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IMMUNOCYTOCHEMISTRY IS A USEFUL TOOL TO ASSESS THE PURITY OF PRIMARILY CULTURED CELLS

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Background: Primarily cultured cells have merits over immortalized cell line culturing as they imitate the physiological nature of the cells from their originating tissue more closely. However, attainment of purified primarily cultured cells is critical to ensure reliable downstream analyses. In primary culturing of mouse cortical astrocytes, other brain cells like neurons, microglia, oligodendrocytes, and epithelial cells could grow in the same culture. Therefore, establishment of method for purity assessment is crucial to ensure the reliability of experiment for primarily cultured astrocytes. **Objective:** To determine the purity of primarily cultured astrocytes through immunocytochemistry targeting astrocytes' cytoskeletal marker, glial fibrillary acidic protein (GFAP). **Methods**: Cerebral cortices of postnatal-day 2 mouse were mechanically crushed and viable cell counting was performed. Cells were seeded in plates containing warm medium at the concentration of 1 x 10^5 cells per well and grown until confluent. Confluent cells were reseeded in chambered cell culture slides and incubated. Cells were fixed with formalin and permeabilized with phosphate buffered saline containing Triton X-100. Non-specific binding proteins were blocked with blocking buffer. Cells were then incubated with monoclonal rabbit anti-GFAP antibody followed by Alexa Fluor 647 goat anti-rabbit IgG. Cell nuclei were counter stained with DAPI. Then, immunoreactivity was observed under the fluorescence microscope. The representative photomicrographs were taken for cell counting. The percentage was calculated for the number of GFAP and DAPI positive cells over the total number of DAPI positive cells. **Results**: The number of GFAP positive cells obtained is 98 ± 0.4% for four independent primary cultures. **Conclusions**: Immunocytochemistry targeting GFAP is a useful method to assess the purity of primarily cultured astrocytes. Hence, this study proved that immunocytochemistry could be applicable for purity assessment of any primarily cultured cells with known markers.

Keywords*:* astrocytes, cell purity, immunocytochemistry, GFAP

PHOTODEGRADATION OF BISPHENOL F USING TITANIUM DIOXIDE UNDER UVA IRRADIANCE

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Background: Bisphenol A (BPA), an endocrine-disrupting chemical (EDC) used during the manufacturing of plastic has been banned in many countries, including Malaysia. However, many industries have opted to replace BPA with Bisphenol F (BPF), an analog of BPA. Recent studies have revealed that BPF exerts similar adverse effects as BPA and therefore has raised concerns due to its presence in the environment that is caused by the degradation of microplastic. **Objective:** In this study, batch photodegradation studies were carried out to optimize the parameters required for titanium dioxide to photodegrade BPF under UVA irradiance. **Methods**: Various factors that affect the photodegradation process, such as the initial pH of BPF solution, photocatalyst dosage, and irradiation period, were optimized. The BPF solutions were analysed using a UV-Vis spectrophotometer at a wavelength of 228 nm. The adsorption ability of titanium dioxide during the photodegradation process was investigated using Langmuir and Freundlich isotherm models. **Results**: It was found that a complete photodegradation of BPF was achieved after 240 minutes of UVA irradiation at initial pH of 6 using 0.06 g of titanium dioxide. The isotherm data obtained indicated that the adsorption process that also took place during the photodegradation of BPF followed both Langmuir and Freundlich isotherm models. **Conclusion**: In conclusion, titanium dioxide is an efficient photocatalyst that is capable of complete photodegradation of BPF under UVA irradiance.

Keywords: photodegradation, bisphenol F, UVA light irradiation, titanium dioxide, endocrine-disrupting chemical

SCREENING OF BIOACTIVE COMPONENTS FROM DURIAN AND MANGOSTEEN AND ANALYZING THEIR INTERACTIONS WITH SARS-CoV-2 PROTEIN BY COMPUTATIONAL STUDIES

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Background: During the COVID-19 pandemic, researchers worldwide have been actively searching for effective treatments and preventive measures against SARS-CoV-2 virus. Therefore, computational studies are helpful in rapidly exploring the potential natural compounds of durian and mangosteen and analyse their interactions that could inhibit the activity of SARS-CoV-2. **Objective:** In this study, we aimed to screen bioactive compounds from durian and mangosteen for potential inhibitors by analysing their interactions with SARS-CoV-2 by computational studies. **Methods**: The bioactive compounds of durian and mangosteen were retrieved from PubChem database with information on chemical substances, and their biological activities were considered for the research study. The sitemap of Maestro Schrödinger was used to study the interactions and binding affinities of the potential bioactive compounds with the target protein of SARS-CoV-2. The selected compounds' various pharmacokinetic, drug-like, and medicinal chemistry properties were also predicted using SwissADME, an open-access webserver. **Results**: According to Lipinski's rule of five, only 24 for durian and 26 for mangosteen bioactive compounds over thousands were filtered. After individual dockings were performed, lead compounds with the highest interaction energies were selected. Kaempferol from durian showed the highest docking score of -7.687 kcal/mol and formed two hydrogen bonds with Glu 166 and Gly 143, followed by chrysanthemin from mangosteen showing the highest docking score (-7.311kcal/mol), among mangosteen bioactive compounds against the main protease and formed five hydrogen bonds with Asp 187, Thr 26, Hip 163, Asn 142 and Gly 143. There was no evidence of carcinogenic or hazardous effects in any of the three two compounds. **Conclusions**: Kaempferol and chrysanthemin are promising therapeutic candidates against SARS-CoV-2 based on their inhibitory effects observed in computational studies.

Keywords: Bioactive compounds, SARS-CoV-2, *in silico*

NEUROPROTECTIVE EFFECT OF MANGIFERIN AGAINST 3-NITROPROPIONIC ACID INDUCED HUNTINGTON'S DISEASE-LIKE SYMPTOMS IN RATS

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Background: Huntington's disease (HD), a neurodegenerative disease, normally starts in the prime of adult life, followed by a gradual occurrence of psychiatric disturbances, cognitive and motor dysfunction. The daily performances and life quality of HD patients have been severely interfered by these clinical signs and symptoms until the last stage of neuronal cell death. To the best of our knowledge, no treatment is available to completely mitigate the progression of HD. Mangiferin, a naturally occurring potent glucoxilxanthone, is mainly isolated from the *Mangifera indica* (mango) plant. Considerable studies have confirmed the medicinal benefits of mangiferin against memory and cognitive impairment in neurodegenerative experimental models such as Alzheimer's and Parkinson's diseases. **Objective:** Therefore, this study aims to evaluate the neuroprotective effect of mangiferin against 3-nitropropionic acid (3-NP) induced HD-like symptoms in rat models. **Methods**: Adult Wistar rats (n = 32) were randomly allocated equally into four groups of eight rats each: normal control (Group I), disease control (Group II) and two treatment groups (Group III and Group IV). Treatment with mangiferin (10 and 20 mg/kg, p.o.) was given for 14 days, whereas 3-NP (15 mg/kg, i.p.) was given for 7 days to induce HD-like symptoms in rats. Rats were assessed for cognitive functions and motor coordination using open field test (OFT), novel object recognition (NOR) test, rotarod and grip strength tests. Histopathological study on brain tissue was also conducted using hematoxylin and eosin (H&E) staining. **Results**: 3-NP triggered anxiety, decreased recognition memory, reduced locomotor activity, declined rotarod performance and grip strength were alleviated by mangiferin treatment. Mangiferin also mitigated 3-NP induced histopathological alteration in the brain hippocampus, striatum and cerebral cortex sections. **Conclusions**: The findings from the present investigation provide a new possibility of mangiferin as an alternate and effective therapeutic agent in treating HD.

Keywords*:* 3-nitropropionic acid, Huntington's disease, mangiferin, natural product, neuroprotective

EVALUATION OF ANTIDIABETIC ACTIVITY OF *Christia vespertilionis* LEAVES EXTRACT USING STREPTOZOTOCIN INDUCED OBESE-DIABETIC RAT MODEL

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Background: About 537 million adults worldwide have diabetes, which is becoming more common among all aged people due to over-nutrition and increasingly sedentary lifestyles. Current therapies are effective but not without limitations, so there is an urgent need for safer and more efficient alternative treatments. Medicinal plants have been a traditional medicine for thousands of years and are a good source of new remedies against many life-threatening diseases. *Christia vespertilionis* (CV) is an emerging plant that scientifically reported its antidiabetic properties via α- glucosidase inhibition activity. **Objective:** The study aims to evaluate the antidiabetic activity of ethylacetate: hexane 50:50, v/v, (EH) extract of CV leaves extract using a streptozotocin-induced obese-diabetic rat model. **Methods**: The CV plant's dry leaves were gathered, powdered, and macerated for three days with a 50:50, v/v EH, changing each solvent daily. After filtration and evaporation, the crude extract was collected and kept at -80°C. Rats in group 1 were fed regular rat pellets, while groups 2 to 5 were given a high-fat diet (HFD). Following a successful obesity induction, 60mg/kg of streptozotocin was intraperitoneally injected into the HFD groups. For the following four weeks, 250 mg/kg body weight (BW) and 500 mg/kg BW dosages were administered. Body weight changes, plasma glucose, insulin levels, haematological parameters, organ weights, and histological analyses were assessed. **Results:** Extract of CV (250 mg/kg BW and 500 mg/kg BW) showed a significant reduction in plasma glucose level compared to normal rats. However, no significant changes in insulin levels compared to normal rats. Additionally, the treatment groups exhibit improved histopathological alterations compared to the untreated, positive control, and normal groups. **Conclusion**: In conclusion, CV leaves extract has potential antidiabetics that provide scientific evidence to substantiate the traditional use of CV plant in managing diabetes mellitus.

Keywords*: C. vespertilionis*, obese-diabetic, plasma glucose, insulin, histopathology

Graptophyllum pictum LEAVES ETHANOL EXTRACT: ANTIOXIDANT ACTIVITY AND ITS PHOTOPROTECTIVE POTENTIAL IN SUNSCREEN CREAM FORMULATIONS

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Background: Natural substances present in various medicinal plants have been used in medicines and cosmetics due to their absorption in the ultraviolet (UV) region and their antioxidant activity against skin damage. *Graptophyllum pictum* leaves, locally known as "Puding" or purple leaves, have antioxidant and photoprotection sources. **Objective:** The present study evaluated the antioxidant and Sun Protection Factor (SPF) activities of the ethanol extract of *G. pictum* leaves as well as the photoprotective potential of the formulated sunscreen creams consisting of ethanol *G. pictum* extract. **Methods**: Antioxidant activity of the *G. pictum* leaves ethanol extract was evaluated using three different spectrophotometry methods, mainly DPPH (1,1-Diphenyl-2-picrylhydrazyl), ABTS, and hydrogen peroxide radical scavenging assays. The total phenolic and flavonoid contents in the ethanol extract were also determined. The SPF of the ethanol extract and the sunscreen cream formulations consisting of different concentrations of the *G. pictum* leaves ethanol extract [1% (F1), 2% (F2), and 3% (F3)] were analysed using an ultraviolet-visible (UV-Vis) spectrophotometer. **Results**: The ethanol extract of *G. pictum* leaves has a total flavonoid content of 133.79 ± 0.32 µg/mL and a total phenolic content of 84.87 ± 0.36 µg/mL. Based on the DPPH, ABTS, and hydrogen peroxide scavenging assay results, the ethanol extract showed potent antioxidant activity with IC_{50} of 31.17±1.03, 17.33±2.57 and 10.00 ±0.79 µg/mL, respectively. The SPF values ranged from 6.42 to 26.6 for the ethanol extract. Meanwhile, the F3 sunscreen cream formulation showed the highest SPF values, ranging from 4.06 to 20.01 in comparison to the F1 and F2 formulations. **Conclusions:** These findings revealed that the ethanol extract of *G. pictum* leaves possesses good antioxidant and photoprotective activities and the sunscreen cream formulated using the ethanol extract also exhibited good photoprotective activity.

Keywords: *Graptophyllum pictum*, antioxidant, total phenolic content, total flavonoid content, sun protective factor

Penicillium-DERIVED IRON OXIDE NANOPARTICLES: BIOSYNTHESIS, CHARACTERIZATION, ANTIBACTERIAL AND ANTIOXIDANT ACTIVITIES

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Background: Fungus-derived nanoparticle production has received extensive attention for biomedical applications due to its eco-friendly, biocompatible, and cost-effective benefits. **Objectives:** The current study focused on the synthesis of iron oxide nanoparticles (IONPs) from soil-isolated *Penicillium rolsfii* (*P. rolsfii)* and their antibacterial and antioxidant properties. **Methods:** The aqueous extract of *P. rolsfii* was treated with 3 mM iron chloride ($FeCl_3$). UV-Vis spectroscopy, TEM, FTIR, SEM, EDX, and zeta potential analyses were used to characterize the synthesized IONPs. The antibacterial and antioxidant activity of IONPs were determined using the disc diffusion method and DPPH assay, respectively. **Results:** The characterization of synthesized IONPs was assessed using a UV-Vis spectrophotometer that revealed an absorption peak at 285 nm, which supports the generation of IONPs. FTIR revealed the protein (amine and amide) involved in the formation of IONPs. SEM and TEM analysis indicated that the IONPs were spherical in shape (size 8.93 to 14.65 nm). The presence of iron was confirmed by EDX. Zeta potential analysis showed the positive charge on the surface (+35.07±1.2 mV) of IONPs confirming its stability. The zone of inhibition recorded against *E. coli, S. sonnei, K. pneumoniae, P. aeruginosa,* and *S. aureus* were 11.7±0.6 mm, 12±0.6 mm, 11.3±0.6 mm, 11.0±0.6 mm, and 11.5±0.7 mm, respectively, at the concentration of 250 µg/ml IONPs. IC_{50} of IONPs was 140 µg/ml which was much higher than ascorbic acid (1.25 µg/ml). **Conclusion:** The biosynthesized IONPs from *P. rolsfii* showed potential antibacterial and antioxidant properties against selected bacterial pathogens.

Keywords*:* Iron oxide nanoparticles, *P. rolsfii,* TEM, antibacterial activity, antioxidant activity

EVALUATION ACUTE AND SUBACUTE TOXICITY STUDIES OF *Christia vespertilionis* LEAVES EXTRACT IN SPRAGUE-DAWLEY RATS

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Background: *Christia vespertilionis* is known as “rama rama” and “rerama” in Malaysia. The plant has been traditionally used to treat and prevent diverse diseases such as microbial infection, strengthen bone health, and improve blood circulation, sore throat, and cold. These activities are due to alkaloids, steroids, triterpenes, tannins, flavonoids, flavones, phenols, and glycosides. Since it is a promising medicinal plant, the safety of ethylacetate:hexane 50:50, v/v, (EH) extract was evaluated for its toxicity effect following the OECD guidelines 423 and 407. **Objective:** The study aims to assess the toxicity profile of *C. vespertilionis* leaves extract through acute and subacute toxicity studies on Sprague-Dawley rats. **Methods**: In the acute toxicity study, adult male and female Sprague-Dawley rats were orally administered a single dose of 2000 mg/kg of EH extract of *C. vespertilionis* and observed for 14 days. The subacute toxicity study involved oral administration of doses (50, 500, and 1000 mg/kg, BW) of the extract for 28 days consecutively. Assessments included clinical observations, body weight changes, haematological parameters, organ weights, gross pathology, and histopathological analysis. **Results**: Results revealed no deaths or significant toxicity signs in acute and subacute toxicity studies. Rats treated with the extract displayed normal behaviour, increased body weight, and maintained normal food and water intake. Haematological and biochemical analyses showed no significant changes between the control and the treated group of both sexes. **Conclusions**: The study demonstrated a favourable safety profile of EH extract of *C. vespertilionis* extract, with no acute or subacute toxicity observed. Thereby, EH extract of *C. vespertilionis* could be considered safe within the doses tested for the results of the toxicological evaluation.

Keywords*:* acute toxicity, subacute toxicity, *C. vespertilionis*, rats, biochemical profile

THE EFFECT OF EXOGENOUS COENZYME Q10 SUPPLEMENTATION ON VITRIFIED MOUSE EMBRYO

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Background: Infertility affects approximately 15% of couples in Malaysia. Assisted Reproductive Technology (ART) is a common treatment of choice for many couples facing infertility issues. However, it comes with its own challenges due to the absence of natural protective mechanisms and exposure to the external environment, which can result in oxidative stress and subsequently impact embryo development. The supplementation of antioxidants in culture media has been suggested to improve the ART outcomes. Coenzyme Q10 (CoQ10) is one of antioxidant that is claimed to have positive effect on embryo development. However, there has been relatively limited research conducted on the effects of CoQ10 on vitrified embryos. **Objective:** To optimize the CoQ10 concentration as a supplement in embryo culture medium and to investigate the effect of CoQ10 on the developmental potential following *in vivo* fertilization and vitrification. **Methods:** Balb/c mouse embryos were cultured in KSOM culture media using four different groups with varying CoQ10 concentrations (control, 20μM, 40μM and 60μM). The development of blastocysts was observed in all groups. The best concentration of CoQ10 was selected for further investigation of its effects on developing embryos after vitrification. Results were analysed using the Chi-square test. **Results:** The results demonstrated that the group with a CoQ10 concentration of 40 μM exhibited the highest blastocyst formation (95%) as compared to the control group (93%), 20μM group (65%) and the 60μM group (56%) (p<0.001). For vitrified embryos, the results showed that the supplementation of CoQ10 led to a significant increase in blastocyst formation (92%) compared to control group (78%) (p<0.05). **Conclusions:** The supplementation of CoQ10 in culture medium has shown promising results as a cost-effective technique to improve the developmental potential of preimplantation embryos, particularly when used at the optimum concentration. It also could increase the blastocyst formation in vitrified embryos. These findings suggest that CoQ10 supplementation can be a beneficial strategy to improve the ART outcomes.

Keywords: coenzyme Q10, vitrification, blastocyst formation

COMMUNITY ACCESSIBILITY TO MENTAL HEALTH SERVICES IN MALAYSIA: A REVIEW

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Background: Mental health illnesses are becoming serious phenomena, remarkably post covid19 pandemic. Nevertheless, people who are at risk of or undiagnosed mental health illnesses left untreated as they are unaware of where to seek help particularly among Malaysians. Despite an emergent of mental health services provided, there are challenges to access to the services both community and mental health providers. Thus, this review discourses around the way the community with mental health illnesses access to the mental health services and their fondness. **Objective:** 1. To evaluate the current situation of community accessibility to mental health services (MHS) in Malaysia. 2. To identify the common mental health services accessed by people with or at risk of mental health illnesses in Malaysia. **Methods**: A profundity search was performed by using databases which are Scopus, Web of Science, Science Direct and Google Scholar to identify related articles. The articles were screened based on their titles and abstracts before the full texts were reviewed. **Results**: The finding of this review indicate that most of the people in Malaysia getting treatments at later stage of mental illnesses. Commonly, the treatment delayed at the first access to the mental health services due to challenges included lack of literacy in mental health, knowledge on how and where to seek help, stigmatism, and lack of mental health service providers. The review also found that primary care is the most mental health services accessed by the community compared to others particularly in community or social settings. **Conclusions**: Clearly, there are gaps in accessing the mental health services in Malaysia specially among people who are at risk of early-stage mental health illnesses. Community pharmacists, the closest health professionals to the community may get involved and play roles in increasing accessibility in the future.

Keywords*:* mental health illness, mental health services, access, Malaysia

DESIGN AND SYNTHESIS OF BIVALENT N^2-β-CARBOLINE DERIVATIVES AS A POTENTIAL COMPOUND DERIVED CHEMOTHERAPEUTIC AGENTS

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Background: β-carboline alkaloids are widely distributed in natural products and represent a promising drug-like scaffold for discovering drugs and bioactive molecules. **Objectives:** This study aimed to design and synthesize new bivalent N^2-benzylated-β-carboline derivatives as potential chemotherapeutic agents and to evaluate the interaction of the synthesized compounds with DNA. **Methods:** Therefore, a new series of bivalent N^2-benzylated-β-carboline bromide derivatives (**T5b.3-T5b.10**) were synthesized and characterized from the commercially available starting material L-tryptophan using a four-step reaction method, and the yields obtained were >50%. Subsequently, all synthesized compounds were evaluated for *in vitro* cytotoxicity using the MTT assay with the human cancer cell line K562. **Results:** It was found that these compounds exhibited potent anticancer activity with IC_{50} values ranging from 1.64 to 4.00 μM. The interaction of the synthesized compounds with DNA was analysed by UV-Vis spectroscopy using calf thymus DNA (CT-DNA). The UV-Vis spectrum showed a hypochromic effect and a red shift indicating intercalation of the compound with DNA. For the computer simulation, which is an *in-silico* study, the synthesized compounds were docked to the dodecamer duplex of the sequence d(CGCGAATTCGCG)2 (PDB ID: 1BNA) using the molecular docking technique and an intercalation mode of binding was revealed. **Conclusion:** In conclusion, this study has the potential to produce new chemotherapeutic agents that can help save the lives of cancer patients.

Keywords*:* bivalent β-carboline, *in vitro* cytotoxicity, drug-DNA study, UV-Visible, molecular docking

HYPERGLYCAEMIA INDUCES CHEMORESISTANCE IN CERVICAL CANCER CELLS

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Background: Cervical cancer is the fourth most common cancer in women worldwide. Studies have shown that patients with cervical cancer and pre-existing diabetes have a worse prognosis than those without diabetes. Currently, chemotherapy is the main treatment for inoperable or advanced postoperative cervical cancer. However, the resistance of cervical cancer to chemotherapy drugs is highly affected by the glucose conditions of the patient. In uncontrollable diabetic patients, cervical cancer is more resistance towards chemotherapy drug compared to non-diabetic patient which causes poorer prognosis of the cancer patient. **Objective**: The aim of this study is to investigate the effect of hyperglycaemia on the response of cervical cancer cells to chemotherapy. **Method:** Using Hela cells, we investigated the effect of different glucose conditions in 5 mM, 9 mM and 25 mM on cells' response to chemotherapy drug cisplastin at concentration of 10 µM and 60 µM. Trypan Blue dye-exclusion assay was used to determine the percentage of cell death. **Results:** We found a significant reduction capability of cisplastin-induced apoptosis on Hela cells grown in 9 mM and 25 mM glucose conditions as compared to Hela cells grown in normal glucose conditions (5mM). In 10 µM cisplastin concentration, we found about 12 % and 28 % reduction of dead cells in 9 mm and 25 mm glucose condition compared to normal glucose condition. Whereas in 60 µM cisplastin concentration, we found about 14 % and 25 % reduction of dead cells at 9 mM and 25 mM glucose condition compared to normal glucose condition which is the 5mm respectively. **Conclusion:** Hyperglycaemia was suggested to induce resistance to chemotherapy drugs in cervical cancer cells. These findings may have important implications for the therapeutic strategy optimization of cervical cancer patients with pre-existing diabetes.

Keyword: Hyperglycaemia, Cervical Cancer, Chemotherapy drug, chemosensitivity, cisplatin, epithelial to mesenchymal transition.

IN VIVO EVALUATION OF CYCLOSPORINE-LOADED NANOEMULSION FOR TOPICAL TREATMENT OF PSORIASIS

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Background: The chronic disfiguring skin disorder like psoriasis, manifested by silvery-white scales and thickened plaques has been linked with various life-threatening conditions. Currently, the disease is treated by cyclosporine as it exhibits anti-inflammatory activity. However, long-term therapy of oral cyclosporine is significantly associated with dose-dependent toxic effects, while conventional topical route is very challenging due to poor absorption and low drug bioavailability properties. Therefore, cyclosporine-loaded nanoemulsion indicated for topical psoriasis treatment is believed to safely treat psoriasis-like symptoms while avoiding adverse effects of systemic treatments. **Objective:** The study was aimed to investigate the efficacy of topical cyclosporine-loaded nanoemulsion and evaluate its anti-psoriatic activity on psoriatic-induced mice. **Methods**: This study was conducted in accordance with OECD-404 guidelines by using female BALB/c mice (healthy and psoriatic-induced mice). The mice were allotted into three groups. Each group of mice received three different treatment classes (control, plain nanoemulsion, and cyclosporine-loaded nanoemulsion). The skin irritation and anti-psoriatic activity of each group of treatment were evaluated on psoriatic-induced mice. The inflammation severity was determined by the psoriasis area severity index (PASI) score and spleen-to-body weight ratio. **Results**: From the results obtained, the PASI score of erythema, induration, and scaling increased due to induction of psoriasis. After therapy termination, the imiquimod-treated nanoemulsion group recorded the highest percentage of psoriasis reduction up to 75.54%, revealing superior anti-psoriatic efficacy in comparison to plain nanoemulsion and positive control groups, which recorded psoriasis reduction of only 34.07% and 18.58%, respectively. The spleen-to-body weight ratio in treatment groups decreased, presenting a high therapeutic potential of the formulation in psoriasis. **Conclusions**: Cyclosporine-loaded nanoemulsion was suggested to be safe for topical treatment of psoriasis and effectively reduce the remission of psoriasis-like symptoms.

Keywords*:* cyclosporine, nanoemulsion, psoriasis, topical

SYNTHESIS AND CHARACTERISATION OF CIPROFLOXACIN CONJUGATED GOLD NANOPARTICLES FOR THE TREATMENT OF *Pseudomonas aeruginosa* BIOFILM

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Background: *Pseudomonas aeruginosa* is the major culprit of nosocomial lung infections, known to be resistant to various antibiotics currently available on the market. An important virulence factor that gives rise to the multi-drug resistance bacteria is the biofilm formation. Currently, metal nanoparticles have shown great inhibition capability towards the biofilm formation. **Objective:** In this study, ciprofloxacin - gold nanoparticles (AuNPs) conjugates were synthesised to study the antibacterial and biofilm inhibitory capabilities. **Methods:** AuNPs were synthesised through chemical reduction method using trisodium citrate as reducing agent. Ciprofloxacin HCl was then conjugated with AuNPs by which the concentrations of ciprofloxacin and AuNPs were identified to achieve treatment with highest stability. After characterising the conjugates, the ability of ciprofloxacin-AuNP conjugates to inhibit the growth and biofilm formation of *P. aeruginosa* PAO1 were studied. **Results:** By comparing the minimum inhibitory concentration (MIC) of AuNP and ciprofloxacin alone as well as ciprofloxacin-AuNP conjugate (Cipro-AuNP), the cipro-AuNP exhibit a much lower MIC value at 0.25%v/v, followed by ciprofloxacin and AuNP. Besides, cipro-AuNP possessed excellent antibiofilm properties. **Conclusion:** With the results obtained, AuNP functions as an antibiofilm agent in which biofilm formation was inhibited. The ciprofloxacin alone kills the bacteria but only at high concentrations, showing that the penetration of ciprofloxacin into the bacteria biofilm was limited by the biofilm matrix wall. Thus, the conjugated cipro-AuNP works effectively by first breaking down the biofilm of PAO1, then ciprofloxacin plays it role to eliminate the bacteria.

Keywords: *P. aeruginosa*, biofilm, gold nanoparticle, antibacterial

EFFECTS OF QUERCETIN TOWARDS LIPOPOLYSACCHARIDE (LPS) ACTIVATED MICROGLIA: A REVIEW

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Background: Microglia regulates homeostasis in the central nervous system (CNS) and is involved in neuroinflammation. During the inflammatory response, microglia transform into amoeboid phagocytic cells, resulting in pathogen phagocytosis. Activated microglia undergo dramatic morphological and functional changes, releasing both pro- and anti-inflammatory cytokines. Due to that, quercetin will antagonize cell toxicity by oxidative stress in neurons and suppresses neuroinflammatory processes by downregulating pro-inflammatory cytokines, while stimulating neuronal regeneration. Quercetin is a flavonoid that is phytochemical and occurs in free form (aglycone) or conjugated. It can sensitize the microglial response through its antioxidant and anti-inflammatory effects. It is a flavone class of flavonoids that occurs as aglycone. High concentrations of quercetin can be found in onions, apples, caper, and berries. **Objective:** This review aims to examine the effects of quercetin on LPS activated microglia. **Methods:** A literature search was done to identify relevant research on the effects of quercetin on LPS activated microglia. Databases including PubMed, Scopus, Science Direct, and Google Scholar were searched using specific keywords. The articles were selected based on their relevancy and reliability. **Result:** This review placed a key focus on highlighting the numerous potential of quercetin towards LPS activated microglia. These include antioxidant, anti-inflammatory, anticancer, and antimicrobial properties. Safety considerations and regulatory aspects are also given due consideration. **Conclusion:** Thus, quercetin which is a flavonoid will act as anti-oxidant that will reduce LPS - induced neuroinflammation, as it is one of the classical triggers that will induce the M1 phenotype, which will produce a pro-inflammatory phenotype that causes neurodegenerative disease. Nonetheless, more research and development are required to fully investigate their effects on microglia. This review provides a comprehensive overview of current knowledge and lays the groundwork for future research and development in this rapidly evolving field.

Keywords: quercetin. LPS activated microglia, neuroinflammation

THE COMBINATION OF POLYPHENOLS AND CHEMOTHERAPEUTIC AGENTS FOR ENHANCED CANCER THERAPY: A REVIEW

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Background: Curcumin is a natural dietary polyphenol compound that has demonstrated various application in the treatment of communicable and non-communicable diseases such as cancer. Many studies have demonstrated that curcumin possessed selective toxicities towards cancer cells while exerting negligible effects towards healthy cells. Curcumin is highly unstable in physiological conditions owing to its limited aqueous solubility. The encapsulation of curcumin into nanoparticles have gained attention to improve targeted drug delivery and efficacy in cancer treatment. Nanoparticles could stabilize hydrophobic anti-cancer drugs, enhance their effects, and increase cellular uptake. Combining bioactive compounds from medicinal plants with anti-cancer drugs may effectively interact with cancer cells and deliver the agents. **Objectives:** Therefore, this review focusses on the recent advances of combination of curcumin and anti-cancer agents in nanoparticle of free form to treat cancers. **Methods:** We have gathered the information on the anticancer activities of curcumin in combination with other compounds from articles published in internationally recognized database including PubMed, Science Direct, Wiley, Google Scholar, Springer, Web of Science, Francis & Taylor and Scopus. These databases were thoroughly searched and relevant publication records from 2000 to 2023 were selected from the keywords as follows: curcumin, nanoparticle, cancer, combination. **Results:** The combination of PTX and CUR has been found to have enhanced anti-cancer activities towards colon cancer, similar therapeutic efficacy to free drugs, and suppressed tumour growth and reduced tumour size in a breast cancer mouse model. CUR also minimizes the toxicity and side effects associated with PTX and reduce fatigue. **Conclusion:** Curcumin is a versatile compound that could be combined with various anticancer agents for the treatment of cancer.

Keywords: curcumin, nanoparticle, cancer, combination

COMBINATION OF POLYPHENOL COMPOUNDS TOWARDS CANCER TREATMENT

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Background: Polyphenols compound from plants have been proven to be effective against cancer. For instance, karanjin is a furanoflavonol isolated compound from *Pongamia pinnata (L.) pierre* with excellent antioxidant properties and other biological benefits. Curcumin, [Cur (1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione)] and is highly available in normal diets and extensively studied for its wide range of medicinal applications such as anti-cancer, antioxidant, anti-diabetic and anti-inflammation. However, curcumin is a poorly water-soluble compound which hampered its clinical application. Recent study showed that combination of curcumin and quercetin in the form of encapsulated nanoparticle demonstrated significantly higher stability and synergistic effect against lung cancer. **Objective:** Therefore, this review focuses on the recent advances of combination of polyphenols to treat cancers. **Methods**: The information on the treatment of cancer using combination of polyphenols from articles published in internationally recognized database including PubMed, ScienceDirect, Wiley, Google Scholar, Springer, Web of Science, Francis & Taylor, and Scopus were gathered. These databases were thoroughly searched and relevant publication records from 2000 to 2023 were selected from the keywords as follows: polyphenol, nanoparticle, cancer, combination. **Results:** Co-delivery of curcumin and quercetin using apoferritin nanoparticles was reported to be more effective in killing breast cancer cells at a lower dose. Curcumin and quercetin were also effective in preventing cancer progression in mice by inhibiting reactive oxygen species in vivo. Combination of curcumin and resveratrol inhibited the growth of colon cancer cells via inhibition of NF-κB activity. Combination of quercetin and ellagic acid showed a synergistic profile to kill human leukaemia cells at 5 μmol/L. **Conclusions**: Combination of polyphenol compounds showed great promising results as anti-cancer agents.

Keywords*:* polyphenol, cancer, nanoparticle

THE PERCEPTION OF ELDERLY TOWARDS TIME BANK IN ADDRESSING THEIR HEALTH AND SOCIAL NEEDS

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Background: There is a rising concern on the well-being of the elderly in Malaysia. As children grow and migrate, elderly with limited physical and cognitive capacity are often left to navigate their senior years alone. Hence, this study proposes a community-based solution to combat this issue; time-banking. Time banking is an exchange system in which time is the primary currency. The elderly need not worry about paying for assistance or help because they may trade time for services from members of the community. Each person's effort is valued in a time back which is a reciprocating service system that prioritizes social rather than economic gains. **Objective**: To study the elderly's perception of using time banking in addressing their health and social needs. **Methods:** This study begins with Phase I, where the study focuses on identifying the health and social needs of the elderly. Then, with the information gathered, the time bank project (Phase II) will be introduced for 6 months to accommodate for the health and social needs. Once the 6 months are over, Phase III will commence. **Result:** In Phase III, the opinions and perceptions of elderly will be collected through a survey to analyse the effectiveness of time bank in addressing the health and social needs of the elderly population through thematic analysis. **Conclusion:** This study can lay a foundation for the mechanisms of operating time banks locally. Consequently, this study can provide valuable insight into the incorporation of how time banks can be integrated into government policies either for the welfare of elderly or managing social issues. NGOs can also benefit from time banks as it is a form of volunteerism. Ultimately, this study will serve as a phenomenal opportunity to examine how time banking influences the fulfilment of needs among the elderly without cash transaction.

Keywords*:* elderly, time banks, community, social, health

COLLUSION OF CALCIUM-REGULATED PROTEINS IN THE ANTIAPOPTOTIC EFFECT OF PHILANTHOTOXIN-343 AGAINST NMDA-INDUCED RETINAL GANGLION CELL DAMAGE IN SPRAGUE DAWLEY

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Background: Irreversible vision loss due to retinal ganglion cell (RGC) apoptosis caused by N-methyl-D-aspartate receptor (NMDAR) mediated excitotoxicity is a common pathological feature in several retinal and optic nerve diseases including diabetic retinopathy. **Objective:** In the present study, we looked onto the neuroprotection of philanthotoxin (PhTX)–343 against NMDA-induced excitotoxic injury in rat retinas involving calcium-regulated proteins. **Methods:** Sprague-Dawley rats were divided into; Group I was intravitreally injected with phosphate buffer saline, Group II with NMDA and Group III with PhTX-343 24 h prior to NMDA. Seven days post-treatment, retinal tissues were harvested and subjected to H&E staining, ELISA (Calpain-1, Cabin-1, Calcineurin, BAX, Caspase-3, BCL), immunohistochemistry (Caspase-3, Brn3A, a marker specific to surviving RGCs) and PCR (calpain, cabin-1, calcineurin). **Results:** NMDA-treated group displayed extensive loss of retinal cell nuclei and thinning of the ganglion cell layer (GCL), greater calpain, calcineurin, BAX, caspase-3, lower cabin-1, BCL, and markedly lower Brn3A expression when compared with PhTX-343 group. Treatment with PhTX-343 resulted in significantly higher number of retinal nuclei within the GCL compared to the NMDA group. Strikingly lower calpain and calcineurin, and greater cabin-1 expression was seen in PhTX-343 treated retinas as opposed to the NMDA group. In PhTX-343 group, retinas showed lower BAX and caspase 3 expression, while BCL-2 expression was greater in contrast to the NMDA group. PhTX-343 treatment was associated with greater RGC survival as the Brn3A expression was significantly greater in comparison to the NMDA group. All parameters measured for PhTX-343 group were statistically comparable with the negative control **Conclusion:** In short, PhTX-343 protected against NMDA-induced RGC apoptosis by modulating the expression of calpain-1, cabin-1, and calcineurin.

Keywords*:* Glaucoma, N-methyl-D-aspartate, Philanthotoxin apoptosis, excitotoxicity

VITAMIN D DEFICIENCY KNOWLEDGE AND VITAMIN D-RELATED BEHAVIOURS OF MALAYSIAN ADULTS

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Background: Vitamin D deficiency (VDD) is a global epidemic associated with a variety of musculoskeletal and non-musculoskeletal diseases, primarily due to insufficient sun exposure and inadequate vitamin D intake. Despite high levels of sunlight throughout the year in Malaysia, VDD remains highly prevalent among Malaysians. **Objective:** This study aims to assess the knowledge of VDD and vitamin D-related behaviour among Malaysian adults. **Methods**: A cross-sectional survey was conducted utilizing questionnaires adapted from different studies and distributed physically as well as through online platforms. The data were analysed using SPSS for Windows (version 23.0). The association between respondents' characteristics with knowledge and behaviour was examined using the Kruskal Wallis and Mann Whitney-U test. Additionally, the correlation between knowledge of VDD and vitamin D intake was assessed using Spearman's rank correlation test. **Results**: A total of 336 respondents were predominantly Malay (84.8%), female (78.3%), aged 18 to 29 (86.6%). The majority of respondents (83.0%) had a poor level of VDD knowledge, whereas the remaining had adequate knowledge (17.0%). Gender is significantly associated (p<0.005) with respondents' knowledge of VDD, however none is associated with respondents' behaviours related to vitamin D intake. Respondents generally do not get enough sunlight exposure and always practise some sun-protective behaviours (e.g., wearing covered clothing and applying sunscreen). Furthermore, most of them (50.9%) also never take vitamin D supplements. Lastly, there was a positive and significant but weak correlation between VDD knowledge and respondents' behaviours related to vitamin D intake (r=0.362, p <0.001). **Conclusions**: Malaysian adults display a low level of knowledge regarding VDD, which can impact their vitamin D-related behaviour and awareness of the importance of adequate vitamin D levels. It is crucial for relevant authorities and healthcare professionals to educate the public about the significance of vitamin D through initiatives such as public health campaigns.

Keywords*:* vitamin D, vitamin D deficiency, vitamin D related behaviours, Malaysia

POTENTIAL UTILIZATION OF POLYSACCHARIDE-POLYPHENOL CONJUGATES IN HEALTH: A REVIEW

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Background: The incredible bioactive properties and health benefits of both polysaccharides and polyphenols have been extensively studied independently. However recent research has shifted towards exploring the combination of these two compounds to unlock their synergistic effects. The conjugation of polysaccharides and polyphenols elevates each compound's functional properties, resulting in enhanced bioavailability, stability, and biological activities. **Objective:** The aim of this review is to examine the bioactivity and delve into the potential utilization of polysaccharide-polyphenol conjugates in health-related applications. **Methods:** An inclusive literature search was done to identify relevant research on polysaccharide-polyphenol conjugates. Databases including PubMed, Scopus, ScienceDirect and Google Scholar were searched using specific keywords. The articles were selected based on their relevancy and reliability. **Results:** This review placed a key focus on highlighting the numerous bioactivity and health benefits associated with polysaccharide-polyphenol conjugates. These include antioxidant, anti-inflammatory, anticancer, and antimicrobial properties. Additionally, this review ventures the vast range of potential applications for these conjugates, exploring their value in pharmaceuticals development, biomedical research as well as their role as nutraceuticals and cosmeceuticals. Safety considerations and regulatory aspects are also given due consideration. **Conclusion:** The utilization of polysaccharide-polyphenol conjugates shows immense promise in health-related applications. These conjugates exhibit synergistic effects and diverse bioactivities, which makes them attractive candidates in various fields. Nevertheless, further research and development are imperative to fully explore their potential capabilities and address any associated safety concerns. This review provides an extensive overview of the current understanding and serves as a foundation for future research and development in this rapidly evolving field.

Keywords: polysaccharide, polyphenol, conjugate, bioactivity

POTENTIAL OF 2-METHYL-1,3-DIPYRRIN-1-YLANTHRACENE-9,10-DIONE AGAINST SARS-COV-2: AN *IN SILICO* DRUG DEVELOPMENT APPROACH

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Background: The ongoing global pandemic of SARS-CoV-2 necessitates effective antiviral treatments. This study explores the potential of 2-methyl-1,3-dipyrrin-1-ylanthracene-9,10-dione as an antiviral agent. Using an *in silico* drug development approach, we investigate its binding interactions with key viral proteins, offering insights for targeted therapeutics. **Objectives:** This study aims to investigate the binding affinity and interactions of 2-methyl-1,3-dipyrrin-1-ylanthracene-9,10-dione with viral proteins, predict its pharmacokinetic properties and potential toxicity, and propose structural modifications to enhance its antiviral activity. **Methodology:** In silico drug development is utilized, involving selection and preparation of protein targets, molecular docking simulations, pharmacokinetic and toxicity predictions, and proposing structural modifications for enhanced antiviral activity. **Results:** 2-methyl-1,3-dipyrrin-1-ylanthracene-9,10-dione exhibited strong binding to SARS-CoV-2 spike protein, disrupting viral entry. Stable interactions are observed in molecular dynamics simulations, disrupting spike protein-ACE2 receptor interaction. The compound showed favourable binding to Mpro and RdRp, inhibiting proteolytic activity and viral RNA replication, with stability at carbon positions R1 and R3. Promising pharmacokinetic properties and low predicted toxicity support its potential as a safe and effective antiviral agent. **Conclusion:** 2-methyl-1,3-dipyrrin-1-ylanthracene-9,10-dione demonstrated strong binding to SARS-CoV-2 proteins, inhibiting viral entry and replication. Its favourable pharmacokinetics and low predicted toxicity suggest it as a potential antiviral agent, necessitating further validation through *in vitro* and *in vivo* studies.

Keywords: 2-methyl-1,3-dipyrrin-1-ylanthracene-9,10-dione, SARS-CoV-2, molecular docking, toxicity and drug-likeness profiles

CORRELATIONS BETWEEN ULTRASTRUCTURES OF CORTICOTROPHS, ADRENOCORTICOTROPHIC HORMONE (ACTH) AND CORTICOSTERONE PRODUCTION AFFECTED BY VARIOUS DIETS

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Background: Modern dietary habits were proposed to have contributed to metabolic and physiological stress. Adrenocorticotrophic hormone (ACTH) and corticosterone are two major stress hormones. Corticotroph in the anterior pituitary gland produces ACTH in response to hypothalamus-pituitary-adrenal (HPA) axis stimulation with the result of corticosterone production. **Objective**: This study aims to examine correlation between certain diets and the ultrastructure of corticotroph along with the stress hormones these cells generate. **Materials and methods**: 8 weeks old, 35 male Sprague-Dawley rats were acclimatized for 2 weeks. Then they were divided into 5 groups according to their diets, namely control (normal rat chow), high-fat diet, high-protein diet, high-sugar diet, and high-starch diet. Feeding was done for 8 weeks with tap water provided ad libitum. After the rats were euthanized, their blood was taken, processed, and analysed using High-Performance Liquid Chromatography (HPLC) processing, and their pituitary gland was harvested, fixed and processed according to electron microscope protocol. **Results**: HPLC analysis showed high-fat diet and high-sugar diet increased corticosterone blood concentrations. There was not much difference of ACTH secretion among the groups. Ultrastructure analysis revealed a high-fat diet, and a high-sugar diet adversely affected the corticotroph cells. Shrunken nucleus, disruption of nucleus membrane, damaged mitochondria and swollen endoplasmic reticulum can be seen in the high-fat and high-sugar groups. **Conclusion**: There is a strong correlation between certain diets and the ultrastructure changes of corticotroph cells, as well as the production of ACTH along with corticosterone hormone. These changes are most probably due to metabolic and oxidative stress.

Keywords: corticotroph, ultrastructure, ACTH, corticosterone