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ศูนย์ความเป็นเลิศด้านอนามัยสิ่งแวดล้อมและพิษวิทยา
Center of Excellence on Environmental Health and Toxicology

สำนักงานโครงการพัฒนาบัณฑิตศึกษาและวิจัยด้านวิทยาศาสตร์และเทคโนโลยี
S&T Postgraduate Education and Research Development Office

การประชุมวิชาการประจำปี 2568

เรื่อง หยิบยกปัญหาด้านอนามัยสิ่งแวดล้อมเพื่อนำไปสู่การแก้ไข

Highlighting Environmental Health Issues: Research towards Solutions

Abstracts

September 20th, 2025

at the Convention Center, Chulabhorn Research Institute, Bangkok, Thailand

EHT PERDO

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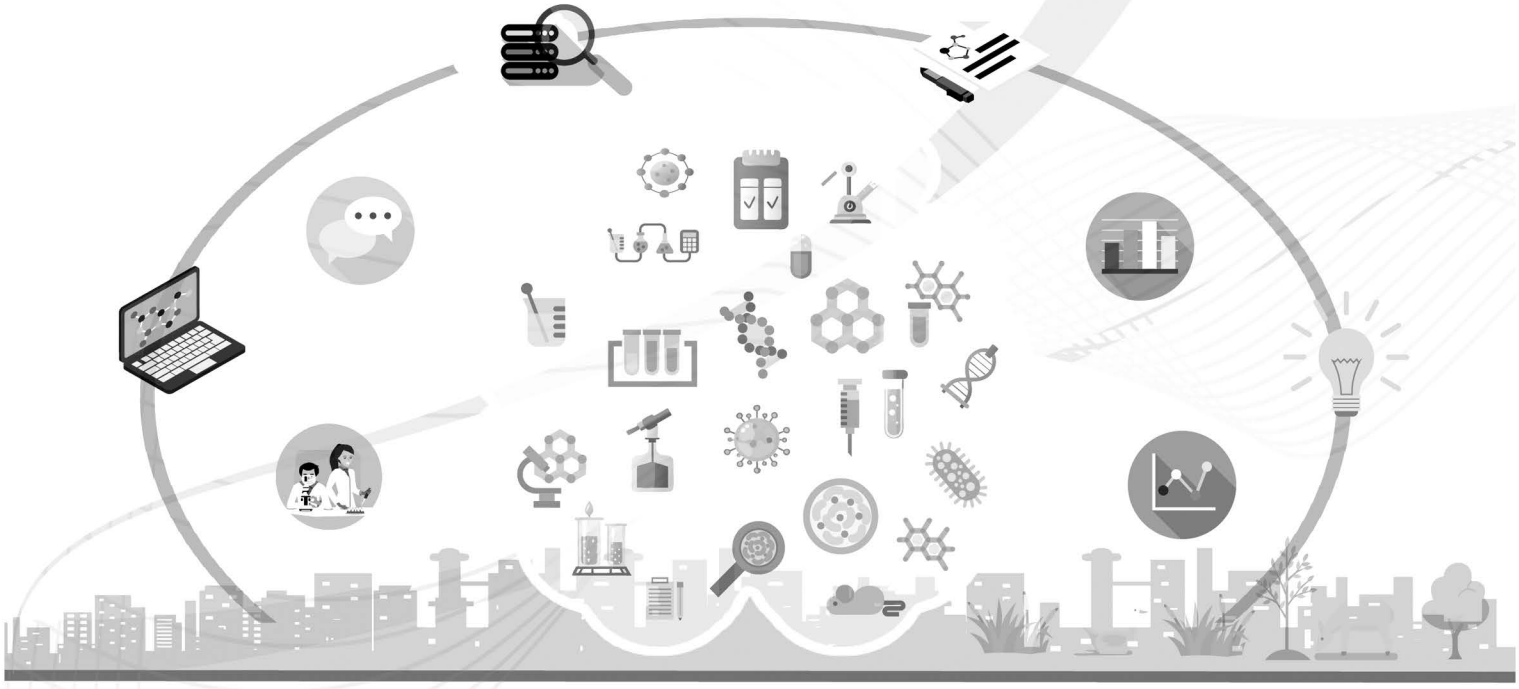

at the Convention Center, Chulabhorn Research Institute, Bangkok, Thailand

The Center of Excellence on Environmental Health and Toxicology (EHT)

Research Direction / Research Focus

Research Direction	Research Focus
1. Impact of the Environment on Human Health	1.1 Impacts of chemicals and climate change on human health and disease development and factors modulating such impacts
2. Development of Technology for Environmental and Health Research	2.1 Development of biologically active compounds for control, prevention and treatment of environmental health problems/diseases 2.2 Innovative technology for production, detection, treatment, detoxification, remediation, reduction, reuse and recycling of chemicals
3. Safety and Risk Assessment and Management of Chemicals and Environmental Management	3.1 Safety and toxicity of food, drugs and other chemicals including biofuels 3.2 Environment / health impact assessment and management

Abbreviations

CGI	=	Chulabhorn Graduate Institute
CRI	=	Chulabhorn Research Institute
PH	=	Faculty of Public Health, Mahidol University
SCBI	=	Environmental Biology / Biology, Faculty of Science, Mahidol University
SCTX	=	Toxicology, Faculty of Science, Mahidol University
EHT	=	Center of Excellence on Environmental Health and Toxicology
PERDO	=	S&T Postgraduate Education and Research Development Office

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Impacts of chemicals and climate change on human health and disease development and factors modulating such impacts

P-01

A MECHANISTIC STUDY OF POLYHALOGENATED CARBAZOLES (PHCZS) ON ADIPOGENESIS IN ADIPOSE-DERIVED MESENCHYMAL STEM CELLS (AD-MSCs)

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Obesity is a metabolic disease characterized by high body mass index (BMI) and excessive body fat. The prevalence of obesity has rapidly increased in over the past decades. Evidence suggests that the etiology of obesity is associated with environmental exposure to obesogens, chemicals that can promote adiposity by reprograming adipocyte development. Various obesogens have been reported to promote obesity via the activation of peroxisome proliferator-activated receptor gamma (PPARγ), a master regulator of adipogenesis. In this study, we investigated the effect of emerging environmental polyhalogenated carbazoles (PHCZs) on adipocyte differentiation in human adipose-derived mesenchymal stem cells (AD-MSCs). Cells were treated with several PHCZs at environmentally relevant concentrations ranging from 0.05 - 15 μM. As a result, PHCZs significantly promoted adipogenesis. We further investigated the molecular mechanism underlying PHCZ-induced adipogenesis by using a selective PPARγ inhibitor. Intriguingly, the level of PHCZ-induced human adipocyte differentiation was completely mitigated by the treatment of a selective PPARγ inhibitor (GW9662) suggesting that PHCZs promoted adipogenesis through the direct activation of the PPARγ signaling pathway. Moreover, the gene expression profile of 15 adipogenesis related genes confirmed the role of PPARγ in PHCZ-induced adipocyte differentiation. Altogether, our findings uncovered a group of novel environmental obesogens promoted adipogenesis at environmentally relevant concentrations and provided implications on metabolic effects posed by environmental chemicals.

Keywords: Polyhalogenated carbazole, obesogen, adipogenesis, endocrine disruptor, peroxisome proliferator-activated receptor gamma

P-02

ASSESSMENT OF CYTOTOXICITY INDUCED BY NON-PSYCHOTROPIC CANNABINOID COMPOUND ON CHOLINOCEPTOR MODULATION IN CHOLANGIOCARCINOMA CELLS

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Cholangiocarcinoma (CCA) is a bile duct cancer with poor prognosis. Both cannabinoid receptors (CBs) and acetylcholine receptors (AChRs) are expressed in CCA cells. HU-308, a selective CB2 agonist, is a non-psychotropic synthetic cannabinoid with anti-inflammatory, analgesic, anti-hypertension properties. However, its cellular toxicity in cancer remains poorly understood. While cannabinoid-cholinergic interactions affect memory, little is known about CBs mediated growth inhibition in cancer cells. This study investigated *in vitro* cytotoxicity of HU-308 in CCA cells, focusing on its molecular mechanisms and the modulation of cholinoceptors including M3-mAChR and α7-nAChR.

Method: KKU-100, a human CCA cell line, was treated with HU-308 for 24 h. The effects on cell viability, cholinoceptors expression and apoptosis level were evaluated by MTT viability assay, Western immunoblotting, and flow cytometry, respectively.

The results: HU-308 (50-200 µM) showed a reduction in cell viability which was mitigated by pre- and co-treatment with a selective CB2 antagonist (AM630 10 nM), confirming CB2 involvement. Apoptotic cells were significantly increased after HU-308 treatment compared to control group. Moreover, the intrinsic pro-apoptotic Bax protein has a trend towards increasing, while anti-apoptotic Bcl2 protein was decreased by HU-308 treatment. Additionally, α7-nAChR protein expression was reduced, but M3-mAChR did not show any reduction.

In conclusion: HU-308, a selective CB2 agonist, exerted cytotoxic effects in KKU-100 cells through activation of the intrinsic apoptotic pathway and downregulation of α7-nAChR which may, at least in part, offer a potential effective on anticancer effects in CCA cells.

Keywords: Cannabinoid receptor subtype 2 (CB2), cytotoxicity, cholangiocarcinoma, apoptosis, cholinoceptor.

P-03

CARBON FOOTPRINT ASSESSMENT OF BAKED AND FRIED SNACK PRODUCTS USING A LIFE CYCLE APPROACH

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Climate change and environmental sustainability have become urgent global concerns, primarily driven by human activities such as energy consumption and industrial expansion, which are the main contributors to greenhouse gas (GHG) emissions. This study aims to analyze and compare the carbon footprint of crispy snack products produced as baked and fried processes using the Life Cycle Assessment (LCA) approach within a cradle-to-gate system boundary. The assessment was conducted using data from a snack manufacturing facility located in Nakhon Pathom Province, Thailand. The functional unit was set at 13 grams per snack package. GHG emissions were calculated in terms of carbon dioxide equivalent (CO_2e) across all production stages, from raw material acquisition to the final product. The results show that the fried snack products generate significantly higher GHG emissions compared to the baked products. This is mainly due to the use of wheat flour and tapioca starch, along with coal as the primary energy source in the production process. The baking process, on the other hand, demonstrated greater energy efficiency and lower emissions. These findings provide valuable insights for the development of policies and strategies aimed at reducing the environmental impacts of the food industry in Thailand, promoting sustainable production, and enhancing international trade competitiveness.

Keyword: Life cycle assessment, greenhouse gases, global warming potential, allocation

P-04

EFFECTS OF ARSENIC EXPOSURE ON INSULIN-MEDIATED EXPRESSION OF *SCYL3*, *CDK8*, and *DEP-1/ PTPRJ* IN DIFFERENTIATED HUMAN NEUROBLASTOMA SH-SY5Y CELLS

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Previously, we reported that prolonged arsenic exposure impairs insulin signaling, decreasing insulin biosynthesis and secretion in neurons. Since the insulin receptor (IR) can translocate to the nucleus and regulate gene expression, we hypothesized that arsenic might alter insulin-mediated gene expression in neurons. In this study, we examined the basal expression of insulin-mediated genes and their corresponding proteins, namely SCYL3, CDK8, and DEP-1/ PTPRJ in differentiated human neuroblastoma SH-SY5Y cells treated with $NaAsO_2$ using qRT-PCR and immunoblotting. The results showed that SCYL3 and CDK8 mRNA and protein levels were significantly decreased in cells treated with $NaAsO_2$ for 1, 3, and 5 days. Meanwhile, DEP-1/ PTPRJ mRNA levels were significantly reduced at all time points; however, the protein levels were decreased significantly only after 3 and 5 days of arsenic treatment. Furthermore, $NaAsO_2$ reduced the expression of HCF-1, an IR transcriptional co-regulator, suggesting that changes in HCF-1 levels may contribute to the downregulation of insulin-mediated genes. Taken together, these findings indicate that arsenic disrupts the basal expression of insulin-mediated genes and their corresponding proteins in neuronal cells, at least in part by modulating the transcriptional co-regulator HCF-1.

Keywords: Arsenic, insulin signaling, insulin-mediated gene expression, neurons

P-05

EFFECTS OF PRENATAL EXPOSURE TO AMBIENT MICROPLASTICS: MATERNAL EXPOSURE AND ALTERED TELOMERE LENGTH AND MITOCHONDRIAL DNA COPY NUMBER IN NEWBORNS

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Ambient microplastics (MPs), particularly from traffic emissions, are increasingly recognized for their contribution to environmental pollution and potential health risks. Growing evidence suggests that maternal exposure to harmful agents during pregnancy can adversely impact fetal development and increase the likelihood of childhood health problems. This study aimed to investigate the effects of prenatal exposure to traffic-related airborne MPs on maternal and fetal exposure and their implications on telomere length (TL) and mitochondrial DNA copy number (mtDNA-CN) in newborns. In addition, an *in vitro* cell-based study was conducted to confirm the effects of MPs on alterations of TL and mtDNA-CN in umbilical cord-derived mesenchymal stem cells (UC-MSCs).

The study was conducted in high- and low-traffic congested areas. A total of 101 subjects were recruited from pregnant subjects consisting 50 and 51 from high- and low-traffic locations, respectively. Pyrolysis GC-MS/MS was used to determine the concentrations of MPs and characterize polymers. Maternal and fetal exposure to MPs was assessed in urine and placental tissue, respectively. In the high-exposed group, the concentrations of MPs were significantly increased in maternal urine by 1.33-fold (8.72 vs. 6.53 mg/g creatinine, $p<0.05$) and in placental tissues (21.03 vs 16.14 mg/g tissue, $p<0.01$), compared to the low-traffic exposed group. Polyethylene (PE) and polyethylene terephthalate (PET) were predominant polymers which was in consistent with previous ambient air analyses from this study. Relative TL and mtDNA-CN was determined using quantitative real-time PCR in cord blood. A significant shortening of telomeres was observed in cord blood from high-exposed newborns, compared to those from low-exposed groups (1.2-fold, $p<0.05$). In addition, newborns from the high traffic-exposed group had a significantly lower mtDNA-CN in cord blood (1.2-fold, $p < 0.05$). Levels of TL and mtDNA-CN were significantly negatively associated with exposure to MPs. *In vitro* experiments confirmed that PE treatment caused a concentration-dependent reduction in both TL and mtDNA-CN in UC-MSCs.

In conclusion, this study demonstrates that prenatal exposure to traffic-related ambient MPs increases maternal and fetal exposure to MPs. Furthermore, the high-traffic exposed group had shortened TL and reduced mtDNA-CN in cord blood. This could potentially result in genomic instability in newborns. Therefore, this study highlights the importance of being aware of *in utero* exposure to ambient MPs which may lead to increase the health risk of disease development in newborns.

Keywords: Microplastics, air pollution, prenatal exposure, telomere length, mitochondrial DNA copy number

P-06

INVESTIGATION OF THE IMPACT OF *PLNS*, *PLNR*, AND *PLNP* ON ANTIBIOTIC RESISTANCE AND VIRULENCE IN *Stenotrophomonas maltophilia*

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Stenotrophomonas maltophilia is an emerging multidrug-resistant opportunistic pathogen that poses a serious challenge in clinical settings. The resistance of this organism is mainly driven by intrinsic mechanisms including the production of β-lactamases, multidrug efflux pumps, and biofilm formation. These traits make infections difficult to treat. Among its virulence factors, type IV pili (T4P) are critical for surface attachment, twitching motility, and biofilm development. The regulatory systems that control these functions and their possible link to antimicrobial resistance in *S. maltophilia* remain poorly characterized. This study investigated the function of a putative major pilin gene (*plnP*) and its associated two-component regulatory system, a sensor kinase (*plnS*) and a response regulator (*plnR*). Clean deletions of *plnP*, *plnS*, and *plnR* were generated in the *S. maltophilia* K279a. Deletion of *plnS* and *plnR* increased resistance to a wide range of antibiotics. These resistance phenotypes were not observed in the Δ*plnP*. In addition, both Δ*plnS* and Δ*plnR* showed enhanced growth rates and biofilm formation compared with the wild type. Notably, only the Δ*plnR* retained twitching motility. Collectively *plnP* is likely not the major pilin in *S. maltophilia.* Instead, *plnS* and *plnR* act as key regulators that modulate both antimicrobial resistance and virulence-associated traits. The findings underscore the critical role of *plnS* and *plnR*, which are likely significant to the regulatory networks in shaping biological traits with direct clinical relevance in this pathogen.

Keywords: *Stenotrophomonas maltophilia*, multidrug resistance, biofilm formation, Type IV pili, two-component system, antibiotic resistance, virulence

P-07

PRELIMINARY STUDY OF POLLEN AND $PM_{2.5}$: SEASONAL OVERLAP AND IMPLICATIONS FOR ALLERGY PREVENTION

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Airborne pollen and particulate matter ($PM_{2.5}$, PM_{10}) provoke respiratory diseases such as rhinoconjunctivitis and asthma in susceptible individuals. Further, they may work synergistically to worsen respiratory symptoms and modulate the immune response. In Bangkok, seasonal peaks in pollen concentration and air pollution overlap. $PM_{2.5}$ levels peak between January and March, while pollen concentrations, especially of the grass family (Poaceae), a major allergen in Thailand, are elevated year-round, highest in November and declining until July. To better understand their combined effect, this study explored the correlation between pollen load and particulate matter levels in central Bangkok.

Aeropollen sampling was conducted from late January until March 2025 using a RotoRod-Type Pollen Sampler at the Faculty of Science, Mahidol University. Samples were taken during the overlap of rush hour and the daily peak of pollen concentration (9:00–12:00). Pollen counts were compared to air pollutant data from the Air4Thai network.

No statistically significant correlation was observed between daily pollen concentrations and PM levels. Most collected pollen grains could not be taxonomically identified; however, among the known grains, Typhaceae and Poaceae were the most frequently observed.

The observed constant presence of either allergenic pollen or $PM_{2.5}$ peaks during this time of year presents a compounded risk for respiratory health and may severely impact the quality of life of affected individuals. No clear trend was observed across the selected time span, however, highlighting the need for a prolonged study period to uncover seasonal or meteorological patterns influencing both factors.

Keywords: Pollen allergy, pollen count, $PM_{2.5}$, PM_{10}

P-08

THE EFFECT OF ARSENIC EXPOSURE ON EXTRACELLULAR MATRIX REMODELING IN CHOLANGIOCARCINOMA MICROENVIRONMENT

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Cholangiocarcinoma (CCA) is an aggressive malignancy of the bile duct epithelium, often associated with poor prognosis. Increasing epidemiological evidence suggests that arsenic (As) exposure may contribute to CCA development and progression, yet the underlying mechanisms remain unclear. Herein, this study investigates the potential effects of As exposure on alteration of CCA microenvironment using an *in vitro* model comprising red fluorescent protein-expressing human intrahepatic CCA cells (HuCCA-A4) and hepatic stellate cells, HSC, (LX-2).

Method: The viability of cells treated with sodium arsenite ($NaAsO_2$) at concentrations of 0-10 µM was assessed by using MTT assays. Expression levels of genes involved in fibrosis and ECM remodeling in HuCCA-A4 were evaluated by using qRT-PCR. Conditioned medium (CM) from $NaAsO_2$-treated HuCCA-A4 was applied to LX-2 cells to assess fibrotic and inflammatory responses evaluated at the mRNA levels using qRT-PCR and at the protein levels using ELISA. Collagen I deposition was evaluated in an HuCCA-A4/LX- 2 co-culture system via immunofluorescence staining.

Results: MTT analysis in NaAsO2- treated HuCCA-A4 cells showed reduced cell viability starting at 5-10 µM (24 h), 2.5-10 µM (48 h), and 2-10 µM (72 h). $NaAsO_2$ treatment in HuCCA-A4 induced dose-dependent upregulation of *CTGF*, a fibrotic marker, as well as both ECM remodeling enzymes, *LOX* and *MMP-1*. In LX-2 cells, CM from HuCCA-A4 alone significantly elevated *IL-6* and *IL-8* expressions at both mRNA and protein levels compared to a control condition. Notably, the levels of *IL-8*, but not *IL-6*, also further increased when LX-2 cells were exposed to CM from $NaAsO_2$-treated HuCCA-A4 cells. In the co-culture system, deposition of extracellular collagen I could be visualized and the increase in its length and abundance was also observed when the co-culture was exposed $NaAsO_2$ treatment. Taken together, these findings suggest that As may promotes CCA progression by directly inducing the expressions of ECM remodeling genes in CCA cells and by stimulating the secretion of pro-fibrotic and pro- inflammatory mediators, which activate surrounding stromal cells and contribute to a tumor- supportive microenvironment.

Keywords: Cholangiocarcinoma, arsenic, sodium arsenite, red fluorescent protein-expressing HuCCA-A4 cells, hepatic stellate cells, extracellular matrix remodeling.

P-09

THE EVALUATION OF GREENHOUSE GAS EMISSIONS IN PRIMARY COFFEE CULTIVATION AND PRIMARY PROCESSING

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Coffee cultivation and primary processing contribute significantly to greenhouse gas emissions (GHGs), Particularly using fertilizers, fossil fuels, and energy consumption during processing. This study aimed to evaluate greenhouse gas emissions from coffee production in Nan Province, Thailand, focusing on two phases 1. Coffee cultivation and coffee processing. Cultivation processes were divided into mono-cultivation and poly-cultivation. Results showed that monoculture cultivation emitted 0.13 $kgCO_2$/kg-coffee, whereas polyculture cultivation released a higher amount at 3.74 $kgCO_2$/kg-coffee, primarily due to greater fertilizer input during the planting phase. For coffee processing, the total emissions were relatively low, averaging 0.042 ± 0.020 $kgCO_2$/kg-coffee, with the main contributions arising from the milling and transportation by using diesel-fueled pickup trucks. A study found that polyculture systems demonstrated relatively lower greenhouse gas (GHG) emissions per unit of yield compared to monoculture practices, suggesting their potential as a more sustainable cultivation model. The findings highlight two key emission hotspots: fertilizer application during cultivation and water use during the coffee milling process. The results emphasize that adopting intercropping and optimized water management practices are potential solutions to significantly reduce GHG emissions. This study provides scientific evidence and practical recommendations to support Thailand's national strategies toward carbon neutrality by 2050 and net-zero emissions by 2065.

Keywords: Greenhouse gas emissions, coffee cultivation, coffee processing, carbon footprint

P-10

TRANSCRIPTOMIC INSIGHTS INTO *PA2806* DISRUPTION REVEAL ALTERED STRESS AND VIRULENCE BALANCE IN *Pseudomonas aeruginosa* PAO1

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Copper is an essential micronutrient but becomes toxic at elevated concentrations. To explore how genetic factors contribute to copper stress adaptation, we examined a *Pseudomonas aeruginosa* PAO1 mutant lacking *PA2806*, a gene involved in tRNA modification. Comparative transcriptomic analysis between wild type and mutant strains revealed distinct transcriptional responses. Notably, loss of *PA2806* led to induction of oxidative stress defense genes and the repression of secretion-associated genes, suggesting a trade-off between stress tolerance and virulence. These findings highlight a previously unrecognized role of *PA2806* in shaping the bacterial response to copper.

Keywords: *Pseudomonas aeruginosa* PAO1, copper stress, transcriptomics, *PA2806*

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Development of biologically active compounds for control, prevention and treatment of environmental health problems /diseases

P-11

GREEN BANANA FLOUR AND PROBIOTIC SYNERGIES: UNLOCKING THE FUNCTIONAL FOOD POTENTIAL OF THAI BANANAS

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Bananas (*Musa* spp.) are among the most important tropical fruits in Thailand, serving as both a staple food and cultural symbol, and as a promising source of bioactive compounds and resistant starch for functional food development. Thai banana cultivars, derived from *Musa acuminata* (A genome) and *Musa balbisiana* (B genome), exhibit genomic diversity that contributes to their nutritional and health-promoting properties. In this study, five cultivars: Teep (ABB), Hin (BBB), Tanee Pa (BB), Hakmuk (ABB), and Theppharot (ABB) were selected for evaluation of total phenolic content (TPC), total flavonoid content (TFC), antioxidant activity, and their potential as prebiotic substrates. Additionally, the encapsulation of *Pediococcus pentosaceus* with green banana flour from Theppharot cultivar was investigated as a freeze-drying strategy to enhance probiotic viability and shelf life. The results revealed that Tanee Pa exhibited the highest phenolic and flavonoid levels with strong antioxidant activity, while Theppharot cultivar demonstrated superior potential for probiotic encapsulation. Collectively, these findings highlight the nutritional diversity of Thai banana cultivars and their dual role as sources of bioactive compounds and encapsulating matrices, supporting their development into novel functional foods that promote gut health and overall well-being.

Keywords: Green banana flour, phenolic compounds, flavonoid content, antioxidant, *Pediococcus pentosaceus*

P-12

MELATONIN-MEDIATED MODULATION OF HYPOXIA-INDUCED NEUROINFLAMMATION IN SH-SY5Y HUMAN NEUROBLASTOMA CELLS

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Neuroinflammation plays a significant role in the progression of neurodegenerative diseases, such as Alzheimer's disease (AD), Parkinson's disease (PD), and Amyotrophic Lateral Sclerosis (ALS). Neuroinflammation is a response that serves both protective and pathological roles in the central nervous system (CNS). However, the prolonged and dysregulated neuroinflammation promotes a plethora of adverse effects on the CNS. Apart from infection, the neuronal damage caused by hypoxia can stimulate the neuroinflammatory response, which is a contributing cause of subsequent neurodegenerative disease. Melatonin is an endogenous molecule primarily synthesized in the pineal gland. The physiological role of melatonin is to regulate sleep cycles and serve as a potent antioxidant. Recently, melatonin has also affected the inflammatory response. Several mechanisms were elucidated to investigate the anti-inflammatory role of melatonin. In this study, we studied the anti-inflammatory effect of melatonin in different concentrations after hypoxia induction in the SH-SY5Y cell line. After inducing an oxygen-glucose deprivation/ reperfusion (OGDR) condition in the SH-SY5Y cell line, the protein expression related to neuroinflammation, the NLRP3 inflammasome, was markedly increased. Different concentration of melatonin was added to the reperfusion medium. The results demonstrated that the protein expression of the NLRP3 inflammasome was significantly reduced in a concentration-dependent manner. This finding led to a further study of the mechanism of melatonin as a potential therapeutic agent for neurodegenerative diseases.

Keywords: Melatonin, neuroinflammation, hypoxia, NLRP3 inflammasome

P-13

MODULATION OF GLYCOSYLATION PROFILE IN CHO-DERIVED MONOCLONAL ANTIBODY PRODUCTION USING MONOSACCHARIDE ANALOGUE

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HER2-positive breast cancer remains a major cause of cancer-related mortality globally and in Thailand, where trastuzumab access is restricted by high costs and lack of local biosimilar production. Trastuzumab acts by blocking HER2 signaling and inducing antibody-dependent cellular cytotoxicity (ADCC), a function strongly influenced by Fc glycosylation. The presence of core α1,6-fucose at Asn297 reduces FcγRIIIa binding, whereas partial afucosylation, consistently observed in reference trastuzumab, is essential for biosimilarity. However, Chinese hamster ovary (CHO) cells predominantly produce fucosylated IgG, limiting equivalence. To combat this, multiple glycoengineering strategies like genetic approaches have been employed to enhance afucosylation but raise biosafety, intellectual property, and regulatory barriers. As a non-genetic alternative, 2F-Peracetyl Fucose (2F-PAF) has been reported to competitively inhibit Fucosyltransferase 8 (FUT8), enabling reversible and dose-dependent modulation of core fucosylation. In this study, stable CHO expressing trastuzumab biosimilar fed-batch cultures were supplemented with different 2F-PAF concentrations and assessed for growth, productivity, and product quality by Octet, LC-MS, and CEX-HPLC. Supplementation at 10-13 μM reproducibly increased afucosylation into the Herceptin® benchmark range while maintaining viability, yield, and charge heterogeneity comparing with no treatment control group. These findings demonstrate 2F-PAF as a scalable strategy for tuning glycosylation, strengthening biosimilarity, and supporting affordable trastuzumab production least affordable comparing with genetic modification methods.

Keywords: Trastuzumab, 2F-Peracetyl Fucose, afucosylation, CHO cells, ADCC, biosimilarity.

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PRODUCTION OF AN ANTIBODY AGAINST *Burkholderia pseudomallei*

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Burkholderia pseudomallei is the causative agent of melioidosis, a tropical disease common in northern Australia and Southeast Asia. Thailand has the highest incidence and mortality rates. Due to its difficulty in diagnosis, melioidosis remains a major health risk. The bacterium was also resistant to many drugs, and the infection frequently recurred. Research into novel treatment is essential. Although monoclonal antibodies (mAbs) targeting capsular polysaccharide (CPS) of *B. pseudomallei* have emerged as a promising strategy for melioidosis treatment, the development of anti-melioidosis mAbs for potential therapeutic use remains challenging. In this study, we produce an anti-melioidosis monoclonal antibody that binds specifically to the capsular polysaccharide (CPS) of the *B. pseudomallei* strain from 4B11 hybridoma cells and test its functionality for binding to CPS. Results showed that the 4B11 hybridoma clone maintained stable viability and cell density over 8 passages, with its production curve peaking within five days. Growth curves showed cell viability above 50% during the 5-day production period. Protein A affinity chromatography was used to purify the antibody, which demonstrated a purity of 84% based on SDS-PAGE results. Western blot also proved the structural identity and functionality of this antibody. Finally, an indirect ELISA showed a high affinity binding to the CPS antigen. Taken together, we present the production and characterization of anti-melioidosis (4B11) monoclonal antibody. In the future, humanization of this antibody for human use can be explored as a potential therapeutic candidate.

Keywords: Monoclonal antibody, melioidosis, *Burkholderia pseudomallei*, hybridoma cell

P-15

PROTECTIVE EFFECTS OF MELATONIN ON ERASTIN-INDUCED FERROPTOSIS NEUROTOXICITY IN MURINE HIPPOCAMPAL HT-22 CELLS

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Ferroptosis is an iron-dependent and membrane lipid peroxidation-mediated form of programmed or regulated cell death. A number of recent studies have demonstrated that ferroptosis contributes to neurodegeneration-mediated nerve cell death. The pathology of neurodegenerative disease has been investigated to identify underlying mechanisms and determine efficient therapeutic strategies. Melatonin, a functionally versatile natural indoleamine, has shown promise in deferring neurodegenerative processes. Recent studies on melatonin also have identified its efficacy in mitigating key events of ferroptosis, introducing it as an anti-ferroptosis agent. In this study, we studied the effects of melatonin on HT-22 cells-induced ferroptosis using erastin. To confirm the occurrence of ferroptosis, we conducted measurements of cell cytotoxicity. The result showed that elastin decreased the cell viability and disrupted the regulation of glutathione peroxidase 4 (GPX4), proteins involved in ferroptosis. Following melatonin treatment, cell viability and the expression of GPX4 were increased. This study demonstrated that melatonin could effectively inhibit the pathological effects caused by erastin in HT-22 cells and further research is needed to confirm melatonin's efficacy in these pathological conditions, both in animal models and clinical trials.

Keywords: Melatonin, neurotoxicity, ferroptosis, glutathione peroxidase 4

P-16

RUTIN: AN ANTI- INFLAMMATORY AGENT FOR MANGANESE INDUCED INFLAMMATION IN RAW 264.7 CELLS

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Manganese is a naturally occurring trace metal that is also introduced into the environment through anthropogenic activities. While it is essential for numerous physiological functions, prolonged exposure to elevated levels of manganese has been associated with adverse health outcomes, including neurotoxicity and inflammation. *In silico* studies have suggested a potential pro-inflammatory role of manganese; however, the precise molecular mechanisms underlying manganese-induced inflammation remain poorly understood. Rutin, a well-characterized flavonoid, exhibits diverse therapeutic properties, including notable anti-inflammatory activity. Despite this, its role in modulating manganese-induced inflammation has not been comprehensively investigated. In this study, RAW 264.7 macrophage cells were exposed to various concentrations of manganese chloride for 24 hours to simulate acute exposure conditions. Differentially expressed genes (DEGs) were identified and analyzed using Gene Ontology (GO), Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway enrichment, protein–protein interaction (PPI) networks, and molecular clustering. Further analyses included transcription factor profiling, disease association mapping, and tissue specificity using the Metascape platform. Publicly available manganese exposure datasets from the Gene Expression Omnibus (GEO) were utilized to validate hub genes. Experimental validation was conducted through ELISA and immunoblotting to assess key inflammatory markers. The findings from this study provide novel insights into the molecular mechanisms of manganese-induced inflammation and support the potential of rutin as a therapeutic agent for mitigating these effects.

Keywords: Manganese, inflammation, bioinformatics, rutin, macrophage

Safety and toxicity of food, drugs and other chemicals including biofuels

P-17

ECOLOGICAL RISK ASSESSMENT OF MICROPLASTICS POLLUTION IN THAILAND

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This study synthesized data on microplastic abundance and characteristics within Thailand from 118 peer-reviewed publications (2017–2024). Predominant microplastic presence in crustaceans ranged of 1.69–160.15 items/g, followed by Mollusca (0.03–9.5 items/g) and fishes (0.01–28.17 items/g), with higher abundances in wastewater (4×10^2 to 6.09×10^5 items/m^3) compared to that in freshwater ($1.44–2.92\times 10^6$ items/m^3) and seawater (2.70×10^{-1} to 6.25×10^4 items/m^3). Marine sediments ($48.3–2.13\times 10^4$ items/kg) also showed significantly higher microplastic concentrations than terrestrial sediments ($3–2.92\times 10^3$ items/kg). Predominant microplastics were identified as fibers (59.36% and 35.05% for biological and environmental samples, respectively) and fragments (24.14%, 30.68%) in blue (25.95%, 18.64%), and colorless/transparent (20.01%, 14.47%), primarily composed of polyethylene terephthalate (19.46%, 9.19%), nylon (3.23%, 9.99%), polypropylene (19.78%, 24.23%), and polyethylene (14.81%, 11.66%). The potential ecological risk was low in all ecosystems except for wastewater. This study has compiled up-to-date insights into the prevalence, distribution, and risks associated with microplastics, which is instrumental in formulating effective strategies for contaminant control and ultimately reducing plastic pollution.

Keywords: Microplastics, Thailand, ecological risk

Environment / health impact assessment and management

P-18

ASSESSING RECYCLING OF BEVERAGE CARTONS IN THAILAND: A PASSIVE COLLECTION SYSTEM

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This study aimed to evaluate the recycling of used beverage cartons (UBCs) through a passive collection system in Thailand. The specific objectives are: (1) to determine the proportion of UBCs present in waste paper supplied to paper mills, and (2) to estimate the total quantity of UBCs in waste paper streams, including the expected recyclable materials (paper pulp) and residual wastes (polyethylene and aluminium foil). The study employed both primary and secondary data. Primary data were obtained through physical waste sampling of both old corrugated containers (OCC) and mixed paper (MP) at six paper mills and four large-scale baling facilities. Secondary data included statistical reports and published literature. The findings indicated that used beverage cartons (UBCs) were present only in the mixed paper (MP) grade. The study found that the average UBC content in MP was 0.029% ± 0.040%. The annual quantity of UBCs embedded in MP domestic collection was estimated from 157 to 162 tonnes between 2020 and 2023. Of these, approximately 153 tonnes of used beverage cartons (UBCs) were processed annually at domestic paper recycling mills, yielding about 84 tonnes of recyclable pulp converted into Kraft paper and 46 tonnes of Poly-Alu residue, which was utilized as an alternative fuel either internally in boilers or externally in cement and power plants.

Keywords: Used beverage cartons (UBCs), waste paper, mixed paper (MP), recycling

P-19

HEALTH RISK ASSESSMENT OF NICKEL AND CHROMIUM CONTAINING PARTICLES IN ARC WELDING FACTORY

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Welding is an essential process in Thailand's growing industrial sector but generates hazardous metal fumes that pose significant health risks. Of particular concern are nickel (Ni) and chromium (Cr), due to their toxicity and carcinogenicity. This study measured Ni and Cr concentrations in airborne dust from a welding factory in Chonburi Province and assessed associated health risks using personal and area samples. Results showed that personal sampling yielded higher Ni (1.35±0.29 – 2.74±3.43 μg/m³) and Cr (2.30±0.60 – 2.67±0.81 μg/m³) concentrations than area sampling. In all areas, hazard quotient (HQ) values remained below 1.0, indicating low non–carcinogenic risks. However, carcinogenic risks (CR) greatly exceeded the occupational limit of 1.00×10^{-4}. Ni risks ranged from $7.54 \times 10^{-3} \pm 0.00$ to $1.68 \times 10^{-2} \pm 0.02$, while Cr risks were markedly higher, ranging from $1.75 \times 10^{-1} \pm 0.04$ to $2.49 \times 10^{-1} \pm 0.08$, suggesting a substantially greater cancer risk from Cr exposure. These CR values exceed acceptable thresholds, indicating residual cancer risk. These findings emphasize the need for improved engineering controls and protective measures to safeguard worker health.

Keywords: Welding fume, nickel, chromium, health risk assessment, occupational exposure

P-20

INFECTIOUS WASTE GENERATION, KNOWLEDGE, ATTITUDE AND PRACTICE OF PERSONNELS TO THE INFECTIOUS WASTE MANAGEMENT IN SUB-DISTRICT HEALTH PROMOTION HOSPITAL OF THE RAYONG PROVINCIAL ADMINISTRATIVE ORGANIZATION

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This study aimed to determine the generation rate of infectious waste as well as knowledge, attitude, and practices of personnel to manage the infectious waste in Sub-district Health Promoting Hospitals (SHPHs) of the Rayong Provincial Administrative Organization (Rayong PAO). The amount of infectious waste and number of patients were collected from 85 SHPHs whereas questionnaire was used to evaluate the level of knowledge, attitude and practice of personnels. The average infectious waste generation rate was 0.88 kg/SHPHs/day while the average number of patient was 32.00 persons/SHPH/day. The significant correlation between the amount of infectious and number of patients (p-value<0.05) was observed in this study. The positive correlation coefficient (r = 0.703) indicates the influence of number of patients to the amount of infectious waste of SHPHs. The average infectious waste generation rate of patients was 0.0284 kg/person/day. Regarding to the regulation on infectious disposal in Thailand, the approximately 96.47% of personnels have relatively high knowledge, attitude and practice to manage the infectious waste in SHPHs .

Keywords: Infectious waste, Sub-district Health Promoting Hospital, knowledge, attitude, practice

P-21

MICROPLASTICS IN EVERYDAY DIET: QUANTIFYING CONTAMINATION IN SOFT DRINKS AND SEAFOOD IN THAILAND

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Microplastic (MP) contamination in human food and beverages is an increasing concern, but evidence from Southeast Asia remains limited. This study examines MP presence in two main dietary sources in Thailand: soft drinks and seafood. A total of 378 soft drink samples from nine popular brands were analyzed across different packaging types (plastic, aluminum, and glass). MPs were found in all brands, with concentrations ranging from 2 ± 3 to 39 ± 12 items per liter. Surprisingly, glass bottles showed higher MP loads than plastic or aluminum packaging, likely due to frequent reuse and the high surface energy of glass that attracts particles. MPs were mainly small (50–100 μm), with fragments (41–82%) and spheres (especially in cans) as the predominant forms. Micro-FTIR analyses identified PET in plastic bottles, while PP and PE were common in glass-bottled drinks, reflecting the materials used for packaging and sealing. Seafood analysis included blood cockles (*Tegillarca granosa*) and green mussels (*Perna viridis*) collected from aquaculture farms and local markets. MPs were found in all specimens, with commercial samples showing higher loads than farmed ones, suggesting additional contamination during packaging and transportation. Polypropylene, polyethylene, polyester, and nylon were the most frequently detected polymers. Smaller size fractions dominated, raising concerns due to their bioavailability and persistence in human diets. These findings confirm that MPs infiltrate both beverages and seafood commonly consumed in Thailand. Estimated consumer exposure from soft drinks alone could reach up to 1,600 MPs per person annually, while seafood contributes an additional dietary route. Given MPs' potential to penetrate biological tissues and carry hazardous chemicals, this study highlights an urgent need for stricter food packaging regulations, safer supply chain practices, and further assessment of health implications for Thai consumers.

Keywords: Microplastics, soft drinks, seafood, human exposure, Thailand

P-22

THE ASSESSMENT OF HEALTH RISKS FROM CHEMICAL AND MICROBIOLOGICAL CONTAMINATION IN WATER USE: A CASE STUDY OF HUAI SO MUNICIPALITY, CHIANG KHONG DISTRICT, CHIANG RAI PROVINCE

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Access to clean water and adequate sanitation is a fundamental human right under Sustainable Development Goal 6 (SDG 6), which aims to ensure universal access to safe drinking water by 2030. This study aimed to assess health risks associated with chemical and microbiological contamination in water use (village tap water and coin-operated drinking water from vending machines) in Huai Xo Subdistrict Municipality, Chiang Khong District, Chiang Rai Province. This research employed a cross-sectional analytical study design, consisting of two phases. Phase 1 Water quality results were analyzed, and the drinking water consumption behaviors of 150 residents were surveyed for the calculation of the Hazard Quotient (HQ). Phase 2 focused on health risk assessment, employing the Hazard Quotient (HQ) approach for chemical contaminants and Quantitative Microbial Risk Assessment (QMRA) for microbiological contamination. The findings indicated that water quantity and quality had the lowest scored (mean = 2.61). Laboratory analysis fond contamination of coliform bacteria (90.48%) and *E.coli* (66.67%). The most frequently detected chemical contaminants were arsenic (61.90%) and fluoride (33.33%). The health risk assessment showed that fluoride levels exceeded HQ > 1 in some place specifically in Ban Chaipattana (HQ = 4.769), Ban Kaen Nuea (HQ = 2.733), and Ban Kieng Tai (HQ = 1.536). Arsenic contamination presented unacceptable cancer risks such as in Ban Kaen Nuea (1.57×10^{-2}) and Ban Kieng Tai (1.10×10^{-2}). Regarding coin-operated water vending machines, most samples had HQ < 1, however, Ban Kieng Tai exhibited a fluoride HQ of 1.968, while arsenic was detected in 40% of the samples. Although *E.coli* was not found, coliform bacteria were still detected in 30% of the samples. In conclusion, the primary health risks associated with drinking water in the study area stemmed from fluoride and arsenic contamination, resulting in both non-carcinogenic risks (HQ > 1) and carcinogenic risks (Cancer Risk > 10^{-4}), coupled with high rates of coliform contamination. Therefore, integrated measures for water quality improvement, continuous monitoring, and effective risk communication to the public are recommended to ensure long-term access to safe and sustainable drinking water.

Keywords: Water use, chemical and biological contaminants, health risk assessment, Chiang Rai Province

P-23

THE EFFECTIVENESS OF FOOD HANDLER TRAINING COURSES ON HYGIENE AND SANITATION COMPETENCIES OF FOOD HANDLERS IN NONTHABURI MUNICIPALITY

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This survey research was aimed to compare the effectiveness of a food handler training program on hygiene and sanitation competencies between two training formats: training at the training venue (onsite training) and training via digital technology (online training). The sample consisted of 180 food handlers from food establishments in Nonthaburi Municipality, which equally divided into 90 participants per group. Data collection tools included a knowledge test, an attitude questionnaire, a practice questionnaire, and a sanitation standard assessment checklist based on the Department of Health's criteria (Clean Food Good Taste). Data were analyzed using descriptive and inferential statistics such as Chi-square test, and Independent Sample t-test at a significance level of 0.05.

Results of the study revealed that both training formats significantly improved knowledge, attitudes, and practices regarding food hygiene and sanitation ($p < 0.05$). After the training, all participants in both formats demonstrated good levels of knowledge, attitudes, and practices (100.00%). No statistically significant difference was found in knowledge scores between the groups ($p = 0.657$). The online training group had a significantly higher mean attitude score than the onsite training group ($p = 0.039$), whereas the onsite training group showed a significantly higher mean practice score compared to the online training group ($p < 0.001$). Chi-square test results indicated that knowledge and attitude were not significantly associated with the training format ($p > 0.05$). On the contrary, practices were significantly associated with the onsite training format ($p < 0.0001$). Clear improvements after both training formats were observed in the individual and environmental domains. Food establishments that met food sanitation standards were proportionally higher in the onsite training group (44.19%) compared to the online training group (35.00%). In conclusion, both training formats were effective in enhancing the competencies of food handlers. However, onsite training was more suitable for developing actual practices and compliance with sanitation standards. The findings suggest that continuous training should be promoted among food handlers, particularly those with less experience or who have never attended food sanitation training. Online training through video presentations should be further developed and integrated with instructor-led teaching to enhance learning effectiveness. Training content should emphasize personal hygiene as a priority, and a long-term follow-up system should be implemented to assess whether improvements in knowledge and attitudes translate into actual hygienic practices in food establishments. Relevant authorities should establish strategies to diversify and adapt training content to be more suitable for specific target groups.

Keywords: Food handlers, training formats at the training venue (onsite training), training formats via digital technology (online training), food handler courses, sanitation competency level of food handlers

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