

THE EFFECT ON MALE RATS' REPRODUCTIVE FUNCTIONS AFTER LONG-TERM ADMINISTRATION OF METHAMPHETAMINE HYDROCHLORIDE AND ITS WITHDRAWAL

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Objectives: This experiment aimed at investigating the effect of methamphetamine hydrochloride (MA) administration and its withdrawal on the male rat reproductive functions. We studied the serum gonadotrophins, namely follicle stimulating hormone (FSH), luteinising hormone (LH), and testosterone; relative weight of reproductive organs; testis morphology; and sperm count and morphology.

Methods: A total of 120 12-week-old male Wistar rats were divided into 3 groups: control, placebo, and MA-treated. MA-treated group received 5 mg/kg body weight of MA daily intraperitoneally, whereas the placebo group were administered normal saline. Each group consists of 5 subgroups (M12, W2, W4, W8, and W12) that were assigned with 5 different withdrawal weeks: 0, 2, 4, 8, and 12 weeks, respectively. At the end of the withdrawal period, the rats were anaesthetised by ether and sacrificed by cervical dislocation, followed by laparotomy. The blood was obtained from inferior vena cava, and the serum concentrations of FSH, LH, and testosterone were analysed. The isolated right epididymis was gently pressed and sperms were collected. The epididymis was minced and mixed with the collected sperms and subsequently filtered. The filtered material was stained with 1% eosin for sperm count and sperm morphology assessment. The testes, left epididymis, prostate gland, and seminal vesicle were weighed and their relative organ weights were determined. The testes were stained with haematoxylin and eosin for histological analysis. Consequently, seminiferous tubular diameter (STD) and seminiferous epithelial height (SEH) were measured using image analyser.

Results: The W8 and W12 subgroups of MA-treated rats had significantly reduced serum FSH and LH concentration. The serum testosterone concentration in W2 and W4 were also significantly reduced. The testis and epididymis relative weight of W2, W4, and W8 were significantly reduced. However, the prostate gland and seminal vesicle relative weight were not affected by MA treatment. The STD of W2 and W4, and SEH of W2, W4, and W8 demonstrated significantly reduced measurement. The sperm morphology and count were also

significantly lowered in W2, W4, W8, and W12 groups. After 12 weeks of withdrawal, the serum FSH and LH returned to normal level. Serum testosterone concentration was restored following 4 weeks of withdrawal. The relative weight of testis and epididymis returned to normal range after 8 weeks of withdrawal. The STD and SEH measurement also returned to normal range after 8 and 4 weeks of withdrawal, respectively. Sperm count and morphology also improved after 12 weeks of withdrawal.

Conclusion: The administration of 5 mg/kg body weight of MA at 12 weeks appears to be harmful to the male rat reproductive function. However, after certain withdrawal weeks, the functions were restored to normal; thus, damages are reversible.

Supervisor:
Associate Professor Dr Mohammed Nasimul Islam

THE IMPACT OF RECONSTRUCTION FILTERS ON ^{99m}Tc MYOCARDIAL SPECT IMAGING

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Objectives: This prospective and retrospective study was undertaken to investigate the effect of filtering on image quality and functional parameters in myocardial single-photon emission computed tomography (SPECT) using various reconstruction filters and their associated parameters.

Materials and Methods: In the prospective study of image quality, a cardiac phantom system (with 1.10 cm cold defect in myocardium) for different ^{99m}Tc radioactivity concentration as background was used in the SPECT procedure. The target-background concentration ratio (T/B) of 5.3, 4.0, 3.3, 2.7, 2.0, 1.3, and 1.0 were used to acquire SPECT images. Based on the SPECT studies, the calculated background count to target count ratio (BTR) for each T/B was 0.2, 0.4, 0.6, 0.7, 0.8, and 0.9, respectively (T/B = 1.0 was excluded). The image quality was analysed based on image contrast, signal-to-noise ratio (SNR), defect size accuracy, and total grade (trade-off between contrast, SNR, and defect size accuracy).

Results: Different filters produce different values of contrast, SNR, and defect size. The increase in cut-off frequency and order of filter resulted in the increase in contrast and SNR, but the accuracy of defect size was reduced. Butterworth filter has the ability to balance between contrast, SNR, and defect size accuracy, while Gaussian filter is good

in producing image with high contrast and SNR. This study suggests that Butterworth filters can be used to analyse SPECT images, while Gaussian filter can be used as an alternative. Based on total grade, the Butterworth filter parameters of (0.40 Nq; $n = 12$), (0.45 Nq; $n = 8$), (0.75 Nq; $n = 12$), (0.80 Nq; $n = 8$), (0.80 Nq; $n = 11$), and (0.80 Nq; $n = 11$) were found to be optimum for BTR = 0.2, 0.4, 0.6, 0.7, 0.8, and 0.9 respectively. For Gaussian filter, the filter parameters of (0.60 Nq; $n = 10$), (0.65 Nq; $n = 12$), (0.65 Nq; $n = 14$), (0.70 Nq; $n = 14$), (0.75 Nq; $n = 14$), and (0.50 Nq; $n = 20$) were found to be optimum for BTR = 0.2, 0.4, 0.6, 0.7, 0.8, and 0.9, respectively. The optimum cut-off frequency of Butterworth and Gaussian filters showed linear relationship with BTR. For Butterworth filter, cut-off frequency = $0.227 + (0.715 \times \text{BTR})$, $R_2 = 0.864$, $P < 0.01$; and for Gaussian filter, cut-off frequency = $0.538 + (0.236 \times \text{BTR})$, $R_2 = 0.876$, $P < 0.05$. These 2 equations were used to predict the functional parameters of 4 patients who underwent ^{99m}Tc myocardial SPECT based on their BTR values (a retrospective study based on the patient data taken in 2003). End diastolic volume (EDV), end systolic volume (ESV), stroke volume (SV), and ejection fraction (EF) were calculated. The results showed that EDV and ESV values depend on the filter types applied during the reconstruction process. Butterworth filter produced lower EDV and ESV compared with Gaussian filter did.

Conclusion: It is recommended that only one filter type need to be used during reconstruction process to ensure correct interpretation.

Supervisor:
Professor Dr Ahmad Zakaria

DETERMINATION OF HEAVY METALS CONTENT IN SEAFOOD FROM EAST COAST OF PENINSULAR MALAYSIA

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Methods: Seafood samples obtained from 3 main markets in the East Coast Peninsular, Malaysia were analysed for the content of heavy metals, using Graphite Flame Atomic Absorption Spectrophotometer (GF-AAS) for copper (Cu), zinc (Zn), chromium (Cr), cadmium (Cd), and arsenic (As), and Flame Injection Mercury System (FIMS) for mercury (Hg). The 3 locations of interest were Pasar Siti Khadijah, Kelantan, Pasar Payang, Terengganu, and Pasar Besar Kuantan, Pahang. Statistical analyses were applied using two-way ANOVA with Duncan's multiple range tests to identify significant differences among species. Comparisons were made of metal concentrations in muscle, bone, and organ of various species of marine fishes.

Results: All samples showed different heavy metal contents. Higher metal content was observed in the organ and bone compared with in the muscle. Concentrations of the heavy metals (in mg/kg dry weight) in muscle samples of fish species ranged as follows: Cu 1.14–10.22, Zn 10.03–42.97, Cd 0.01–1.32, As 0.01–0.28, and Pb 0.01–0.09.

Conclusion: The results indicated that, in the edible parts of 13 species of marine fishes from marine coastal of East Coast Peninsular Malaysia, the heavy metal concentrations were well below the permissible amount according to Malaysian Food Act 1983 and Food Regulations 1985. Their contribution to the body burden could be considered as negligible and deemed safe for human consumption. However, Cd and Zn in the bones and organs were significantly above permissible limit ($P < 0.05$).

Supervisor:
Associate Professor Dr Shariza Abdul Razak

BELIEFS, ATTITUDES, AND PRACTICES OF PARENTS IN FEEDING OBESE SELECTED PRIMARY SCHOOL CHILDREN IN KOTA BHARU, KELANTAN

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Introduction: The increasing prevalence of obesity among children in Malaysia is becoming a major problem because childhood obesity can result in many diseases in adulthood. Thus, parents play an important role in determining their children's food intake.

Objective: This study was conducted to evaluate parents' belief, attitudes, and practices in child feeding among obese and overweight primary school children.

Methods: This was a cross sectional study involving 175 Standard 2 children at 3 schools in Kota Bharu. Height, weight, and triceps skin-fold thickness were measured. Questionnaires, which include socio-demography questionnaire, Child Feeding Questionnaire (CFQ), and International Physical Activity Questionnaire (IPAQ), were distributed to the parents. Qualitative study was also carried out on predictor variables of body mass index (BMI) and child obesity. Eight parents of obese children were involved in an in-depth interview.

Results: This study showed that the prevalence of weight problems among children was 13.2%, of which 6.9% was overweight and 6.2% was obese. All the children in the study were Malays. Significant difference between obese and normal-weight child was found in father's occupation, where 52.2% of fathers of obese children were self-employed and 47.8% were paid employees. Scores on perceived parent's own weight ($P < 0.05$) and their children's weight ($P < 0.001$) were

higher among parents of obese children compared with among parents of normal-weight children. Pressure on children to eat ($P < 0.05$) among obese children was less than among normal-weight children. Total days of moderate physical activity of parents showed significant correlation ($P < 0.05$) with child anthropometry (weight, height, and triceps skin-fold thickness). This study also found that perceived child weight and pressure to eat were the predictor variables of child BMI. Only perceived child weight was the predictor for obesity among children. Qualitative research showed that most parents perceived their children were overweight or obese since their children were 5 years old, and the pressure to eat was less among overweight or obese child because the parents realised that their children have high appetite. However, the way parent identified their child as obese or overweight was not accurate because they did not refer to any growth chart or correct indicator.

Conclusion: This research showed that parents play a major role in preventing obesity among children.

Supervisor:

Professor Dr Wan Abdul Manan Wan Muda

PHARMACOLOGICAL ANALYSIS, MORPHOLOGICAL AND IDENTIFICATION OF BIOACTIVE COMPOUNDS OF THE EDIBLE BIRD'S NEST

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Introduction: The edible bird's nests (EBN) are made by the swiftlets using their saliva. In the traditional Chinese medicine, EBN is considered as one of the top health foods and is claimed to have many therapeutic effects. Although some of the in vitro effects of EBN have been studied, a study looking at the pharmacological effects of EBN on the vital body system is not available.

Methods: In the present study, the morphology of the beak of the swiftlets and EBN, the bioactive compounds, and the cardiovascular system (CVS) effect of the EBN water extract (EBN-WE) were analysed. Two experimental procedures were executed to determine the effect of the EBN-WE on the CVS of anaesthetised normotensive rats: (1) the direct effect of the intravenously administered EBN-WE on the mean arterial pressure (MAP), systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR); and (2) the effect of the intravenously administered EBN-WE on the responses of MAP, SBP, DBP, and HR to endogenous chemicals, namely acetylcholine (Ach), noradrenaline (NA), adrenaline (Adr), histamine (His), and serotonin (5-HT).

Results: The swiftlet's tongue sections revealed the presence of intralingual and sublingual salivary gland structures, which may be the main source of the salivary secretion used in nest building. Presence of other structures such as the intrinsic skeletal muscle and cartilaginous structures showed the relationship between the function of these structures and nest-building ability. The morphology of the EBN showed solidity and uniformity of the nest building material. Gas chromatography-mass spectrometry (GC-MS) analysis of the EBN-WE revealed the presence of amino acids and its analogues, biogenic amine analogues, and amphetamine analogues. The intravenous administration of the EBN-WE (0.01, 1, and 100 mg/kg) caused transient decreased in the blood pressure and HR. The effects of the EBN-WE on the MAP and DBP were inversely proportional to the dose level and were found significant at 0.01 mg/kg. Following EBN-WE injection, SBP was decreased by 3 times as the dose level was increased, without change in the HR. MAP and SBP responses to Ach after EBN-WE injection were significantly increased at the dose of 1 mg/kg EBN-WE, and no significant changes were observed on the DBP and HR responses to Ach. There were no significant changes on the degree of responses of MAP, SBP, DBP, and HR to Adr and NA after EBN-WE injection. The change in DBP response to His after EBN-WE injection was only significant at the dose of 0.1 mg/kg. There were no significant changes observed in MAP, SBP, and HR responses to His administration after EBN-WE injection. MAP and DBP responses to 5-HT showed significant increased after EBN-WE injection at the dose of 1 mg/kg. The change in SBP response to 5-HT after EBN-WE injection was significant at the doses of 0.1 and 1 mg/kg of EBN-WE. No significant changes were observed on HR. Based on the observation throughout the experiment, no toxic effect was apparent due to intravenous injections of EBN-WE. The test substance was successfully administered directly through the blood circulation without deterring the haemodynamics of the blood pressure in the rats. The EBN-WE did not cause much alteration in the responses of MAP, SBP, DBP, and HR to endogenous chemicals.

Conclusion: The present findings may be the first report that provides an overall aspect of the EBN, which include the source of the salivary secretion, the morphological structure of the EBN, the composition of the bioactive compounds, and the pharmacological effects of the EBN-WE on the cardiovascular system of an in vivo rat model. This study had also provided substantial data to verify that the EBN is safe for human consumption.

Supervisor:

Professor Dr Syed Mohsin Syed Sahil Jamalullail

Co-supervisor:

Associate Professor Dr Syed Waliullah Shah

EFFECT OF ZINC SUPPLEMENTATION ON THE MORPHOLOGY AND PERMEABILITY OF THE SMALL INTESTINE MUCOSA SECONDARY TO CHRONIC MILD STRESS IN RATS

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Introduction: Psycho-physiological stress has widely attracted researchers to investigate the effects of stress on physiological system. However, no study on the beneficial role of zinc in stress-induced physiological alterations has been established.

Objectives: This study examined the effect of zinc supplementation on the physiological parameters, morphology, permeability, and inflammatory cell infiltration of the small intestine mucosa secondary to chronic mild stress in rats.

Methods: A total of 40 male Sprague Dawley rats aged 6 weeks with a mean body weight of 49.69 g (SD 3.92) were divided into 4 groups ($n = 10$ each): control (C), control with zinc supplement (CZ), stress (S), and stress with zinc supplement (SZ). The rats were exposed to water avoidance stress 1 hour daily for 10 consecutive days. Body weight gain, food and water intake, and number of stool pellet after every stress session were documented throughout the study. On the 11th day, after an overnight fasting, rats were anaesthetised with diethyl ether, and fluorescein isothiocyanate dextran solution was injected into a loop of small intestine. One hour later, rats were re-anaesthetised, and blood was collected from the abdominal aorta to measure the intestinal permeability. Rats were then sacrificed, and ileum and jejunum were taken for histological evaluation and inflammatory cell assay. Statistical comparisons were made by one-way analysis of variance, followed by post hoc Tukey test.

Results: Daily stress sessions in this study had significantly reduced the body weight gain of the S group compared with that of the C group's, although no significant difference was seen in the comparison of food and water intake between the 2 groups. However, the SZ group had significantly increased body weight gain and food intake compared with those of the S group's. The number of stool pellet was significantly higher in the S group compared with in the C group, and in the SZ group compared with in the CZ group. The S group had significantly shorter crypt depth in the ileum, lower villus height in the jejunum, lower number of goblet cell in the crypt of the ileum and the jejunum, and lower number of goblet cell in the villus of the jejunum compared with those of the C group's. The SZ group had significantly longer crypt depth, higher villus height, and higher number of goblet cell in the crypt as well as in the villus of the ileum and the jejunum compared with those of the S group's. The S group had significantly higher permeability of FITC in the small intestine

and higher inflammatory cell infiltration in the ileum and the jejunum compared with those of the C group's. However, SZ group had significantly lower permeability of FITC in the small intestine and lower inflammatory cell infiltration in the ileum and the jejunum compared with those of the S group's.

Conclusion: Chronic mild stress compromised the small intestinal mucosal morphology, permeability, and inflammatory cell infiltration, which were attenuated by zinc supplementation. These findings suggest that zinc might be involved in the prevention of small intestinal barrier dysfunction secondary to chronic mild stress and possibly be a promising nutrient for diseases related to intestinal barrier dysfunction.

Supervisor:
Dr Jesmine Khan
Co-supervisor:
Professor Dr Zalina Ismail

ANALYSIS OF BIOLOGICAL, BEHAVIOURAL, AND ENVIRONMENTAL DETERMINANTS OF MALNUTRITION: A STUDY OF MALNOURISHED CHILDREN IN TUMPAT, KELANTAN, MALAYSIA

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Introduction: Many studies have shown that poor growth in children is associated with malnutrition. The contributing factors are diverse, multi-sectoral, and interrelated, including biological, social, cultural, and economical factors. As poor growth is one of the most serious health issues in the world, it is important for policymakers to understand the determinants in order to design more concise and effective public health intervention programmes.

Objective: The purpose of this cross-sectional study was to examine the relationships between biological, behavioural, and environmental factors and malnutrition in children aged 5 years and below.

Methods: The instrument used in this study was based on a previously described conceptual framework for malnutrition in children (Sastry 1996) and was tested for its psychometric component, using both qualitative and quantitative methods. In addition to the use of a questionnaire, anthropometric and dietary data were collected from 295 children who were randomly selected from clinics in Tumpat, Kelantan, Malaysia. The proposed model was tested and modified using Structural Equation Modelling. The modified model was adequately fitted with the data.

Results: The results demonstrate that the environmental construct with its factors (total household income, $\beta = 0.68$, $P < 0.01$; total expenditure, $\beta = 0.67$, $P < 0.01$; number of rooms in house, $\beta = 0.46$, $P < 0.01$; socio-economic status,

$\beta = 0.71, P < 0.01$), had a significant effect on malnutrition. None of the biological and behavioural constructs showed any significant effects.

Conclusion: These findings provide useful insights into the importance of focusing on environmental factors as the main target in designing intervention programmes, particularly in the area that can promote economic growth. The adoption of 'pro-poor growth', establishment of social and physical infrastructure, and execution of public policy that directly helps the poorest groups should be continued to be the main agendas of the government in eradicating malnutrition among children. Nevertheless, the existing health intervention on behavioural change and infrastructure support should be continued to maintain the current nutritional status of the children. Moderate malnutrition among children 5 years and below in rural communities is still an area of importance. The findings also have implications for the use of multiple techniques in anthropometry for screening the nutritional status of children. Future efforts should focus on promoting public awareness on poverty and child malnutrition among the rural communities, developing partnership between private sectors and non-governmental agencies with the government in eradicating poverty and child malnutrition, empowering communities in the implementation of intervention programmes, and capacity building among the communities to take care of themselves.

Supervisor:

Professor Dr Wan Abdul Manan Wan Muda

Co-supervisor:

Professor Dr Zabidi Azhar Mohd Hussin

DEVELOPMENT OF A GLASS FIBRE MEMBRANE-BASED LATERAL FLOW BIOSENSOR FOR THE DETECTION OF LABELLED PCR AMPLICONS USING VIBRIO CHOLERAE AS THE MODEL ORGANISM

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Introduction: In recent years, molecular techniques have played an increasing role in the diagnosis of infectious diseases, and polymerase chain reaction (PCR) is one of the predominant techniques used. However, major setbacks such as requiring trained personnel, cold-chain storage, and cumbersome detection protocols hampered the general use of PCR in place of conventional methods. Furthermore, PCR products are commonly detected using agarose gel electrophoresis methods, involving carcinogenic ethidium bromide and harmful ultraviolet illumination.

Objective: The objective of this study was to develop and evaluate a thermostabilised PCR assay and a lateral flow-based device for detection of amplicons.

Methods: *Vibrio cholerae* was used as a model organism to develop a molecular detection kit named the cholera PCR-ICT-DNA assay. A multiplex PCR with an incorporated internal amplification control (IC) and utilising hapten-modified primers was developed and optimised. The PCR was thermostabilised and evaluated for analytical specificity. Concurrently, a lateral flow device was developed and optimised using FUSION 5 glass fibre membrane (Whatman, UK). Capture reagents were coupled to carrier beads and detector reagent bioconjugated to gold nanoparticles. The device consisted of a conjugate pad embedded with detector reagents, a reaction pad immobilised with capture reagents, and a wicking zone. Dispensing, blocking, and drying parameters were refined to produce a stable ICT-DNA dipstick prototype. Analytical sensitivity and specificity of the ICT-DNA dipstick were also determined. The cholera PCR-ICT-DNA assay kit was then evaluated for analytical sensitivity. Clinical evaluation was also performed using spiked stool specimens ($n = 174$). The shelf life of the kit was then estimated using elevated temperature-based accelerated aging techniques. The cholera PCR-ICT-DNA assay translated PCR results of the kit into visual signals on the ICT-DNA dipstick. The test line of the ICT DNA dipstick detected target amplicons, while the IC line detected IC amplicons. Control line provided the chromatographic control element for the ICT-DNA dipstick.

Results: The analytical specificity of the thermostabilised PCR component and the ICT-DNA dipstick component was at 100% each. The ICT-DNA dipstick reported a limit of detection (LoD) of 0.5 ng/ μ L at the DNA level for both monoplex and duplex PCR products, which was 2 times more sensitive than agarose gel electrophoresis analysis. The cholera PCR-ICT-DNA assay recorded a LoD of 106 CFU/mL at bacterial cell level and 10 pg at genomic DNA level. Clinical evaluation yielded 100% for sensitivity, specificity, positive predictive value, and negative predictive value. The kit was estimated to be stable for at least 3 months at ambient temperature.

Conclusion: A novel molecular detection kit for cholera was developed. The detection kit provided an easy and rapid format to perform PCR that requires no cold-chain, coupled with a PCR amplicons detection device that can translate results into visual signals within 10 minutes. The versatile detection kit can be easily modified for PCR amplicon detection of other infectious diseases.

Supervisor:

Professor Dr Lalitha Pattabhiraman

Co-supervisor:

Dr Lim Boon Huat

INFLUENCE OF RAIN, MALATHION, SUNLIT, AND SHADED HABITATS ON THE DURATION OF DEVELOPMENT AND MOLECULAR IDENTIFICATION OF *CHRYSOMYA MEGACEPHALA* (FABRICIUS) (DIPTERA: CALLIPHORIDAE) IN KELANTAN, MALAYSIA

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Introduction: *Chrysomya megacephala* (Fabricius) is the earliest and the most prevalent necrophagous species infesting dead bodies in Malaysia and thus, may provide the best estimate of minimum post-mortem interval (PMI). In Malaysia, heavy and/or incessant rain is a commonplace occurrence, and malathion is the most prevalent poison used for committing suicide.

Methods: In this research, the independent and combined influences of the rain and the presence of malathion in whole rabbit carcasses decomposing in sunlit and shaded habitats on oviposition and development of *C. megacephala* were studied over a period of 1-year in Kelantan, Malaysia, to provide baseline data for the estimation of PMI. Base sequence of *CO1* gene was used for species identification, and the influence of malathion on the sequence of *CO1* gene of *C. megacephala* was determined. The possible use of larvae and pupae of *C. megacephala* for detecting malathion in diagnosing the cause of death, especially when visceral organs have liquefied, was also investigated.

Results: In general, rain, depending on its intensity, delayed initial oviposition by 1 to 2 days and prolonged the pupation period by 1 to 3 days. The presence of malathion in the carcasses delayed initial oviposition by 1 to 3 days and prolonged the pupation period by 2 to 3 days. Presence of rain and malathion cumulatively prolonged pupation period that extended to a maximum of 8 days. It was found that malathion did not impede the accuracy of species identification while using the base sequence of *CO1* gene fragment amplified by CI-J-2495/CI-N-2800 primers.

Conclusion: The detection of malathion in larvae and pupae *per se* may prove useful in diagnosing the cause of death, since malathion is a poison unlike other drugs that are abused. These findings deserve consideration in estimating PMI in decomposed bodies recovered in Malaysia during both rainy and dry months, as well as when malathion poisoning is suspected.

Supervisor:
Associate Professor Dr PT Jayaprakash
Co-supervisor:
Dr Zafarina Zainuddin

INTERACTION OF CTCF AND ITS INTERACTING PARTNERS IN HYPERTROPHIC SCAR AND NORMAL FIBROBLASTS FOLLOWING CHITOSAN DERIVATIVES TREATMENT

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Introduction: Chitosan, a deacetylated form of chitin with excellent biological properties implicated in wound healing activity via well-regulated regulators.

Methods: In this study, primary human skin keratinocytes and fibroblasts of both normal and hypertrophic scars were established in order to assess the cytocompatibility of novel chitosan derivatives sheets and pastes, carboxymethyl chitosan and oligochitosan, as well as the involvement of multivalent transcription factor, CTCF, with its interacting partners in wound healing mechanism.

Results: The establishment of primary cell was confirmed by immunocytochemistry and Western blot approaches using specific markers, involucrin and cytokeratin 6 for keratinocytes and fibroblast surface protein and heat shock protein 47 for fibroblasts. All tested chitosan showed appropriate cytocompatibility properties as judged by colourimetric tetrazolium salt (MTT) assay, whereby SH120 (N, o-carboxymethyl-chitosan) was considered the most cytocompatible, with stimulation of the normal fibroblast cell growth and inhibition of the overgrowth of hypertrophic scar. Using Western assay, CTCF and its associated proteins (YB-1, c-Myc, and p53) were found to be differently expressed in both normal (pNHDF) and hypertrophic scar (pHSDF) fibroblasts, including cells treated with chitosan. These factors most probably play different roles in cell cytocompatibility, proliferation, and apoptosis. Using *in vitro* and *in vivo* biochemical interaction assays, YB-1 has been found to interact physically with CTCF N-terminal domain. This interaction was further characterised using both cognate sequence of YB-1 and AP-1 via electrophoretic mobility shift assay. This study showed that the physical protein-DNA interaction may act as an activator of the matrix metalloproteinase (MMP-13) promoter activity of normal and hypertrophic scar fibroblasts, which may further regulate cell proliferation and MMP-13 activity in the wound healing pathway.

Supervisor:
Associate Professor Dr Shaharum Shamsuddin
Co-supervisor:
Professor Dr Ahmad Sukari Halim

FACTORS INFLUENCING THE USAGE OF MULTIMEDIA FOR TEACHING AMONGST HEALTH SCIENCES LECTURERS IN MALAYSIAN PUBLIC UNIVERSITIES: TOWARDS THE DEVELOPMENT OF A MULTIMEDIA REPOSITORY SYSTEM

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Introduction: In higher institutions worldwide, the integration of multimedia for teaching medical and health sciences (HS) has been limited owing to organisational and individual factors. Organisational factors identified were insufficient organisational support in terms of teaching resources, facilities, information technology training programmes, and technical support. Individual factors include attitude and knowledge of academics on technology integration into their lectures.

Objectives: This study was conducted to explore the current status of multimedia usage among HS lecturers in Malaysian public universities, to conduct a situational assessment study in order to observe the current system of organisation support for HS lecturers, and to design, implement, and evaluate the acceptance of a new Multimedia Repository System (MRS).

Methods: This study was conducted in 2 phases. Phase I consisted of 2 substudies: an exploratory study and a situational assessment study. For the exploratory study, a cross-sectional survey was conducted, from January until August 2006, among the HS lecturers from 10 Malaysian public universities. An English version of a validated questionnaire was sent to 190 participants, and 90% responded. The Mann–Whitney test, Kruskal–Wallis test, and multiple linear regression analysis were carried out using SPSS version 15. The situational assessment study investigated the perceptions of training and workshop organisers, as well as the organisation support in the Universiti Sains Malaysia Health Campus. Consequently, in Phase II of the study, a new MRS was developed in conformance with Health Education Assets Library metadata schema standard. In January 2008, a User Evaluation Workshop was conducted among 35 HS lecturers in the School of Health Sciences, Universiti Sains Malaysia. An English version of the validated questionnaire was given to participants at the end of the hands-on section. Structural Equation Modeling was used for the path analysis using AMOS 7. To test MRS acceptance, a web-based System Acceptance Model (WebSAM) was developed, comprising 6 determinants to predict the intention to use (IU) of MRS in the future: perceived ease of use (PEU), perceived usefulness (PU), web experience (WE), technical support (TS), computer experience (Com_Exp), and compatibility (COM).

Results: Although HS lecturers' technology usage was high on computer and the Internet, their use was just above average on hardware and library materials, and low on software, digital repositories, and sharing digital materials (DM) among them. Their practice was significantly associated with their technological knowledge ($R^2 = 0.34$; F [df1, dt2] = 79, 46; $P < 0.0001$), attitudes towards sharing DM via the Internet ($R^2 = 0.40$; F [df1, dt2] = 51, 44; $P < 0.0001$), working experience ($R^2 = 0.43$; F [df1, dt2] = 37, 44; $P < 0.0001$), perceived organisational support on teaching materials ($R^2 = 0.44$; F [df1, dt2] = 30, 06; $P < 0.0001$), and the teaching facilities ($R^2 = 0.45$; F [df1, dt2] = 24, 95; $P < 0.0001$). The findings from the situational assessment study indicated that the Universiti Sains Malaysia Health Campus was lacking in information technology training programmes and workshops that foster HS lecturers' technology integration into teaching, as well as the need for a repository to support them with sharable DM resources. The results from the acceptance study showed that PU ($\beta = 0.68$, $P < 0.01$), COM ($\beta = 0.41$, $P < 0.05$), and Com_Exp ($\beta = 0.15$, $P < 0.01$) were the direct determinants of HS lecturers' IU of MRS for their lecture preparations. TS had a significant direct effect on COM ($\beta = 0.71$, $P < 0.01$), and COM had a significant direct effect on the PU ($\beta = 0.43$, $P < 0.01$). The proposed Web-SAM accounted for 59% of the variance explained on IU. When it was tested on Davis' original Technology Acceptance Model (TAM) with 2 determinants (PEV and PU), the variance explained of IU was only 45%. The greater proportion of the Web-SAM model proved that it is more robust than the original TAM.

Conclusion: In the future, this study can be replicated in other fields and the proposed Web-SAM will be useful for evaluating the acceptance of other Web-based systems. MRS can be further enhanced to incorporate more features and functions to support the lecturers need.

Supervisor:

Associate Professor Dr Sharifah Mastura Syed Mohamad