

A COMPARATIVE STUDY BETWEEN CULTIVATED AND WILD *Colocasia esculenta* (TARO) ON PHYTOCHEMICALS AND TOXICITY

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Cultivated plants are reported to have more advantages and no toxic compared to wild plants. However, wild plants are still being consumed. *Colocasia esculenta* with common name of taro is one of the tuber crop, which can be cultivated or wild. Taro is used as food and traditionally medicinal plant widely. However, taro may cause poisonous due to soluble and insoluble oxalate, and heavy metal contamination. Hence, this study was conducted to study the safety of cultivated and wild local taros as well as their pharmacological potentials based on the presence of phytochemicals. In this study, phytochemicals and toxicity were compared between corms and petioles of both cultivated and wild taros. Phytochemicals were analysed qualitatively and quantitatively. In the quantitative analysis, aqueous extract of cultivated petiole had the highest total phenolics (63.51 mg/g), flavonoids (58.74 mg/g) and tannins (36.46 mg/g) content. Meanwhile, cultivated corm had the highest total saponins content of 232.24 mg/g. In the heavy metal analysis, their concentrations were compared with WHO permissible limits in plant. Zinc, iron, lead and cadmium of all samples exceeded the limits whereas copper, chromium and manganese were lower than the limits. Wild taro had significant higher heavy metal concentrations such as manganese (23.43 mg/kg) and iron (61.05 mg/kg). Cultivated petiole had less heavy metal concentrations. Furthermore, Brine Shrimp Lethality Test (BSLT) was used to determine toxicity in terms of median lethal concentration (LC₅₀). Aqueous extracts of corms and petioles of both cultivated and wild taros were classified as non-toxic based on Meyer's toxicity index and Clarkson's toxicity criterion, even though aqueous extract of wild corm had the lowest LC₅₀ compared to others. Cultivated petiole is recommended for further investigation, especially on fields of antioxidant and anticancer because it had the greatest amount of phytochemicals, and it was non-toxic.

Keywords: Phytochemical, Toxicity, Heavy metal

EVALUATION OF SKIN IRRITATION EFFECT OF PTEROSTILBENE ON ALBINO RABBITS

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Pterostilbene is a methoxylated derivative of resveratrol that is also found to have many health benefits. Besides antioxidant activities, pterostilbene has also been reported to have the ability to protect skin from UVB exposure. The purpose of the study was to evaluate the skin irritation of pterostilbene when applied topically on albino rabbit. A total of 5 albino rabbits were divided into 3 groups representing the initial, conformational and control groups which were also observed up to 14 days. Initial and conformational groups were exposed with 5 % and 10 % of pterostilbene meanwhile the positive control group was applied only with sodium lauryl sulfate (SLS 20 %) and cottonseed oil as the negative control. Using the OECD 404 guidelines, the evaluation of irritation was scored based on erythema and edema reaction. After 14 days observation, skin-fold was determined the on exposed skin between the control and test groups. Blood was collected and kept in EDTA tubes before proceeding with the blood smear preparation to measure the white blood cell count. Skin tissue for histology observation was collected by using the skin punch after the albino rabbits were sacrificed. Observation of skin scoring for erythema and edema showed that positive control had significant differences compared to the initial and conformational groups with $p < 0.05$ ($p=0.03$). Skin folding data showed a slight significant difference between positive and treatment groups of pterostilbene ($p<0.05$). On the other hand, white blood cell count was significant lower ($p<0.015$) in the positive group compared to the treatment groups for lymphocyte cell count. Lastly, skin histology observation did not show any morphology changes at 5 % and 10 % of pterostilbene.. Thus, the application of 5 % and 10 % of pterostilbene did not cause any severe skin irritation effect on the animal model.

Keywords: Pterostilbene, skin irritation, topical

**ROLE OF P63 ISOFORMS IN ASPC-1 PANCREATIC
CANCER CELL LINE**

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Pancreatic cancer is among the top 3 cancers leading to cancer-related mortalities; due to lack of specific markers and preventive measures, and hence, late detection. A panel of pancreatic cancer cell lines were evaluated for their p53 and p63 protein expression using western blotting. AsPC-1 cells (null for p53 and p63) were selected in order to further evaluate the role of p63 isoforms. Reverse transfection of AsPC-1 cells with each isoform of p63 was performed and cell viability was measured using MTT assay. qRT-PCR was performed to verify successful transfection in all groups. Upon transfection of AsPC-1 cells with p63 isoforms, DNp63 as well as TAp63 γ isoforms showed significant mRNA expression. Transfection with TAp63 α and TAp63 β also lead to mRNA expression in AsPC-1 cells, but the results were not significant. Two isoforms of p63; TAp63 α and TAp63 γ , when expressed in AsPC-1 cells, reduced cell viability of these cells in compared to vector control ($p < 0.05$). TAp63 α and TAp63 β may have possible anti-cancer properties in AsPC-1 pancreatic cells. However, the mechanism of action needs to be further elucidated by studying the signalling pathways associated with p63 and p53. In future, co- transfection of AsPC-1 cells with p63 and p53 would be beneficial to examine their interaction in triggering tumour-suppressive or tumourigenic properties.

Keywords: p63, pancreatic cancer, oncology

**THE EFFECTS OF REPEATED EXPOSURE TO FENITROTHION ON
BIOCHEMICAL AND OXIDATIVE STRESS STATUS IN KIDNEYS OF SPRAGUE
DAWLEY RATS.**

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Fenitrothion (FNT) is commonly used as an insecticide to eradicate pests especially in Asian countries. Repeated exposure to FNT will lead to depletion of AChE activity and increase ROS that will eventually induce oxidative damage in vital organs including kidneys. However, studies regarding the effect of repeated exposure to FNT at a lower dose is not well documented. Hence, this study is aimed to investigate the effects of repeated exposure to the low dose of FNT on the kidney of male Sprague Dawley rats by evaluating the kidney function and oxidative stress status. This study utilised a total of 24 male Sprague Dawley rats which were divided randomly into three different groups (n=8/group): Control which received 1mg/ml corn oil; FNT 10 which received 10 mg/kg (bw); and FNT20 which received 20 mg/kg (bw). All the substances were administered via oral force feed for 28 consecutive days. All rats were sacrificed after 28 days and the kidneys were taken for evaluation. The results showed significant decreasing in the weight gain between the FNT groups and the control group ($p < 0.05$). However, no significant differences were observed for the absolute and relative kidney weight among all groups. The AChE activity is significantly reduced in FNT20 group compared to the control group ($P < 0.05$). The rats from FNT20 group showed the signs and symptoms of toxicity such as lacrimation, piloerection, hypoactivity and tremor. The urea level was significantly increased in FNT 10 ($p < 0.05$) and FNT 20 ($p < 0.01$) group in comparison to the control group. The SOD activity in kidneys revealed a significant reduction between FNT20 group compared to the control group ($p < 0.05$). Lastly, MDA level showed significantly increased between FNT20 group compared to the control group ($p < 0.05$). In conclusion, the low dose of FNT induced oxidative damage to the kidney of male rats.

Keywords: *Fenitrothion, Kidneys, Toxicity.*

ASSOCIATION OF *GSTT1* AND *GSTMI* POLYMORPHISMS ON CD4+ LEVEL IN MALAYSIA'S HIV INFECTED INDIVIDUAL AFTER HIGHLY ACTIVATED ANTI-RETROVIRAL THERAPY

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Glutathione S-Transferase (GST) enzyme is a family of enzyme that are involved in a two-stage detoxification of various toxin and drug. *GSTT1* and *GSTMI* subfamily enzyme are commonly reported for gene polymorphism with different frequency distribution among various population. In Malaysia, high rate of *GSTT1* and *GSTMI* polymorphisms has been reported. These enzyme play an important role in maintaining and regulating normal oxidative state in an organism by conjugating glutathione. This may reduce the formation of radical and slower the rate of CD4+ reduction. The chronic reduction of CD4+ cell count lead to the manifestation of Acquired Immune Deficiency Syndrome (AIDS) and one of the current treatment are Highly Activated Anti-Retroviral Therapy (HAART). This treatment aimed to reduce total plasma viral load and increase the CD4+ cell count. This study sought to investigate the association of *GSTT1* and *GSTMI* polymorphism with CD4+ level of HIV patient after HAART. This study involve a total sample of 150 (Malay: 72, Chinese: 52 & Indian: 26). *GSTT1* and *GSTMI* from the extracted genomic DNA were amplified using Polymerase Chain Reaction (PCR) with specific primers. The PCR product were run through gel electrophoresis and visualized under UV illumination. Statistical difference of *GSTT1* and *GSTMI* polymorphism in accordance to the level of CD4+ were performed under SPSS software and estimated using chi-squared test. GST polymorphism varied significantly ($p < 0.05$) between races. Frequency of *GSTMI* and *GSTT1* null in HIV individuals are 50.7% and 10.7% respectively. While frequency of wild type and homozygous deletion are both 19.3%. This study shows no significant relationship between GST polymorphism with CD4+ level after HAART. Further study are needed to confirm the mechanism and interaction between other GST variant with HIV disease progression.

Keywords: Gene polymorphism, Glutathione S-Transferase, HIV

HEART RATE VARIABILITY (HRV) AND MEMORISATION OF QURAN AMONG MALE STUDENTS FROM SELECTED SCHOOLS IN SELANGOR

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Heart rate variability (HRV) is a non-invasive tool that can be used to assess autonomic balance of the nervous system. Many factors had proven to affect HRV such as stress, physical activity, and lifestyle. Study showed listening and recitation of the Quran could also affect the HRV. The study aimed to examine the relationship between memorisation of Quran towards HRV among tahfiz students in Selangor. In the experimental study involving 16 tahfiz students and 16 non-tahfiz students (n=32), the HRV was measured in three memorisation tasks, involving - 1) recalling familiar surah, 2) memorising new surah and, 3) recalling the newly memorised surah. HRV analysis was done using the parameters from time domain (standard deviation of N-N interval (SDNN)) and frequency domain (low frequency/high frequency (LF/HF) ratio). Independent t-test revealed that there was no significant difference of mean HRV between tahfiz students compared to non-tahfiz students ($p>0.05$). Mixed model ANOVA revealed that there were significant differences between tasks for SD ($F(2, 60) = 16.53$, partial $\eta^2 = 0.355$) and LF/HF ratio parameters ($F(2, 60) = 12.03$, partial $\eta^2 = 0.286$), ($p<0.05$). Both parameters proved that recalling newly memorised surah (task 3) has a higher mean compared to recalling memorised surah (task 1), suggesting task 3 has a higher autonomic balance than task 1. Pearson correlation showed a moderate positive correlation between number of pages memorised and LF/HF ratio ($r=0.541$). The result indicates a higher sympathetic activation as the number of pages memorized increased. In conclusion, memorisation of Quran strongly contributes to the effects on HRV especially on LF/HF ratio.

Keywords: *Heart rate variability, Quran memorisation, tahfiz schools*

**ASSESSMENT OF LABORATORY BIORISK MANAGEMENT IN UNIVERSITI
PUTRA MALAYSIA: GAPS AND CHALLENGES**

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The advancement of biotechnology contributed to the improvement of the industries and health care system which requires the establishment of regulations, policies, and guidelines. However, more often, it lacks the institutional capacities and professional competence in exercising regulatory oversight. Therefore, Universiti Putra Malaysia (UPM) has taken a proactive approach by implementing the Laboratory Biorisk Management to ensure the safety and security in dealing with biological products, with the establishment of Institutional Biosafety Committee (IBC), under the provision of Biosafety Act. This study also discusses the gaps identified and challenges on the implementation of Laboratory Biorisk Management to adequately and sustainably manage the biorisks and helps in better understanding of management approaches for laboratories that handle Living Modified Organisms (LMOs). This study aimed to assess the organizational framework of IBC and biosafety programs along with identifying gaps and challenges of biorisk management practiced in UPM. A cross-sectional study was conducted with thorough Biorisk Management program review and analysis of the activities implemented in UPM since 2012 by referring to the annual report. This study observed a consistent pattern in number of LMO research applications from year 2012 to 2017 but significant increase recorded in the year 2018, with 51% of total number of LMO research applications. This study also observed a consistent pattern in trainings provided to the personnel involved in LMO researches annually which is consistent to the role of IBC as described in Guidelines for IBC by Ministry of Water, Land and Natural Resources, Malaysia. As a conclusion, UPM IBC managed to deliver its functions since its implementation. However, with the ever-increasing interest on LMO research, IBC may need to increase its workload, therefore utilization of resources is important to ensure its efficiency and sustainability.

Keywords: *Biorisk management, Biosafety, Living Modified Organisms*

**PREVALENCE OF ANTIBIOTIC RESISTANCE *STAPHYLOCOCCUS EPIDERMIDIS*
ISOLATED FROM HEALTHY PEOPLE IN INTERNATIONAL ISLAMIC
UNIVERSITY MALAYSIA KUANTAN**

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Staphylococcus epidermidis become one of the important microorganism mainly in hospital setting due to its ability to cause infection related to medical devices. The management of *S. epidermidis* infections become harder with the increase case of antimicrobial resistance in this bacteria. Less reports on *S. epidermidis* antimicrobial resistance data among healthy people leave uncertain idea of seriousness of antimicrobial resistance spreads among community. Furthermore, the host factors that may contribute to the antimicrobial resistance pattern in *S. epidermidis* are underreported as compared to other bacterial species. This paper will focus on the percentage of resistance for each antibiotic used and antimicrobial resistance pattern of *S. epidermidis* among healthy adults in IIUM Kuantan. The collected sample undergo several tests including microscopic, biochemical identification tests and antibiotic susceptibility test using common drugs used to treat *S. epidermidis* infection such as erythromycin, gentamicin, penicillin, tetracyclin and oxacillin. The susceptibility (susceptible, intermediate and resistant) of each antibiotic was classified based on Clinical and Laboratory Standard Institute (CLSI) guidelines. Penicillin showed highest percentage of resistancy (72.73%) followed by Erythromycin (40.91%), Tetracycline (27.27%) and Oxacillin (4.55). The finding showed that the resistant strain towards antibiotic are accumulating in healthy population, which could be the source of its spreading. This finding could be useful for treatment plan of *S. epidermidis* in the future.

Keywords: antibiotic resistance, *Staphylococcus epidermidis*, commensal bacteria

BHMC REDUCES PROLIFERATION OF HUMAN LIVER CANCER CELLS, HEPG2

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Curcumin is a natural occurring [polyphenol](#) derived from the [turmeric](#) rhizome (*Curcuma longa*) with a variety of pharmacological activities. It inhibited cell proliferation and induced apoptosis in various cancer cell lines. Several curcumin analogues have been synthesized to overcome curcumin's poor bioavailability in order to enhance its pharmacological activities. One of the curcumin analogue is known as 2, 6-bis-(4-hydroxyl-3-methoxybenzylidene) cyclohexanone (BHMC). It was synthesized by eliminating β -diketone moiety and modifying into a conjugated double bond while maintaining the phenolic hydroxyl group. BHMC with improved bioavailability has been proved to exhibit greater anticancer effects. This study aims to investigate the cytotoxicity effect of BHMC and curcumin on human liver cancer, HepG2 and non-cancer mouse fibroblast, 3T3. Both cell lines were purchased from ATCC and cultured in supplemented DMEM. Cell viability of both cell lines upon treatment of BHMC and curcumin were determined via MTT assay and confirmed with trypan blue assay. The reactive oxygen species (ROS) generation in HepG2 upon treatment of BHMC was measured using DCFDA assay. Early apoptosis in HepG2 upon treatment of BHMC was detected by monitoring externalization of phosphatidylserine on the cell surface by Annexin V-FITC/PI staining. BHMC and curcumin were effective towards HepG2 and normal 3T3. The cytotoxicity effects were further confirmed with trypan blue assay which showed that both compounds significantly reduced the proliferation of HepG2 and 3T3. 5 μ M BHMC induced significant ROS level in HepG2. BHMC was able to induce early apoptosis in HepG2. BHMC has a stronger cytotoxicity effect on HepG2 compared to curcumin despite its non-selective inhibitory effect on proliferation of non-cancer 3T3.

**THE ROLE OF TLR4 ON HUMORAL IMMUNE RESPONSE AGAINST
RECOMBINANT *Mycobacterium bovis* BCG CLONE EXPRESSING THE MSP-1C of
*Plasmodium falciparum***

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Mycobacterium bovis bacille Calmette-Guérin (BCG) is one of the most extensively used live attenuated vaccine vector for the development of vaccine against diseases including malaria. Previous study had constructed recombinant BCG (rBCG) expressing C-terminus of merozoites surface protein (MSP-1C) of *Plasmodium falciparum* using *M. bovis* BCG as the vaccine vector. Toll like receptors especially TLR4 is among the essential components of innate immune response in recognition of *M. bovis* BCG by macrophages. In animal study, rBCG vaccine was shown to be immunogenic to induce humoral response and some extent of protection against malaria infection. Nowadays, malaria still being a life-threatening disease as the *Plasmodium* parasites have a complex and multistage lifecycle. If TLR4 plays significant role in the interaction between macrophages and rBCG vaccine, hence its function should be enhanced in developing more efficiency vaccine. Thus, this study was conducted to understand the role of TLR4 in mediating humoral immune response against the rBCG vaccine candidate. The significant role of TLR4 in this study was reflected using TLR4 inhibitor (TAK 242) by immunizing BALB/c mice (n=6/group) with PBS, parent BCG and rBCG in the presence and absence of TLR4 inhibitor (0.5 mg/kg) through intraperitoneal immunization. Production of total IgG, IgG1 and IgG2a subclasses antibodies in the immunized sera was determined using ELISA assay. The findings demonstrated the presence of TLR4 inhibitor significantly decreased the production of total IgG and IgG2a subclass antibodies in both parent BCG and rBCG immunized mice which reflecting the crucial role of TLR4 receptor in interaction of rBCG or parent BCG with immune cells to elicit humoral response by B lymphocytes. This study results revealed the importance of TLR4 in enhancing the effectiveness of rBCG vaccine candidate. Therefore, TLR4 could be used in future vaccine to stimulate a greater humoral immune response towards the candidate vaccine.

**EFFECT OF FRENCH FRIES TOWARDS
MALE RAT FERTILITY**

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Fast food franchise growth steadily in Malaysia and it became a popular main choice among Malaysian. A common fast food that served is French fries and a chemical substance known as acrylamide can be produce through process of frying of fast food. The effect of acrylamide shown a clear morphological change in sperm of rats however it remains relatively unclear whether the consumption of French fries directly effects sperm and testis morphology. The study was carried out to study the effect of French fries on sperm parameter and the morphology of the testis. In this study, French fries was given to Sprague Dawley rats for 30 days. The rats also were mated to determine the offspring. The testis organ was harvested and going through tissue processing and staining. The morphology of the testis was observed. The testis organ also undergo sperm count and cholesterol test. The data were analysed and further interpreted by using T-test. The sperm count, cholesterol concentration and generation study shown a significant difference between the control and French fries group with ($p < 0.050$), ($p < 0.009$) and ($p < 0.001$) respectively. The morphology of testis shown present of fat droplet in the French fries group. This study proves that there are significant difference in sperm count and changes in morphology of the testis after a prolonged period French fries consumption.

EXPOSURE TO TRAFFIC RELATED AIR POLLUTION ON INFLAMMATORY MARKERS AMONG THE TRAFFIC POLICE OFFICERS IN KUALA LUMPUR

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Inflammation is a pathological process characterized by injury or destruction of tissues caused by a variety of factors such as air pollution that could trigger the cytologic and chemical reactions in the body. Interleukin-6 (IL-6), Tumor Necrosis Factor- α (TNF- α) and Erythrocyte Sedimentation Rate (ESR) level had been used as the indicator for the inflammatory status. Therefore, this study aims to assess the level of inflammatory markers due to the exposure to air pollution among the traffic police officers in Kuala Lumpur and to determine the concentration of volatile organic compound (VOC) and particulate matter (PM10). A cross-sectional studies was conducted and universal sampling method was applied comprised of traffic police officers. A set of questionnaire including demographic information survey, health status and Personal Protective Equipment (PPE) awareness was distributed to them. Personal air pump sampler was attached to the traffic police officers for 8 hours to measure and analyse the concentration of VOC and PM10. Besides, ELISA kit was used to measure the level of IL-6 and TNF- α from the blood serum of the subjects. While, Westergren ESR tube containing 3.8% of Sodium Citrate used to measure the level of ESR. From the studies, the concentration of the VOC and PM10 contained in the polluted air are expected to be higher. Besides, there should be a significant differences of the inflammatory markers between the traffic police officers and the office staffs. The high concentration of VOC and PM10 in the air, will indirectly cause the increase in IL-6, TNF- α and ESR level among the traffic police officers who exposed to air pollution compared to those performing the office work. Therefore, it is expected that some chemical agents contained in the air pollution could cause greater risk of inflammation among traffic police officers in Kuala Lumpur.

Keywords: Inflammatory markers, traffic police officers, air pollution

**INTELLIGENCE QUOTIENT(IQ), MEMORY AND QURAN MEMORIZATION
AMONG STUDENTS IN SELECTED TAHFIZ SCHOOLS IN SELANGOR**

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The process of memorizing helps to improve the brain capacity in processing, storing and building memory. However, the association between Quran memorization with IQ and memory is still lack of evidence. Therefore, the study was conducted to determine the relationship between Quran memorization with IQ and memory among Tahfiz students in Selangor. The cross-sectional study (n=64) was conducted using purposive sampling for choosing Tahfiz schools. The instrument used to assess students' IQ level was Wechsler Abbreviated Scale of Intelligence (WASI-II). Digit Span *forward*, Digit Span *backward* and Rey Auditory Verbal Learning Test (RAVLT) were conducted to measure the memory status of each students. Level of Quran memorization showed weak positive correlation with IQ level in School 1 (r=0.013) and School 2 (r=0.049), weak positive correlation with Digit Span *forward* for School 1 (r=0.002) and School 1 (r=0.033). Digit Span *backward* shows weak positive correlation with Level of Quran Memorization for both school 1 and 2 (r=0.278, r=0.281) respectively and RAVLT shows weak positive correlation with Quran memorization for School 1 and 2 (r=0.219, r=0.201) respectively. Result suggests that there is an association between memorizing Quran and IQ level as well as the memory status among Tahfiz students.

Keywords: Quran memorization; IQ level; memory status

THE EFFECTS OF UV-INDUCED OXIDATIVE STRESS ON THE CORNEA IN A ZEBRAFISH LARVAL MODEL

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Keratoconus is a progressive corneal thinning disorder that frequently results in visual loss with an onset typically in early adulthood. Keratoconus has a complex multifactorial etiology and ultraviolet light has been reported to play a role in its pathogenesis by formation of reactive oxygen species (ROS) which can cause oxidative stress. This study aims to investigate the effects of UV radiation on the developing eyes of zebrafish embryos while inducing keratoconus-like features. Firstly, dechorionated zebrafish embryos were exposed to UV radiation at 30 hours post fertilization (hpf) and their morphological changes were observed daily until 5 days post fertilization (dpf). Dechorionated embryos at the same age that were not exposed to UV radiation were used as controls. Body curvature, pericardial edema, blood pooling, fins malformation, curled tail and eye abnormalities were observed in UV-exposed larvae. At 5dpf, zebrafish larvae were euthanized for either histology with hematoxylin and eosin (H&E) or biochemical analyses. For the latter, 5dpf enucleated larval eyes were homogenized in phosphate buffered saline (PBS) and supernatants were then subjected to spectrophotometric measurements of superoxide dismutase (SOD) and catalase (CAT) activities, and glutathione (GSH) levels. Detailed histopathological changes of the eye were seen in the H&E-stained eye sections. SOD activity increased significantly ($p=0.007$) in UV-treated eyes compared to the control. CAT activity increased in UV-treated eyes, but the increase was not significant ($p=0.427$). Lastly, a decrease of total glutathione (T-GSH) content, although not significant ($p=0.583$) was observed in the UV-treated eyes, possibly due to increased utilization to neutralise the ROS. In summary, UV radiation caused zebrafish embryos to develop abnormal morphologies and increased the antioxidant activities in UV-treated eyes as a possible means to protect themselves against UV-induced oxidative stress.

Keywords: Keratoconus, ultraviolet radiation, oxidative stress, zebrafish

**THE EFFECT OF DEPARAFINIZATION OF ARCHIVED SOFT TISSUES FOR
SCANNING ELECTRON MICROSCOPE PROTOCOL USING HMDS
(HEXAMETHYLDISILAZANE)**

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Formalin-fixed paraffin embedded (FFPE) tissue is a block of specimen that is preserved by using preservatives such as formalin or glutaraldehyde. These tissues are mostly preferred in hospitals and research institutes due to its higher cost effectiveness as compared to frozen tissues that required much higher maintenance to run and to store. In term of preservation, formalin is very useful for light microscopy but not for scanning electron microscope (SEM) which requires the addition of a preservative setting such as glutaraldehyde. Simultaneously, the drying phase of SEM protocol is a critical phase where cells might be shrunk or enlarged depending on the method chosen. Therefore in this study we investigate on the effectiveness of new SEM processing protocol on tissues recovered from archived paraffin blocks as compared to the conventional method. Tissue samples used for this study were fresh mice brain tissues and a decade old archived mice brain tissues. Both samples were stained with H&E stain and observed under light microscopy. Subsequently, the samples underwent conventional and the alternative SEM protocols. In the alternative method that we are proposing, hexamethyldisilazane (HMDS) is utilized instead of critical drying point for the drying phase. The qualities of the microscopic images were observed, the landmark organelles were measured and the effects of processing temporal variations were assessed. Similar morphological organelles dimension were observed from both conventional and alternative protocol for decade old and freshly prepared samples. To conclude, the alternative method for the archived FFPE blocks using HMDS have successfully retained the ultrastructure characteristic of the tissues and therefore showing a promising potential as a new protocol for reusing archived blocks that has already proven to be more cost effective than the frozen tissues.

Keywords: Archived paraffin blocks; alternative protocol; scanning electron microscope; critical drying point.

**ACUTE TOXICITY EVALUATION OF CONSTRUCTION WASTE RUNOFF
COLLECTED FROM ILLEGAL DUMPING SITE USING BRINE SHRIMP AND
ZEBRAFISH MODELS**

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Urbanization results in the augmentation of construction and demolition (C&D) waste. Improper dumping of C&D waste will eventually contaminate the surrounding environment, affect the ecosystem and deteriorate the health status of nearby living organisms. This study aimed to investigate the potential toxic effects and heavy metals bioaccumulation of construction waste runoff collected from the illegal construction waste dumping site, Kampung Sungai Pelong, Malaysia (3°12'47.2"N 101°32'11.3"E) by using brine shrimp (*Artemia* sp.) and zebrafish (*Danio rerio*). The runoff sample collected in January 2018 was proceeded with the physicochemical test, heavy metal analysis, acute brine shrimp test and acute, sub-acute and bioaccumulation zebrafish test. Several physicochemical properties biochemical oxygen demand (30.0 ± 1.63 mg/L), total suspended solid (228 ± 2.49 mg/L), ammoniacal nitrogen (2.04 ± 0.04 mg/L) and nitrates (24.83 ± 0.05 mg/L) and heavy metal content (Cu>Cd>Ni>As>Pb>Cr>Hg) of runoff (except Zn) had values significantly exceeding the respective Class IIA Malaysia National Water Quality Standards ($p < 0.05$). TSS, NH₃-N and BOD contents of runoff have reached standards of Class III (water supply which requires extensive treatment), Class IV (for irrigation only) and Class V (not suitable for drinking and agriculture usage), respectively. No mortality and abnormal swimming behaviour were observed for acute brine shrimp test, but severely damage appendages and pigmentation were evident in treated brine shrimp. In the zebrafish sub-acute assay, no constant trend of mortality was observed, but abnormal swimming pattern (swimming near the water surface and sudden speeding in the water) and alterations in gill tissue (cell vacuolation, curvature lamellars and clubbed tips). In bioaccumulation zebrafish assay, no significant accumulation of heavy metal observed in muscle tissue. The results signify the potential eco-toxicity caused by construction waste runoff and urge the need for long-term toxicity study and strict legislative actions by the local authority.

Keywords: Surface runoff, construction and demolition waste, Kampung Sungai Pelong

ASSESSMENT OF SKIN SENSITIZATION BY PTEROSTILBENE ON GUINEA PIGS

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Pterostilbene is a naturally occurring compound belonging to a group called stilbenes, and its benefits have been widely researched over the past 20 years. Among its benefits is the one which involves the skin, such as its anti-inflammatory action, anti-oxidants response and recently it was also found from our study to exhibit the skin protecting properties from the UV radiation. However, the toxicological profiling of pterostilbene is still lacking. In the present study, an in-vivo study will be conducted in accordance to the ISO 10993-10 to investigate skin sensitization by pterostilbene by using the albino guinea pig model. A pilot test was also done to determine the challenge dose and inducing dose, followed by the conformational test known as Buehler's test. By gross examination, the pterostilbene did not indicate any sign of erythema or edema at the challenge site, by giving a score of 0 with a 0% percentage of any positive reaction. Results also showed no damage to the stratum corneum and no necrosis with the absence of any inflammatory cells. The white blood cell counts also indicated no significant increase of monocytes and eosinophils compared to the negative control. Results from the study suggested pterostilbene is generally safe to be applied on the skin without causing any sensitization effects.

Keywords: Pterostilbene, skin, sensitization

**GENOTOXICITY PROFILES OF 1, 4-BENZOQUINONE-INDUCED MURINE
HEMATOPOIETIC STEM / PROGENITOR CELLS OF DIFFERENTIAL
LINEAGES**

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Benzene is a known hematotoxic and leukemogenic agent with Hematopoietic Stem / Progenitor Cells (HSPCs) niche being the highly potent target in benzene hematotoxicological effects. However, the mechanism of benzene-induced toxicity targeting HSPCs niche comprised of lineages-committed progenitors remains elusive. This study aims to investigate the genotoxicity profiles following benzene exposure targeting HSPCs populations using a lineage-directed approach. Mouse bone marrow cells (MBMCs) were exposed *ex vivo* to the benzene metabolite, 1,4-benzoquinone (1,4-BQ) at 0 - 12 μ M for 24 hours and the growth of myeloid, lymphoid Pre-B and erythroid progenitors were evaluated using colony forming cell (CFC) assay. The level of DNA damage was determined using Comet Assay. 1,4-BQ exposure causes DNA damage on HSPCs in a dose-dependent manner. At the highest concentration (12 μ M), 1,4-BQ caused significant ($p < 0.05$) increases in both the percentage of DNA in tail and tail moment of exposed bone marrow cells. Differential genotoxicity profiles were observed among the hematopoietic progenitors. A significant ($p < 0.05$) increase in the percentage of DNA in tail in erythroid progenitors was only notable at 12 μ M 1,4 BQ as compared to myeloid and lymphoid pre-B progenitors of which the significant increase ($p < 0.05$) occurred at as lower as 7 μ M and 12 μ M of 1,4-BQ. A significant increase ($p < 0.05$) in the percentage of tail moment was only noted at 12 μ M 1,4-BQ for all progenitors. In conclusion, benzene could cause hematological disorders by targeting genomic stability of HSPCs which is mediated by lineage-dependent response.

Keywords: Benzene, 1, 4-BQ, hematopoietic stem / progenitor cells, genotoxicity, lineage-directed strategy.

DETERMINATION OF THE WHITTEN EFFECT BASED ON VAGINAL CELL CHARACTERISTICS AND BEHAVIOR IN GROUPED FEMALE MICE

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Breeding management in a laboratory animal facility practise synchronize estrus for breeding for logistic purposes. Female mice were kept together for a few estrus cycles to suppress estrus. The suppression of the estrous cycling activity derived from grouping female mice called the Lee Boot Effect were eliminated by exposure to urine of male mice. The male-originating pheromones are required in the induction of estrus known as the Whitten effect. The Whitten effect induces estrus in a uni-sexual group of female mice by exposure to male mice urine soaked bedding. This study generally aims to determine the time taken for the Whitten effect to occur based on changes in vaginal cell characteristics and behavior in grouped female mice. The Whitten effect will occur when pheromones from the urine of male mice stimulate synchronous estrus in a population of grouped female mice. Ten female mice are used for this study. The female mice will be acclimatized for 3 estrus cycles or 12 days. Evaluation of the phases of the estrous cycle is by visual observation to assess changes in the vulva and by vaginal cytology to verify the phases of the estrous cycle. The vaginal smear is collected daily from each female mouse. Male urine soaked bedding were exposed to the females for 4 days (one estrus cycle) and the determination of time taken for the Whitten effect to occur were based on changes in vaginal cell characteristics and observation of behavior. The phases of the estrous cycle is identified for purposes of estrous synchronization and the time taken for the Whitten effect to occur is determined by sexual receptivity and aggressive behavior with the presence of predominately anucleated keratinized epithelial and superficial cells.

Keywords: Whitten effect, Female mice, Pheromone, Vaginal cell characteristics, Behavior

REPEATED EXPOSURE OF FENITROTHION INDUCED BIOCHEMICAL ALTERATIONS IN THE LIVERS OF MALE SPRAGUE-DAWLEY RATS

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Fenitrothion (FNT) is an organophosphate insecticide (OPI) that is widely used in agriculture and public health. Liver is one of the main organ involved in biotransformation and detoxification of OPI; thus make this organs at the higher risk of damages in repeated exposure of OPI. Therefore, the aimed of this study is to evaluate the biochemical status of liver in male Sprague Dawley rats in FNT repeated exposure. A total of 24 male Sprague Dawley rats were divided into 3 groups (n=8), namely the Control which received the corn oil at the dose of 1 mg/kg, FNT 10 received 10 mg/kg bw of FNT; and FNT 20 received 20 mg/kg bw of FNT. All the substances were given orally for 28 consecutive days. After 28 days, the rats were sacrificed and the blood as well as the liver were taken for biochemical analysis. As a result, the body weight gain is significantly reduced in both of FNT groups as compared with the control group ($p<0.05$). The FNT20 rats exhibit the signs and symptoms of toxicity such as lacrimation, piloerection, tremor and hypoactivity. The acetylcholinesterase enzyme activity was significantly decreased in FNT20 group compared to the control group ($p<0.05$). A significant increase in the level of aspartate aminotransminase (AST) was found both in FNT groups as compared to the control group ($p<0.05$). For oxidative stress status, the superoxidase dismutase (SOD) activity was significantly decreased in FNT20 group compared to the control group ($p<0.05$). However, the malondialdehyde (MDA) level showed insignificantly increased in FNT20 group compared to the control group. In conclusion, the repeated exposure of FNT alter the biochemical status in the liver of Male Sprague Dawley rats in dose dependent manner.

Keywords: Fenitrothion, Oxidative stress, liver

**MOLECULAR DOCKING STUDY ON ANTICANCER ACTIVITY FROM PORCUPINE
BEZOAR EXTRACT**

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Porcupine bezoars (PBs) are masses of undigested organic and inorganic material which formed within gastrointestinal tract. It is a stone like material that has been recognized as one of natural remedies existed in Malaysia. In early medical text, PBs was reputed to possess various medicinal properties including in cancer. Recently, we had reported porcupine bezoar has significant anticancer activity through induction of apoptosis and cell cycle arrest. Hence, this study was designed to further delineated at molecular level the protein-ligand interaction between inhibiting metabolites identified in PB and the survivin (receptor). Survivin which was known as an anti-apoptotic protein had been characterized as one of therapeutic targets in treating cancer due to its involvement in multiple signaling pathway. The resultant PBs extract was studied through metabolite profiling using liquid chromatography- mass spectrometry (LS-MS). Three metabolites were identified 1) Propafenone; (2) Mangiferin and (3) 4-(Toluene-4-sulfonylamino)-cyclohexanecarboxylic acid using the partial least square (PLS) statistical analysis. The docking was performed using crystal structure of human survivin in complex with Smac/DIABLO(1-15) peptide (PDB code : 3UIH) as retrieved from the Protein Data Bank (PDB). Metabolites structures were retrieved from PubChem database. The docking was conducted using AutoDock Tools version 1.5.6. The binding affinities, root-square square deviation (RMSD) value and bonding interaction were calculated and analyzed. It was found that the metabolites possessed good inhibitory interaction against survivin. The result proposed the metabolites in PB extract were found as effective molecules exhibiting important potential to inhibit survivin thus restoring apoptosis in cancer cells.

Keywords: Porcupine bezoar; anti-apoptotic; survivin

**EXTRACTION AND QUALITATIVE PHYTOCHEMICAL SCREENING OF
MALAYSIAN *Sphagnum sericeum* MOSS**

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Sphagnum is a moss from Bryophyta phylum and is a family member of *Sphagnaceae*. Previous research studies on phytochemistry of various species of *Sphagnum* have shown that these species exhibits a wide range of biologically active compounds. The active constituents are usually used as antibacterial, antifungal, antioxidant, antiproliferation, antitumor, and as insecticidal agents. This study was carried out to measure the percentage yield and to identify the presence of phytochemical compounds in Bryophytes moss *Sphagnum sericeum* extracts. *S. sericeum* was extracted using different polarity of solvents (aqueous, methanol, chloroform) by sonication method. Phytochemical screening of SSE was performed using chemicals to investigate the presence of phenols, flavonoids, alkaloids, tannin, coumarin, saponin, terpenoids and glycosides compounds. The result showed the percentage yield of aqueous, methanol and chloroform extracts were 5.41%, 2.51% and 1.04% respectively. The extracts was tested positive for alkaloid, glycosides and terpenoids. This is the first report on the phytochemical contents in Malaysian *S. sericeum* moss, which is the scientific basis for its usefulness as potential therapeutic agents.

Keywords: *Sphagnum sericeum*, phytochemical screening, Malaysian Bryophyte moss

**EFFECTS OF VOLATILE ORGANIC COMPOUND AND PARTICULATE MATTERS
TOWARDS VITALS ORGAN AMONG TRAFFIC POLICE IN KUALA LUMPUR**

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Exposure towards air pollutant that consists variety of hazardous gases, heavy metals, particulate matters (PM10) and volatile organic compounds (VOC) are affecting organs such as heart, kidney and liver. Therefore, the purpose of this study is to assess the effect of particulate matters (PM10) and volatile organic compound (VOC) towards changes in the biomarkers of vital organs among traffic police in Kuala Lumpur. Questionnaires were distributed among the respondents (45 traffic police officers and 55 office staffs that work in the police station) to know their socio-demographic information and health status. Blood were collected in plain tube for determination of Troponin T, urea, creatinine, AST and ALT level. Besides that, personal air sampler are also attached to the traffic police to measure the personal exposure of particulate matter (PM10) for 8 hours from 6am to 2pm. The measurement of particulate matters were taken from 10 different hotspots and the mean value is expected to be higher. For AST test, there is significant higher level ($p < 0.05$) between traffic police (22.50 ± 4.99 IU/L) compared to office staff that work in the police station (19.95 ± 5.12 IU/L) while there is no significant different ($p = 0.746$) for ALT level in traffic police (29.57 ± 6.71 IU/L) and office staff (29.18 ± 4.65 IU/L). On the other hand, the biomarkers for kidney (urea and creatinine) and heart (Troponin T) are expected to be higher in the traffic police than the office staff that work in police station. Even though some of the organs biomarkers of traffic polices are still in normal range, but they are actually higher than the office staffs that work in the police station. Thus, proper protection and care need to be taken to avoid organ damage, due to long exposure to air pollution.

Keywords: particulate matters, volatile organic compounds, vital organs.

SCREENING OF PRESERVATIVES PROPERTIES OF CALAMANSI LIME (*CITRUS MICROCARPA*) AND GINGER (*ZINGIBER OFFICINALE*) EXTRACTS ON COCONUT (*COCOS NUCIFERA*) WATER

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Chemical, biological or physical agents are the factors that contribute to food spoilage. Thus, to preserve food, artificial preservatives are commonly use but these chemicals are potential health hazard that leads to various diseases. Alternatively, the use of natural product-based preservatives are potentially safe compared to chemical products. In addition, fresh fruit juice such as fresh coconut water deteriorates easily due to microorganism activities. Since calamansi lime and ginger were previously shown to have antimicrobial and antioxidant activities, this study aims to screen preservative properties of calamansi lime and ginger extracts on fresh coconut water. Ginger was extracted by using an aqueous extraction method and dried using freeze dryer while calamansi juice was used purely prior to the test. Ginger extracts and pure calamansi juice was added to the coconut water to the final concentrations of ginger extracts of 0, 5, 10, 15, 20 and 25 mg/mL and final concentrations of the calamansi juice of 0, 1.0, 1.5, 3.0% v/v. Microorganisms that were isolated from pure coconut water were identified using gram staining and several biochemical tests. The extracts were screened for their total phenolic content by Folin-Ciocalteu reagent while the total antioxidant activities were determined by Ferric Reducing Antioxidant Power (FRAP) assay. Preservative properties of extracts were determined by physico-chemical analysis and microbial load studies. It is expected that calamansi lime and ginger extracts will increase shelf life of coconut water without changing the composition of coconut juice compound and inhibit microbial growth in the coconut water.

Keywords: Plant extract; Natural food preservative; Antioxidant activity.

COMPARISON OF PHYSICAL ACTIVITY, STRESS LEVEL, FOOD INTAKE AND MOOD WITH DIFFERENT LEVELS OF QURAN MEMORISATION AMONG STUDENTS FROM SELECTED TAHFIZ SCHOOLS IN SELANGOR

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In Malaysia, Tahfiz school employs Quran memorisation method to improve physiological and psychological well-being of the students. The cross-sectional study (n = 64) was conducted to compare the physical activity, stress, food intake and mood according to levels of Quran memorisation and age categories. The study also determined the association between physical activity, stress, mood and food intake with number of pages memorised. Students from two selected Tahfiz schools in Selangor were recruited using purposive sampling. Physical activity, stress and mood were assessed using Physical Activity Questionnaire for Older Children (PAQ-C), Depression Anxiety Stress Scale (DASS-21) and Profile of Mood States (POMS) respectively. Food intake was analysed using Nutritionist Pro Diet software. One-way ANOVA showed there were no significant difference between levels of Quran memorisation with physical activity (p = 0.81), stress level (p = 0.36), mood (p = 0.96), energy (p = 0.13), protein (p = 0.26), carbohydrate (p = 0.28), total fat (p = 0.37), dietary fibre (p = 0.07), sodium (p = 0.73), potassium (p = 0.31), vitamin C (p = 0.14), vitamin E (p = 0.44) and zinc (p = 0.70). Results showed that there were a weak negative correlation between number of pages memorised with stress (r = -0.15) and mood (r = -0.01), a weak positive correlation between number of pages memorised with energy (r = 0.21), carbohydrate (r = 0.19), dietary fibre (r = 0.11), zinc (0.10) and potassium (r = 0.14). However, there was no correlation between number of pages memorised with physical activity (r = 0.00). In conclusion, stress, food intake and mood does had weak effect on process of memorising Quran among students from selected Tahfiz schools from Selangor.

Keywords: Physical Activity; Food Intake; Quran Memorisation

OXIDATIVE STRESS-MEDIATED CRYOINJURY STATUS OF N-ACETYL CYSTEINE SUPPLEMENTED-CRYOPRESERVED BONE MARROW DERIVED- HEMATOPOIETIC STEM CELLS

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Hematopoietic stem cells (HSCs) transplantation was introduced as curative treatment for various diseases. Cryopreservation of HSCs is crucial for long term storage and maintenance of cellular quality; however it has been reported that cryopreservation itself causes oxidative stress- driven apoptosis and cell loss. This study investigated impact of supplementing N-acetylcysteine (NAC) as antioxidant during cryopreservation on viability and oxidative stress in HSCs. HSCs were isolated from murine bone marrow, cultured in HSCs growth media and cryopreserved (1×10^6 cells per vial) together with 10% DMSO and NAC (0 μM , 0.25 μM , 0.5 μM or 2.0 μM) for 48 hours, 2 weeks or 8 weeks at -196°C using controlled-rate-freezing technique. Cell viability and oxidative stress in cryopreserved cells were analysed at each time-point. Cell viability was significantly reduced ($p < 0.05$) following cryopreservation as compared to pre- cryopreservation. NAC supplementation significantly increased cell viability ($p < 0.05$) after 48 hours cryopreservation at 0.5 μM and 2.0 μM and after 2 weeks cryopreservation at 0.25 μM compared to the controls. Cryopreservation significantly enhanced GSH level ($p < 0.05$) and reduced MDA level ($p < 0.05$) without affecting SOD activity and PC level in HSCs compared to pre-cryopreservation. NAC supplementation significantly increased GSH level at 0.25 μM in cryopreserved HSCs compared to the control. In conclusion, NAC supplementation during cryopreservation showed potential in minimizing cryoinjury by promoting cell viability, increasing antioxidant capacity and reducing oxidative damage in HSCs, however these effects are influenced by both duration of cryopreservation and NAC concentration.

Keywords: cell viability; cryopreservation; hematopoietic stem cells; N-acetylcysteine; oxidative stress.

**EFFECTS OF VOLATILE ORGANIC COMPOUND AND PARTICULATE MATTER
EXPOSURE ON HEMATOLOGICAL PROFILE AMONG TRAFFIC POLICE
OFFICERS IN KUALA LUMPUR**

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Traffic police who work at the busy road and exposed to the air pollution everyday may be affected due to inhalation of air pollution. The traffic police may have changes in hematological profile such as hemoglobin levels and blood count in the body. The aim of this research is to study the effects of volatile organic compound (VOC) and particulate matter (PM10) exposure on hematological profile among traffic police officers in Kuala Lumpur. The hematological profile in this study includes hemoglobin levels, blood count and differential blood count. Besides, the concentration of particulate matter (PM10) is measured by using personal air sampler that attached to the traffic police who are working 8 hours at busy traffic area while charcoal tube are used to measure the concentration of benzene in the air pollutant. There are two groups of subject, in which the first group consists of 55 traffic police officers and staffs who are working in the office and not exposed to the air pollution and second group consists of 45 traffic police officers who are working at the busy traffic and exposed to the air pollution every day. The traffic police officers who are exposed to higher levels of VOC, benzene and PM 10 might have a change in the hematological profile. The hemoglobin levels, blood count and differential blood count are expected to be significant lower in the traffic police officers who are exposed to air pollution compared to those who are working in the office. Hence, the hematological profile is expected to be lower with the high concentration of VOC, benzene and PM 10.

Keywords: Traffic Police, Air pollution, Hemoglobin levels,

**EVALUATION OF ALTERNATIVE TRANSMISSION ELECTRON MICROSCOPE
PROTOCOL USING ARCHIVED PARAFFIN EMBEDDED BRAIN TISSUES.**

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In many hospitals, most pathological samples are kept as formalin fixed paraffin embedded (FFPE) tissues. Samples can be kept for years and most of the times are rarely been relooked again. Due to the advancement in technologies, these valuable samples can be studied again using a newer approach that can't be made possible before. However, since the samples are embedded in paraffin for a long period, some modifications must be made to allow the new techniques to work on the preserved samples. Therefore, this study was conducted to examine the possibility reusing a decade old FFPE archived paraffin embedded brain tissues for transmission electrons microscope (TEM). By comparing the quality and reliability of the resulting images between a decade old FFPE samples and freshly blocked tissues using modified protocol and conventional protocols. The modified TEM protocol differs in the time used for critical drying point. Paraffin embedded blocks from both sources were process for histological landmarks and compared under light microscopic observation. Following that, FFPE blocks with the brain tissues were reprocessed using traditional and conventional protocols for transmission electron microscope. The current histological results shows promising a faster, cheaper yet effective in producing images from a decade old FFPE blocks that is off the same quality as the freshly prepared blocks based on the histological landmarks observed. In general, the new protocol that were developed has successfully making the reusing or recycling the FFPE recycling use of archived FFPE blocks is possible. This new protocol its even quicker and cheaper to run as compared to the conventional protocol.

Keywords: Archived paraffin embedded tissue; modified protocol; transmission electron microscope; critical drying point.