ABSTRACT BOOK

37th International Annual Meeting in Pharmaceutical Sciences

(IAMPS37)

"Foster Integrative Pharmaceutical Sciences for all"

March 24-25th, 2022

via ZOOM Webinar

CONTENT

FACULTY OF PHARMACEUTICAL SCIENCES, CHULALONGKORN UNIVERSITY
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TEL: +662-218-8454, E-MAIL: CE@PHARM.CHULA.AC.TH

Welcome Address

Dean of Faculty of Pharmaceutical Sciences, Chulalongkorn University

Welcome distinguished guests and speakers, ladies and gentlemen,

In a rapidly changing world nowadays, we are facing new challenges. The most important of which is the global public health problem. In the area of sciences, these challenges brought us to the latest technologies and new normal lifestyles. Modern and traditional medicines have been developed, using pharmaceutical technology as a key, for both treatment and prevention. As of the COVID-19 situation, knowledge in all areas, especially herbal substances, has been utilized worldwide. This is an excellent opportunity for all of us to share an update in the area of pharmaceutical sciences together with new normal health systems.

On behalf of the Faculty of Pharmaceutical Sciences, Chulalongkorn University, I am pleased to welcome all participants and speakers from the United States of America, Europe, and Southeast Asia to the 37th International Annual Meeting in Pharmaceutical Sciences. This meeting aims not only to promote the pharmaceutical research collaboration but also to strengthen our relationship with other researchers in health sciences-related areas.

This conference has attracted more than 200 registrations. We will have an incredible line-up of 4 plenary speakers, 4 invited speakers, 7 oral presenters, and 35 posters presenting the advancement in pharmaceutical sciences. It is also an honor that Professor Tsuneji Nagai joins this meeting. As you may know, Professor Nagai is the founder and president of the Nagai Foundation Tokyo. The Nagai Foundation has continually supported three awards every year for the best research publications in Pharmacy Practice/Social and Administrative Pharmacy and in the field of Pharmaceutical Sciences. We all are looking forward to the highlights of this meeting, the award presentation by Prof. Nagai.

This is the first time we have presented the Vichiara Jirawongse Award for graduate research excellence in herbal medicine and the Vichiara Jirawongse Award for outstanding pharmacy students in herbal medicines 2022. Professor Vichiara Jirawongse, a member of the Royal Institute, was the pharmacist who dedicated all his life to teaching and educating herbal medicine to students and the public. The benefaction of his works helps to improve the pharmaceutical vocation, academic, research, and applications of herbal medicine in Thailand. To honor and commemorate him on the 100th anniversary of his birth, the Professor Vichiara Jirawongse Fund was established by the alumni committee on 11th February 2018. The fund mainly aims to support the improvement of herbal medicine research and education. Starting in 2022, the Vichiara Jirawongse Award for Graduate Research Excellence in Herbal Medicine is granted for the achievements of graduate students who are successfully publishing their research work in high-impact journals in the field of herbal medicine. In addition, the Vichiara Jirawongse Award for outstanding pharmacy students in herbal medicines is granted for the undergraduate pharmacy students who outstand in their study.

At this conference, we also award the presenters who outstand in their presentation. The awards include 3 awards for outstanding oral presentations and 3 awards for poster presentations.

This conference would not have been possible without financial support from PerkinElmer Thailand, Rushmore Precision Co., Ltd., Biosynthesis Biotechnology Co., Ltd., Chemical Express Co., Ltd., Bio-Active Co., Ltd., and the research affairs, Faculty of Pharmaceutical Sciences, Chulalongkorn University. My deepest gratitude goes to these organizations on behalf of the Faculty of Pharmaceutical Sciences. I would like to extend my sincere appreciation to honorable speakers and all participants. Last but not least, I would like to thank the organizing committees and staff. We truly appreciate your dedication and effort in managing all conference details.

Once again, I would like to thank all of you for attending the conference. I hope that you have a wonderful time over this day and that you will find the conference to be scientifically rewarding.

Professor Pornanong Aramwit, Pharm.D., Ph.D
Dean of Faculty of Pharmaceutical Sciences, Chulalongkorn University

About the Meeting

37th INTERNATIONAL ANNUAL MEETING

IN PHARMACEUTICAL SCIENCES (IAMPS37)

“Foster Integrated Pharmaceutical Sciences for all”

May 24-25, 2022 *via* online platform (ZOOM Webinar)

The Chulalongkorn University Faculty of Pharmaceutical Sciences has continuously arranged an annual meeting in pharmaceutical and health sciences since 1982. This is intended to give an opportunity for researchers, academics, graduate students from the Faculty of Pharmaceutical sciences and any interested persons form various institutes to communicate their work via oral and poster presentations and to share their knowledge and experiences with other participants in 3 areas that embrace:

- Pharmaceutical Chemistry and Natural Products
- Pharmaceutical Technology and Biopharmaceutical Sciences
- Clinical and Social/Administrative Pharmacy

The meeting will be held by Faculty of Pharmaceutical Sciences on May 24-25, 2022 *via* online platform (ZOOM Webinar / Meeting)

Supportive Organization

Faculty of Pharmaceutical Sciences, Chulalongkorn University

Phyathai road, Pathumwan, Bangkok, Thailand 10330

https://www.pharm.chula.ac.th

Other Sponsors

- PerkinElmer Thailand
- Rushmore Precision Co., Ltd.
- Biosynthai Biotechnology Co., Ltd.
- Chemical Express Co., Ltd.
- Bio Active Co., Ltd.,
- PharmaGem Inc.,

Conference Committee

Consultant

Professor Wanchai De-eknamkul, Ph.D.
Professor Pornanong Aramwit, Ph.D.
Associate Professor Chankit Puttilerpong, Ph.D.
Assistant Professor Police Lieutenant Walaisiri Muangsiri, Ph.D.
Assistant Professor Thitima Wattanavijitkul, Ph.D.

Chair of Organizing committee

Professor Pithi Chanvorachote, Ph.D.
Associate Dean of research affairs,
Faculty of Pharmaceutical Sciences, Chulalongkorn University

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Nonthaneth Nalinratana, Ph.D.
Wongsakorn Phongsopitanun, Ph.D.

Conference Committee

Scientific committee

Associate Professor Kulwara Meksawan, Ph.D.
Associate Professor Supakarn Chamni, Ph.D.
Associate Professor Boonchoo Sritulalak, Ph.D.
Associate Professor Pornchai Rojsitthisak, Ph.D.
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Assistant Professor Jittima Chatchawalsaisin, Ph.D.
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Assistant Professor Suntaree Watcharadamrongkun, Ph.D.
Tatta Sriboonruang, Ph.D.
Romchat Chutoprapat, Ph.D.
Bunchai Chongmelasami, Ph.D.
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Nonthalert Lertnitikul, Ph.D.

Presentation committee

Associate Professor Kulwara Meksawan, Ph.D	**Chulalongkorn University**
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Assistant Professor Chatchai Chaotham, Ph.D.	**Chulalongkorn University**
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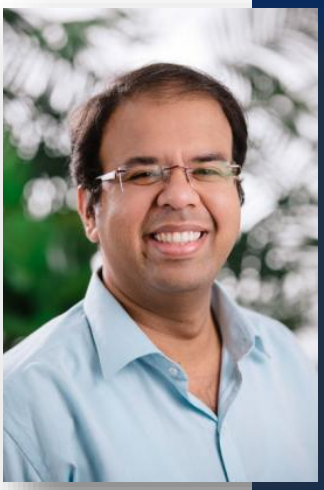
Assistant Professor Somnuk Bunsupa, Ph.D.	**Mahidol University**
Apirada Sucontphunt, Ph.D.	**Rangsit University**

PLENARY SPEAKER

PLENARY SPEAKER



Abhijit A. Date, Ph.D., M.Pharm.

Assistant Professor of Pharmaceutical Sciences

R.K. Coit College of Pharmacy, University of Arizona, USA

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"I am a pharmaceutical scientist by training and the focus of my research is to develop novel delivery systems to improve therapeutic efficacy and to reduce the adverse effects of drugs. To date, I have published 60 papers in international peer-reviewed journals and filed 4 US patents (1 issued)."

ABSTRACT

Repurposing pharmaceutical excipients and drugs for the treatment of herpes simplex virus infections

Abhijit A. Date

Department of Pharmacology and Toxicology, R.K. Coit College of Pharmacy, University of Arizona

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Keywords: Drug Repurposing, Nanomedicine, Genital herpes, Herpes Simplex Keratitis

“Drug repurposing” is a drug development strategy that focuses on establishing new indications for existing or previously discarded drugs. “Drug repurposing” has gained significant momentum to develop effective treatment modalities for neglected parasitic diseases, emerging infectious diseases, and infectious diseases with limited therapeutic options. My current research is focused on drug repurposing and reformulation for the treatment of herpes simplex virus (HSV) infections. HSV infections can affect multiple anatomical sites in humans such as the mouth (herpes labialis), reproductive tract (genital herpes), eye (herpes simplex keratitis), and brain (herpes simplex encephalitis). The lack of vaccine, availability of a limited number of antiviral drugs, and the emergence of drug-resistant strains highlight the need for drug repurposing to treat HSV infections. My research group, in collaboration with Dr. Shukla from the University of Illinois Chicago, has demonstrated that pharmaceutically acceptable pH-sensitive enteric polymers (polycarboxylates) can be repurposed for the prevention and treatment of HSV infections. The transformation of polycarboxylates into nanoparticles retained or enhanced their antiviral activity. Furthermore, polycarboxylate nanoparticles showed synergy with various antiviral drugs. We are currently developing topical modalities based on polycarboxylate nanoparticles containing anti-HSV drugs for the improved treatment of genital herpes and herpes simplex keratitis. In summary, our efforts on the repurposing of drugs and pharmaceutical excipients for the treatment of infectious diseases have shown promising results.

PLENARY SPEAKER

Professor Ken Fujise

Professor and Principal Investigator

University of Washington

kfujise@uw.edu

Tel: 206-616-8786

"Dr. Ken Fujise is a physician-scientist and Professor at the University of Washington. His lab has characterized fortilin at both basic and translational levels over the last 20 years, during which time the lab has been able to establish the mechanism by which fortilin protects against apoptosis and cellular stress."

ABSTRACT

Fortilin, bench to bedside

Dr. Ken Fujise

The University of Washington

* Corresponding author: Tel: 206-616-8786; E-mail address: kfujise@uw.edu

Keywords: fortilin, heart failure, CHF, p53, tumor suppressor protein, apoptosis

Heart failure (HF) has reached epidemic proportions in developed countries, affecting over 20 million people worldwide. Despite the modern medical and device therapies, 60–70% of HF patients still die within 5 years of its diagnosis as it relentlessly progresses through pervasive apoptotic loss of cardiomyocytes. Although fortilin, a 172-amino-acid anti-p53 molecule, is one of the most expressed proteins in the heart, its precise role there remained unknown. Also unclear is how cardiomyocytes are protected against apoptosis. Here, we report that the failing human hearts express less fortilin than do non-failing hearts. Fortilin sustains cardiomyocyte viability because mice lacking fortilin in the heart (fortilin[KO-heart]) die by 9 weeks of age due to extensive cardiomyocyte apoptosis and severe HF. The lack of fortilin was associated with drastic upregulation of p53 target genes in the hearts. The heart-specific deletion of p53 in the fortilin[KO-heart] mice extended their life spans from 9 to 18 weeks by mitigating cardiomyocyte apoptosis. Our data suggest that fortilin is a novel cardiac p53 inhibitor and that its inadequate expression in failing hearts and subsequent overactivation of the p53 apoptosis pathway in cardiomyocytes exacerbates HF.

PLENARY SPEAKER

Bahne Stechmann, Ph.D

Head of Operations & Scientific Strategy

EU-OPENSCREEN,

Robert-Roessle-Str. 10, 13125 Berlin, Germany

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“Bahne worked in academia, biotechnology and consulting, and holds an MSc, PhD and MBA. His PhD work led to the discovery of the first small molecules that show efficacy against ricin in animal experiments (Stechmann et al., Cell 2010). He joined EU-OPENSCREEN in 2010.”

ABSTRACT

EU-OPENSCREEN - A collaborative model for accelerating early drug discovery

Bahne Stechmann

EU-OPENSCREEN

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Keywords: Chemical Biology, early drug discovery, research infrastructure, compound submissions, FAIR data

Chemical compounds, which are selected for their ability to exert a specific biological effect on cellular targets, represent versatile chemical probes in basic research to advance our understanding of pathologies at the molecular and cellular level and to validate novel drug targets. At the same time, bioactive compounds represent starting points for the development of new effective therapeutics. In fact, the majority of marketed drugs today are small chemical molecules. Despite the benefits, however, the discovery of these compounds requires significant efforts in terms of state-of-the-art facilities, expertise (e.g., in assay development or medicinal chemistry) and resources (e.g., comprehensive compound collections), which are often unavailable to most academic researchers.

As the European Research Infrastructure for Chemical Biology and early Drug Discovery, EU-OPENSCREEN (www.eu-openscreen.eu) supports researchers with the aim to accelerate drug discovery efforts in an open-access setting through collaborations with international researchers from academia and industry. All generated tool compounds and associated bioactivity data are made available to the global scientific community.

PLENARY SPEAKER

Jirarat Permphusri

Pharmacist, Professional Level

Herbal Products Division,
Food and Drug Administration Thailand
Food and Drug Administration 88/24 Tiwanon Road
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Title of talk: Regulation of herbal medicine : Update 2022

Ms. Jirarat Permphusri obtained Bachelor's Degree in Pharmacy form Silpakorn University in 2004. After graduation, she has started the position of pharmacist at Phraputthabat Hospital, Ministry of Public Health in 2004-2014. Since 2014 to present, she works as the pharmacist, professional level, at Herbal Products Division, Food and Drug Administration Thailand, Ministry of Public Health.

INVITED SPEAKER

Associate Professor

Supakarn Chamni, Ph.D.

Associate Dean of Graduate Studies

and Lifelong Learning Affairs

Vice Chair of Pharmaceutical Sciences

and Technology Program

Department of Pharmacognosy and Pharmaceutical Botany

Faculty of Pharmaceutical Sciences, Chulalongkorn University,

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“Dr. Supakarn Chamni obtained the doctoral degree in organic chemistry from Texas A&M University (Ph.D., Class of 2011) supported by The Royal Thai Government and Ministry of Science’s Scholarship. Her post-doctoral research was funded by the Asia/Africa Center for Drug Discover (2015-2017, Japan), the Junior Research Fellowship Program (France, 2015), the Talented Young Scientist Program (China, 2018). Her research area focusing on chemical modification of natural products and their structure-activity relationship studies for drug discovery and development.”

ABSTRACT

Natural Product-Inspired Steroid 5α-Reductase Inhibitor based on HaCaT Cell Based Assay with Non-Radioactive and Direct Dihydrotestosterone Detection using High Performance Thin Layer Chromatography (HPTLC)

Supakarn Chamni*

Department of Pharmacognosy and Pharmaceutical Botany, Faculty of Pharmaceutical Sciences

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Keywords: Steroid 5α-reductase, human keratinocytes (HaCaT), High performance thin layer chromatography (HPTLC), Natural product derivative, Androgenic alopecia, and Acne.

Steroid 5α-reductase or 3-oxo-5α-steroid 4-dehydrogenases is a transmembrane and microsomal NADPH-dependent enzyme converting testosterone (T) to the more potent androgen, dihydrotestosterone (DHT) via stereoselective reduction. The imbalance between T and DHT involves in several human diseases such as prostate cancer, benign prostatic hyperplasia, acne, hirsutism and androgenic alopecia. To develop a series of non-steroidal inhibitors against steroid 5α-reductase, natural products such as avicequinone C, caffeic acid, and asiatic acid were employed as the precursor for chemical modification. The structure-activity relationship were examined via human keratinocytes (HaCaT) cell-based assay in conjugation with direct detection of the enzymatic product dihydrotestosterone using a non-radioactive high performance thin layer chromatography (HPTLC). Our research reveals the natural product inspired steroid 5α-reductase inhibitors exhibiting greater inhibitory activity exceeded the parent compounds. These natural product derivatives would be further studied as the potential active compounds for the tropical treatment of androgenic alopecia and acne.

INVITED SPEAKER

Wanatchaporn Arunmanee, Ph.D.

Assistant Dean

Faculty of Pharmaceutical Sciences,

Chulalongkorn University

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Tel: 022188370

“Arunmanee holds earned a MSc in Medicinal and Biological Chemistry from University of Edinburgh and a Ph.D. in Biochemistry from Newcastle University, UK. Shortly thereafter, she works at Chulalongkorn university. Her current research is centered on protein engineering for seeking the novel function of therapeutic proteins and targeted delivery system from bacterial outer membrane vesicles.”

ABSTRACT

Polycationic resurfacing of colicin N elevates its cytotoxicity against human lung cancer cells

Wanatchaporn Arunmanee[1,*], Methawee Duangkeaw[1], Pornchanok Taweecheep[1], Pithi Chanvorachote[2, 3], Chatchai Chaotham[1,3] and Natapol Pornputtapong[1,4]

Affiliation:

[1] Department of Biochemistry and Microbiology, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok 10330, Thailand

[2] Department of Pharmacology and Physiology, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok 10330, Thailand

[3] Center of Excellence in Cancer Cell and Molecular Biology, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok 10330, Thailand.

[4] Center of Excellence in Systems Biology, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand

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Keywords: Pore forming toxin; Colicin; Protein Resurfacing; Anticancer

Colicin N (ColN) is a bacteriocin produced by *Escherichia coli* (*E. coli*) to kill sensitive Gram-negative bacteria by forming ion channels in the inner membrane. In addition to its bactericidal activity, ColN have been shown to selectively induce apoptosis in human lung cancer cells via the suppression of integrin modulated survival pathway. However, the mild toxicity of ColN against human lung cancer cells was observed hence this should be improved for further applications. The extensive mutagenesis of ColN at the solvent exposed Asp and Glu was carried out. Those residues on wildtype ColN ($ColN^{WT}$) were replaced by Lys to generate polycationic resurfacing ColN ($ColN^{+12}$). Previous studies have reported that polycationic resurfacing of proteins promoted mammalian cell penetration as well as enhanced interaction with negatively charged surface of cancer cells. Those highly accessible residues of ColN were identified by Rosetta and AvNAPSA (Average number of Neighboring Atoms Per Sidechain Atom) approaches. After expression and purification of $ColN^{+12}$ in *E. coli*, the structural features and stability of $ColN^{+12}$ were determined by circular dichroism. $ColN^{WT}$ and $ColN^{+12}$ have the similar structural features and melting temperature at approximately 65^{o}C despite six substitutions in $ColN^{+12}$. Furthermore, the cancer-selective properties of $ColN^{+12}$ were observed. Human lung cancer cells, H460 and H23, were susceptible to ColN but human dermal papilla cells were not. $ColN^{+12}$ also showed more potent toxicity than $ColN^{WT}$ in cancer cells. This confirmed that protein resurfacing is a versatile tool which offers a development of desired features such as promotion of anticancer properties.

INVITED SPEAKER

Prof. Pithi Chanvorachote, Ph.D

Associate Dean of Research Affairs

Faculty of Pharmaceutical Sciences, Chulalongkorn University

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“Prof. Pithi Chanvorachote, PhD, is a professor in the Department of Pharmacology and Physiology at the Faculty of Pharmaceutical Sciences, Chulalongkorn University, where he heads the Center of Excellence in Cancer Cell and Molecular Biology. He has conducted several research projects which result in more than 195 publications. He has awarded the Thailand Young Scientist Award 2011 from the Foundation for the Promotion of Science and Technology under the Patronage of His Majesty the King, TRF-CHE-Scopus Young Researcher Award 2012 from The Thailand Research Fund, Office of the Higher Education Commission and Elsevier, The Royal Golden Jubilee Ph.D. 2015 Award from The Thailand Research Fund, BMB Award, and The 1st Ouay Ketusingh Honorary Award, The Pharmacological and Therapeutic Society of Thailand 2014. He got the Fellowship for Experienced Researchers from The Alexander von Humboldt Foundation, Germany and the Professional Development Programme from Newton Fund, United Kingdom.”

ABSTRACT

Newborn skin adaptation to ambient air after birth: focusing on the dynamic of transepidermal water loss

Peeraya Amnucksoradeja MD[1], Nithipun Suksumek MD[1] , Jarukit Sa-nguanwong[2] , Pitchaporn Chantreesri[2], Wisarut Klayphueak[2], Supalerk Kowinthanaphat[2] and Pithi Chanvorachote[3*]

[1]*Department of Pediatrics, Phramongkutklao College of Medicine, Thailand.*

[2]*Faculty of Pharmaceutical Sciences, Chulalongkorn University, Thailand*

[3]*Department of Pharmacology and Physiology, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Thailand.*

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Keywords: Skin barrier; Neonate, Transepidermal water loss, Vernix caseosa

Skin is a key protective organ that prevent human body from pathogens, toxic substances, and harmful environmental factors. For infants, skin is an important organ preventing several kinds of skin complications. As the epidermis and stratum corneum of infants are exposed to amniotic fluid and covered with natural proteolipid vernix caseosa, the removal of such protective layer and direct contact to the external air afterbirth may have an impact on the skin protective functions. Here, we evaluated the response of the infant skin after expose to the air by monitoring water loss through epidermis layer as transepidermal water loss (TEWL). Full term neonates were transferred to nursey for routine newborn care including maintaining normal temperature, wiping with dry towel. Transepidermal water loss (TEWL) measurement was performed in 4 parts in each one infants (left and right arm, left and right legs). TEWL were measured at 0-6 hours. A total of 24 healthy, full-term neonates (15 male and 9 female) were enrolled in this study. Eleven infants (45.8%) were born by vaginal delivery. The gestational age was 39 ± 1 weeks of gestation. Birth weight were 3020 ± 280 grams. There is no difference in baseline TEWL in sex and mode of delivery (6.89 g/m^2 in male and 7.29 g/m^2 in female and 6.95 g/m^2 in vaginal delivery and 7.11 g/m^2 in C-section, respectively). There was a significant difference of baseline TEWL in parts of extremities (7.34 g/m^2 at forearm and 7.29 g/m^2 at leg, p=0.002). The significant differences were observed in overall TEWL in pairwise comparison in immediate after arriving to nursery and 6 hours, 1 and 4 hours, 1 and 6 hours, 2 and 4 hours, 2 and 6 hours (mean difference 0.431, 0.447, 0.581, 0.476, 0.610 g/m^2, respectively). Sub-group analysis demonstrated significant difference in forearm TEWL in pairwise comparison in 2 and 6 hours at forearm (mean difference 0.604 g/m^2), 1 and 4 hours, 1 and 6 hours, 2 and 6 hours at leg (mean difference 0.571, 0.698, 0.617 g/m^2, respectively). There were no differences between infants born by vaginal delivery group and C-section. We demonstrate the dynamically change in period of time in overall TEWL, parts of extremity. Moisturizing methods for term neonates need to be focused accompanied with routine newborn care.

INVITED SPEAKER

Dr. Prasopchai Patrojanasophon

Associate Professor

Department of Pharmaceutical Technology,
Faculty of Pharmacy, Silpakorn University,
Nakhon Pathom, Thailand
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"Dr. Prasopchai Patrojanasophon is currently an associate professor at the faculty of pharmacy, Silpakorn University, Thailand. He graduated from the Faculty of Pharmacy, Silpakorn University with a Bachelor's and Ph.D. degrees. He had received funding from the Newton Fund, British Council, UK, and RGJ Thailand to do research training at the School of Food, Chemistry, and Pharmacy, the University of Reading focusing on the synthesis of mucoadhesive materials. Dr. Prasopchai Patrojanasophon has published more than 70 papers in SCOPUS-indexed journals."

ABSTRACT

Maleimide-bearing materials as promising drug carriers for mucoadhesive drug delivery systems

Assoc. Prof. Dr. Prasopchai Patrojanasophon
Department of Pharmaceutical Technology, Faculty of Pharmacy, Silpakorn University, Thailand
* Corresponding author: Tel: 034-255800; E-mail address: patrojanasophon_p@su.ac.th

Keywords: Mucoadhesion, maleimide, drug delivery, thiol-maleimide reaction

The development of mucoadhesive materials has been considerably researched in recent years since it is a strategy to prolong the retention of a drug at the site of action or site of absorption leading to the increase in drug bioavailability. Maleimide chemistry stands out as an excellent moiety in bioconjugation due to its high reactivity and its ability to generate a robust bioconjugate linkage. Maleimides exhibit excellent reactivity toward the thiol groups presented on the mucosal membrane due to the discharge of ring strain and C=C bond reactivity which provide a massive driving force for thiol–maleimide reactions. The use of maleimide-bearing materials as mucoadhesive drug delivery systems has been firstly introduced in 2016. Since then, a number of maleimide-bearing drug delivery systems; for example, polymeric compressed tablets, nanogels, liposomes, and nanoparticles, have been developed for localized delivery at the mucosal area. Maleimide-bearing materials have been conveyed as promising materials to retain at the mucosal membrane for a prolonged period and may improve the efficacy of a localized drug delivery system.

MEETING SCHEDULE

37th International Annual Meeting in Pharmaceutical Sciences (IAMPS37)

"Foster Integrated Pharmaceutical Sciences for all"

Mar 24th-25th, 2022 (Online conference) ***(Bangkok Time, UTC+07:00)***

Thursday 24th March, 2022	
08:00 – 08:40	Registration on ZOOM Webinar https://chula.zoom.us/j/97879371909?pwd=Q05QVVNldzlYK3pGSDd3VktWL2ozQT09 Meeting ID : 978 7937 1909 Passcode : 955362
08:40 – 09:00	**Welcome Address** by **Professor Dr. Pornanong Aramwit, Ph.D.** Dean, Faculty of Pharmaceutical Sciences, Chulalongkorn University **Opening Speech** by **Professor Dr. Pithi Chanvorachote, Ph.D.** Associate Dean for Research Affairs, Faculty of Pharmaceutical Sciences, Chulalongkorn University
09:00 – 09:30	**Plenary Lecture 1**: **Repurposing pharmaceutical excipients and drugs for the treatment of herpes simplex virus infections** By Abhijit Date, Ph.D. University of Arizona, USA
09:30 – 10:45	**Nagai Award Ceremony 2021** Oral Presentation by three awardees
10:45 – 11:00	Refreshment Break
11:00 – 11:30	**Plenary Lecture 2: Fortilin, bench to bedside** By Professor Kenichi Fujise, M.D., University of Washington, Seattle, USA
11:30 – 12:00	**Plenary Lecture 3**: **EU-OPENSCREEN - A collaborative model for accelerating early drug discovery** By Bahne Stechmann, Ph.D., Head of Operations & Scientific Strategy, EU-PENSCREEN, Berlin, Germany
12:00 – 13:00	**Lunch symposium :** In vitro fertilization (IVF) in mouse model By Liying Ma, Pharmagem Inc., and Pharmaceutical Laboratory Animal Center

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Thursday 24th March, 2022		
13:00 – 14:00	**Invited Speaker Presentation**	
	Room 1: Pharmaceutical Chemistry and Natural Products ZOOM Meeting : https://chula.zoom.us/j/91899788396?pwd=aFhuWXUvM3dETFhtWmxFY2FWK1BWdz09 Meeting ID: 918 9978 8396 Password: 186946	**Room 2 :** Pharmaceutical Technology and Biopharmaceutical, Pharmacy Practice, Social and Administrative Pharmacy ZOOM Meeting : https://chula.zoom.us/j/93434680709?pwd=azRUWjRZalpNeGtHcHo5Yk9XVTh6Zz09 Meeting ID: 934 3468 0709 Password: 196942
14:00 – 15:00	**Oral Pitch Presentation (10 mins/topic)**	
	Room 1 : Pharmaceutical Chemistry and Natural Products	**Room 2 : Pharmaceutical Technology Biopharmaceutical and Clinical/Social Administrative Pharmacy**
15:00 – 17:00	**Poster Presentation: divided into 2 rooms**	
	Room 1: Pharmaceutical Chemistry and Natural Products	**Room 2 : Pharmaceutical Technology Biopharmaceutical and Clinical/Social Administrative Pharmacy**

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Friday 25th March, 2022	
08:30 – 09:00	Registration on ZOOM Webinar https://chula.zoom.us/j/97879371909?pwd=Q05QVVNldzlYK3pGSDd3VktWL2ozQT09 Meeting ID : 978 7937 1909 Passcode : 955362
09:00 – 09:45	Vichiara Jirawongse Award Ceremony Oral Presentation by awardees
09:45 – 10:00	Announcement of Outstanding Poster and Oral Pitch Presentations
10:00 – 12:00	**Plenary Lecture 4**: **Regulation of herbal medicine : Update 2022** By Jirarat Permphusri, Pharmacist, Professional Level Department of herbal products, Food and Drug Administration Thailand
12:00	Closing Ceremony by Professor Dr. Pithi Chanvorachote, Ph.D. Associate Dean for Research Affairs, Faculty of Pharmaceutical Sciences, Chulalongkorn University

Meeting schedule parallel session

Invited Speaker – Parallel Session (Room 1) **Symposium I : Pharmaceutical Chemistry and Natural Products**	
13.00-14.00	**Chairperson** : Assistant Professor Chaisak Chansriniyom, Ph.D.
13.00-13.30	**IVS-01 :** Natural Product-Inspired Steroid 5α-Reductase Inhibitor based on HaCaT Cell Based Assay with Non-Radioactive and Direct Dihydrotestosterone Detection using High Performance Thin Layer Chromatography (HPTLC) **Associate Professor Supakarn Chamni, Ph.D.** Department of Pharmacognosy and Botany, Faculty of Pharmaceutical Sciences, Chulalongkorn University
13.30-14.00	**IVS-02 :** Polycationic resurfacing of colicin N elevates its cytotoxicity against human lung cancer cells **Wanutchaporn Arunmanee, Ph.D.** Department of Biochemistry and Micrology, Faculty of Pharmaceutical Sciences, Chulalongkorn University

Invited Speaker – Parallel Session (Room 2) **Symposium II : Pharmaceutical Technology and Biopharmaceutical, Pharmacy Practice, Social and Administrative Pharmacy**	
13.00-14.00	**Chairperson** : Assistant Professor Chatchai Chaotham, Ph.D. **Co-chairperson** : Associate Professor Kulwara Meksawan, Ph.D.
13.00-13.30	**IVS-03 :** Newborn skin adaptation to ambient air after birth: focusing on the dynamic of transepidermal water loss **Professor Pithi Chanvorachote, Ph.D.** Department of Pharmacology and Physiology, Faculty of Pharmaceutical Sciences, Chulalongkorn University
13.30-14.00	**IVS-02 :** Maleimide-bearing materials as promising drug carriers for mucoadhesive drug delivery systems **Associate Professor Prasopchai Patrojanasophon, Ph.D.** Faculty of Pharmacy, Silpakorn University

Meeting schedule parallel session

Oral Pitch Presentation – Parallel Session (Room 1) **Symposium I : Pharmaceutical Chemistry and Natural Products**	
14.00-15.00	**Chairperson** : Assistant Professor Chaisak Chansriniyom, Ph.D.
14.00-14.15	**OP-01 :** Prediction of anticarcinogenic bioactivities and molecular docking targeting Bcl-2 pro-survival protein of steroidal saponin derived from Aspidistra letreae **Iksen, Varisa Pongrakhananon***
14.15-14.30	**OP-02 :** Antioxidant Activity of Prunus domestica L. Extract Protects Against Reductions of Memory in D-galactose Induced Aging in Adult Rats **Puncharatsm Pannin, Jariya Umka Welbat***
14.30-14.45	**OP-03 :** Bromelain as a postoperative treatment of third molar surgery: a review of clinical studies **Thitapa Janurai, Niti Sunsandee***

Oral Pitch Presentation – Parallel Session (Room 2) **Symposium II : Pharmaceutical Technology and Biopharmaceutical, Pharmacy Practice, Social and Administrative Pharmacy**	
14.00-15.00	**Chairperson** : Assistant Professor Chatchai Chaotham, Ph.D. **Co-chairperson** : Associate Professor Kulwara Meksawan, Ph.D.
14.00-14.15	**OT-01 :** Expression of Plant-produced Anti-PD-L1 Antibody with Anoikis Sensitizing Activity in Human Lung Cancer Cells via., Suppression on EMT **Thareeya Phetphoung, Ashwini Malla, Kaewta Rattanapisit, Naruechai Damrongyot, Keerati Joyjamras, Pithi Chanvorachote, Chatchai Chaotham*, Waranyoo Phoolcharoen***
14.15-14.30	**OT-02 :** In Silico Study of Bile Pigments Inhibition Activity on Bioactivation of Tobacco Nitrosamines Mediated by CYP2A13 **Nurnadia Majid, Siti Azma Jusoh, Ong Chin Eng, Aedah Abu Bakar, Hasseri Halim, Salfarina Ramli***
14.30-14.45	**OT-03 :** Plant-produced Receptor-Binding Domain and S1 subunit protein from SARS-CoV-2 spike protein induce neutralizing responses in mice **Chalisa Panapitakkul***
14.45-15.00	**OC-01 :** The impact of antimicrobial stewardship program at medical wards on antimicrobial consumption, antimicrobial susceptibilities, and cost at a university hospital in Thailand **Watchara Sakares*, Chotirat Nakaranurack*, Sang Usayaporn, Rongpong Plongla, Gompol Suwanpimolkul, Chusana suankratay**

Meeting schedule parallel session

Poster Presentation – Parallel Session (Room 1) **Symposium I : Pharmaceutical Chemistry and Natural Products**	
15.00-17.00	**Chairperson** : Assistant Professor Chaisak Chansriniyom, Ph.D.
PN-01	Cytotoxic activity of *Baeckea frustescens* leaves in hypoxic breast cancer cells **S Maniam*, SH Shahruzaman**
PN-02	Beneficial effects of stingless bee honey on stress management in mice **Krittiya Thisayakorn*, Ubon Rerk-am, Pataranapa Nimtrakul, Vichein Khueynok, Kanjana Sriyam, Darunee Pahusi, and Sirinan Thubthimthed**
PN-03	HPLC analysis and antioxidant activity of lutein and zeaxanthin in various plants **Krongkan Kingkaew, Tanwarat Kajsongkram, Siwinee Yongpaiboo, Sureechai Timwongsaz, Somkamol Intawong***
PN-04	Thai Vetiver Roots Oil Obtained by Using Different Extraction Methods **Peerakan Kietthanakorn, Jittima Luckanagul*, Sornkanok Vimolmangkang**
PN-05	The discovery of novel lichen-derived actinobacteria and their antimicrobial activity **Achiraya Somphong*, Somboon Tanasupawat, Wongsakorn Pongsopitanun**
PN-06	MiR-34c mimic as a potential therapeutic agent for cholangiocarcinoma **Chanatip Metheetrairut*, Donlapat Chumtong, Ladawan Khowawisetsut**
PN-07	Combined simulation of natural cannabinoids and α-amyrin extracted from *Trema orientalis* (Cannabaceae) against *Acinetobacter baumannii* **Tiwtawat Napiroon*, Phuphiphat Jaikeaw, Supenya Chittapun, Theppanya Charoenrat, Markus Bacher, Keerati Tanruean, Wichai Santimaleeworagun***
PN-08	Effect of stingless bee honey wound gel in excisional wound healing model in rats **Amonrat O'Reilly*, Warakorn Songmuang, Boonruksa Gusayakorn, Pataranapa Nimtrakul, Pattarawadee Kengkwasingh, Worawan Tiatragoon, Sarunya Laovitthayanggoon, Wissarut Sukhaket, and Sirinan Thubthimthed**
PN-09	Antibacterial potency of (unripe, half ripe fruit and leave from) Carissa carandas Linn. ethanolic extracts against seven upper respiratory pathogens **Rattanasiri Jiwanon*, Pongsatorn Limsiriwong, Tanwarat Kajsongkram, Sawai Nakakaew, Saowaluck Ruengsri, Pawinee Pungpa, And Sirinan Thubthimthed**
PN-10	Evaluation of rice bran protein extracts on antioxidants activity and streptozotocin-induced cytotoxicity **Ubon Rerk-am*, Sarunya Laovitthayanggoon, Bantika Kongsombat**
PN-11	Inhibitory effect of Triphala on the hepatocellular carcinoma cells in mice **Jantana Yahuafai*, Prayumat Onsrisawat, Suratsawadee Piyaviriyakul, Jannarin Nontakham, Pongpun Siripong, Naowarat Suthamnatpong**
PN-12	STUDY OF THE EFFECT OF MOLECULAR WEIGHT DISTRIBUTION OF ACEMANNAN EXTRACTED FROM ALOE VERA ON HUMAN GINGIVAL FIBROBLASTS CELL PROLIFERATION **Siriwan Seeleamngam, Pasutha Thunyakitpisal, Vorasit Vongsutilers***
PN-13	Anti-genotoxicity assessment of the mushroom *Ganoderna lucidum* and *Pleurotus eryngii* extracts in V79 cells **Prapaipat Klungsupya*, Nantaporn Pinnak, Saranya Laovitthayanggoon, Tantima Kumlung**
PN-14	Preliminary study on anti-zoonotic dermatophytes activity of seven essential oils **Rattanasiri Jiwanon*, Ubon Rerk-am, Saowaluck Ruengsri, And Sirinan Thubthimthed**
PN-15	Development and validation of a HPLC method for rosmarinic acid in gout treatment capsules containing *Mentha cordifolia* leaf extract **Tanwarat Kajsongkram*, Saowalux Rotamporn, Pawinee Pungpa**

PN-16	Utilization of response surface methodology in optimization for curcumin in Thai herbal compress extraction: Ultrasound-assisted extraction **Sureewan Duangjit*, Pattarapol Witchayapong, Siripong Pochana, Chanida Nilabon, Kusuma Jitsaeng**
PN-17	Characterizations, bioactivities, and safety studies of bio compound preparation from goat hoof **Wipaporn Phatvej*, Boonruksa Gussayakorn, Warakorn Songmuang, Sarunya Laovitthayanggoon, Ubon Rerk-Am, and Sirinan Thubthimthed**

Poster Presentation – Parallel Session (Room 2) **Symposium II : Pharmaceutical Technology and Biopharmaceutical, Pharmacy Practice, Social and Administrative Pharmacy**	
15.00-17.00	**Chairperson** : Assistant Professor Chatchai Chaotham, Ph.D. **Co-chairperson** : Associate Professor Kulwara Meksawan, Ph.D.
PT-01	Improved specific coagulant activity of recombinant human factor IX by *F9* gene transfection into immortalized hepatocyte-like cell line **Kultasnim Kado, Karnsasin Seanoon, Panwajee Payongsri, Porntipa Korprasertthaworn, Suradej Honging and Pansakorn Tanratana***
PT-02	Construction of three-dimensional (3D) co-culture system for in vitro genotoxicity tests **Sarunya Laovitthayanggoon*, Prapaipat Klungsupya, Nantaporn Pinnak and Sirinan Thubthimthed**
PT-03	Effects of natural extracts on keratinocyte (HaCaT) cell-induced psoriasis associated cytokines **Thanchanok Muangman*, Intira Pechtubthim, Weerasak Taengphan Nantaporn Pinnak, Prapaipat Klungsupaya**
PT-04	Antimicrobial activity of the actinomycetes isolated from the black ant, *Camponotus lasiselene* **Tuangrat Tunvongvinis, Somboon Tanasupawat, Wongsakorn Phongsopitanun**
PT-05	Investigation of ternary components of dispersed system for the development of dry powdered self-emulsifying system **Natcha Chaysinsorn*, Dusadee Charnvanich, Wanchai Chongcharoen***
PT-06	Development of a film-forming spray solution for wound healing **Thanatcha Sahasuntorn*, Wanchai Chongcharoen, Dusadee Charnvanich***
PT-07	The preparation and characterization of ferulic acid solid dispersions prepared by spray-drying **Pattravee Thong-on*, Sitthipong Soradach, Krongkarn Kingkaew, Khaunnapa panapong**
PT-08	An immortalised erythroid cell line as a model for foetal haemoglobin inducing agents testing **Kongtana Trakarnsanga*, Chartsiam Tipgomut, Saiphon Poldee, Jan Frayne**
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PT-10	Formulation of buccal mucoadhesive preparations based on oleogel **Apichaya Domrongchai, Jittima Luckanagul, Dusadee Charnvanich***
PC-01	Carbapenem-nonsusceptible Gram-negative bacteremia: Clinical characteristics, outcomes, and risk factors for mortality in a university hospital in Thailand **Chotirat Nakaranurack, Gompol Suwanpimolkul***
PC-02	The factors that associated with irrational antibiotics use behavior among social media users in Thailand **Kamolwan Tantipiwattanasakul*, Thamonwan Mongkhonchun, Natthawit Bunchuen, Piyathida Mangkharat, Pornpun Prajaknate, Shinnawat Saengungsumalee**
PC-03	Monitoring of unsafe health products in the community in the Central, West, and East region of Thailand **Shinnawat Saengungsumalee*, Suyanee Pongthananikorn, Suntaree Watcharadamrongkun, Sunti Chomyong, Narongchai Sritaphatso, Pansri Phone, Chumpol Saengwan**

PC-04	Sore-throat mirror device enhancing patient awareness on rational antimicrobial use for upper respiratory tract infection **Suyanee Pongthananikorn*, Suntaree Watcharadamrongkun, Yupadee Sirisinsuk**
PC-05	Correlations of methods commonly used to quantify renal function for medication dosing **Somratai Vadcharavivad*, Pheeraphat Sarppreuttikun**
PC-06	An exploration of health literacy and awareness on antimicrobials usage and resistance in Thai citizen **Suntaree Watcharadamrongkun*, Suyanee Pongthananikorn, Prompiriya Pitirattanaworranat**
PC-07	Knowledge, attitude, and practice of unused medication among non-communicable disease patients in central region, Thailand **Prompiriya Pitirattanaworranat*, Suyanee Pongthananikorn, Suntaree Watcharadamrongkun, Shinnawat Saengungsumalee**
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LIST OF ABSTRACTS

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Prediction of anticarcinogenic bioactivities and molecular docking targeting Bcl-2 pro-survival protein of steroidal saponin derived from *Aspidistra letreae*

Iksen[1], Varisa Pongrakhananon[1,*]

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Keywords: Aspiletrein A, Aspiletrein B, Anticancer, Molecular docking, Bcl-2

Steroidal saponins from *Aspidistra letreae* are natural compounds that manifest anticancer activity through several mechanisms. Aspiletrein A (AA) and Aspiletrein B (AB) derived from *Aspidistra letreae* have shown cytotoxic activity in the lung cancer cells. This study was conducted to predict the cytotoxic potency, apoptosis-related mechanism and binding affinity of AA and AB as inhibitor of Bcl-2 pro-survival proteins (Bcl-2, Bcl-xL, and Bcl-w). In silico cytotoxic prediction was carried out by using CLC-Pred (Cell Line Cytotoxicity Predictor) database, followed by apoptosis-related mechanism by using PASS Online database predictor, and PyRx virtual screening tool (V.0.8) and Discovery Studio for the ligand-target interaction. Our results showed that AA and AB have cytotoxic potency against several cancer cell lines. The cytotoxic ability of AA and AB was confirmed by the prediction of apoptotic-related mechanisms such as inhibition of apoptotic antagonists and stimulation of caspase-3 and caspase-8. *In silico* molecular docking revealed that AA and AB could interact with Bcl-2, Bcl-xL, and Bcl-w with high affinity. In conclusion, the findings of this study demonstrated that steroidal saponin from *Aspidistra letreae* has anticancer potential possibly through apoptosis-related mechanism and inhibition of Bcl-2 pro-survival proteins.

Antioxidant activity of *Prunus domestica* L. extract protects against reductions of memory in D-galactose induced aging in adult rats

Puncharatsm Pannin[1], Jariya Umka Welbat[1*]

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Keywords: Antioxidant Activity, Memory, *Prunus domestica* L., D-galactose

This study evaluated the phytochemical contents and antioxidant activity of fruits extract *Prunus domestica* L. (PD). Fresh fruits of PD was extracted with 95% ethanol and then analyzed the quantity of total phenolic and total flavonoid contents. FRAP and DPPH assays were used to evaluate antioxidant and free radical scavenging activities. Furthermore, protective effect of PD crude extract against reductions of memory in D-galactose induced aging rats was studied. Male Sprague Dawley rats were divided into 8 groups, including vehicle, D-gal, PD 75, PD 100, PD 150, D-gal+PD 75, D-gal+PD 100 and D-gal+PD 150 groups. Examination of spatial and recognition memory was performed using novel object location (NOL) and novel object recognition (NOR) tests, respectively. The results revealed antioxidant activities of the ethanolic PD extract as follows: 19.69 GAE mg/g extract of total phenolic content and 0.05 QE mg/g extract of total flavonoid content, 63.27 mg $FeSO_4$ equivalent/g of antioxidant activity and 503.10 ⌈g/mL of IC_{50} of free radical scavenging activity. In addition, the results of both the NOL and NOR tests showed that co-treatment with PD extract could ameliorate memory deficits caused by D-galactose. This may be through the antioxidant activity of this crude extract.

Bromelain as a postoperative treatment of third molar surgery: a review of clinical studies

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Keywords: Bromelain, third molar surgery, postoperative treatment, proteolytic enzyme

Third molar surgery is commonly performed in dental practice due to a high incidence report. This surgery produces pain, trismus, and local edema in the postoperative phase. Prescription drugs used to control these symptoms were stated to have adverse side effects. Thus, alternative substances with fewer adverse effects are considered. Among these molecules, bromelain, an extract from *Ananas comosus* L. Merr. or pineapple, has been reported to have beneficial effects in the postoperative treatment of third molar surgery. Bromelain is a proteolytic enzyme widely used in traditional medicine for reducing swelling. Bromelain demonstrates various biological activities including platelet aggregation inhibition, cytotoxicity, and anti-inflammatory effects. Furthermore, recent studies have shown the beneficial use of bromelain in pain management, swelling, and trismus after third molar surgery. This paper mainly reviews clinical studies in both non-randomized and randomized controlled clinical trials of bromelain in postoperative treatment of third molar surgery. The results of this study suggest that administration of bromelain is an effective treatment in the postoperative management of third molar surgery.

Expression of Plant-produced Anti-PD-L1 Antibody with Anoikis Sensitizing Activity in Human Lung Cancer Cells *via*., Suppression on EMT

Thareeya Phetphoung[1,2,3], Ashwini Malla[4], Kaewta Rattanapisit[4], Naruechai Damrongyot[5], Keerati Joyjamras[1,5,7], Pithi Chanvorachote[6,7], Chatchai Chaotham[5,7*], Waranyoo Phoolcharoen[2,3*]

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Keywords: Anoikis, Anti-PD-L1, Atezolizumab, Cancer, Immunotherapy, Monoclonal antibody, *Nicotiana benthamiana,* Transient expression

Immune checkpoint antibodies in cancer treatment are receptor-ligand pairs that modulate cancer immunity. PD-1/PD-L1 pathway has emerged as one of the major targets in cancer immunotherapy. Atezolizumab, the first anti-PD-L1 antibody approved for the treatment of metastatic urothelial, non-small cell lung, small cell lung and triple-negative breast cancers, is produced in Chinese Hamster Ovary (CHO) cells with several limitations i.e., high-production costs, low-capacity yields and contamination risks. Due to the rapid scalability and low production costs, the transient expression in *Nicotiana benthamiana* leaves was investigated by co-infiltration of *Agrobacterium tumefaciens* GV3101 cultures harboring the protein sequences encoding for Atezolizumab heavy chain and light chain in this study. The transient expression of Atezolizumab in transformed *N. benthamiana* accumulated up to 86.76 µg/g fresh leaf weight after 6 days of agroinfiltration (OD600 0.4) with 1:1 ratio of heavy chain to light chain. The structural and functional characteristics of plant-produced Atezolizumab was compared with commercially available Tecentriq® from CHO cells with similar binding efficacies to PD-L1 receptor. The direct anti-cancer effect of plant-produced anti-PD-L1 was further performed in human lung metastatic cancer cells H460 cultured under detachment condition, demonstrating the activity of anti-PD-L1-antibody on sensitizing anoikis as well as the suppression on anti-apoptosis proteins (Bcl-2 and Mcl-1) and modulation of epithelial to mesenchymal regulating proteins (E-cadherin, N-cadherin, Snail and Slug). In conclusion, this study manifests plants as an alternative cost-effective platform for the production of functional monoclonal antibodies for use in cancer therapy.

In Silico Study of Bile Pigments Inhibition Activity on Bioactivation of Tobacco Nitrosamines Mediated by CYP2A13

Nurnadia Majid[1], Siti Azma Jusoh[1], Ong Chin Eng[2], Aedah Abu Bakar[3], Hasseri Halim[1,4], Salfarina Ramli[1,4]*

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Keywords: NNK, CYP2A13, Bilirubin, Biliverdin, Molecular docking

Binding of cytochrome P450 2A13 (CYP2A13) enzyme to tobacco-specific N-nitrosamine, 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) results in electrophilic species that later react with DNA to form DNA adduct. Bile pigments like bilirubin and biliverdin are known to be CYP2A6 enzyme substrates. Because the amino acid sequences of CYP2A13 are nearly comparable to those of the CYP2A6 enzyme, this bilirubin could likewise prevent NNK bioactivation by CYP2A13. Therefore, the aim of this study was to evaluate the binding affinity and interaction of bile pigments on CYP2A13 using an *in silico* approach. Molecular docking simulation using AutoDock software (version 1.1.2) was performed to computationally predict the binding properties and calculate the binding affinity of bile pigments on the CYP2A13 enzyme. The DoGSiteScorer webserver was used to predict potential allosteric pockets on the CYP2A13 enzyme. The binding affinities of bilirubin and biliverdin to CYP2A13 crystal structures, 4EJG and 4EJH, ranged between 14.53 and 20.93 kcal/mol, whereas 4EJI, ranged between -4.47 and -5.03 kcal/mol. Meanwhile, the binding affinity of NNK to these three crystal structures ranged between -7.16 and -7.46 kcal/mol. Bilirubin and biliverdin showed good binding affinities to predicted allosteric sites as compared to the active site of the CYP2A13 enzyme. The binding affinity of bile pigments to the predicted allosteric and active sites of 4EJI suggests that they have the potential to inhibit the binding of NNK to the CYP2A13 enzyme, but this will need to be confirmed by enzymology studies.

Plant-produced Receptor-Binding Domain and S1 subunit protein from SARS-CoV-2 spike protein induce neutralizing responses in mice

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Keyword: SARS-CoV-2, subunit vaccine, spike protein, receptor-binding domain, plant-produced recombinant protein, Fc fusion protein

Coronavirus disease 2019 (COVID-19) is a disease that causes severe acute respiratory syndrome and has pandemics over the world with high morbidity and death, and virus management has been challenging owing to a lack of specific therapies or vaccinations. As a result, there are numerous ways for developing economical vaccines or drugs, and an effective vaccination is urgently required. In this study, the immunogenicity of the plant-produced receptor-binding domain (RBD) and S1 subunit protein of SARS-CoV-2 was examined in order to utilize as a subunit vaccine. The SARS-CoV-2 receptor-binding domain (RBD) and S1 subunit protein were fused with the Fc fragment of human IgG1 and transiently produced in *Nicotiana benthamiana* by agroinfiltration. After which, using protein A affinity column chromatography to isolate the plant-produced RBD-Fc and S1-Fc fusion protein from the crude extract. The RBD-Fc and S1-Fc proteins are derived from plants and formulated with alum as an adjuvant. RBD-Fc protein from plants induced higher neutralization titers in vaccinated mice than S1-Fc protein. Furthermore, it elicited mixed Th1/Th2 immune responses, and a neutralization antibody titer test indicated the RBD-Fc protein has a higher than the S1-Fc protein. However, an interferon-gamma (IFN-©) enzyme-linked immunospot test revealed that both vaccinations boosted vaccine-specific T-lymphocyte responses, although S1-Fc protein was higher than RBD-Fc protein. As a consequence, the plant-produced SARS-CoV-2 RBD may be a potential for SARS-CoV-2 vaccine candidate more than plant-produced SARS-CoV-2 S1.

The impact of antimicrobial stewardship program at medical wards on antimicrobial consumption, antimicrobial susceptibilities, and cost at a university hospital in Thailand

Watchara Sakares[1,2], Chotirat Nakaranurack[3*], Sang Usayaporn[3], Rongpong Plongla[4], Gompol Suwanpimolkul[4], Chusana Suankratay[4]

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Keywords: Antimicrobial stewardship program, ASP, Antimicrobial consumption, Antimicrobial susceptibility, Antibiotic cost

The Antimicrobial stewardship program (ASP) is a method that promotes appropriate antibiotic use. There have been limited studies regarding the impact of ASP in Thailand. This study aims to evaluate the impact of ASP at medical wards on antimicrobial consumption (AC), antimicrobial susceptibilities (AS), and cost. A retrospective study between January 2016 to June 2020 was conducted at 6 medical wards, King Chulalongkorn Memorial Hospital, Thailand. The ASP was implemented in October 2017 with the prospective audit and feedback intervention. Infectious disease pharmacists reviewed the appropriateness of antimicrobial therapy. AS was obtained from the institution's annual antibiograms for the years 2016 and 2018. The T-test was used to compare AC and cost differences between pre-and post-ASP program. The mean AC per quarter was 1484.2 defined daily doses (DDD) per 1,000 patient-days for the pre-ASP period and 1371.7 DDD per 1,000 patient-days for the ASP period (7.6% decrease; $p = 0.015$). The mean cost of antimicrobial agent per quarter was 69,276.99 USD for the pre-ASP period and for the ASP period 56,330.35 USD (18.7% decrease; $p = 0.002$). The DDD of carbapenems declined after the ASP implementation (26.1%; $p < 0.001$). There was an AS change for *Klebsiella pneumoniae* to meropenem (10% increase). The implementation of the ASP in only 6 medical wards was associated with decreasing AC and cost in the hospital and improved antimicrobial susceptibility. Due to the significant value with beneficial consumption and economic impacts after the ASP period, The ASP program should be implemented shortly in Thailand.

Cytotoxic activity of *Baeckea frustescens* leaves in hypoxic breast cancer cells

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Keywords: Baeckea frutescens, glucose uptake, apoptosis, oxidative phosphorylation

Pathological cancer cell growth relies on the maintenance of proliferative signalling pathways with increased autonomy relative to non-malignant cells. The adaptive metabolic response towards a low oxygen environment is essential for rapid tumour proliferation and progression. The vascular network surrounding the tumor develops an intermittent hypoxic condition and stimulates hypoxia-inducing factors. *Baeckea frutescens* of the family of Myrtaceae is a medicinal plant that has been used in traditional medicine is known to possess antibacterial, anti-pyretic and cytoprotective properties. In this study, the cytotoxic effect of five *Baeckea frutescens* leaves extracts against human breast cancer (MCF-7) was investigated. The ethanol and hexane extracts were prepared using the Soxhlet apparatus while the water extract was prepared by the freeze-dried method. *In vitro* cytotoxic activity and the glucose consumption rate of *Baeckea frutescens* extracts at various concentrations (20 to 160 µg/ml) after 24, 48 and 72-h incubation were studied under the hypoxic condition induced by DMOG using the MTT assay. The cytotoxic activity was also evaluated in the 3D cell culture model. The hexane extract showed the lowest IC_{50} value of 23 µg/ml, indicating its potent cytotoxic activity. The hexane extract was subsequently tested on 3-dimensional cultured cells. The results showed an IC_{50} value of 17.2 ug/ml. Overexpression of HIF-1 has been found in various cancers and is a target for cancer therapy. Adaptation of tumour cells to hypoxia-induced HIF-1 significantly contributes to the aggressiveness and chemoresistance of different tumours. The identification of *Baeckea frutescens* and its possible role in eliminating breast cancer cells in hypoxic conditions defines a new role of natural products that can be utilized as an effective agent that regulates metabolic reprogramming in breast cancer.

Beneficial effects of stingless bee honey on stress management in mice

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Keywords: stingless bee honey, anxiolytic, sedative, cortisol, melatonin

The pharmacological activities of honey from stingless bee (*Trigona apicalis* Smith) was studied. The brain functions in stress management were determined including anxiolytic and sedative effects. Anxiety-like symptoms were performed in mice by administrating corticosterone in drinking water for 16 days. The antianxiety activity of stingless bee honey (HN) was then evaluated using hole-board testing and light-dark task. The results showed that HN at 500 and 750 mg/kg as well as 30 mg/kg phenobarbital exhibited higher numbers of head-dipping than the control ($p \leq 0.05$). Moreover, 500 mg/kg HN mice were found to show statistically better performance than the control group in both parameters of the light-dark task including the latency in the light chamber and the number of entries in the chamber ($p \leq 0.05$). Correspondent to the behavioural study, significantly lower levels of brain cortisol were revealed in 500 mg/kg HN mice. For the sedative effect, ICR mice were tested in both sleeping time and rota-rod techniques. All three doses of HN were a statistically sleeping induction since all HN mice had shorter onset and longer duration times of sleeping test than the control mice ($p \leq 0.05$). In addition, HN mice could not run on the rota-rod apparatus longer than 10 seconds. Serum melatonin showed remarkably higher levels in these HN mice. Altogether, the findings suggest that HN from stingless bees possibly possess the potential stress management. It established the anxiolytic-like effect and sedative activity at both behavioural and molecular levels. Therefore, HN is useful for developing as new alternative substances from natural products for anxiolytics and sedation. Since chemical contents in HN contributing to its pharmacological properties depend on several factors such as source of floral nectar, environmental surrounding, and climatic condition, the study on chemical profiles of this specific HN is required for further research.

HPLC analysis and antioxidant activity of lutein and zeaxanthin in selected plants

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Keywords: Lutien, Zeaxanthin, Antioxidant, HPLC

Lutein and zeaxanthin are carotenoids, which are isomeric compounds and show several biological activities. The aim of this study investigated the levels of lutein and zeaxanthin in 7 selected plants and their antioxidant activity using Trolox 0.01 mg/ml as a positive control. Among the tested extracts, *Spinacia oleracea* L. extract showed the highest level of lutein, followed by *Ocimum basilicum* Linn. and *Petroselinum crispum* (Mill.) Fuss extracts, while *Zea mays* Linn. extract contained a low level of lutein. Moreover, *Z. mays* was found zeaxanthin, but it was not found in the rest selected plants. The *O. basilicum* extract exhibited strong antioxidant activity with an IC_{50} value of 0.66 mg/ml, followed by *Coriandrum sativum* L. (IC_{50}, 0.80 mg/ml) and *Brassica oleracea* L. cv. Alboglaba group extracts (IC_{50}, 0.93 mg/ml), respectively. The *S. oleracea* extract showed the lowest antioxidant activity. Thus, the *O. basilicum* Linn extract can be utilized to produce lutein, which can be used as a source of natural antioxidants.

Thai vetiver roots oil obtained by using different extraction methods

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Keywords: Vetiveria zizanioides, essential oil, volatile compound, extraction method

Vetiver oil is extracted from roots of vetiver grass (*Chrysopogon zizanioides* (L.) Roberty), Poaceae Family. It is one of the ingredients found in almost every fragrance and perfume formula and its characteristic note is a combination of woody, earthy, rooty, balsamic, and amber odour. This study aimed to compare the quantity and appearance of vetiver oil extracted from vetiver roots by supercritical carbon dioxide extraction (SC) and other conventional methods such as hydro-distillation (HD) and solvent extraction (SE). The result showed that among all extraction methods, SC clearly gave the highest yield of the vetiver oil at 2.15 ± 0.25 **%** with pale-yellow color, followed by SE (60 °C,2 h.) and HD at 1.02 ± 0.08 **%** (60 °C,6 h.) and 1.12 ± 0.22 **%** (100 °C,24 h.), respectively. It indicated that SC is a better effective method than HD and SE for the extraction of vetiver oil. This would be due to the character of the supercritical fluid that can penetrate in vetiver roots for successfully extracting both polar and non-polar compounds.

The discovery of novel lichen-derived actinobacteria and their antimicrobial activity

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Keywords: Actinobacteria, Actinomycete, Lichen, Antibacterial activity, Antifungal activity

Lichens are the symbiotic association between mycobiont (fungi) and photobiont, including cyanobacteria or algae. From the last decade, lichens were considered as the untapped source of actinobacteria. In this study, a total of 41 actinobacteria was isolated from lichen samples collected in Thailand. Based on the 16S rRNA gene sequences, strain Ptm05 and PM05-2 showed low 16S rRNA gene similarity values compared to the well-known type strains and were selected for the further taxonomic study using the polyphasic approach. The DNA-DNA hybridization and average nucleotide identity of strain Ptm05 and PM05-2 with closely related type strains were lower than 70% and 95%, respectively, the threshold for designing the strain to the same species. Based on both phenotypic and genomic evidence, strain Ptm05 and PM05-2 represent the novel species of the genus *Streptomyces* and *Actinomadura*. The culture broth of all actinobacterial isolates obtained in this study showed antibacterial and antifungal activities, of which 11 isolates showed microbial activity against *Bacillus subtilis, Kocuria rhizophila, Staphylococcus aureus,* and *Candida albicans.* In addition, 13 isolates showed antifungal activities against the plant pathogen, including *Fusarium oxysporum, Colletotrichum gloeosporioides,* and *Alternaria alternata.* According to this study, lichens were a promising source of the novel actinobacterial species and a new source of bioactive compounds.

MiR-34c mimic as a potential therapeutic agent for cholangiocarcinoma

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Keywords: cholangiocarcinoma, microRNA, miR-34c

Current treatment for cholangiocarcinoma includes surgical resection and/or adjuvant radio/chemotherapy, although many cases present at a late stage with unresectable diseases. Currently approved targeted therapy for cholangiocarcinoma is FGFR2 inhibitors, but they are useful only for a small group of patients with FGFR2 mutations. Other targeted therapy options are still needed. Small RNAs, including siRNAs and microRNAs, are currently being developed as therapeutic agents with a few already in Phases 1 and 2 clinical trials, although the delivery method is still a challenge. The miR-34 family microRNAs, including miR-34a, miR-34b, and miR-34c, have been demonstrated to function as tumor suppressor miRNAs in several types of cancer. In this study, we aimed to test whether miR-34c had a function as a tumor suppressor in cholangiocarcinoma. We determined that the expression of *hsa*-miR-34c-5p was lower in cholangiocarcinoma cell lines than in a normal cholangiocyte cell line. Furthermore, transfection of *hsa*-miR-34c-5p locked nucleic acid (LNA) mimic led to decreased cell numbers and cell viability as measured by Trypan-blue cell staining and Cell-Titer Blue assay. The reduced numbers of cells correlated with higher apoptotic cell death after 72h transfection with *hsa*-miR-34c-5p LNA mimic as analyzed by flow cytometry with FITC-Annexin V and propidium iodide staining. Further study on cholangiocarcinoma cell-specific delivery is needed to achieve tumor-specific treatment.

Combined simulation of natural cannabinoids and α-amyrin extracted from *Trema orientalis* (Cannabaceae) against *Acinetobacter baumannii*

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Keywords: Chromatography, Phytochemistry, Computational biology, Pneumonia

Trema orientalis (L.) Blume is a species in the cannabis family (Cannabaceae) that is widely distributed throughout Tropical Asia and Thailand. The inflorescences dominantly used as traditional medicines for the treatment of respiratory tract infection that led to the investigation of bioactive compounds and bioactivity. The purpose of this work was to investigate bioactive compounds and antibacterial activity. In addition, the simulation of compounds interacted with *Acinetobacter baumannii* was demonstrated. The fractionation of lipophilic extracts using flash column chromatography fractionated 50 ml in each fraction with gradient elution by using solvent system of hexane, ethyl acetate, diethyl ether and methanol. All fractions were demonstrated on thin-layer chromatography (TLC) plate and high-performance liquid chromatography-mass spectrometry (HPLC-MS) as well as used gas chromatography-mass spectrometry (GC-MS) for compound detection. Sub-fraction F1 was found α-amyrin while sub-fraction F2 presented cannabinoids (tetrahydrocannabinol; THC, cannabidiol; CBD, and cannabinol; CBN) based on mass spectrometry analysis and compared with internal standard. Characterized fractions and combined fraction were used in bioassays with *Acinetobacter baumannii*. Two fractions (F1 and F2) exhibited inhibitory activity for *A. baumannii* with minimum inhibitory concentration values varying from 125 to 62.5 µg/mL. While the combination of two fractions showed potential inhibition with MIC at 31.25 µg/mL. Basic computational analyses, the fraction combination that contained α-amyrin and cannabinoids has strength affinity to interact with outer membrane protein (Omp38) at -8.6 and -7.2 kcal/mol binding energy. It seems like against *A. baumannii* and effect on outer membrane. Findings of this study strongly suggest the usage of α-amyrin and cannabinoids combinations tend to suitable for bioactive ingredient as anti-*Acinetobacter* agent in pharmaceutical product development.

Effect of stingless bee honey wound gel in excisional wound healing model in rats

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Keywords: stingless bee honey, wound gel, wound healing

Stingless bees (*Trigona spp*.) or "Chunnarong" act as the main pollinators for many wild and cultivated tropical plants in Thailand. Previous studies reported the potential value of stingless bee honey (SBH) as an antioxidant, anti-inflammatory, and antimicrobial for use in medical treatments. In this study, SBH was prepared in gel form for wound healing treatment. The healing efficacy of stingless bee honey wound gel (SBHG) for the treatment of cutaneous wounds was evaluated in rats. Eighteen Wistar rats were randomly divided into three groups that received negative control, positive control (Medihoney®), or SBHG treatment. Rats were anesthetized, their back was shaved, and a cutaneous wound was made on the back. Visual observation was performed on days 0, 3, 7, and 14 after the operation. Histopathological examination was performed at the end of the experiment (14 days). Similar promotion of wound contraction and epithelialization was observed in rats treated with SBHG and those treated with positive control. Histopathological analysis revealed that wounds in the SBHG group had completed epithelialization and exhibited fewer inflammatory cells than the other treatment groups 14 days after the operation. The findings of this study suggest that SBH extract may be developed into an effective wound healing treatment.

Antibacterial potency of (unripe, half ripe fruit and leave from) *Carissa carandas* Linn. ethanolic extracts against seven upper respiratory pathogens

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Keywords: unripe, half ripe fruit, leave, upper respiratory pathogens, *C. carandas*, antibacterial

Carissa carandas Linn. or karanda had been widely used as medicinal plant for treatment of sore throat. The elucidation of chemical constituents from various parts of it revealed antimicrobial potency. Some of the major causes of upper respiratory tract infections are the rising of antibiotic-resistance pathogens and the side effects of antibiotics. In this study, we aimed to investigate antibacterial action of three ethanolic extracts from two parts of karanda (half ripe ethanolic fruit extract (HE) and unripe fruit ethanolic extract (UE), and ethanolic leave extract) against seven upper respiratory pathogens (*Staphylococcus aureus* ATCC 25923(A), *S. aureus* subsp. aureus ATCC 43300(B), *Streptococcus pyogene* DMST 30653(C), *S. pyogene* DMST 4369 (D), *S.pyogene* DMST 4478 (E), *Klebsiella pneumoniae* subsp. pneumonia ATCC 9591(F), and *S. pneumoniae* ATCC 33400(G)). HE exhibited significantly the most active antibacterial effect against the tested strains using well diffusion method (20 µl/well) (p <0.05). Its range of inhibition zone was from 12.12 to 20.25 mm. These findings indicate the possibility of using HE as an alternative antibiotic drug for preventing upper respiratory infection diseases.

Evaluation of rice bran protein extracts on antioxidants activity and streptozotocin-induced cytotoxicity

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Keywords: rice bran protein, streptozotocin-induced cytotoxicity, anti-oxidants activity

Rice bran has been an excellent source of potential proteins demonstrated in several bioactivities. Rice bran protein (RBP) extracts were extracted from Jasmin 105 and Sang-yod by using alkaline and pepsin process. The present study aims to investigate the biological activity of proteins, which are extracted from rice bran for use as an active ingredient in dietary supplements. Antioxidant activities were measured by DPPH, ABTS, singlet oxygen ($^1O_2$) and nitric oxide radical scavenging assays. The protective effect of RBP extracts on streptozotocin-induced cytotoxicity was evaluated on RIN-5F pancreatic β cell line using MTT assay. The results showed that the RPB extracts showed strong antioxidant activity which gave IC_{50} rang 21.88±0.23-120.37±0.81 ⌈g/mL. Cytoprotective action on RIN-5F pancreatic β cell was revealed that at concentration 500 ⌈g/mL of RPB extracts which had potent protection activity 32.62 ± 0.21-59.29 ± 0.99 %, whereas N-acetyl-cysteine at 10 mM showed 39.56 ± 0.89 %. In addition, alkaline extracts from Jasmin 105 rice showed higher antioxidant activities and trended to cytoprotective action on RIN-5F pancreatic β cell than RPB extracts from Sang-yod rice. From the results, RPB alkaline Jasmin 105 rice had potent cytoprotective action, prevented apoptosis when exposed to STZ and high potential antioxidant activity. This study suggests the need for further research elucidates the exact mechanism of this effect.

Inhibitory effect of Triphala on the hepatocellular carcinoma cells in mice

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Keywords: Inhibitory effect, Triphala, Hepatomacellular carcinoma, tumor

Triphala is a traditional herbal formulation consisting of dried fruits from three plants namely, *Terminalia chebula, Terminalia bellirica,* and *Phyllanthus emblica*. Its traditional used to treat many ailments, including various types of cancers, health promotion, and longevity. This study was designed to evaluate the ability of an aqueous extract Triphala (TPL) to inhibit the growth of Hepatocellular carcinoma cells (HepG2) and in mice. Mice inoculated with HepG2 cells were divided randomly into five groups: control group (Gr. 1), positive control group (Doxorubicin 2 mg/kg by weight, Gr. 2), and TPL treatment groups (50, 100, and 200 mg/kg by weight, Grs. 3-5). Each group contained six mice. Anticancer activity based on body weight change, tumor growth volume, % inhibition, mean survival time, increase in life span, relative organ weight, and hematological parameters, after administrating the extract for 14 consecutive days was determined. The results demonstrated that the TPL extract exhibited antiproliferative activity against cells in a dose-dependent manner. Oral administration of TPL extract at the doses of 200 mg/kg by weight inhibited tumor growth volume and increased in life span. No abnormality of hematological parameters, relative organ weight, body weight changes, and morphological of organs were observed. These observations suggested that the TPL extract at test doses was a non-toxic drug. Our finding reveals the anti-cancer efficacy of TPL extract.

Anti-genotoxicity assessment of the mushroom *Ganoderma lucidum* and *Pleurotus eryngii* extracts in V79 cells

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Keywords: *Ganoderma lucidum, Pleurotus eryngii*, cytotoxicity, anti-genotoxicity, CBMN

This study was aimed at evaluation of cytotoxicity and anti-genotoxicity (DNA damage protection property) of extracts of two Thai indigenous mushroom including *Ganoderma lucidum* Karst and *Pleurotus eryngii* (DC.) Quél. in V79 Chinese hamster lung cells. Dried powder of *G. lucidum* was extracted with 95% ethanol/water whereas of *Pleurotus eryngii* was extracted with water. Cytotoxicity of *G. lucidum* and *P. eryngii* extracts on the viability of V79 cells was determined in the MTT assay which measures the conversion of MTT to insoluble formazan by the mitochondrial dehydrogenase enzymes. MTT results demonstrated that the two extracts were non-cytotoxic to V-79 cells at concentrations 250-1000 ⌈g/ml (viability > 70-90%). At 2000 ⌈g/ml which was the highest concentration tested, *G. lucidum* extract (viability = 51.07 ± 11.21%) exhibited a more cytotoxic effect than *P. eryngii* (viability = 67.53 ± 1.70%). The anti-genotoxicity of two extracts were assessed using cytokinesis block micronucleus assay (CBMN). The aneugen mitomycin C (MMC 1.5 ⌈g/ml) was used as DNA damage inducer indicating by micronucleus formation evaluated in V79 binucleates (BNC) of cell division after treatment. Cytokinesis-block proliferation index (CBPI) was also calculated to ensure that test substances (MMC and mushroom extracts) did not impact on cell proliferation in CBMN assay. For each treatment, micronucleus frequencies (MN) were analysed in 2000 BNC using the image analysis-based Metafer™ following DAPI stain. Results of CBMN revealed the micronucleus frequencies of binucleated cells (MNCB) following 1.25 µg/ml MMC (positive control) by 132.44 ± 3.95 which was significantly ($p \leq 0.05$) greater than that of the control group (12.20 ± 3.87). It was found that *G. lucidum* extract at all concentrations (250, 500 and 1000 µg/ml) tested could inhibit MN formation by 46.42, 81.28 and 85.43 %. This phenomenon was also observed for *P. eryngii* extract, but with a lesser degree at 43.25, 59.12 and 77.33% when tested at corresponding concentrations. The findings from this study suggest safety and anti-genotoxic property of *G. lucidum* and *P. eryngii* extracts under our condition tested. This information is crucial to support and justify their folkloric usage for human health benefits.

Preliminary study on anti-zoonotic dermatophytes activity of seven essential oils

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Keywords: zoonotic, essential oil, *T. mentagrophytes*, *T. rubrum, M. canis*, antifungal

The prevalence of zoophilic dermatophytes, which belonged to the genera *Microsporum* and *Trichophyton* caused pet-associated illness in humans. Some topical antifungal treatments caused severe side effects and drug resistance. Essential oils, derived from medicinal plants have been widely acknowledged as antifungal agents. The effort to use essential oils as an alternative antifungal agent for the treatment of mycosis becomes interested. Our study aimed to evaluate antifungal action of essential oils from seven plants including *Alpinia galanga*l (L.) Willd, *Zingiber cassumunar* Roxb., *Litsea cubeb*a Pers., *Curcuma longa* L., *Zingiber officianale* Roscoe L., *Citrus maxima* Merr., and *Azadirachta indica* against three ascomycetes dermatophytes that were *Trichophyton mentagrophytes* DMST 19735, *Trichophyton rubrum* ATCC MYA–4438, and *Microsporum canis* ATCC 42888) by using disc diffusion method (20 µl/disc). Determination of the best minimal inhibitory concentration (MIC) value of the selected essential oil against the above three strains was performed by using the agar dilution method. The result of the comparative anti-zoonotic dermatophytes potency of the seven essential oils against the three dermatogens revealed that the oil from *L. cubeba* Pers exhibited the most potent antimycotic activity against the three pathogens. *L. cubeba* Pers. oil showed the range of its inhibition zone at 90 mm and the MIC value against all tested three dermatophytes was 100 µg/ml. These findings indicate the possibility to develop *L. cubeba* Pers. oil as a topical antifungal agent for preventing ringworms in dogs and cats.

Development and validation of a HPLC method for rosmarinic acid in gout treatment capsules containing *Mentha cordifolia* leaf extract.

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Keywords: *Mentha cordifolia*, Rosmarinic acid, HPLC, leaf extract capsules, method validation

High Performance Liquid Chromatography (HPLC) method was developed and validated for determination of Rosmarinic acid in gout treatment capsules (GTC) containing *Mentha cordifolia* leaf extract. Rosmarinic acid, a caffeic acid derivative, is widely distributed in various Labiatae herbs and is reported to be used as a novel natural agent for the treatment of hyperuricemia. The objective of this research is to develop and validate the analytical method of this marker for quality control of gout treatment capsules. The chromatographic separation was achieved by using a C18 column, 150 x 3.9 mm i.d., 5µm XTerra, and a mobile phase system containing 1% phosphoric acid and acetonitrile (gradient elution). The flow rate was 0.8 mL/min, and the absorbance was monitored at 290 nm. The retention time of rosmarinic acid was found to be 8.03 min. The proposed method was validated in terms of the analytical parameters such as specificity, accuracy, precision, linearity, range, limit of detection (LOD), limit of quantification (LOQ) and determined based on the International Conference on Harmonization (ICH) guidelines Q2(R1).[1] The linearity range of rosmarinic acid was obtained over 20-60 µg/ml. A good linearity result was observed over the above-mentioned range with linear regression equation y = 53691x – 30672 (x is concentration of analytes in µg/ml and Y is peak area). The value of correlation coefficient was found to be 0.9993. The limit of detection (LOD) and limit of quantification (LOQ) for rosmarinic acid were 2.93 and 8.88 µg/ml respectively. The recovery range was from 86.74 to 101.31 for all three spiked levels. The RSD value from repeated extractions was 0.71%. The validation of developed method on precision, accuracy, specificity, linearity, and range were also performed with well-accepted results.

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Utilization of response surface methodology in optimization for curcumin in Thai herbal compress extraction: Ultrasound-assisted extraction

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Keywords: Turmeric, Curcumin, Micellization, Thai herbal compress, Sonication

Thai herbal compress (THC) is an alternative medicine to alleviate osteoarthritis and muscle pain. Nowadays, a new product of THC was developed for convenience, stabilized efficacy and stability of herbs. The concentrated extract from THC may be utilized as a new product. The objective of this study was to improve the optimal conditions of ultrasonic-assisted extraction (UAE) combined with ethanol and micellar extraction for curcumin using the response surface methodology (RSM). The extraction parameters, including types of solvent, concentrations and methods of extraction, were varied. The ethanol concentrations (50-90%), micellar concentrations (5-15%) and sonication times (60-180 min) were chosen as causal factors (X_n). The concentrations of curcumin and physicochemical properties of micelles were investigated as response variables. The appropriate condition of ultrasound-assisted micellar extraction was optimized by the Design Expert® software. The results indicated that the concentration factor has more influence on the extraction yield than the sonic time factor. The vesicle size of micellar model was smaller than 20 nM with narrow polydispersity index (0-0.25). The zeta potential was close to zero charge with a pH range of 4.5-6.0. The benefits from this study may be applied to extract active substances from other Thai herbs incorporated the turmeric. The ultrasound-assisted extraction was an alternative method that is environmental safety.

Characterizations, bioactivities, and safety studies of bio compound preparation from goat hoof

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Keywords: Goat hoof, bioactivities, safety studies

Bio compound from the goat hoof has been used as the ingredient in pharmaceutical products, nutraceuticals, and health products. This study was aimed to produce bio compound from the goat hoof and performed quality controls, including characterizations, bioactivities, and safety studies. The goat hoof was extracted using 0.2% NaOH. Next, bio compound was characterized for amino acids and conducted chemical structure determination by SDS-page and H-NMR spectrum. Bioactivity evaluations of the extract were performed included DPPH assay, ABTS scavenging, nitric oxide scavenging assay, collagen activation, and cytotoxicity. This study was also performed on the acute toxicity of goat hoof extraction for safety evaluation. The extract yield of the goat hoof was 9.12% (w/v). The extract determination with SDS-page verified 18 amino acids. The NMR characterization of the goat extract contained polysaccharide, protein, and proteoglycan groups. The goat extract showed moderate anti-oxidative effects. Moreover, the goat extract at 750 µg/mL showed potent collagen Typ1 stimulation. The cytotoxicity test of the goat hoof extract showed IC_{50} > 1,000 µg/mL. The acute oral toxicity of goat hoof extract was classified as category 5 or unclassified according to the Globally Harmonized System (GHS) of Classification and Labelling of Chemicals. The LD50 cut-off was greater than 5,000 mg/kg per body weight. The goat hoof extract was a promising bio compound as a health product and added value of the material with scientific information.

Antioxidative activity of *Clerodendrum petasites* using conventional methods and intracellular assay

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Key words: *Clerodendrum petasites*, antioxidation, cellular antioxidant capacity

Clerodendrum petasites (CP) has been long used as Thai traditional medicine in treating fever. In particular, the root of CP is used in the 5-roots antipyretic formulations. Other parts, such as leaves and branches, have been identified as providing antipyretic properties in Thai medicinal text. The objective of this study is to compare the properties of methanol extracts of roots, leaves, and branches by DPPH, ABTS and FRAP assays, and cellular antioxidative activity by HaCaT cells. The results of CP in the DPPH and ABTS tests showed that there is no difference in the antioxidative activity. Whereas FRAP assay found that roots and branches extracts were more active than leaves (441.94 ± 33.61, 385.47 ± 29.60 and 222.36 ± 22.16 (μM) Fe^{2+} per g of extract, respectively). In cellular testing, all extracts at 62.5 and 250 μg/ml showed a similar cellular antioxidant capacity (CAA) unit (29.57 ± 0.91 to 45.38 ± 11.83 unit). The results of the study could be used as a guideline on how to use different parts of CP to produce the best benefit. In particular, different sections of CP may be used to substitute in the antipyretic formula as well.

Improved specific coagulant activity of recombinant human factor IX by *F9* gene transfection into immortalized hepatocyte-like cell line

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Keywords: Coagulation factor IX, Hemophilia B, HEK293T cells, imHC cells, Recombinant protein, Transfection

The major strategy for hemophilia B treatment is a replacement therapy using recombinant factor IX (rFIX). Currently, there are two commercially available cell lines for rFIX production, human embryonic kidney 293 (HEK293) and Chinese hamster ovary (CHO). Administration of rFIX produced by CHO cell can be limited in patients due to the neutralization of procoagulant activity by antibody development. Therefore, rFIX produced by HEK293 has been long preferable. Recently, an immortalized hepatocyte-like (imHC) cell line has been developed, exhibiting several properties resembling hepatocytes because FIX is a hepatic protein. rFIX produced by *F9* DNA transfected in imHC (FIX-imHC) cells was determined the FIX antigen production and coagulant activity, using immunoassays and modified aPTT assay. The results showed that FIX-imHC cells produced lower FIX antigen (20%) compared to HEK293T cells. Interestingly, rFIX produced by FIX-imHC exhibited a slight increase in FIX coagulant activity at the equivalent molar concentration. Taken together, imHC cells might be an alternative host system for rFIX production.

Construction of three-dimensional (3D) co-culture system for *in vitro* genotoxicity tests

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Keywords: Three-Dimension cellular model, genotoxicity, micronucleus

3D tissue equivalents have been used as an unique preclinical test system and an alternative to animal testing throughout the last decade. Equivalency testing techniques for skin, airway (lung), and liver tissue equivalents have been developed into a genotoxicity testing strategy in the field of genetic toxicology. As a result, using 3D tissue in genotoxicity testing is a reliable method for genetic research. The goal of this strategy is to create a 3D co-culture model of A549 and monocyte-derived macrophages (dTHP-1), which will allow for a more realistic genotoxicity assessment of inhaled compounds. In this experimental design for 3D co-culture model development, A549 cells were initiated as adherent monolayers and THP-1 cells were used as suspension cultures. THP-1 cells ($1x10^7$ cells/mL) were treated with the phorbol ester phorbol-12-myristate-13-acetate (PMA) for 48 hours in a T75 flask for cell attachment. Following treatment, the THP-1 cells were removed from the PMA and kept in fresh RPMI for 24 hours. A549 cells were trypsinized, counted, and added (5×10^5 cells/mL) to the transwell-6 well plate, which was entirely filled with medium. After 24 hours, THP-1 cells were trypsinized with Accutase® cell detachment solution. The cells were counted, and added to the top chamber of the transwell-6 well plate (1×10^5 cells/mL) for 2 hours. The media in the upper and lower chambers were changed after 24 hours. In this study, Mitomycin C (MMC): a chemotherapeutic agent was used as a positive control. The frequencies of micronucleated cytokinesis-blocked cells (MNCBs) was evaluated after the cells exposed to MMC. The result showed that MMC (112 ± 3.56) significantly increased the frequencies MNCBs of MMC when compared to the control group. This study also showed that the coefficient of variation (CV) was 3.16% indicating a good performance of the method based upon the acceptable values for the CV should be less than 5. In conclusion, using a co-culture testing system between two cell types considers a possible advantage of advanced models consisting of several cell types in discovering pathways in standard genotoxicity testing systems. The application of co-culture models co-culture models will be used for pro-inflammatory and cytotoxicity studies in the future.

Effects of natural compounds on psoriasis-associated cytokines induced keratinocyte (HaCaT) cells

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Keywords: Psoriasis; Human keratinocyte; Inflammatory; T helper

T helper (Th) cells-secreted cytokines particular Th1 and Th17are the key players in psoriasis pathogenesis. The effects of these T helper cytokines secretion on keratinocyte cells lead to aberrant of psoriasis symptom. This study aimed to investigate the effects of natural compounds on psoriasis-related inflammatory and epidermal proteins marker of keratinocyte (HaCaT) cells induction with T helper cytokine. HaCaT cells were induced with cytokine mixture between Th1 and Th17 cytokines for 24 hours. Natural compounds were treated after cytokines induction. The inflammatory mediators and protein expression of skin proliferation (Ki67) and keratinization (elafin and filaggrin) were analyzed by ELISA assay. It was found that T helper cytokine mixture were stimulated the expression of all inflammatory mediators and epidermal marker proteins elafin and Ki67 while fillaggrin was decreased. The effects of natural compounds on T helper cytokine induced-HaCaT cells exhibited the improving of inflammation and epidermal protein marker expression. The results show that retinoic acid was significant decrease level of IFN-γ. Moreover, retinoic acid, curcumin and resveratrol significant inhibited TNF-α expression. Curcumin showed the most potential inhibition on IL1 and IL 8. The efficiency of all natural compounds trends to effect on fillaggrin elevation resulted to improve the skin desquamation and curcumin showed significant efficiency to elafin protein. Interestingly, quercetin had significant efficiency to filaggrin and Ki67 that marker of hyperproliferation. The result indicated that retinoic acid, curcumin, genistin and resveratrol were effect on inhibition of psoriasis-related inflammatory on keratinocyte cells. While curcumin and quercetin exhibit strong effect on keratinocyte epidermal proteins leading to decrease level of keratinization and hyperproliferation.

Antimicrobial activity of the actinomycetes isolated from the black ant, *Camponotus lasiselene*

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Keywords: antimicrobial activity, actinobacteria, *Streptomyces*, social insects, ants

Actinomycetes are Gram-positive bacteria with high guanine and cytosine content in their genome and are abundant in terrestrial habitats such as in soils and organic materials. Actinomycetes are an excellent source of promising bioactive compounds. In a recent study, two-thirds of bioactive microbial metabolites are derived from actinomycetes, especially members of the genus *Streptomyces*. The attempt to find out the new source of actinomycetes started in the last two decades. Since the late 1990s, it has been accepted that some ant species used actinomycetes to produce antibiotics to protect their colony from pathogens. Thailand has a high diversity of ants. However, the study of the ant-derived actinomycetes in Thailand has been very limited. In this present study, a total of 15 actinomycetes were isolated from the black ant, *Camponotus lasiselene*, collected from Pathum Thani province. Based on the 16S rRNA gene analysis, these species were classified in the genus Streptomyces including *S. xylanilyticus* (1 isolate), *S. olivaceus* (7 isolates), *S. costaricanus* (3 isolates), *S. aculeolatus* (1 isolate), *S. diacarni* (1 isolate), *S. tendae* (1 isolate). The antimicrobial activity screening revealed that ten isolates exhibited antagonist activity against tested Gram-positive bacteria, including *Staphylococcus aureus*, *Kocuria rhizophila,* and *Bacillus subtilis*. Meanwhile, two isolates exhibited antifungal activity against *Candida albicans*. Interestingly, one isolate, Caml017, showed a low 16S rRNA gene similarity value of 98.7% and represented the candidate of novel actinomycetes species. However, this hypothesis needs to be confirmed by further study. This study revealed that ants harbored antibiotic-producing actinomycetes and some of them might be the novel species of the antibiotic producer.

Investigation of ternary components of dispersed system for the development of dry powdered self-emulsifying system

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Keywords: Ascorbic acid, Self-emulsifying drug delivery system, Dry powder, Topical application

Topical emulsion is mostly used to deliver active ingredients through the skin. However, some active ingredients show low skin permeation and instability in liquid-form preparation. Ascorbic acid (AA), a moisture-sensitive potent antioxidant, has low skin permeation due to its high water-soluble nature. Therefore, the stability of both formulation and active compounds would be considered. Self-emulsifying drug delivery system (SEDDS) is spontaneously emulsified when exposed to water with mild agitation and provides more stable emulsion than a regular emulsion obtained from a typical method. Moreover, phase separation can occur in a liquid-form of SEDDS as same as in a regular emulsion. Dry powdered self-emulsifying system which separates water phase out and produces the "ready-to-use" topical formulation might preserve the better stability for both active ingredient and formulation. This study aims to investigate the proper concentration and ratio among oil phase, emulsifier, water phase for dry powdered self-emulsifying system preparation. The results showed significant difference among three different concentrations of glycerin solution on ternary phase diagram at 24 hours after storage at room temperature. Nine formulations without phase separation were selected to characterize the physical properties. Increasing water phase resulted in larger particle size while increasing the emulsifier resulted in lower particle size. The pH of emulsions obviously decreased when AA was incorporated due to the acidic property of AA. These findings provided evidence to the further study for dry powdered self-emulsifying system preparation for topical application to preserve the better stability and provided preferred skin permeation for highly sensitive active compounds.

Development of a film-forming spray solution for wound healing

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Keywords: Film-forming spray solution, Eudragit® RL100, PEG 400, Solvents, Polymer concentration

The aim of this study is to develop a film-forming solution with waterproof properties in a spray form for wound healing. Effects of solvent system and polymer concentration on the properties of film-forming solution were investigated. Eudragit® RL100 and PEG 400 were used as a polymer and a plasticizer, respectively. An experimental method for determining the proper solvent ratio between Ethanol: Acetone: Water was based on the evaporation rate of solvents. The effects of the polymer concentration on the properties of the film-forming solution were evaluated for appearance, evaporation rate constant (K), viscosity, washability and sprayability. From the results, it was found that Ethanol: Acetone: Water (70:20:10) was the highest water content ratio with a high evaporation rate constant (K) which was not significantly different from those of other formulations containing only Ethanol, Ethanol: Acetone (90:10), and Ethanol: Acetone (80:20). The polymer concentration had no effect on appearance and washability. Eudragit® RL100 at a concentration of 5% w/w gave a faster evaporation rate, less viscosity, and better sprayability than 10% w/w polymer. Therefore, 5% w/w Eudragit® RL100 and a solvent mixture of Ethanol: Acetone: Water (70:20:10) was suitable for further study in the development of film-forming solutions containing interested active ingredients for wound healing

The preparation and characterization of ferulic acid solid dispersions prepared by spray-drying

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Keywords: Solid dispersion, Spray-drying, Ferulic acid, Differential scanning calorimetry, FT-IR microspectroscopy

Solid dispersions in water-soluble carriers have attracted considerable interest as a means of improving the solubility, and hence possibly bioavailability, of a range of hydrophobic drugs. Solid dispersions of PVP K30 and ferulic acid (FA), a poorly water-soluble agent, were prepared by spray-drying technique using Büchi B-90 nano spray dryer (B-90) with varied inlet temperature (80 and 90 ºC). Their physicochemical properties were evaluated after preparation. The solubility was substantially improved for FA from both formulations of solid dispersion compared with physical mixture. Moreover, the solubility of small particle size was found to be greater than large particle size. As indicated from DSC thermograms, X-ray diffraction pattern, FTIR spectrum and SEM photographs, FA was in the amorphous form, which confirmed the better solubility of solid dispersions. SEM images of solid dispersions showed a spherical shape, nonporous, with a microparticle size. No FA crystal was observed on the surface of both formulations

An immortalised erythroid cell line as a model for foetal haemoglobin inducing agents testing

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Keywords: ß-Thalassemia, foetal haemoglobin induction, immortalised erythroid cell line

ß-Thalassemia, a common genetic disorder with high prevalence in Asian countries including Thailand, is caused by mutations in and around beta globin gene, which result in globin chain imbalance with excess alpha globin. Aberrant expression of globins in ß-thalassemia patients causes ineffective erythropoiesis, red blood cell instability and degradation of the cells in the circulation. Previous studies have shown that increased expression of gamma globin, a subunit of foetal haemoglobin, could ameliorate ineffective erythropoiesis of ß-thalassemia and reduce severity of the disease. Therefore, the identification of potential foetal haemoglobin inducers with high specificity and high efficacy is required. This study utilised an immortalised erythroid cell line generated from stem cells of a normal individual, PB-A, as a model for foetal haemoglobin induction by Hydroxyurea (HU), a drug approved by FDA as a foetal haemoglobin inducer for sickle cell anaemia patients. As expected, HU significantly induces gamma globin production in PB-A. HU also affects erythroblast proliferation as the number of erythroid cells was significantly lower in the HU-treated group than in the control group. However, viability of the cells was not affected by HU treatment. Moreover, the percentages of enucleation were similar among HU-treated and control groups. Our study demonstrates the potential of this immortalised erythroid cell line as a model for foetal haemoglobin inducing agents testing and could be applied further with other foetal haemoglobin inducers to obtain more information before entering the clinical phase.

Factors affecting the formation of hyaluronic acid entrapped self-assembly hydrophobic silica particle

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Keywords : Hydrophobic silica , Self-assembly particle , Hyaluronic acid, Concentration, Viscosity

Hyaluronic acid (HA) entrapped Self-Assembly Hydrophobic Silica particle (SAHS) was fabricated from the mixture between hydrophobic mesoporous silica (Aerosil® R812S) and HA aqueous solution at a weight ratio of 3:97 through high shear mechanism. The higher concentration of HA was not able to entirely entrap in SAHS that could be seen from the leaking of HA solution upon manufacture. The physical appearance of wet lumpy with mousse texture was acquired. In-depth investigation revealed that low viscosity with Newtonian flow behavior at low concentration of HA solution was more favorable on the formation of HA entrapped SAHS. It was due to the fact that typical shear force applied during SAHS formation was only sufficient for low viscosity fluid with non-Newtonian flow in order to generate tiny liquid droplet before coating by the network of Aerosil® R812S. Another pivotal factor affecting the formation of HA entrapped SAHS was given by the contact angle (θ). The contact angle with higher θ was more hydrophobic liquid pronounced a better incorporation into the hydrophobic core-shell structure because of its ability to retain the droplet form. Therefore, the lower concentration of HA with higher θ was promising to be prepared as SAHS. However, surface tension that usually should also influence on the curvature of liquid droplet negligibly impacted on the HA entrapped SAHS in this study. In conclusion, three major factors on the formation of SAHS containing HA were the viscosity, rheological property and θ, respectively. All aforementioned factors could be employed as the essential material attributes on the development of SAHS product.

Formulation of buccal mucoadhesive preparations based on oleogel

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Keywords: Oleogel, Buccal mucoadhesive preparation, Hydrophilic polymers, Texture profile analysis, Rheology

Buccal bioadhesive delivery systems are used for the purpose of providing prolonged retention on the buccal mucosa and allowing continuous release of active ingredients. The objective of this study was to develop and characterize the buccal mucoadhesive preparations based on oleogel for containing lipophilic drugs as a platform for oral ulcer treatments. The optimal concentration of Aerosil® 200 as a gelling agent was determined. Effects of types and concentrations of bioadhesive polymers were investigated in terms of rheology, viscosity, spreadability and mechanical properties. Three different bioadhesive polymers including hydroxypropyl methylcellulose (HPMC), sodium carboxymethylcellulose (SCMC) and Carbopol® 940 at 5%,10% and 15% were used in this study. The findings showed that 5% Aerosil® 200 could create an oleogel with the optimal viscosity. HPMC and SCMC could be dispersed homogeneously into the oleogel. With an increase in the concentrations of bio-adhesive polymers, the viscosity and the magnitude of textural parameters of the formulations were also increased. However, the addition of an excessive amount of bioadhesive polymers resulted in the formulation that was difficult to spread on the oral mucosa and caused poor mouth feeling due to too high viscosity. The optimized formulation contained 5% Aerosil® 200 and 5% SCMC providing suitable viscosity, ease of spreading, low hardness and good adhesiveness. Based on these results, the formulation can be employed as a carrier for loading lipophilic drugs for application to oral mucosa which indicated good textural and mucoadhesive properties for use in the oral cavity.

Carbapenem-nonsusceptible Gram-negative bacteremia: Clinical characteristics, outcomes, and risk factors for mortality in a university hospital in Thailand

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Keywords: bacteremia, carbapenem, Gram-negative, mortality, nonsusceptible

Carbapenem-resistant Gram-negative bacterial infections are a significant public health problem. There are limited studies in carbapenem-nonsusceptible Gram-negative bacteremia in Thailand. Our study aimed to identify clinical characteristics, outcomes, and factors associated with mortality in Thai patients with carbapenem-nonsusceptible Gram-negative bacteremia. A retrospective cohort study was conducted at King Chulalongkorn Memorial Hospital, Thailand. The inclusion criteria were as followed: (i) adult patients with documented Gram-negative bacteremia not susceptible to ertapenem, meropenem, imipenem, or doripenem (ii) received inpatient care between 2015 and 2017. Logistic regression was used to estimate the factors associated with mortality, odds ratios (ORs), and associated 95% confidence intervals (95% CI). Eighty-three patients fulfilled the inclusion criteria. Forty-four patients (53%) died during hospitalization. The most common comorbidity was cancer. The mean (SD) APACHE II score was 18.9 (6.4). *Acinetobacter baumannii* was the predominating organism found. The intra-abdominal cavity was the most common site of infection. APACHE II score (adjusted Odds Ratio [OR], 1.16; *P* = 0.03) and pneumonia (aOR, 6.42; *P* = 0.03) were associated with in-hospital mortality. Nine (69.2%) *Klebsiella pneumoniae* isolates had high minimum inhibitory concentrations for fosfomycin. All isolates of *Aeromonas* sp. were susceptible to ceftriaxone and ceftazidime. A high mortality rate was observed in patients with carbapenem-nonsusceptible Gram-negative bacteremia, especially in patients with high APACHE II scores and pneumonia. Few antibiotic options remain for this group of patients. Carbapenem overuse should be avoided in Thailand to decrease the incidence of carbapenem-resistant Gram-negative bacteremia.

Factors associated with irrational antibiotic use behavior among social media users in Thailand

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Keywords: Antibiotics, Antimicrobial resistance, Antibiotic use behavior

The antibiotics are currently less effective as the bacteria adapt to resist the antibiotics, resulting in a lower efficacy affecting drug-resistant bacterial infections. The objective of this study was to examine factors related to the irrational use of antibiotics among social media users in Thailand. This quantitative research approach was employed in this study, using a cross-sectional survey. Self-administered online questionnaires were distributed to 400 respondents who were social media users. The study was conducted between February and April 2021. The result showed that 400 study respondents were more females than males (58%, 41%, respectively). The median age was 38.1 ± 15.2 years. The highest level of education was 53.5% at the bachelor's degree level. The most common cause of antibiotic use was sore throat (69.25%), followed by diarrhea (45.25%). Most antibiotics access was from government hospitals (66%) and drugstores (58.25%). The attitude factors were associated with low levels of antibiotic use behavior with Pearson's correlation coefficient of 0.320 (p-value <0.001). Knowledge of antibiotic use and drug resistance was associated with deficient antibiotic use behavior levels with Pearson's correlation coefficient of 0.178, 0.198 (p-value = 0.554, 0.120). The factors associated with irrational antibiotic use behavior levels were attitude, knowledge about antibiotic use, and antimicrobial resistance. The research has some minor limitations in that the data were filled by the respondents, which might have a comprehension error in completing the questionnaire. There should be a contact channel for the respondents to reduce confusion in specific questions.

Monitoring of unsafe health products in the community in the Central, West, and East region of Thailand

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Keywords: Unsafe health products, exaggerated ads

The health products harmful to people are still a big problem that Thailand's health personnel must be urgently concerned. It was revealed that Thai people chose low-quality health products that affected the body. In addition, there were many problems of the distribution and consumption of dietary supplements and cosmetics containing substances prohibited for medicinal purposes, including exaggerated ads in various media. People receive misleading or deceptive information that leads to irrational use of health products. This study aimed to investigate the problem of unsafe health products in the community using the specific tool “4Q2S” by surveying in the Central, West, and East regions of Thailand. The data were collected between January – May 2021. The results showed 232 (80.56%) unsafe health products were found in the Central region, 9 products (3.13%) in the Western region, and 13 products (4.51%) in the Eastern region. In part of advertising content for health products, exaggerated ads were found in 211 (73.3 %) products. In conclusion, the problem of unsafe products in the community in all regions was still found. 4Q2S indicated that there were several problems including incorrect registration number, no registration number, exaggerated ads, and misuse. The problems of distribution and advertising channels were found on the internet, especially online media, and shopping malls. This problem became more outstanding during the COVID-19 pandemic crisis and people easily access to the. Therefore, government agencies, health professionals and civil society should work together more intensely to monitor this problem.

Sore-throat mirror device enhancing patient awareness on rational antimicrobial use for upper respiratory tract infection

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Keywords: rational drug use, mirror device, sore-throat, patient awareness, antimicrobial

Antimicrobial drugs are one of the irrational use factors leading to the antimicrobial drug resistance. Upper respiratory infection (URI) may be caused from viral or bacterial infection, but some patients have no awareness of rational antimicrobial use. An innovative sore-throat mirror device was developed to be a screening tool. This research was a cross-sectional study aimed to assess whether the use of the sore-throat mirror device in the diagnosis of URI may enhance the patient's awareness of using antimicrobial drugs rationally and determine the patient's satisfaction of the use of sore-throat mirror device. Participants were patients with URI symptoms who used healthcare services at sub-district health promotion hospitals from ten provinces. The study was conducted between July 2018-2019. Data collection was performed by a self-administered questionnaire after getting services from healthcare providers with the sore-throat mirror device. Descriptive statistics and a Pearson's *chi*-square *test* were used. The respondents consisted of 2,266 patients. 63.1% of them were females, and 41.3% aged range of 31-50 years. 2,031 patients received treatment with the device for diagnosis. Of those, only 17.3% received antimicrobial drugs from the providers; however, 25.8% of those who did not received antimicrobials continually requested antimicrobials, and 13.9% thought to be treated elsewhere for antimicrobials. The device can reduce the irrational antimicrobial use by 83.4%. In conclusion, the sore-throat mirror device is effective to promote rational antimicrobial drug use because patients accept not to use antimicrobials after seeing the different images between virus and bacterial infections inside the throat.

Correlations of methods commonly used to quantify renal function for medication dosing

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Keywords: Creatinine clearance, Estimated glomerular filtration rate, Renal dose, Renal function, Serum creatinine

This study aims to determine correlations among different methods commonly used to estimate renal function in clinical practice among Thai adult patients with stable renal function. Twenty-four patients, who visited cardiovascular outpatient clinic at King Chulalongkorn Memorial Hospital from December 2020 to March 2021 were invited and enrolled. Venous blood and urine samples were collected. Creatinine was measured by enzymatic method. The 12-h measured creatinine clearance (mCrCl) was calculated by multiplying the ratio of urine creatinine to serum creatinine (Scr) concentration by 12-hours urine volume. Creatinine clearance by Cockcroft-Gault equation ($CrCL_{CG}$) and estimated glomerular filtration rates by Chronic Kidney Disease Epidemiology Collaboration equation ($eGFR_{EPI}$) and Thai eGFR equation ($eGFR_{Thai}$) were calculated. To measure the strength of binary association between methods, Pearson or Spearman correlation coefficient was determined as appropriate. Of 24 participants, 15 (62.5%) were female with a median age of 68.9 [IQR: 64.5, 72.6] years. The Mean±SD of weight and Scr were 68.1±16.2 kg and 0.89±0.22 mg/dL, respectively. Medians of $CrCl_{CG}$ and mCrCl were 67.9 [IQR: 56.8, 89.7] and 72.9 [IQR: 56.5, 109.0] mL/min, respectively. Median $eGFR_{Thai}$ was 74.6 [IQR: 66.0, 85.8] mL/min/1.73 m^2 and mean $eGFR_{EPI}$ was 78.1±18.8 mL/min/1.73 m^2. Strong positive correlations were found between all tested pairs of methods, with Spearman correlation coefficient ranged from 0.720 to 0.921 (all P<0.001). Renal function estimated by 12-h mCrCl, $CrCl_{CG}$, $eGFR_{EPI,}$ and $eGFR_{Thai}$ were highly correlated. Whether or not using these methods interchangeably for renal dosage adjustment of medications would impact clinical outcomes remains to be further investigated.

An exploration of health literacy and awareness on antimicrobials usage and resistance in Thai citizen

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Keywords: health literacy, antimicrobial, resistance, awareness, attitudes

This cross-sectional study investigated health literacy on antimicrobials usage and resistance in Thai citizen using a self-administered questionnaire. The questionnaire was developed from a review of the related literatures. Questions were composed of items those assessed health literacy, attitudes and behaviors on antimicrobials usage and resistance. The health literacy included 6 components including knowledge (L1), access to information (L2), communication to increase expertise (L3), managing health conditions (L4), media and information literacy (L5), and corrected action decision (L6). Participants were adults aged 18 years and over from 17 provinces of 6 regions in Thailand. The data were collected between December 2021 and January 2022. The results revealed that there were 711 female respondents (66.7%) with the mean age of 43.0 ± 14.8 years. The mean total score of health literacy on antimicrobials usage and resistance (L1 - L6) was 58.42 ± 16.11 that was classified as a low level. However, the mean score of L4 was 63.57 ± 24.15 classified as a medium level and the mean score of L6 was 84.01 ± 21.34 classified as a good level. The mean scores of attitudes and behavior were 70.82 ± 15.10 and 75.27 ± 15.18, respectively; those were classified as a medium level. A pearson's correlation coefficient was used to analyze the relationships between dimensions of health literacy, attitude and behavior. All components of health literacy, except L5 and L6, were significantly related ($p < 0.01$) and the relationships between health literacy, attitude and behavior were found ($p < 0.01$). The health literacy of all components (except L3) and attitudes were good predictors for behaviors related to antimicrobials usage and drug resistance of Thai people. The knowledge development of information access and communication is needed to enhance more health literacy on antimicrobials usage and drug resistance of Thai people.

Knowledge, attitude, and practice of unused medication among non-communicable disease patients in central region, Thailand

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Keywords: unused medicines, knowledge, attitude, practice, non-communicable diseases

This study aimed to explore the knowledge, attitude, and practice of unused medication among non-communicable disease (NCD) patients in central region, Thailand. A descriptive cross-sectional study was conducted among 409 NCD patients in central region, Thailand from August 2020 to February 2021. Convenient sampling was used to recruit the participants, and data were collected by self-administered questionnaires. Descriptive statistics were used, and results were presented as frequencies and percentage.Out of the 409 respondents included in the study, 294 (71.88%) of them were females, with an average age of 60.95 ± 14.08 years and graduated with primary school diploma (45.72%). Most respondents knew about unused medicines (78.24%) but only half of them had correct understanding toward the disposal of unused medications (51.83%). Most of the respondents had a correct attitude toward the risk of unused medicine such as the risk related to duplicated medicine (54.04% VS 3.42%) and potential harm to children or elderly (65.28% VS 22.98%). Except for using antibiotics, most of them thought that there should be a backup of antibiotics at home (44.50% VS 41.07%). Approximately 55.26% of the respondents had unused medicines stored at home because non-compliance. Preferred approaches of unused medicine disposal were returning them to hospital (64.30%) and throwing in household garbage (54.77%), respectively. Majority of the respondents are aware of the need for safe disposal of unused medicines; however, most of them still lack knowledge and practice on safe disposal of medicines. Therefore, knowledge of the appropriate drug use and disposal should be promoted.

Financial feasibility of cannabidiol product for canine osteoarthritis

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