-guided therapeutic innovations.

ISMM_29 2025
ABSTRACTS FOR ORAL PRESENTATION - PARTICIPANTS

MITOCHONDRIAL DNA COPY NUMBER AS A MOLECULAR BIOMARKER: TRANSLATING INSIGHTS INTO NEXT-GENERATION INFERTILITY THERAPIES

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ABSTRACT

Mitochondrial DNA (mtDNA) is increasingly recognized as a dynamic molecular biomarker. Variations in mtDNA copy number have been linked to infertility, a growing public health concern worldwide. In Malaysia, fertility rates have declined from 4.9 children per woman in 1970 to 1.7 in 2021. The most common infertility treatment, in vitro fertilization (IVF), faces a major challenge in selecting embryos with the highest implantation potential. This narrative review examines current evidence on the role of mtDNA copy number as a non-invasive biomarker of embryo developmental competence and highlights its potential translational value in women with unexplained infertility. A literature search was conducted from May to September 2025 in PubMed, Scopus, and ScienceDirect using search terms related to mtDNA, infertility, and embryo developmental competence. Additionally, selected institutional websites were reviewed to identify relevant publications. A discourse analysis was performed, and the findings were synthesized into a narrative review. Results revealed a limited but growing body of literature on mtDNA and infertility. However, current findings remain inconsistent, where several studies report that elevated mtDNA levels correlate with reduced implantation potential and pregnancy success, while others find no significant association. Institutional reports highlighted increasing interest in non-invasive biomarkers for embryo selection, though standardized protocols for mtDNA assessment are lacking. Notably, no studies have been conducted in the Southeast Asian region, where population-specific genetic variations may influence outcomes. In conclusion, mtDNA copy number holds potential as a non-invasive biomarker of embryo developmental competence and improving fertility outcomes. Advancing this field will require standardized protocols and regionally contextualized research for next-generation infertility therapies.

Keywords: mitochondrial DNA, biomarker; infertility, embryo developmental competence, molecular pathology, translational medicine.

TUMOR IMMUNE CELLS DENSITY, BUDDING STATUS AND LYMPHOID FOLLICLES IN CRC

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ABSTRACT

Colorectal cancer (CRC) affects more than 1,000,000 people worldwide each year. Recently, the number of young patients with early-onset colorectal cancer has increased, and right-sided colorectal cancer is still often diagnosed only in advanced stages. The TNM classification is not perfect for CRC staging. This study aimed to perform, for the first time, simultaneous analysis of tumor-infiltrating immune cell density, presence of lymphoid follicles, and budding status in CRC tissue. Intraoperative samples of neoplastic tissue were collected from 195 consecutive patients who were admitted to the surgical ward for elective colorectal surgery. Histological parameters were assessed in the tissue samples: tumor budding foci, poorly differentiated clusters and areas of poorly differentiated components. Tumor-infiltrating immune cells (tumor-associated neutrophils and tumor-infiltrating lymphocytes) were detected in five randomly chosen, areas at the tumor center and at the invasive front. Additionally, the presence of lymphoid follicles in CRC tissue was assessed. Tumor budding parameters were positively correlated with colorectal cancer advancement or histologic (mucinous) type of CRC. The number of poorly differentiated clusters was higher in younger patients. Lower densities of CD3 and CD4 lymphocytes were seen in CRC with a greater depth of tumor invasion. Lower densities of CD3 and CD8 lymphocytes were found in CRC with metastases to the surrounding lymph nodes. The lower density of CD8 lymphocytes was observed in CRC with distant metastases. Lower densities of tumor-associated neutrophils and tumor-infiltrating lymphocytes (CD3 and CD8) were revealed in CRC without lymphoid follicles. The number of lymphoid follicles was higher in patients with less advanced CRCs. Three histopathology markers, such as high tumor budding, scanty lymphocyte infiltration, and the poverty of lymphoid follicles, complement each other, appear to be reliable indicators of colorectal cancer progression, and could be useful in everyday medical practice, but their widespread use requires further research. We propose to take into account these markers, in the assessment of colorectal cancer advancement, in addition to the TNM classification.

SHORT-TERM SYNBIOTIC APPLICATIONS IN TILAPIA AQUACULTURE: EFFECTS ON GROWTH, WATER QUALITY AND MICROBIAL DYNAMICS

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ABSTRACT

Synbiotics, defined as the combination of probiotics and prebiotics that act synergistically to improve host performance and environmental balance are increasingly promoted as sustainable alternatives to antibiotics in aquaculture. This study assessed the short-term effects of Thohira®, a commercial synbiotic containing multiple Bacillus strains and prebiotic substrates on hybrid red tilapia (Oreochromis spp.). A total of 360 juvenile fish (12 weeks old; 9.6 ± 0.3 g; 7.0 ± 0.2 cm) were reared for 60 days in six tanks (three control, three synbiotic-treated). Synbiotic treatment significantly enhanced growth with final weight (237.4 ± 4.6 g) and length (23.0 ± 0.3 cm) exceeding controls (184.3 ± 5.1 g; 21.3 ± 0.4 cm), representing a 28% improvement in weight gain. Survivability was higher (95% vs. 88%) and condition factor increased (1.95 vs. 1.91). Proximate analysis indicated improved crude protein (18.7% vs. 17.9%) and omega-3 content (1.9% vs. 1.4%) suggesting enhanced nutritional quality. Water quality was also improved in treated tanks with reduced ammonia (0.24 vs. 0.41 mg/L), COD (32 vs. 48 mg/L), and turbidity (8.3 vs. 12.1 NTU). Microbial assessments significantly revealed lower coliform counts (2.1 × 102 vs. 4.5 × 102 CFU/mL) and reduced detection of Pseudomonas aeruginosa while beneficial Bacillus spp. persisted. These findings demonstrate that Thohira® synbiotic application improves tilapia growth, survivability, nutritional value, and water quality in the short term while suppressing undesirable microbes, though long-term studies remain essential to confirm product quality and consumer-level impacts, strengthening the case for synbiotics as antibiotic alternatives in aquaculture.

Keywords: Synbiotics; Tilapia aquaculture; Growth performance; Water quality; Microbial dynamics

PERI-IMPLANTATION SEXUAL ABSTINENCE IMPROVES PLACENTAL HEALTH BY REDUCING OXIDATIVE STRESS AND ENHANCING ANGIOGENESIS: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

This study investigated the impact of peri-implantation sexual abstinence on placental histomorphology, oxidative stress biomarkers, and pregnancy outcomes.

A randomized controlled trial was conducted with 33 participants allocated to an **Abstinence Group** (n=9; no intercourse for 14 days post-conception) or a **Non-Abstinence Group** (n=24). Placental tissues collected at delivery were analyzed.This first-in-human RCT demonstrates that peri-implantation sexual abstinence is associated with superior placental development, characterized by reduced oxidative damage and enhanced angiogenesis. These findings identify a simple, modifiable behavioral factor that can optimize the uterine environment for implantation. This research provides a strong scientific basis for integrating peri-implantation abstinence counseling into preconception care to improve pregnancy outcomes.

Keywords: Peri-implantation, Sexual Intercourse, Oxidative Stress, Placental Histomorphology, Angiogenesis, Randomized Controlled Trial, Antioxidants (or Antioxidant Defense), Placental Development, Preconception Care

TROXERUTIN'S CYTOTOXICITY AGAINST THE ESCC KYSE-150 CELL LINE

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ABSTRACT

Esophageal cancer (EC) is one of the most diagnosed cancers globally, with esophageal squamous cell carcinoma (ESCC) being its deadliest subtype, accounting for 85% of EC cases. Despite current advances in diagnosis and treatment, the prognosis for ESCC remains poor due to late detection and limited therapeutic options associated with high recurrence rates, side effects, and high costs. Troxerutin is a naturally occurring type of flavonoid derived from rutin that can be found naturally in foods or isolated from the Japanese pagoda tree. With beneficial effects like being an antioxidant, anti-inflammatory, and so on, troxerutin is used as a drug for a myriad of medical disorders. This study aims to assess the cytotoxicity, drug-likeness, and molecular mechanisms of troxerutin against ESCC cells, specifically the KYSE-150 cell line. MTT cell viability assay was used to determine the cytotoxicity of troxerutin against KYSE150, HET1A, and Vero cells. The drug likeness and toxicity of troxerutin were predicted with in silico screening tools. In silico molecular docking analysis was used to predict the binding affinity of troxerutin to selected target proteins that promote apoptosis, anti-apoptosis, necroptosis, anti-ferroptosis, and pyroptosis to understand the molecular mechanisms involved. Troxerutin exhibited cytotoxic effects against KYSE-150 cells with an IC50 of 81.88 μM, but the effects were minimal at low concentrations. Troxerutin was more cytotoxic toward Vero cells (IC50 of 71.60 μM) and less cytotoxic toward HET-1A cells (IC50 of 119.2 μM). The toxicity of troxerutin was predicted to be relatively safe, but it violated drug-likeness common filters. In silico molecular docking showed troxerutin had the strongest binding affinity scores towards ferroptosis, apoptosis, and necroptosis-related proteins. Troxerutin exhibits a potent and selective cytotoxicity against KYSE-150 cells and may induce ferroptosis as a cell death mechanism regarding ESCC cells. It possesses acceptable drug-likeness and toxicity results, although nanoformulation techniques could be used to improve oral availability. Troxerutin deserves further investigation to claim its anticancer properties against ESCC cells.

PRESENTATION OF AN AUTOPSY CASE OF SUDDEN DEATH WITH CARDIAC INFARCTION AS THE DIRECT CAUSE

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ABSTRACT

Sudden death is of great medicolegal importance, as it is essential to define the true cause of death and its circumstances to determine whether it is of natural or violent origin, and thus properly administer justice. The World Health Organization defines it as a natural death that occurs within six hours of the onset of symptoms, in an apparently healthy person or in a patient in whom death was not expected within that period. Therefore, it is necessary to look for morphological or biochemical alterations that explain the death with sufficient certainty, although in some cases autopsies fail to clarify the cause, resulting in blank autopsies. Sudden death is the leading cause of death in men between 20 and 65 years of age. After the medicolegal investigation, which includes the collection of prior information, the performance of an autopsy, and laboratory tests, a clear cause may not be found, resulting in a blank autopsy. The causes of sudden death can be diverse, but cardiac causes are the most common, accounting for 75% of cases. A 24-year-old woman experienced sudden death while in the shower. No visible traumatic changes were found throughout her body during a cavity examination; there was evidence of cerebral edema in the brain, as well as edema in the thoracic cavity and lungs. The heart showed grade I atherosclerosis in the coronary arteries and the presence of a 0.05 cm microinfarct in the left ventricle. The stomach contained early-digested food residue, with a negative toxicology report. Sudden cardiac death based on the findings of the autopsy, and the toxicology report was negative for all types of drugs. Consideration should be given to whether any environmental factors contributed to additional hemodynamic changes, such as prolonged hot bathing, which could trigger peripheral vasodilation, decreased systemic blood pressure, and loss of alertness.

BIOCHEMICAL AND HISTOPATHOLOGICAL STUDIES OF ANTHURIUM SCHLECHTENDALII KUNTH (STONE ROOT) EXTRACT ON ADENINE-INDUCED RENAL DAMAGE IN WISTAR RATS

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ABSTRACT

Anthurium schlechtendalii Kunth is used by the Zoque group in southeastern Mexico for kidney and urinary diseases, but its safety and effectiveness are unproven, therefore a model of adenine-induced renal failure in rats was performed. The rats were fed with solid and aqueous plant extracts for 4 weeks to study its effects on kidney histological morphology. Kidneys were examined, and statistical analysis was performed. The adenine-containing diet caused renal failure, characterized by crystal deposits, cystic dilatation of tubules, and micro-abscesses. Both extracts caused tubular damage and collagen increase without inflammation. However, when combined with adenine, the extracts showed some protective effects, although cystic dilatation and granulomatous inflammation were observed. The extracts at the tested doses resulted in glomerular and tubular damage, aggravating cystic degeneration, therefore, its indiscriminate use in Humans is not safe. Additionally, the extracts can serve as a model for studying renal damage without crystal deposits.

Keywords: Anthurium schlechtendalii Kunth root, kidney damage model, traditional, renal function

THE ROLE OF MICROBIOMES IN ENDOMETRIOSIS AND ENDOMETRIAL CANCER

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ABSTRACT

Endometriosis and endometrial cancer are significant gynecological diseases affecting women worldwide, with growing evidence linking their pathogenesis to the microbiome. Endometriosis, a chronic inflammatory condition characterized by ectopic endometrial tissue, affects 6–10% of reproductive-aged women. Endometrial cancer, associated with hormonal imbalance and genetic susceptibility, arises from the uterine lining. Emerging research highlights the microbiome's role in these conditions through mechanisms involving chronic inflammation, immune dysregulation, and hormonal modulation. Microbial communities in the gut and reproductive tract are increasingly recognized for their influence on disease onset and progression. This review explores the complex microbiome-host interactions in endometriosis and endometrial cancer and outlines six therapeutic strategies: dietary modulation, antibiotics, hormonal therapy, immunotherapy, chemotherapy, and targeted treatment. Understanding these microbial contributions may lead to novel diagnostic markers and therapeutic interventions. Further research is essential to elucidate the microbiome's full role and harness its potential in managing these multifactorial disorders.

Keywords: Endometriosis; Endometrial cancer; Gut microbiota; Endometrial microbiota; Dysbiosis

THERMODYNAMIC AND FLUORESCENCE CHARACTERISATION OF MALABARICONE-C-HSA COMPLEX IN THE CONTEXT OF CANCER THERAPEUTICS

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ABSTRACT

Malabaricone C (MLC), a bioactive compound derived from Myristica fragrans (nutmeg), has gained increasing attention for its potent anticancer and antioxidant properties. The pharmacological efficacy of MLC in oncology may be influenced by its interaction with plasma carrier proteins such as human serum albumin (HSA), which plays a crucial role in modulating drug bioavailability, transport, and tumor targeting. This study aimed to elucidate the biophysical interactions between MLC and HSA to better understand its potential as a therapeutic agent in cancer treatment. Fluorescence quenching titrations were conducted at physiological pH (7.4) and temperatures of 290 K, 300 K, and 310 K to assess the thermodynamic and conformational changes in the MLC-HSA complex. Results revealed a concentration-dependent quenching of HSA fluorescence by MLC, indicating the formation of a stable ligand-protein complex. The quenching efficiency decreased with rising temperature (49%, 42%, and 20% at 290 K, 300 K, and 310 K, respectively), suggesting a static quenching mechanism. Thermodynamic parameters confirmed that hydrophobic interactions, hydrogen bonding, and van der Waals forces primarily stabilize the MLC-HSA complex. These findings provide key insights into the binding dynamics of MLC, supporting its potential development as an anticancer compound with favorable pharmacokinetic behavior and HSA-mediated transport mechanisms relevant to cancer drug delivery.

Keywords: Malabaricone C; anticancer agent; human serum albumin; fluorescence spectroscopy; drug-protein interaction; molecular oncology.

RUTIN AS A NATURAL ALPHA-GLUCOSIDASE INHIBITOR FOR DIABETES THERAPY

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ABSTRACT

Diabetes mellitus remains a major global health challenge, with rising prevalence and significant complications associated with poor glycaemic control. Managing postprandial hyperglycaemia is crucial in preventing disease progression and associated comorbidities. Alpha-glucosidase inhibitors play a vital role in controlling postprandial glucose levels by delaying carbohydrate digestion, yet current synthetic inhibitors such as acarbose and miglitol often cause gastrointestinal side effects and variable patient tolerance. This has sparked growing interest in natural alternatives such as flavonoids, particularly rutin, a flavonol glycoside composed of quercetin and rutinose, widely distributed in foods like buckwheat, citrus fruits, and apples. This comprehensive review highlights rutin's potential as a natural alpha-glucosidase inhibitor, with promising implications for diabetes management. Drawing on evidence from studies published between 2014 and 2024, it synthesises data from in vitro, in vivo, and emerging clinical investigations. The review also explores the pharmacological and antioxidant properties of rutin, and its safety advantages compared with synthetic inhibitors. However, challenges such as low bioavailability, poor stability, and limited human data currently hinder its full therapeutic translation. Addressing these challenges through advanced formulation strategies, such as nano-delivery systems, and exploring combinatory therapy with conventional anti-diabetic agents could enhance rutin's clinical utility. This study highlights the need for multidisciplinary research integrating pharmacology, formulation science, and clinical evaluation to unlock the potential of rutin as a safe and effective natural therapy for diabetes management.

Keywords: rutin; in vitro; in vivo; nano delivery systems; alpha-glucosidase inhibitor

BARIATRIC SURGERY IN MALAYSIA DELIVERS SUSTAINED CLINICAL BENEFITS AND COST SAVINGS IN TYPE 2 DIABETES: EVIDENCE FROM A 10-YEAR RETROSPECTIVE ANALYSIS

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ABSTRACT

Malaysia records the highest prevalence of obesity in Southeast Asia, driving rising rates of type 2 diabetes mellitus (T2DM) and escalating healthcare costs. While bariatric surgery is established globally as an effective treatment, there are no long-term, real-world cost-effectiveness data from Malaysia. This study evaluated the clinical effectiveness, safety, and cost-effectiveness of bariatric surgery compared with conventional care in Malaysian patients with poorly controlled T2DM. We conducted a retrospective cohort study of 182 patients who underwent laparoscopic sleeve gastrectomy or Roux-en-Y gastric bypass at Hospital Canselor Tuanku Muhriz, Universiti Kebangsaan Malaysia (2014–2016). Clinical outcomes (BMI, HbA1c) were tracked over 5 years. Out of 182 patients in the bariatric registry, 20 individuals who underwent surgery between 2012 and 2014 met the eligibility criteria for inclusion in the 10-year cost-effectiveness analysis. These surgical patients were matched 1:1 with 20 controls receiving conventional medical therapy for Type 2 Diabetes Mellitus. The analysis adopted a healthcare payer perspective, and a 10-year cost-effectiveness comparison was conducted between the two cohorts. The incremental cost-effectiveness ratio (ICER) was calculated both per unit reduction in HbA1c and per quality-adjusted life year (QALY) gained to evaluate the long-term economic and clinical impact of bariatric surgery. At 5 years, mean BMI decreased from 49.3 to 27.2 kg/m² (p<0.001), and HbA1c declined from 6.34% to 5.23% (p<0.001). Surgical safety was favorable, with a 2.2% complication rate and most patients discharged within 2 days. The cost-effectiveness analysis showed that bariatric surgery substantially reduced long-term medication dependence and diabetes-related complications compared with conventional management. With an ICER of RM4,682.71 per 1% HbA1c reduction and RM7,676.56 per QALY gained, both values fall significantly below Malaysia's willingness-to-pay threshold (RM12,810–RM29,080), reinforcing the economic and clinical value of bariatric surgery as a sustainable diabetes treatment option. Bariatric surgery provides durable metabolic benefits and is cost-effective compared with conventional care in Malaysia. These findings support its inclusion in insurance coverage and healthcare financing as a cost-saving strategy for managing obesity and T2DM.

Keywords: Bariatric surgery; cost-effectiveness; type 2 diabetes; obesity; Malaysia; health economics

POSTER

INVESTIGATION THE INFLUENCE OF IL-1B POLYMORPHISM (+3954 T>C (RS1143634)) IN MELANOMA PROGRESSION

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ABSTRACT

This study aimed to investigate the role IL-1B +3954C>T (rs1143634) polymorphism in a Bulgarian population, in the development and progression of skin melanoma. A total number of 198 non-affected of the disease control individuals and 76 patients with malignant melanoma were included. There was no statistically significant difference in genotype and allele distribution (p=0.118 and p=0.895 respectively). In total within patient group, 47 (61.8 %) were homozygous by the more common C allele; 22 (28.9 %) heterozygous and 7 (9.2 %) homozygous by variant T allele. In control group the genotype distribution was as the following: 107(54.0 %) were with CC allele, 80 (40.4 %) with CT and 11 (5.6 %) with TT genotype. However, when only men were analyzed, the carriers of CC genotype had 2.53-fold higher risk for skin melanoma than the heterozygous individuals, (CT genotype, p=0.039), and 2.06-fold higher than those with T allele genotypes (CT+TT, p=0.086). No statistically significant correlations were found between the carriage of the different genotypes and biochemical parameters of patients with cutaneous malignant melanoma. Of the clinical parameters, a significant correlation was found between the Clark scale staging (Clark scale): male patients with CC genotype were predominantly (92.3%) with more advanced melanoma extending in depth through the entire papillary layer of the dermis and into the underlying layers of the dermis (reticular layer) and even into the subcutaneous fat tissue (Clark 3/4/5) than the males with T allele genotypes (33.3%. p=0.018). A statistically significant association was found between the presence of lymph node metastases and the IL1B +3954 C>T SNP genotypes: patients with T allele genotypes had significantly more often lymph node metastases (26.3%) compared with those with the CC genotype (2.6%, p=0.005). This association was significantly stronger in male patients (60% vs. 0%, p=0.001). When analyzing the survival of patients according to the different genotypes we did not find a statistically significant difference between those with the CC genotype and genotypes with at least one T allele (p=0.360), however when divided by gender, it was found that male patients with the CC genotype had a more favorable prognosis, although not significantly (p=0.114): survival after diagnosis of the disease was longer (median value of 43.9 months) compared to men carrying a genotype with at least one variant T allele (median value of 12.0 months (Figure 15). In conclusion we may suggest that the CC genotype of IL1B +3954 C>T SNP may be a risk factor for men for skin malignant melanoma, but it could be associated with less aggressive disease having more favorable prognosis.

Keywords: Melanoma, polymorphisms, SNP, Il-1

IS THE SERUM RANKL VALUABLE BIOMARKER OF OSTEOPOROSIS AND EXACERBATION IN PATIENTS WITH COPD

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ABSTRACT

COPD is chronic inflammatory lung disease with variety of co-morbidities, as osteoporosis is one of them. The receptor activator of NF-kB ligand (RANKL), receptor activator of NF-kB (RANK) and osteoprotegerin (OPG) pathway is critical in bone homeostasis through regulation of osteoclasts. In the current preliminary study we aimed to explore the possible role of RANKL, a critical protein of bone remodeling, as biomarker of osteoporosis in patients with COPD. The serum levels of RANKL in 59 patients with COPD measured by ELISA method was significantly higher than in 32 control individuals (412.9±46.5 ng/ml vs. 267.9±27.7 ng/ml, p=0.003, p=0.018). Applying the ROC curve we assessed that the levels of 290 ng/ml determined COPD with 65.3% sensitivity and 63.3% specificity (p=0.013). The serum levels of RANKL positively correlated with the duration of the disease (Rho=0.288, p=0.028), and although not significantly, the patients with higher levels of RANKL (above 290 ng/ml) had an earlier disease onset (54.2±1.4 (SEM) years vs. 62.9±1.7 (SEM) years, p=0.115). Patients who used to smoke or are current smokers had higher serum RANKL (455.0±50.8 ng/ml vs. 179.2±30.8 ng/ml, p=0.003). The serum levels of RANKL did not correlate with the spirometric indexes of lung function and GOLD stages, presence of different comorbidities, as arterial hypertonia or diabetes mellitus, but patients with osteoporosis had significantly higher levels of RANK (492.0±69.1 ng/ml vs. 238.2±65.8 ng/ml, p=0.012). Moreover, serum RANKL was higher also in patients who are exacerbations (503.4±55.3 ng/ml vs. 249.4±57.4 ng/ml, p=0.003).

Keywords: COPD, RANKL, biomarker

EXPRESSION OF DUAL SPECIFICITY PHOSPHATASE 7 (DUSP7) IN COLORECTAL CANCER

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ABSTRACT

Dual-specificity phosphatases (DUSPs) dephosphorylate the threonine/serine and tyrosine residues of many key signaling molecules, including mitogen-activated protein kinases, leading to the regulation of their activities. Although reports have indicated that DUSPs may be involved in the initiation and progression of human cancers, the relationship between the expression level of human dual-specificity phosphatase 7 (DUSP7/Pyst2) and the development and progression of cancers has rarely been investigated and remains to be verified in colorectal cancer (CRC). Therefore, the aim of the present study was to compare *DUSP7* gene expression in tumour and matched unchanged colorectal mucosa tissues obtained from patients with CRC and to investigate its association with clinicopathological parameters, as well as patients' overall survival. We used quantitative polymerase chain reaction and immunohistochemistry to determine *DUSP7* mRNA and protein levels, respectively. We found decreased levels of *DUSP7* mRNA in CRC compared to the corresponding unchanged colorectal tissues. Immunoreactivity of the DUSP7 protein was higher in CRC cells compared to enterocytes of matched unchanged colorectal mucosa, but significantly lower in the intratumoral stroma than in the lamina propria of unchanged mucosa. Furthermore, elevated levels of DUSP7 protein in the lamina propia of unchanged mucosa of CRC patients were associated with worse clinicopathological parameters, such as lymph node involvement, presence of metastases, higher TNM stage and shorter overall survival of patients. Moreover, increased DUSP7 immunoreactivity in CRC cells was found to be an independent negative prognostic factor. Our results suggest multiple roles of DUSP7 in the pathogenesis of CRC, depending on its site of action, and also indicate the prognostic value of its expression level.
Funded by the Minister of Science under "the Regional Initiative of Excellence Program" and the statutory grant of the School of Medicine, University of Warmia and Mazury in Olsztyn, Poland.

ANTIOXIDANT ACTIVITY OF *SALVINIA* SPP. EXTRACTS

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ABSTRACT

Invasive plants pose significant ecological challenges, often leading to disruption of native biodiversity and aquatic ecosystems. However, their rapid growth and resilience also open opportunities for exploitation, particularly in the search for novel phytochemicals with therapeutic potential. *Salvinia* spp., a free-floating aquatic fern native to tropical regions, has been known for its ability to form dense mats over water surfaces. Despite this notoriety, *Salvinia spp.* has been repeatedly studied for its phytoremediation capabilities against heavy metal contaminated waters. Moreover, the antioxidant activity of *Salvinia* spp. has been rarely touched on. In this study, wild *Salvinia* spp. specimens were collected and subjected to either air-dried or oven dried and extracted through maceration. A total of three assays (DPPH radical scavenging assay, ABTS antioxidant capacity assay and iron chelating assay) were used to assess the antioxidant capacity of the two *Salvinia* spp. extracts. Both extracts reported antioxidant activities with the air-dried samples reporting highest activity at 74.3% and 85.6% in DPPH and ABTS assay. A three-way ANOVA revealed that drying method, assay type and concentration each significantly influenced the scavenging activity %. However, both extracts did not show any activity in the iron chelating assay although previous studies have shown *Salvinia* spp. to effectively remove metals without toxicity effects. This study fills in the gap on the lack of evidence on the antioxidant potential of *Salvinia* spp. through biochemical assays. The data obtained facilitates future investigation into utilisation of invasive plant species as valuable resources within the pharmaceutical and nutraceutical fields.

HIV PREVENTION THROUGH PREP AND PEP: AN ANALYSIS OF CLINICAL TRIALS AND REAL-WORLD OUTCOMES

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ABSTRACT

The Human Immunodeficiency Virus (HIV) still affects over 40 million individuals worldwide despite advancements in treatment, highlighting the critical need for effective prevention measures. Clinical trials have demonstrated the remarkable effectiveness of Pre-exposure Prophylaxis (PrEP) and Post-exposure Prophylaxis (PEP). This paper summarizes findings from studies conducted from 2015 to 2025, showing both the advancements and challenges in converting clinical efficacy into practical success. PEP provides almost total protection when started within 72 hours and continued for 28 days, while PrEP can prevent HIV transmission by up to 99%. However, achieving similar outcomes outside clinical settings remains difficult. Stigma, limited awareness, delayed initiation, poor adherence, and unequal healthcare infrastructure especially in low- and middle-income regions create a substantial gap between trial efficacy and real-world effectiveness. Individuals frequently lack the regular counseling, supervision, and support that trial participants have access to in community settings. PrEP acceptance is modest in Southeast Asia, and adherence to daily and on-demand regimens varies, and PEP completion rates are still low. While the advent of long-acting injectable drugs like cabotegravir presents new opportunities, it also highlights inequalities in cost and accessibility. Wider accessibility, better education, digital adherence tracking, and services conducted by pharmacists or the community are all necessary to close these gaps.

Keywords: Pre-exposure Prophylaxis (PrEP); Post-exposure Prophylaxis (PEP); HIV, ART

THE SYNERGISTIC THERAPEUTIC EFFECTS OF CURCUMIN AND PIPERINE ON ALZHEIMER'S DISEASE MODEL THROUGH THE MODULATION OF PICALM CRITICAL PATHWAY

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ABSTRACT

Our previous work demonstrated a synergistic effect of curcumin and piperine as anti-cholinesterase and anti-amyloidogenic agents in Alzheimer's disease (AD). This effect was hypothesized to occur through modulation of multiple pathways, involving the upregulation or downregulation of specific genes identified via microarray analysis. The present study aimed to extend these findings by focusing on a putative target gene, PICALM, and its modulation by curcumin alone or in combination with piperine in an in vitro AD model. Methods: We performed cytotoxicity assays, plasmid construction and transfection, cell lysis, Western blotting, APP internalization and cell surface biotinylation assays, and Aβ ELISA to evaluate the effects of the treatments. Results. Results revealed that selective manipulation of PICALM expression by curcumin and piperine modulates APP endocytosis and alters Aβ production in neuronal cells. These findings suggest that PICALM plays a key role in intracellular APP processing and amyloid plaque pathogenesis. Understanding the cellular mechanisms underlying PICALM dysregulation may provide novel therapeutic targets and early biomarkers for AD-associated episodic memory decline.

Keywords: curcumin, piperine, alzheimer's disease, picalm

TRYPAN BLUE DETOXIFICATION BY MULTI-WALLED CARBON NANOTUBES (MWCNTS) FOR SAFE APPLICATION IN CANCER CELL ASSAYS

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ABSTRACT

Trypan Blue exhibits cytotoxic and mutagenic properties that can compromise cellular integrity and interfere with molecular assays when improperly handled or disposed of Prolonged exposure to this azo dye has been associated with oxidative stress, DNA damage, and apoptosis in mammalian cells, emphasizing potential health and environmental hazards. Therefore, effective strategies for its removal from laboratory and industrial effluents are essential to prevent bioaccumulation and minimize toxicological risks in molecular oncology settings. In this study, multi-walled carbon nanotubes (MWCNTs) were investigated as a potential adsorbent for the decolorization of synthetic industrial wastewater. Functionalized MWCNTs were utilized to assess their adsorption efficacy, and process optimization was performed using Box-Behnken Design (BBD). Experimental results revealed that optimal removal of Trypan Blue (100% decolorization) was achieved within 24 minutes. The adsorption behavior was analyzed using both Langmuir and Freundlich isotherm models. Kinetic analysis revealed that the process followed a pseudo-second-order model, with an excellent correlation coefficient ($R^2 = 0.999$), suggesting chemisorption as the primary mechanism. Thermodynamic evaluation confirmed that the adsorption was spontaneous and endothermic, as evidenced by negative ΔG and positive ΔH values.

Keywords: MWCNTs; Azo dyes; Isotherm models; BBD

DEGRADATION OF MUTAGENIC RBBR DYE BY IMMOBILIZED LACCASE: IMPLICATIONS FOR CYTOTOXICITY CONTROL IN CANCER RESEARCH ENVIRONMENTS

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ABSTRACT

The growing concern over environmental and laboratory contamination from synthetic dyes, including those used in cancer research and histological staining, highlights the need for efficient biodegradation strategies. Laccase enzymes have emerged as a promising solution due to their broad substrate specificity and ability to break down toxic dye compounds into non-carcinogenic by-products. This enzymatic approach not only supports sustainable waste management but also reduces potential cytotoxic and mutagenic risks associated with dye exposure in oncology research environments. The poor stability and reusability of the free enzyme make its practical use difficult. In this study, the laccase was immobilized on chitosan beads to improve its stability and reusability. Employing Box Behnken Design (BBD), the effectiveness of immobilized laccase in decolorizing was achieved at 91%. The kinetic studies indicate that K m and V max values increased with increasing temperature with a high degree of correlation ($R^2 = 0.99$) on non-linear analysis. The difference in V max values between the Lineweaver-Burk and non-linear models was relatively minor at all temperatures. The decolorization process is kinetically controlled and not influenced by internal mass transfer limitations. Reusability tests revealed that laccase can be recycled for additional 6 cycles after being immobilized with chitosan beads. Immobilized laccase efficiently breaks down complex dye molecules such as RBBR, offering a sustainable and affordable approach to manage dye-derived cytotoxicity and reduce hazardous waste in oncology research and diagnostic laboratories.

Keywords: RBBR; Kinetic models; biocatalyst; histological staining

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