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NUTRITION RESEARCH IN MALAYSIA

Selected Bibliography of Published Journal Articles
from 2015 to 2017

Volume III

Technical Working Group on Nutrition Research
National Coordinating Committee on Food and Nutrition,
Ministry of Health, Malaysia

2019

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TECHNICAL WORKING GROUP ON NUTRITION RESEARCH
NATIONAL COORDINATING COMMITTEE ON FOOD AND NUTRITION,
MINISTRY OF HEALTH, MALAYSIA

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Preface by
Deputy Director-General of Health (Public Health)

Nutrition research in Malaysia has rapidly evolved. The publication of this "Nutrition Research in Malaysia Selected Bibliography of Published Journal Articles from 2015 to 2017" is indeed very timely. This publication portrays our commitments in providing access to published nutrition research conducted in Malaysia. With the compilation of the abstracts, it will hopefully benefit all the relevant researchers and programme managers in ensuring evidence-based policy making and programme.

I would like to congratulate and express my utmost appreciation to the Editorial Committee for this publication. This committee is set up under the Technical Working Group on Nutrition Research which is under the purview of National Coordinating Committee on Food and Nutrition (NCCFN). I would also like to extend my sincere gratitude to all who have directly or indirectly contributed to the publication of this document.

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Acknowledgement

On behalf of the Technical Working Group of Nutrition Research under the purview of National Coordinating Committee for Food and Nutrition (NCCFN), I would like to express my warm appreciation to the Ministry of Health and all the editorial board members for their hard work towards the successful completion and publication of "Nutrition Research in Malaysia- Selected Bibliography of Published Journal Articles from 2015-2017".

This publication is the continuation of the two previously published bibliography. This is our third abstract volume publication. This third volume consists of 12 nutrition research scopes with 645 abstracts published from 2015 to 2017. All research abstracts are either in English or Bahasa Malaysia, collected from researchers with nutrition and related disciplines from both local universities and institutions in Malaysia.

The painstaking efforts and valuable contributions from those who have directly or indirectly involved in making this document a success are greatly acknowledged. Hence, I wish to express my warm appreciation and gratitude to the following:

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List of Scientific Terms

Acalypha indica	Indian copperleaf, India acalypha (Kucing Galak, Cika Mas)
Aerodramus fuciphagus	White-nest swiftlet
Agrocybe	Mushroom species
Allium atroviolaceum	Herbaceous plant
Aloe barbadensis	Aloe vera
Alternanthera sessilis	Sessile joyweed (Keremak Bukit)
Amaryllifolius roxb	Pandan
Amusium pleuronectes	Scallop
Anacardium occidentale	Cashew (Pucuk gajus)
Anadara granosa	Cockle
Ananas comosus	Pineapple
Andrographis paniculata	Green chireta (Hempedu Bumi)
Annona muricata	Soursop
Artocarpus heterophyllus	Jackfruit
Atractylis gummifera	Glue thistle plant, masticogna, musciurida, chardon` a glu
Auricularis polytricha	Telinga kera mushroom
Averrhoa Carambola	Starfruit
Baccaurea angulata	Belimbing dayak or belimbing hutan
Bacillus subtilis	A gram-positive bacteria found commonly in soil environments
Basella alba	Malabar spinach
Bennicasa hispida	Winter gourd,wax gourd, white gourd
Bifidobacterium bifidum	A gram-positive bacteria which function as probiotic
Bifidobacterium infantis	A gram-positive bacteria which function as probiotic
Bifidobacterium longum	A gram-positive bacteria which function as probiotic
Brassica oleracea	Chinese kale
Brucea javanica	Melada pahit
Caenorhabdis elegans	Roundworm
Camellia sinensis	Green tea
Canarium odontophyllum	Black olive, Borneo olive, Sibu olive, Kanna, Ka Lang, Zaitun tropika, *(Buah Dabai)*
Carica papaya	Papaya
Centella asiatica	Pegaga
Chlamydia trachomatis	A gram-negative bacteria that associate with sexually transmitted disease
Chlorella vulgaris	Green microalgae
Cicer arietinum	Chickpea
Cinnamomum zeylanicum	Cinammon
Citrullus lanatus	Watermelon
Citrus grandis	Pomelo
Clinacanthus nutans	Belalai gajah
Commelina nudiflora	Rumput Aur, Rumput Kupu-kupu, Rumput Tahi Itek
Corynebacterium xerosis	A gram-positive bacteria found in skin and mucous membranes of humans
Cosmos caudatus	*Ulam raja*
Crocus sativus	Autumn Crocus, Saffron

List of Scientific Terms

Cronobacter sp.	A gram-negative bacteria associated with neonatal meningitis.
Cucumis sativus	Cucumber
Cynoglossus arel	Largescale tonguesole (Ikan lidah sisik besar)
Dacryodes rostrata	*Kedondong kerut*
Dioscorea hispida	Wild yam
Dioscorea pyrifolia	*Akar kemenyan paya*
Elaeis guineensis	African palm oil
Enterobacter cloacae	A gram-negative bacteria found in respiratory and urinary tract infactions
Enterococcus faecalis	A gram-positive bacteria found in urinary tract infactions
Epinephelus fasciatus	*Kerapu*
Escherichia coli	A gram-negative bacteria normally live in the intestines
Eucheuma cottonii	Red seaweed
Eucheuma denticulatum	Red seaweed
Eurycoma Longifolia	Longjack *(tongkat ali)*
Euthynnus affnis	Tuna fish
Garcinia mangostana	Mangosteen
Garcinia xanthochymus	*Asam kandis*
Glycine max	Yellow soya bean and black soya bean
Goniothalamus umbrosus	*Kenerak*
Gymnura sp.	Butterfly ray
Gynostemma pentaphyllum	Traditional Chinese medicine (Tea), Jiaogulan
Hibiscus cannabinus	*Kenaf*
Hibiscus sabdariffa	Roselle, asam susur
Hilsa macrura	*Terubuk*
Hylocereus polyrhizus	Dragon fruit
Ipomoea aquatica	Water spinach
Kappaphycus alvarezii	Red seaweed, Elkhorn sea moss (Red algae)
Kappaphycus striatum	Red seaweed
Labisia pumila	Kacip fatimah
Lactobacillus acidophilus	A gram-positive bacteria which function as probiotic
Lactobacillus casei	A gram-positive bacteria which function as probiotic
Lactobacillus delbrueckii	A gram-positive bacteria used in fermented dairy products
Lactobacillus helveticus	A gram-positive bacteria used in fermented dairy products
Lactobacillus lactis	A gram-positive bacteria which function as probiotic
Lactyca sativa	Letture
Lagerstroemia speciosa	Crepe Myrtle, Banaba tree
Larea tridentata	Creosote bush
Lates calcarifer	Giant seaperch (Kakap putih)
Lawsonia inermis	Henna tree
Lens culinaris	*Dhal*
Lentinus edodes	Shiitake mushroom
Leonurus sibiricus	*Kacangma*

List of Scientific Terms

Lignosus rhinocerotis	Tiger milk mushroom (Fungus)
Luvunga scandens	Mengkurat Jakun
Mangifera indica	Mango
Mangifera pajang	*Buah bambangan*
Mannihot esculenta	*Pucuk ubi*
Marantodes pumilum	*Kacip Fatimah*
Melaleuca cajuputi	*Cajuput,* White samet, Gelam
Melicope lunu-ankenda	*Tenggek burung*
Meretrix spp	Asian hard clam
Metapenaeus affinis	Prawns
Metroxylon sagu	*Sago*
Micrococcus luteus	A gram-positive bacteria found in soils, freash water and frequently on human skin
M*ikania micrantha*	*Selaput tunggul,* Cheroma, *Ulam tikus*
Mitragyna speciosa	Kratom *(ketum)*
Momordica charantia	Bitter melon *(Peria katak)*
Morinda citrifolia	Cheese fruit *(Noni)*
Moringa oleifera	Drumstick tree *(Pokok Kelor)*
Musa acuminata cv P.Berangan	*Pisang Berangan*
Musa acuminata cv P.Susu	*Pisang Susu*
Musa acuminate cv P.Mas	*Pisang Mas*
Musa balbisiana cv P.Abu	*Pisang Abu*
Musa balbisiana cv P.Nipah	*Pisang Nipah*
Musa paradisiaca	*Banana tepal, Jantung pisang, Pisang Tanduk, Pisang Nangka*
Musa paradisiaca cv P.Rastali	*Pisang Rastali*
Mycoplasma hominis	A bacteria without gram stain that associated with sexual transmitted diseases
Myrmecodia pendens	*Sarang Semut*
Nigella sativa	Fennel flower (Black Seed Oil)
Orthosiphon stamineus	*Misai Kucing*
Oryza sativa	Asian rice
Pangasius sutchi	*Patin* fish
Parkia speciosa	Bitter bean *(Petai)*
Pereskia bleo	Rose cactus, Leaf cactus (Pokok jarum tujuh bilah)
Persea americana	Avocado
Phoenix dactylifera	Date palm
Phytophthora palmivora	Coconut budrot
Piper betle	Betel Pepper
Piper sarmentosum	Wild Pepper *(Daun kaduk)*
Pithecellobium bubalinum	*Kerdas*
Pithecellobium jiringa	*Jering*
Plantago major	Broadleaf plantain
Pleurotus flabellatus	Red oyster mushroom
Pleurotus sajorcaju	Grey oyster mushroom
Pluchea indica	*Beluntas*

List of Scientific Terms

Pseudomonas aeruginosa	A gram-negative bacteria which causes severe acute and chronic infections at different sites within body such as respiratory tract, skin and urinary tract
Psidium guajava	Guava
Punica granatum	Pomegranate
Pynoporus cinnabarinus	White-rot fungus
Rastrelliger kanagurta	Indian mackerel
Salmonella enterica	A gram-negative bacteria found commonly in gastrointestinal tract of ruminants
Salmonella typhimurium	A gram-negative bacteria found commonly in gastrointestinal tract of ruminants
Sargassum binderi	Brown seaweed
Sargassum polycystum	Brown seaweed
Sargassum siliquosum	Brown seaweed
Sauropus androgynus	Star gooseberry, cekur manis, cangkok manis
Selaroides leptolepis	Yellowstripe scad
Sepia officinalis	Cuttlefish
Shigella flexneri	A gram-negative bacteria associated with diarrhea
Staphylococcus epidermidis	A gram-positive bacteria found in human epithelia predominantly the axillae, head and nares
Stevia rebaudiana	Candyleaf *(Daun stevia)*
Stichopus chloronotus	Sea cucumber
Streptococcus pyogenes	A gram-positive bacteria found in oropharynx
Streptococcus thermophilus	A gram-positive bacteria used in fermented dairy products
Strobilanthes crispus	*Daun picah beling, pecah kaca, jin batu*
Strombus canarium	Edible sea snail, dog conch
Symphytum officinale	Common comfrey
Tlymphocytes	White blood cell
Terminalia	Ketapang tree, tropical/indian almond tree
Tetrapleura tetraptera	Exotic fruit tree, Aridan
Teucrium chamaedrys	Wall germander
Trachinotus blochii	Nyior-nyior, golden pompano
Trichosanthes Cucumerina	Snake gourd or Labu Ular
Trigona	Stingless bees, kelulut
Typhonium flagelliforme	Rodent Tuber (Keladi Tikus)
Ureaplasma urealyticum	A gram-negative bacteria associated with genital tract infaction disease
Vigna angularis	Red bean
Vigna radiata	Mung bean
Vigna unguiculata	Black-eyed pea
Woodfordia fruticosa	Fire Flame Bush
Xanthium strumarium	Rough cocklebur

List of Abbreviations

(OH)D	Hydroxyvitamin D
AA	Antioxidant activities
AAS	Atomic Absorption Spectroscopy
ABTS	2,2'-azino-bis-3-ethylbenzthiazoline-6-sulphonic acid
ACI	Autologous Chondrocyte Implantation
ADHD	attention deficit–hyperactivity disorder
ADMET	Absorption, Distribution, Metabolism, Excretion and Toxicity
AEAC	ascorbic acid equivalent antioxidant content
AIP	Atherogenic Index of Plasma
ALDH	aldehyde dehydrogenase
ALT	alanine transaminase
ANOVA	Analysis-of-variance
AOAC	Association of Official Agricultural Chemists
aOR	adjusted odds ratio
ARFS	Adverse reactions to foods
As	arsenic
ASC	adipose-derived stem cells
AUC	area under the curve
AV	acid value
BAZ	body mass index for age z-score
BECK	Beck Depression Inventory
BED	Binge eating disorder
BES	Binge Eating Scale
BF	body fatness
BF%	body fat percentage
BHA	butylated hydroxyanisole
BMC	bone mineral content
BMI	body mass index
BP	blood pressure
CARB	high-carbohydrate
CAT	catalyse
CBG	Case Based Group
CC	Calf circumference
CCl4	carbon tetrachloride
Cd	cadmium
CD	conjugated dienes
CFA	Confirmatory factor analysis
CHDR	conventional healthy dietary recommendation
ChEAT	Children's Eating Attitudes Test
CI	confidence interval
CK	creatine kinase
CRC	colorectal cancer
CREYP	cholesterol-reduced egg yolk powder
CVR	content validity ratio
DBP	diastolic blood pressure
DDC	daily dietary cost
DHA	Docosahexanoic Acid
DHQ	dietary history questionnaire
DMFX	dental missing filled extracted teeth
DNA	Deoxyribonucleic acid
DPPH	2,2-diphenyl-1-picrylhydrazyl
DSS	dextran sodium sulfate
EAL	ethyl acetate leaves
EAS	ethyl acetate stems
EBQ	Eating Behaviours Questionnaire
EC	European Commission
ECLIA	Electrochemiluminescence Immuno Assay
EDE-Q	The Eating Disorder Examination Questionnaire
EDTA	Ethylenediaminetetraacetic acid
EIT	electrical impedance tomography
ELISA	enzyme-linked immune-absorbent assay
EMI	low body mass index
EORTC QLQ-C30	European Organization for Research and Treatment of Cancer Care Quality of Life Questionnaire
FAC	fatty acid composition
FBG	fasting blood glucose levels
FBS	fasting blood sugar
FCD	Food Composition Database
FEC	formalin ether concentration
FELDA	Felda Land Development Authority

List of Abbreviations

FFQ	food frequency questionnaire
FNI	Food Nutrition Intervention
FRAP	ferric reducing antioxidant potential
FRF	fucoxanthin-rich fraction
FSHP	food safety and hygiene practice
FSTCM	Fitzpatrick Skin Type Chart Measurement
FTND	Fagerstrom Test for Nicotine Dependence
GAS	goal-adjustment scale
GBR	germinated brown rice
GBSA	group-based step aerobics
GCA	Glycyrrhizic acid
GC-MS	Gas chromatography-mass spectrometry
GDM	gestational diabetes mellitus
GDS	geriatric depression scale
GEE	Generalised equation estimation
GFAAS	graphite furnace atomic absorption spectrophotometer
GGH	The Gamma Green House
GI	glycaemic index
GIS	Geographical Information System
GM	gut microbiota
GPAQ	Global Physical Activity Questionnaire
GPAQ-M	Global Physical Activity Questionnaire
GPx	glutathione peroxidase
HAZ	Z scores for height-for-age
Hb	haemoglobin
HDFs	human diploid fibroblasts
HDL	High density lipoprotein
HDL-C	high-density lipoprotein cholesterol
HEMS	Health Monitoring System
HFHC	high fat and high cholesterol
Hg	mercury
HIIT	high-intensity interval training
HNO3	nitric acid
HO-1	Heme oxygenase-1
HOMA-IR	homeostatic model assessment of insulin resistance
HPLC	High-Performance High Chromatography
HPLC-UV-/ESI-MS-MS	High-performance liquid chromatography/ Ultraviolet and electronspray ionization —tandem mass spectrometry
HRGC/HRMS	high resolution gas chromatography/ high resolution mass spectrometry
HRQoL	health-related quality of life
HS	Herbal Seasoning
HVR	hepatic volume reduction
HypoSRQ	The Hypoglycaemia Symptom Rating Questionnaire
iAUC	Incremental Area Under Curve
ICC	intra-class correlation
ICP-MS	Inductively Coupled Plasma Mass Spectrophotometer
IDA	Iron deficiency anemia
IDDs	Iodine Deficiency Disorders
IDF	insoluble dietary fiber
IG	intervention group
IgE level	Immunoglobulin E level
IM	Intervention Mapping
iNOS	inducible nitric oxide synthase
IOTF	International Obesity Task Force
IPAQ	International Physical Activity Questionnaire
IPR	Index of Peer Relation
IQ	intelligence quotient
IQR	Interquartile range
IRRI	International Rice Research Institute
ISO	International Organization for Standardization
JAKIM	Jabatan Kemajuan Islam Malaysia
KAP	knowledge, attitude, and practice
KK	Kato-Katz
LDH	lactate dehydrogenase
LDL	low density lipoprotein
LDL-C	low-density lipoprotein cholesterol
LG	Low glycaemic index

List of Abbreviations

LGS	Long grain specialty
LRGS TUA healthy	the longitudinal study on neuroprotective model for longevity
MANOVA	multivariate analysis of variance
MBC	minimum bactericidal concentration
MCH	mean corpuscular haemoglobin
MCI	mild cognitive impairment
MCP	microbial cell preparation
MCS	Mental Health Composite Scale Score
MCV	mean corpuscular volume
MDA	malondialdehyde
MDG	Malaysian Dietary Guideline
MET	metabolic equivalent
MFG	Malaysian Food Guideline
M•HEI	Malaysian Healthy Eating Index
MMP12	matrix metalloproteinase 12
MMP-9	matrix metallopeptidase 9
MMSE	mini mental state examination
MoCA	Montreal Cognitive Assessment
mRNA	Messenger Ribonucleic Acid
MRST-H	Malnutrition Risk Screening Tool-Hospital
MST	The Malnutrition Screening Tool
MUAC	mid_upper arm circumference
MUFAs	monounsaturated fatty acids
MVPA	moderate-to-vigorous physical activity
MyBFF@Home	My Body is Fit and Fabulous at Home
MyHeARTs	Malaysian Health and A dolescents Longitudinal Research Team Cohort study
NaOH	Sodium hydroxide
NCDs	non-communicable diseases
NCI	National Cancer Institute
NHMS	National Health and Morbidity Survey
NKAP	nutrition knowledge, attitude, and practice
NLTPA	non-leisure time physical activity
NPC	nasopharyngeal
NPV	Negative Predictive Value
OLR	ordinal logistic regression
OR	Odd Ratio
ORAC	Oxygen Radical Absorbance Capacity
PA	physical activity
PALMS	Physical Activity and Leisure Motivation Scale
PAQ-C	Physical Activity Questionnaire for Older Children
Pb	lead
PCBs	polychlorinated biphenyls
PCDD/PCDF	dioxin and furan
PCS	Physical Health Composite Scale Score
PedsQoL	Paediatric Quality of Life
PER	Protein Efficiency Ratio
PFT	Pulmonary Function Tests
PG-SGA	Patient-Generated Subjective Global Assessment
PMW	postmenopausal women
PPB	plasma protein binding
PPV	Positive Predictive Value
PUFA	polyunsaturated fatty acid
PV	peroxide value
QEAC	quercetin equivalent antioxidant content
QOL	quality of life
qPCR	quantitative real-time polymerase chain reaction
RBP4	retinol binding protein 4
RC	randomised controlled
RDA	Recommended Dietary Allowance
RdRp	RNA-dependent RNA polymerase
RI	refractive index
RM	Ringgit Malaysia
RNA	Ribonucleic acid
RNI	Recommended Nutrient Intake
ROC	Receiver Operating Characteristic
ROS	reactive oxygen species

List of Abbreviations

RQLQ	Rhinoconjuntivitis Quality of Life Questionnaires
RT	room temperature
RTEC	Ready-To-Eat cereals
RWL	rapid weight loss
SAFAs	saturated fatty acids
SBP	Systolic blood pressure
SCFA	faecal short chain fatty acids
SD	Standard deviation
SDF	soluble dietary fiber
SEANUTS	South East Asian Nutrition Surveys
SEGAK Standard	National Physical Fitness for Malaysian School Children
SEM	standard error mean
SER	Standard Exercise Regimen
SFA	Saturated fatty acid
SGA	Subjective Global Assessment
SHBG	sex hormone binding globulin
SIRS	systemic inflammatory response syndrome
SOD	superoxide dismutase
SPSS	Statistical package for social sciences
SPT	skin prick test
SSB	Sugar-sweetened beverage
SSE	Standardized site effects
STH	soil-transmitted helminth
SVM	Support Vector Machine
T2DM	type 2 diabetes mellitus
TAC	Total antioxidant capacity
TAGs	triacylglycerols
TBARS	thiobarbituric acid reactive substances
TC	total cholesterol
TD	typical development
TDF	total dietary fiber
TFC	total flavonoid content
TFEQ-R21	Three-Factor Eating Questionnaire-R21
TG	triglycerides
TOPKAT	Toxicity Prediction by Komputer Assisted Technology
TPC	total phenolic content
TRF	tocotrienol rich fraction
TSC	total saponin content
TSQ	teamwork survey questionnaire
TTM	Trans Theoretical Model
UHPLC-MS/MS	Ultra-high performance liquid chromatography tandem mass spectrometry
UIC	urinary iodine concentration
UiTM	Universiti Technology MARA
UKM	Universiti Kebangsaan Malaysia
UKMMC	Universiti Kebangsaan Malaysia Medical Centre
UMT	Universiti Malaysia Terengganu
US	United States
USD	United States Dollar
USI	universal salt iodization
USM	Universiti Sains Malaysia
UV	Ultraviolet
VCO	Virgin coconut oil
VLCD	very low calorie diet
WAZ	weight-for-age z-score
WC	Waist Circumference
WHO	World Health Organization
WHR	waist-to-hip-ratio
WHZ	weight for height z-score
WIRS	water-immersion restraint stress
α-SMA	alpha-smooth muscle actin
α-TF	α-tocopherol

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Scope Description

Scope	Brief Description
Scope 1: Maternal, Infant and Young Child Nutrition	1) Relationship between maternal nutritional status and health outcomes throughout life cycle
	2) Nutritional status
	3) Breastfeeding
Scope 2: Nutritional Status	1) Monitoring national nutritional status and trend
Scope 3: Food Intake, Dietary Practices and Physical Activity	1) Food intake and dietary practices among various age groups
	2) Relationship between physical activity practice and health outcome in various age group
Scope 4: Micronutrient	1) Association between micronutrient status with health outcomes
	2) Micronutrient intervention and health outcome
Scope 5: Overweight and Obesity	1) Epidemiology of overweight and obesity
	2) Risk factors influencing development of overweight and obesity
	3) Management of overweight and obesity
Scope 6: Diet Related Non-communicable Diseases	1) Lifestyle risk factors and diet related NCDs
	2) Social and environment factors in association with diet related NCDs
Scope 7: Nutrient and Non-nutrient Components in Foods	1) Nutrient and non-nutrient compositions
Scope 8: Clinical Nutrition/ Intervention	1) Clinical nutrition studies involving patients

Scope		Brief Description	
Scope 9: Food Science and Technology		Related with Processing	
a)	Food Safety and Quality	1)	Food safety (Food hygiene, Good manufacturing practice, HACCP and Halal)
b)	Food Methodology and Analysis	1)	Development and improvement of methodologies in food analysis
c)	Food Processing and Preservation	1)	Traditional and new methods in food processing or preservation
d)	Food Antioxidant	1)	Antioxidant properties (content and activity) and profile
e)	Food Microbiology	1)	Studies on food microbiology
Scope 10: Experimental Nutrition		Related with Effect (in vivo and in vitro)	
a)	Antioxidants	1)	Health benefits and toxicity of antioxidant/ (s)
b)	Herbs and Spices	1)	Health benefits of herbs and spices
c)	Oils and Fats	1)	Health benefits of oils and fats
d)	Plant Based (fruits, vegetables, legumes, cereal, flower extract, seaweed, plant by product, honey)	1)	Health benefits of fruits, vegetables, legumes, cereal, flower extract, seaweed, plant by product, honey
e)	Non Plant Based (microbes, edible animal source)	1)	Health benefits of microbes, edible animal source in foods
Scope 11: Nutrition Education, Promotion and Strategies		1)	Effective interventions to promote healthy dietary practices among various age groups
		2)	Development and evaluation of innovative strategies
Scope 12: Methodologies		1)	Improvement of methodologies (lab analysis, sampling, storage)
		2)	Development of reliable, accurate and valid method of nutritional status and nutrient analysis

Scope 1

Maternal, Infant and Young Child Nutrition

Advanced maternal age and adverse pregnancy outcomes in Muar, Johor

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Sains Malaysiana, Vol. 45(10), 2016, 1537–1542

Various factors may contribute to adverse pregnancy outcomes; either maternal or foetal outcomes. This study aimed was to determine the association between advanced maternal age and adverse pregnancy outcomes. This is a cross sectional study. Data were collected from the birth records from January 1st 2012 until December 31st 2012 in Muar District. Descriptive and multiple logistic regression analyses were done and the results were presented as adjusted odds ratio (aOR) with p-value <0.05. The proportion of birth in Muar district, Johor was 14.8% among mothers aged 35 years and older and 85.2% among mothers aged 20 to 34 years. Advanced maternal age was associated with pregnancy induced hypertension (aOR: 5.00; 95%CI: 1.95-12.65), gestational diabetes mellitus (aOR: 2.32; 95%CI: 1.35-4.00) and Caesarean section (aOR: 2.21; 95%CI: 1.53-3.19). Anaemia was negatively associated with advanced maternal age (aOR: 0.50; 95%CI: 0.32-0.78). No significant association was found between advanced maternal age and adverse foetal outcomes. In view of the findings, special attention should be paid to the antenatal mothers aged 35 years and older, even to those without any pre-existing medical problems.

Association of parental body mass index before pregnancy in infant growth and body composition: Evidence from a pregnancy cohort study in Malaysia

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Obesity Research & Clinical Practice, Vol. 10(S1), 2016, S35-S47

Parental body mass index (BMI) is strongly linked with the development of offspring overweight and obesity. However, there are a limited number of studies focusing on the association of parental body mass index before pregnancy on offspring growth and body composition in early life, particularly in developing countries. Data from the Universiti Sains Malaysia (USM) Pregnancy Cohort which consists of 153 mother-offspring pairs were used. Data were collected using interview-administered questionnaires and anthropometric measurements were also obtained. Multiple linear regression and generalised equation estimation (GEE) were used to examine the direction and impact of the association between parental BMI and child growth and body composition (weight for age, height for age, body mass index for age, weight for height and fat mass at age 2m, 6m, and 12m). Potential confounders, including validated measures of maternal diets and physical activity during pregnancy, were considered. Of 153 parents, one-quarter of the mothers and 42.2% of the fathers, respectively, were overweight or obese before pregnancy. A significant association was found between maternal BMI and child's weight for height z-score (WHZ) and body mass index for age z-score (BAZ). Having high pre-pregnancy BMI may increase BMI and WAZ of offspring in early life. Findings from this study emphasise the importance of monitoring maternal weight status, particularly before and during pregnancy and early life of offspring among Malaysians.

Concept and measurements of household food insecurity and its impact on malnutrition: A review

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International Medical Journal, Vol. 22(6), 2015, 509-516

Introduction: Food security is an evolutionary concept being used over time which finally encompassed overall access of all people at all times to enough food for an active and healthy life. Eventually the concept has been expanded to different level of type of food security such as household food insecurity, individual hunger and child hunger through different measurements. Household food insecurity issues currently become a main issue parallel with malnutrition studies. **Method**: Literatures from Scopus, Pubmed and Medline was carried out to gather information about global food insecurity as well as reports, in particular about the association of malnutrition and food insecurity at household level. Most studies showed that household food insecurity is significantly associated with poverty and gave impacts on malnutrition. It has been considered as a universal indicator of measuring hunger, not only at national level but within the household. However, most studies were implemented among low income population. Debate also has been highlighted that household food insecurity may exist among higher income populations and can affect the nutritional status of children and mothers in different ways depending on the context. This review article also has made an attempt to discuss various dimensions of the concept and measurements of household food insecurity and its impact on dietary intake and nutritional status of children and mothers from different backgrounds. **Result**: The existence of dual form malnutrition in which underweight children and overweight mother in the same households were shown in many studies, especially among lower income group. Surprisingly, more food insecure women had abdominal obesity problem than food secure women. Cheap prices of energy-dense foods and financial constraint might encourage overconsumption of an energy-rich but low quality diet and led to weight gain among individuals in poor communities. **Conclusion**: Malnutrition is an indicator of either overnutrition or undernutrition. It is a global and worldwide problem, but concern should be emphasized at household level especially among vulnerable groups such as elderly, children and women. On the other hand, concept and measurement of food insecurity should be taken into account especially at household level.

Correlation between dietary intake and serum ganglioside concentrations: a cross sectional study among Malaysian toddlers

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BMC Nutrition, Vol. 2 (1), 2016, 74-86

Gangliosides are a group of sialylglycosphingolipids, widely distributed in body tissues, mainly as components of plasma membranes. They play crucial roles in neurodevelopment, gut maturation, and immune system. Dietary gangliosides have been shown to bring about benefits including cognition and immune support for breastfed infants. There is dearth of studies on dietary gangliosides intake or plasma ganglioside levels for toddlers. Given toddlers are still growing rapidly, a good understanding of ganglioside intake during this early childhood period is important for future dietary

recommendations. The aim of this study was to provide information on dietary ganglioside intake in Malaysian toddlers and correlations with serum ganglioside levels. Toddlers who fulfilled the inclusion criteria were recruited from the Federal Territory of Putrajaya and neighboring urban suburbs. Background characteristics and food intake using food frequency questionnaire were collected for the entire sample (n = 153). As for ganglioside correlation determination, a 2 day weighed food record was conducted on a sub-group who provided blood (n= 74). Ganglioside levels in the food and blood were determined using modern high performance liquid chromatography mass spectrometry method. Results: The average dietary intake of total gangliosides for the Malaysian toddlers (aged 12–24.5 months) was 5.86 ± 0.56 mg/day. Growing up milks had a wide ganglioside concentration range (0.03 11.4 mg/100 g), and were the major contributor to dietary ganglioside intake (85%). The remaining dietary gangliosides were provided by other dairy products, meat, fish, bakery and biscuits. Serum levels varied from 5.05 g/mL to 16.15 g/mL. While no significant correlation was observed between dietary ganglioside intake from growing up milks and serum ganglioside levels in the toddlers, there was a significant but weak correlation between dietary ganglioside intake from dairy products (r= 0.241; p= 0.038) and meat (r= 0.294; p= 0.010) with serum ganglioside levels. Gangliosides are a component of the Malaysian toddlers' diet (5.68 ± 0.56 mg/day), and were measured in their plasma at levels ranging from 5.05 to 16.15 μ/mL. Growing up milk contributed to 85% of the total dietary gangliosides intake, with remaining contributions from chicken meat and fish. More studies should be undertaken on the contributions of dietary gangliosides, including breast milk, in bringing about health benefits to young children.

Determination of ganglioside concentrations in breast milk and serum from Malaysian mothers using a high performance liquid chromatography-mass spectrometry-multiple reaction monitoring method

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Gangliosides, found in blood, tissues and in human breast milk, are sialic acid-containing glycosphingolipids with implicated bioactivities in neural and brain development, maturation of the gastrointestinal tract, and the immune system. In a cross-sectional study, high performance liquid chromatography-mass spectrometry was used to measure the average total ganglioside concentrations in Malaysian mothers' colostrum and transitional milk; results were 26.8 and 18.9 mg L^{-1}, respectively. In mature milk, the average ganglioside concentrations at 2, 6, and 12 months lactation were 14.8, 25.3, and 16.6 mg L^{-1}, respectively. Considering the data from the typical exclusive breast feeding period (2 and 6 months) and adjusting for outliers, the trimmed mean was 18.5 mg L^{-1}. The average total ganglioside concentrations in maternal serum increased from 14.7 mg L^{-1} during the second trimester to 19.6 mg L^{-1} during the third trimester. However, in 45% of the mothers total serum ganglioside decreased in the third trimester.

Determination of phospholipid concentrations in breast milk and serum using a high performance liquid chromatography-mass spectrometry-multiple reaction monitoring method

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International Dairy Journal, Vol. 71, 2017, 50-59

Phospholipids (PLs), including sphingomyelin, play important roles in cell membrane integrity, neural and brain development, and inflammatory responses. They are found in tissues and biological fluids, including human breast milk. In this cross-sectional study using high performance liquid chromatography–mass spectrometry, the average total PL concentrations in Malaysian mothers' colostrum and transitional milk were determined as 331 and 266 mg L^{-1}, respectively. In mature milk, the average total PL concentrations were 170, 210 and 220 mg L^{-1} at 2, 6 and 12 months, respectively, with a strong correlation between the total PL concentration and the fat concentration ($p < 0.001$). The dominant PL class in mature milk was sphingomyelin (36–38%), followed by phosphatidylethanolamine (27–37%). The average maternal serum PL concentrations were higher in the third trimester (2089 mg L^{-1}) than in the second (1667 mg L^{-1}), with phosphatidylcholine predominant at 66% and with sphingomyelin at 22–24% of total PLs.

Early nutrition, growth and cognitive development of infants from birth to 2 years in Malaysia: A study protocol

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BMC Pediatrics, Vol. 16(1), 2016, 160-166

Background: The first 2 years of life is a critical period of rapid growth and brain development. During this period, nutrition and environmental factors play important roles in growth and cognitive development of a child. This report describes the study protocol of early nutrition, growth and cognitive development of infants from birth to 2 years of age. **Methods/Design:** This is a prospective cohort study of mothers and infants recruited from government health clinics in Seremban district in Negeri Sembilan, Malaysia. Infants are followed-up at 6, 12, 18 and 24 months of age. Pre-natal factors that include mother's pre-pregnancy body mass index, gestational weight gain, blood glucose and blood pressure during pregnancy, infant's gestational age, birth weight and head circumference at birth are obtained from patient card. Post-natal factors assessed at each follow-up are feeding practices, dietary intake, anthropometric measurements and cognitive development of infants. Iron status is assessed at 6 months, while infant temperament and home environment are assessed at 12 months. Maternal intelligence is assessed at 18 months. **Discussion:** Early life nutritional programming is of current interest as many longitudinal studies are actively being conducted in developed countries to investigate this concept. The concept however is relatively new in developing countries such as Malaysia. This study will provide useful information on early nutrition and infant development in the first two years of life which can be further followed up to identify factors that track into childhood and contribute to growth and cognitive deviations.

Empowering mothers of preterm infants for continuous breastfeeding in Malaysia

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Perinatology, Vol. 18(3), 2017, 81-89

With increasing survival rate of preterm infants, the management of this high-risk group is very important to improve overall outcomes and their quality of life. Preterm birth is an unanticipated event, which can bring about maternal stress and anxiety. In case of preterm birth, as mothers and neonates are separated at birth and the neonate is immature to suck, mothers require guidance and assistance to initiate and maintain successful lactation. Initially, at least for a few weeks to months, breast milk should be expressed either manually or with the help of a breast pump. However, the lack of knowledge on expressing breast milk may perpetuate anxiety and indirectly affect milk production. If the mother's milk is not sufficient, donor human milk is the recommended alternative source of nutrition for the preterm infant. The establishment of human milk banks in Muslim-predominant countries is quite challenging because of the interpretation of milk kinship. A holistic antenatal program that emphasizes not only the importance of breastfeeding but also breast milk feeding should be initiated to help mothers to prepare on the method of breast milk expression, appropriate storage and transport, and preserving the quality of milk. This in turn helps in empowering mothers for continuous breastfeeding and direct breastfeeding of their preterm neonates. Governmental and employer incentives with multidisciplinary organizational support may also aid in prolonging the duration and rate of breastfeeding.

Excessive and inadequate gestational weight gain among Malaysian pregnant women in rural area: Are there any associated factors?

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Pakistan Journal of Nutrition, Vol. 14(12), 2015, 854-861

Inadequate and excessive gestational weight gain during pregnancy is associated with adverse maternal and child outcomes. The aim of this study is to determine the prevalence, associated factors and outcomes of gestational weight gain among pregnant women in a rural district in Kelantan in a year of 2013. Data was derived from antenatal and birth registry. Pregnant women who registered for antenatal booking during first trimester in health clinics and fulfilled the inclusion criteria were included in this study. No sampling method was applied. Information on sociodemographic data, obstetric characteristics, maternal and fetal outcomes were recorded. Gestational weight gain were classified into three categories (inadequate, adequate and excessive) based on pre-pregnancy body mass index using Institute of Medicine, 2009 guidelines. Simple and multiple logistic regression analyses were carried out to identify factors associated with inadequate and excessive gestational weight gain, respectively. Based on the inclusion and exclusion criteria, 422 women were included in this study. The prevalence of inadequate and excessive gestational weight gain was 54.5% (95% CI; 49.6, 59.3) and 13.0% (95% CI; 10.0, 16.7), respectively. Advanced maternal age women (>35 years old) (AOR 0.45; 95% CI: 0.23, 0.87), pre-pregnancy BMI of overweight and obese (AOR 0.39; 95% CI: 0.24, 0.62) and who received primary or lower education (AOR 5.73; 95% CI: 1.72, 19.13) were significantly associated with inadequate gestational weight gain. While pre-pregnancy overweight and obese status was the only factor found to be significantly associated with excessive gestational weight gain (AOR 3.25; 95% CI: 1.49, 7.06). There was a significant association between low birth weight with three categories of gestational weight gain (p-value=0.021). Nutritional requirement before conception and during pregnancy is crucial. Identification for risk factors of inadequate or excessive gestational weight gain is needed in order to plan for intervention in reducing risk for maternal and foetal outcomes.

Factors related to any-breasfeeding duration in a sample of Malay mothers

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International Journal of Public Health and Clinical Sciences, Vol. 4(1), 2017, 133-141

Background: While the benefits of breastfeeding have been established, sustaining breastfeeding for a longer duration is a challenge. This cross-sectional study aimed to determine factors related to any breastfeeding duration in a sample of the ever-breastfed Malay mothers. **Materials and Methods:** Mothers regardless of their current breastfeeding status and having a child between 12 and 36 months participated in this study. We assessed breastfeeding practices, obstetric history, nutritional status and information about their breastfed child. **Results:** A total of 60 ever-breastfed mothers aged 30.9 ± 3.4 years participated in the study. The duration of any breastfeeding was 15.0 ± 7.6 months with 31.7% were still breastfed up to 24 months. The BMI of the participants was in the normal range but increased by 1.8 kgm^{-2} as compared to the pre-pregnancy BMI. Intake of macronutrients distributed evenly but a substantial proportion of the participants did not achieve the recommendations for energy, calcium and iron intake. Mother's age ($r = 0.288$, $p < 0.05$), duration of exclusive breastfeeding ($r = 0.408$, $p < 0.01$) and later introduction to formula milk ($r= 0.550$, $p < 0.001$) were positively related with duration of any breastfeeding. **Conclusion:** In this sample of ever breastfed Malay women, only 31.7% were still breastfeeding. The increase in BMI at a postpartum and possible micronutrients inadequacy are of a particular concern. A longer duration of any breastfeeding was related to a longer duration of exclusive breastfeeding, the mother's age and later introduction to formula feeding. Understanding issues of breastfeeding mothers help to sustain a longer duration of breastfeeding.

Food taboos of Malay pregnant women attending antenatal check-up at the maternal health clinic in Kuala Lumpur

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Integrative Food, Nutrition and Metabolism, Vol. 3(1), 2016, 262-267

Food taboos are generally practiced during pregnancy in many cultures. Certain food or activities are not allowed during pregnancy in order to safeguard the unborn child and prevent any negative outcomes to the mother and the baby alike. Passed on from one generation to another, most of these taboos are based on learned behaviour, either acquired mostly by instruction from parents and family members or observation from close relatives and friends. The main aim of the study was to determine the prevalence and types of food taboos and its reason for avoidance. The secondary objective was to determine its association with rates of weekly weight gain of the pregnant women. A cross sectional study was conducted among 104 Malay pregnant women ranging from age 20 to 46 years. Information on socio-demographic profile and practices pertaining to food taboo was collected using a structured questionnaire. Weight gain status during pregnancy was assessed by comparing the current weight with pre-pregnancy weight. About 70.2% of the respondents avoided at least one food item due to food taboos. Pineapple and sugar cane drink were regarded as taboo foods by more than half of the subjects (70.2% and 59.6% respectively), followed by hot foods (47.1%), carbonated drinks (39.4%) and cold foods (12.5%). The most common reason for avoiding foods were fear of abortion (95.2%), followed by fear of excessive bleeding during labor (34.6%), baby born with deformities (27.9%) and other reasons such as difficult labor, unnecessary sickness, induced vomiting

and edema (19.2%). Multiparous women with 3 pregnancies or more were found to be associated with the practice of food taboos ($p \leq 0.05$). About 71.2% of women who practiced food taboos had an inadequate weight gain and there was a significant association between prevalence of food taboos with weekly rates of weight gain of the pregnant women ($p<0.05$). Prevalence of food taboos was high among the Malay pregnant women and the main reason for adhering to food taboos was fear of abortion. A significant association was found between the prevalence of food taboo with weekly rates of weight gain. Nutrition education should be conducted in all health centers to help pregnant women with a healthier food choice to ensure a healthy pregnancy.

Guidelines model of adoptive breastfeeding for Muslim foster mother among the Malay community in Malaysia

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Al-Qanatir: International Journal of Islamic Studies, Vol. 8(5), 2017, 42-50

Adoptive breastfeeding can be accomplished by non-puerperal women with a combination of medical protocols and specific stimulus techniques. However, this technology is not practically able to be accomplished without the help of the non-technical factors such as humanity, maternal instinct, passion and perseverance of a foster mother. Therefore, the aim of this study is to explore the experience of 12 non-puerperal Muslim females who had successfully nursed their foster children. This study used a qualitative research design and the methods of data collection was semi-structured interviews and focus group discussions. Data were analysed using QSR NVivo using the technique of content analysis, analysis of word-based and code-based analysis. This study has successfully developed a Guidelines Model of Breastfeeding Adopted Child in accordance to the Fiqh and Science perspective. This model was built with the design of a house that symbolizes a shelter and a symbol of love for an adopted child who is accepted in a foster family. This house-shaped model includes four phases which is described in the storied building starting from the entrance up to the roof of the house. The stages of this model are: (1) The conditions of Fiqh; (2) The implementation; (3) The Implications of Fiqh; (4) The Goal. In conclusion, the resulting model can be a guide to the foster mother and professionals in the lactation field for the success of the breastfeeding process to the adopted child.

Identification, characterisation and phylogenetic analysis of commensal bacteria isolated from human breast milk in Malaysia

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Pertanika Journal of Science & Technology, Vol. 24(2), 2016, 351-370

Human breast milk microbiota is essential for infant immune system development, maturation and protection against infection. However, there is scarce information on the fluid's microbiological composition from Malaysia. The objective of the study was to isolate, identify and characterise commensal bacterial population present in human breast milk from Malaysia. One hundred bacteria

were isolated from the human breast milk of healthy lactating women (n=30). After preliminary screening, 20 isolates were characterised using both phenotypic and molecular techniques. The results indicated that most frequently identified bacteria in this study were *E.faecalis* and *S.hominis*. These organisms alongside *E.cloacae* were all metabolised D-Maltose, Sucrose, D-Turanose, -D-Glucose, D-Fructose, D-Mannose, D-Galactose, D-sorbitol and D-Mannitol and were able to grow at pH 5 and 6, 1% sodium lactate, 1%, 2% and 8% NaCl. BLAST showed over 99% similarity to those deposited in Genbank. Phylogeneticrelatedness was depicted using neighbour-joining method and had two clades with 100% bootstrap. These findings provided insight into the nature, characteristics and also phylogenetic-relatedness of bacteria present in human milk from Malaysia. Isolation and identification of commensal bacteria from human milk are considered the first step for future studies on the benefit of these organisms towards human health.

Influence of breastfeeding on quality of life and serum IgE level in allergic rhinitis children

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Bangladesh Journal of Medical Science, Vol. 16(4), 2017, 530-534

Background: Allergic rhinitis is a known health problem worldwide. **Objective**: The aim of the study was to determine the association between breastfeeding and serum IgE level as well as its impact on quality of life in children with allergic rhinitis. **Methodology**: A cross sectional comparative study was done among pediatric patients aged 6-12 who have allergic rhinitis with evidence of positive skin prick test (SPT), for 30 specifically selected patients each for breastfed and non-breast-fed. For each patient, serum IgE was taken and interviewed using the modified allergy questionnaire by validated Sher Allergy Specialists questionnaire (Florida) and Rhinoconjuntivitis Quality of Life Questionnaires (RQLQ) by Juniper. Statistical analysis was performed using SPSS 13.0. The significant association was analyzed using Pearson's chi-square and Mann-Whitney U tests. **Results**: There was no significant difference (p = 0.688) with regards to serum IgE level between breastfed and non-breast-fed children. However, children who were breastfed have a better mean of quality of life (mean=1.1679) than non-breast-fed (mean=1.5274). **Conclusion**: Our study showed that there is no association between breastfeeding and serum IgE level. Nevertheless, the quality of life is better in breastfed children. A larger sample and longer duration of study are required to substantiate these findings.

Iodine status among pregnant women form selected rural divisions in Sabah, Malaysia

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In 2000, legislation on mandatory universal salt iodisation was enacted in Sabah, Malaysia, to reduce the incidence of iodine deficiency disorders among its population. To evaluate the iodine levels among pregnant women from selected rural divisions in Sabah 13 years after the enactment of the universal salt iodisation programme. This cross-sectional study was conducted from 1 May to 30 June, 2013, in three rural divisions of Sabah (the Interior, the West Coast, and Kudat). Data regarding domestic

iodised salt use and iodine-containing supplement consumption were obtained from respondents through face-to-face interviews; goitre enlargement was examined through palpation and graded according to the World Health Organization classification. Spot urine samples were also obtained to assess urinary iodine levels by using an in-house modified micromethod. In total, 534 pregnant women participated. The prevalence of goiter was 1.0% (n=5), noted only in the West Coast and Kudat divisions. Although all pregnant women consumed iodised salt, overall median urinary iodine concentration was only 106 g/L, indicating insufficient iodine intake, with nearly two-thirds of the women (60%) having a median urinary iodine concentrations of <150 g/L. Pregnant women from the rural divisions in Sabah still exhibit iodine deficiency disorder despite the mandatory universal salt iodisation programme. Iodine supplementation programmes targeting pregnant women are warranted.

Perspective of healthcare professionals and patients on management of gestational diabetes mellitus: A qualitative study in Negeri Sembilan, Malaysia

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Introduction: Understanding the perceptions of healthcare professionals and patients regarding gestational diabetes mellitus (GDM) is important for optimal pregnancy outcomes. This study aimed to identify the problems faced by healthcare professionals in the management of GDM and the patients' perspectives as well. **Methods:** Two focus groups consisting of thirteen pregnant women diagnosed with GDM at 20-28 weeks of gestation and sixteen healthcare professionals were interviewed using a semi-structured questionnaire. The subjects were recruited purposively from a public health clinic in Negeri Sembilan, Malaysia. Audio recordings were made of the interview sessions and transcribed verbatim before being assessed independently by two researchers. The NVivo 10.0 programme was used to extract key themes. **Results:** Five emergent themes consisting of views from both groups of subjects were identified. They were: (1) perceived patients' non-adherence to medical advice versus patients' own negligence; (2) poor appetite control versus patients' poor temptation control; (3) patients' lack of knowledge versus confusing information provided by healthcare staff; (4) patients 'giving up' versus being in a non-supportive environment; and (5) patients being in denial versus the disappointment when required to control diet. **Conclusion:** This study revealed conflicting perspectives between pregnant mothers with GDM and the healthcare staff in managing these patients. There is a need to promote positive communication between healthcare staff and patients for a better understanding of the needs of GDM patients.

Risk factors for antenatal hypovitaminosis D in an urban district in Malaysia

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Background: Pregnant women form one of the high risk groups facing hypovitaminosis D. Low level of vitamin D will affect directly or indirectly both mother and fetus. Screening vitamin D in the first trimester of pregnancy is important to determine the necessary preventive action. Therefore, this study was aimed to determine the prevalence of hypovitaminosis D and its risk factors among pregnant women in the first trimester. **Methods**: A cross sectional study was carried out among first trimester pregnant women during their first antenatal visit. Samples were taken from different ethnicities in an urban district in Malaysia. A total of 396 respondents (99 % response rate) aged 18–40 years completed self–administered and guided questionnaire (characteristics and risk factors), validated semi-quantitative food frequency questionnaire for vitamin D in Malaysia (FFQ vitamin D/My), anthropometric measures (weight and height), blood test for serum 25(OH)D, skin measurement using Mexameter (MX 18) and Fitzpatrick Skin Type Chart Measurement (FSTCM). Data were analyzed to determine the association between risk factors and hypovitaminosis D. **Results**: The prevalence of hypovitaminosis D (serum 25(OH)D < 50 nmol/L) was 90.4 % (358). The mean age of respondents was 28.06 ± 4.09 years old. The independent predictors of hypovitaminosis D were Malay ethnicity (OR 33.68; 95 % CI: 12.81, 88.56), Indian ethnicity (OR 16.86; 95 % CI: 3.78, 75.20), secondary education (OR 12.12; 95 % CI: 2.71, 54.16) and tertiary education (OR 14.38; 95 % CI: 3.31, 62.45). **Conclusion**: Awareness should be raised among Malay and Indian pregnant women with secondary and tertiary education who consumed vitamin D (especially milk) poorly in order to prevent adverse health outcomes. Further studies need to be conducted among health care workers to determine their level of knowledge related to vitamin D, as they are front liner in detecting the hypovitaminosis D.

Suburban breastfed infants in Klang Valley are at higher risk of dioxins toxicity

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Dioxins are a most toxic compound ever studied by human until today. Their significant health effects involved all ranges of age, including infants due to exposure to contaminated breast milk. The objective of the study was to appraise the status of dioxin contamination in breast milk among postnatal mothers live in urban and suburban areas in Klang Valley. It was conducted as a cross sectional study involving 101 postnatal mothers who came for their infant second hepatitis B vaccination. The samples were analysed using High Resolution Gas Chromatography (HRGC) following the USEPA Method 8290. About 70.3% of the samples were found detected with dioxin congeners. More suburban mothers have positive breast milk dioxins compared to urban mothers, 100.0% and 67.0% respectively. Significant associated factors include high fat daily intake (p=0.013), high milk daily intake (p=0.044), high meat daily intake (p=0.001), body mass index more than 30 kg/m2 (p=0.005), and body fat % of more than 26% (p=0.046). In conclusion, amount daily intake of fat diet, meat, milk, body mass index and body fat are significant associated factors for the present of dioxins in breast milk among postnatal mothers in Klang Valley. More suburban mothers contain dioxins in their breast milk, which poses higher risk of health problems among their infants. A comprehensive study need to be conducted and regular followup need to be established in monitoring the future severity of maternal breast milk contamination to ensure the health of the next generations.

The availability of information on induced lactation in Malaysia

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Induced lactation is a method of stimulating the production of breast milk in women who have not gone through the process of pregnancy. Recent advances in technology have given such women the opportunity to breastfeed adopted children. Previous studies conducted in Western countries have explored the breastfeeding of adopted children, as well as the experiences, successes and challenges of this process. However, research on procedures for breastfeeding adopted children is lacking in Malaysia. The authors have therefore reviewed literature related to induce lactation in Malaysia to fill this gap. Of the 30 related articles identified, 19 described the breastfeeding practices and experiences of adoptive mothers in Malaysia. Out of 19 articles, there were four journal articles, five circulars and regulations, two books, two post-graduate theses, four blogs posts and forum discussions, and two online newspaper articles. Medical information relating to induced lactation procedures was also reviewed, showing that there was a lack of scientific studies focusing on induced lactation practices among adoptive mothers. Information on religious, specifically Islamic, perspectives on breastfeeding and child adoption laws was gathered from websites, social networks, blogs, magazines and online news sources. In consideration of recent advancements in medical technology and the dire need among Malaysians, it is crucial that evidence-based, accurate and reliable information on induced lactation is made available to professionals and other individuals in this country.

The extended theory of planned behaviour in explaining exclusive breastfeeding intention and behavior among women in Kelantan, Malaysia

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Background/Objectives: The purpose of this study is to utilize an extended Theory of Planned Behavior in identifying predictors of exclusive breastfeeding intention and behavior among women in Kelantan, Malaysia. **Subjects/Methods**: A prospective cohort study was conducted, recruiting pregnant women through two-stage cluster sampling. Their exclusive breastfeeding intention, attitude, perceived norm, perceived behavioral control and past behavior were obtained at baseline through interviewer-guided questionnaire. At one month after delivery, another interview was conducted to determine the two additional variables in the extended theory, which were their postpartum support and breastfeeding difficulty. The behavior, which was the actual duration of exclusive breastfeeding, was obtained from the second follow-up at six months. Pearson correlation and two hierarchical regression analyses were conducted. **Results**: A total of 200 women completed the study follow-up. Their median intended exclusive breastfeeding duration was 4.0 (IQR 5) months, and the median actual duration was 1.0 (IQR 4) month. The Theory of Planned Behavior explained 51.0% of the variance in intention, with perceived behavioral control and attitude were the significant predictors. It also explained 10.0% of the variance in behavior, but the addition of postpartum support and breastfeeding difficulty increased the amount of explained variance in behavior by 6.0%. The significant predictors of exclusive breastfeeding behavior were intention, postpartum support and breastfeeding difficulty. **Conclusion**: The extended Theory of Planned Behavior had a good predictive ability in explaining exclusive breastfeeding intention and behavior. The women's intention to practice exclusive breastfeeding may be improved by improving their perceived behavioral control and attitude. Providing correct postpartum support and skills to handle breastfeeding difficulties after delivery will improve their exclusive breastfeeding behavior.

Scope 2

Nutritional Status

Assessment of food insecurity and nutritional outcomes in Bachok, Kelantan

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Aim: This study is to examine the association between food insecurity and nutritional outcomes among children and adults and its impact on the quality of life of the mother in rural sample in Bachok-Kelantan. **Method**: A cross-sectional survey of low income households was conducted and 223 households of mothers aged 18-55 years old, non-lactating, non-pregnant mother and having at least one child in 2-12 years range were purposively selected. A questionnaire was administered including the Radimer/Cornell scale; items on sociodemographic characteristics, anthropometric measurements and quality of life tool (SF36). **Results**: The study reported that 16.1% of the households were food secure, while 83.9% experienced some kind of food insecurity, (29.6% households were food insecure, 19.3% individuals were food insecure and 35.0% fell into the child hunger category). The prevalence of underweight, stunting and wasting among the food insecure children were 61.0%, 61.4% and 30.6% respectively, and the prevalence of weight-for-height (overweight) was 1.3%. Based on multinomial logistic regression, larger household size (OR=1.776; 95%C.I, 1.35, 2.32; p<0.001), number of children in the household (OR=1.20; 95%CI,1.025, 1.42; p=0.024), total monthly income (OR=0.977; 95% CI, 0.995, 0.998; p<0.001), income per capita (OR=0.98; 95% CI, 0.97, 0.98; p<0.001) and food expenditure (OR=0.977; 95% CI, 0.99, 1.00; p=0.049) were found to be significant risk factors for household food insecurity. This study showed there was an association between food insecurity and Diet Dietary score and dietary pattern. Furthermore, food insecure households had lower intake of animal protein, fruits and vegetables compared to their counterparts in the food secure group. The findings of the study reveal that the children in the food insecure were 2.15 times more likely to be underweight and 3 times more likely to be stunted than the children in the food secure households, while no association with wasting was reported. Although, the study reported higher prevalence of overweight and obese mothers (52%) and (47.1%) at-risk WC (≥80 cm), no significant association has been found between food insecurity, BMI and waist circumferences. The score for all the eight domains of quality of life were negatively associated with food insecurity. **Conclusion**: Our study showed that food insecurity in low income households from Bachok´ is highly prevalent and associated with poor living conditions and it highlighted the pervasive vulnerability of individuals living in food insecure households. In addition to nutritional problems, food insecure households in Bachok- Kelantan struggle with a broad spectrum of health- related problems.

Body weight status of school adolescents in Terengganu, Malaysia: A population baseline study

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Background: Body weight is highly associated with overall health status. Being severely thin or obese may impose the risk of many health problems. Early detection of body mass index (BMI) status may help to reduce the associated comorbidities. Although many studies in the literature have investigated the BMI of school adolescents in Malaysia, the data on status of body weight among school adolescents in suburban states like Terengganu is limited. This study aimed to describe the body weight status of the whole population of school adolescents in all seven districts in Terengganu, Malaysia. **Methods**: Using a cross-sectional study design, body weight and height were measured, and BMI was calculated and classified using WHO BMI-for-age Z-score. Data was obtained using the National Fitness Standard (SEGAK) assessment, which was uploaded in a specific Health Monitoring System (HEMS). **Results**: From a total of 62,567 school adolescents, 50.7% were boys and 49.3% were girls. Girls had significantly higher BMI than boys in age groups of 13 to 15 and 16 to 17 years old. Among boys and girls, there were significant differences in mean BMI of school adolescents between rural and urban school locations in all age groups ($p<0.001$). There were also significant differences in BMI between boys and girls in all districts in Terengganu, except Kemaman and Kuala Terengganu, for all age groups ($p<0.001$). Overall, the prevalence of thinness, normal, overweight and obesity were 8.4, 64.6, 15.0 and 12.0%, respectively. There were significant differences between BMI categories and genders in total participants, and within rural and urban school locations ($p<0.05$). In all districts except Marang and Dungun, significant difference was also found between BMI categories and genders. **Conclusion**: The prevalence of thinness, overweight and obesity in Terengganu were substantial. In this study, BMI category was associated with gender, age, school location and district. However, the actual effects of these factors on the prevalence of thinness and obesity among this population demand further investigation.

Determination of calf circumference cut-off values for Malaysian elderly and its predictive value in assessing risk of malnutrition

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Introduction: Malnutrition is a growing problem but quite often under-recognised in elderly people. Calf circumference (CC) is a simple measurement that can be used to identify elderly people who are at high risk of malnutrition; however, a population-specific cut-off point must be developed. Therefore, this study aimed to determine suitable cut-off points and evaluate the predictive value of the CC cut-off point for elderly Malaysians. **Methods**: A total of 820 persons comprising 433 men and 387 women were recruited as subjects. The mean age was 69.0 ± 6.8 and ranged between 60 to 97 years. Data were collected from Sabak Bernam, Selangor; Kuala Pilah, Negeri Sembilan; Pasir Mas, Kelantan, and Kodiang, Kedah. A linear regression analysis with the z-score procedure by gender was used to derive the CC prediction equations. **Results**: The CC cut-off points for men and women at risk of malnutrition were 30.1 cm and 27.3 cm, respectively. The final predictive CC equations for men was CC (cm) = 3.69 (z score) + 33.81, $R^2 = 1$ and CC (cm) = 0.7103 (BMI) + 18.54, $R^2 = 1$; and for women, CC (cm) = 4.31 (z score) + 31.63, $R^2 = 1$ and CC (cm) = 0.6698 (BMI) + 16.847, $R^2 = 1$. Based on these equations, using the z-score equal to negative 1 for men (BMI 16.30 kg/m^2) and women (BMI 15.64 kg/m^2), the mean of the predictive value of the CC cut-off point was 32.0 ± 4.2

cm in men and 30.5 ± 4.6 cm in women. **Conclusion**: It is suggested that these cut-off points be used to screen elderly individuals who are at risk of malnutrition. Further studies should be undertaken to further verify the application of the findings of this study.

Differences in body build in children of different ethnic groups and their impact on the prevalence of stunting, thinness, overweight and obesity

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Food and nutrition bulletin, Vol. 37(1), 2016, 3-13

Background: The prevalence of stunting, thinness, overweight, and obesity among children differs by ethnicity. It is not known whether differences in body build across the ethnic groups influence the interpretation of nutritional parameters. **Objective**: To explore the differences in body build across the 5 main ethnic groups in Malaysia and to determine whether differences in body build have an impact on the interpretation of nutrition indicators. **Methods**: A total of 3227 children aged 2.0 to 12.9 years who participated in the South East Asian Nutrition Surveys (SEANUTS) in Malaysia were included in this analysis. Body weight, height, sitting height, wrist and knee breadths, and biceps and subscapular skinfolds were measured, and relative leg length, slenderness index, and sum of skinfolds were calculated. Z scores for height-for-age (HAZ) and body mass index-for-age (BAZ) were calculated using the World Health Organization (WHO) 2007 growth standards. **Results**: Differences in relative leg length and slenderness across the ethnic groups were correlated with HAZ and BAZ. Correction for differences in body build did, in some ethnic groups, have significant impact on the prevalence of stunting, thinness, overweight, and obesity, and the pattern of prevalence across ethnic groups changed. **Conclusion**: At the population level, corrections for body build had only minor and mostly nonsignificant effects on prevalence, but at an individual level, corrections for body build placed a substantial number of children in different height or weight categories. Whether these misclassifications warrant additional assessment of body build in clinical practice will need further investigation.

Frequency of anaemia among UiTM medical undergraduates

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Introduction: Anaemia is a global public health problem in both developing and developed countries. World Health Organisation (WHO) reported the prevalence of anaemia in women of childbearing age is 30.2%, of which 35.7% is found in South-East Asia. A local data reported the presence of hypochromic microcytic red cell indices in 14.5% medical students. **Methods**: This was a cross-sectional study aiming to estimate the number of medical students with anaemia. A total of 100 medical students, aged 19 to 23 years old, enrolled. Blood samples collected in EDTA tubes were analyzed for haemoglobin (Hb) level, mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH). A structured questionnaire in relation to anaemia, was also given to the subjects. **Results**: There were more female (n=87) than male (n=13) participants. 16 students were found to have anaemia, of which all were females. None of the male students have anaemia. The mean Hb was

13 g/dl (min 9.6 g/dl, max 15.9 g/dl), of which 9% have hypochromic microcytic red cells. The mean MCV is 87.36 fl (min 66.2 fl, max 95.3 fl) and mean MCH is 28.18 pg (min 18.3 pg, max 32.4 pg). Of 16 students with anaemia, only two complained of tiredness and one gave a history of menorrhagia. 2 of 29 students who claimed they exercise regularly had anaemia. None of the participants gave a history of chronic disease. **Conclusions**: This study highlighted the presence of anaemia amongst medical students. Unfortunately, due to financial constraint, no further investigation could be carried out within the scope of this study.

Helminthic infection and nutritional studies among Orang Asli children in Sekolah Kebangsaan Pos Legap, Perak

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Canadian Journal of Infectious Diseases and Medical Microbiology, Vol. 2016(1326085), 2016, 1-5

Background: Orang Asli (*aborigine*) children are susceptible to soil-transmitted helminth (STH) infections due to their lifestyle and substandard sanitation system. **Objectives**: This study aimed to examine the helminthic and nutritional status of Orang Asli school children in Sekolah Kebangsaan Pos Legap, a remote primary school at Kuala Kangsar District in the state of Perak, Malaysia. In addition, the sensitivities of four STH stool examination techniques were also compared. **Methods**: Demography and anthropometry data were collected by one-to-one interview session. Collected stools were examined with four microscopy techniques, namely, direct wet mount, formalin ether concentration (FEC), Kato-Katz (KK), and Parasep™. **Results**: Anthropometry analysis showed that 78% (26/33) of children in SK Pos Legap were malnourished and 33% (11/33) of them were stunted. Stool examinations revealed almost all children (97%) were infected by either one of the three commonest STHs. FEC was the most sensitive method in detection of the three helminth species. **Conclusion**: This study revealed that STH infections and nutritional status still remain a health concern among the Orang Asli children. These communal problems could be effectively controlled by regular monitoring of STH infection loads, administration of effective antihelminthic drug regimen, and also implementation of effective school nutritional programs.

High body fat percentage among adult women in Malaysia: The role of lifestyle

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Body fat percentage is regarded as an important measurement for diagnosis of obesity. The aim of this study is to determine the association of high body fat percentage (BF%) and lifestyle among adult women. The study was conducted on 327 women, aged 40-59 years, recruited during a health

screening program. Data on socio-demography, dietary intake and physical activity were collected through validated questionnaires. BF% was measured using InBody 270 Body Impedance analyzer machine. Association between lifestyle factors and body fat percentage were investigated using multiple linear regression, adjusted for age and body mass index (BMI). Intake of protein, calcium and physical activity on household intensity were the predictors of high BF%.

Improving the nutritional status of patient with colorectal cancer undergoing chemotherapy through intensive individualised diet and lifestyle counselling

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Introduction: Malnutrition is common among patients with cancer and it is also associated with their negative health outcomes. Generally, cancer patients undergoing chemotherapy have a high risk of malnutrition, secondary to both the disease and the treatment. It is important that patients maintain a good nutritional status to improve the effects, and minimise the side effects of cancer treatment. A good nutritional status should be maintained for patients through nutritional intervention during cancer treatment. There appears to be no published studies on the effects of intense dietary counselling versus usual dietary care on the nutritional status of colorectal cancer (CRC) patients undergoing chemotherapy alone. Furthermore, there have been no randomised controlled trials (RCT) undertaken in Malaysia, where CRC is increasing. It is therefore important to undertake a RCT of a dietary and lifestyle counselling intervention of CRC outpatients undergoing chemotherapy. **Methods**: The intervention study was an open (masking not used), prospective, and Rcr to examine the effects of intensive individualised dietary and lifestyle counselling on dietary intake and nutritional status in CRC patients undergoing chemotherapy. It was designed as an 8-week program of intensive, individualised dietary and lifestyle counselling followed up with another 8-week post-intervention period without dietary and lifestyle counselling, and compared to a control arm given the usual care. A total of forty-two participants took part in this study and were randomised into two groups, namely, the intervention group (IG) (n=22) and the control group (CG) (n=20) at Kuala Lumpur Hospital and Selayang Hospital, Malaysia. **Results**: In this study, 67% of CRC patients were malnourished at baseline. In the IQ the prevalence of malnutrition dropped from 72.7% at baseline to 27.3% eight weeks after the intervention. This repesents a large, and clinically meaningful shift. In the CG, the prevalence of malnutrition, or at risk of malnutrition, was still at 75% at the end of the sixteen weeks. **Conclusion**: Intensive, individualised dietary and lifestyle counselling resulted in improved nutritional status in patients with CRC undergoing chemotherapy.

Influence of socio-economic and psychosocial factors on food insecurity and nutritional status of older adults in FELDA settlement in Malaysia

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Background/Purpose: Older adults are at high risk of food insecurity and malnutrition. However, the magnitude of food insecurity and malnutrition and their associations with socio-economic and psychosocial factors among older adults especially in rural areas of Malaysia are yet to be discovered. Therefore, this study aimed to determine the association between socio-economic and psychosocial factors with food insecurity and among older adults people in a rural area of Malaysia, i.e. an agricultural settlement under the Felda Land Development Authority (FELDA). **Methods**: A total of 289 respondents were recruited with a mean age of 69.7 ± 6.0 years through random sampling. Household visits were conducted to get information on food insecurity, depressive symptoms, stress, social support and functional status using a standardized questionnaire and face-to-face interview. Anthropometric indicators including weight and height were measured. **Results**: Results indicated that the prevalence of food insecurity was 27.7% (22.4% in men and 29% in women). Mean Body Mass Index (BMI) was 25.1 ± 4.7 kg/m^2 with men having a significantly lower BMI (23.1 ± 3.7 kg/m^2) and majority of the respondents having normal body weight (40.8%) followed by overweight (36.7%). Risk factors of food insecurity were depressive symptoms [Odd Ratio (OR=11.132], stress from family (OR=2.470) and BMI (OR=0.911) ($p<0.05$ for all parameters). Malnutrition as assessed using BMI was influenced by age (ß coefficient=-0.205), being women (ß coefficient=0.182) presence of depressive symptoms (ß coefficient=0.154) and food insecurity (ß coefficient=-0.140). **Conclusions**: In conclusion, about one third of the respondents experienced food insecurity. However, a substantial number of respondents were overweight. Psychosocial factors including stress and depressive symptoms increased the risk of food insecurity and malnutrition. There is a need to identify individuals at high risk of food insecurity and malnutrition and incorporate strategies and programmes to tackle these issues.

Length and height percentiles for children in the South-East Asian Nutrition Surveys (SEANUTS)

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Public Health Nutrition, Vol. 19(10), 2016, 1741-1750

Objective: Health and nutritional information for many countries in the South-East Asian region is either lacking or no longer up to date. The present study aimed to calculate length/height percentile values for the South-East Asian Nutrition Survey (SEANUTS) populations aged 0·5–12 years, examine the appropriateness of pooling SEANUTS data for calculating common length/height percentile values for all SEANUTS countries and whether these values differ from the WHO growth references. **Design**: Data on length/height-for-age percentile values were collected. The LMS method was used for calculating smoothened percentile values. Standardized site effects (SSE) were used for identifying large or unacceptable differences (i.e. jSSEj>0·5) between the pooled SEANUTS sample (including all countries) and the remaining pooled SEANUTS samples (including three countries) after weighting sample sizes and excluding one single country each time, as well as with WHO growth references. **Setting**: Malaysia, Thailand, Vietnam and Indonesia. **Subjects**: Data from 14 202 eligible children were used. **Results**: From pair-wise comparisons of percentile values between the pooled SEANUTS sample and the remaining pooled SEANUTS samples, the vast majority of differences were acceptable (i.e. jSSEj≤0·5). In contrast, pair-wise comparisons of percentile values between the pooled SEANUTS

sample and WHO revealed large differences. **Conclusions**: The current study calculated length/height percentile values for South East Asian children aged 0·5–12 years and supported the appropriateness of using pooled SEANUTS length/height percentile values for assessing children's growth instead of country-specific ones. Pooled SEANUTS percentile values were found to differ from the WHO growth references and therefore this should be kept in mind when using WHO growth curves to assess length/height in these populations.

Malnutrition and associated factors among aboriginal preschoolers in Kelantan, Malaysia

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Pakistan Journal of Nutrition, Vol. 15(2), 2016, 133-139

Aboriginal children are known as one of the communities that engaged the highest prevalence of malnutrition in Malaysia for ages. The study was participated by 256 (131 males and 125 females) aboriginal preschooler aged one to six years from Gua Musang, Kelantan. This study attempts to determine the current prevalence of malnutrition and to identify the possible factors that may be associated with malnutrition among the subjects. This cross-sectional study was carried out between September to December 2014 at three aborigines' settlements. Socio-demographic and economic status information, health history and anthropometric measurement of the participants were obtained and all the subjects were screened for presence of soil-transmitted helminths (STH). Current study revealed that the prevalence of underweight and stunted was 45.3 and 76.2%, respectively. From the analysis, there was no significant associated factors between demographic, socioeconomic, health history and personal hygiene with underweight ($p>0.05$). However, binary logistic regression confirmed that the significant factors contribute to stunting were household monthly income (<RM520) ($p<0.01$), number of siblings (>5) ($p<0.01$) and gender (male) ($p<0.01$). The current prevalence of malnutrition is still a major concern for public health with lower family monthly income and is the main factors that contribute to stunting. Hence, government should consider revising health strategies to overcome these issues in order to provide a better future for these children to survive.

Nutritional status and feeding problems in pediatric attention deficit-hyperactivity disorder

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Pediatrics International, Vol. 59(4), 2017, 408-415

Background: Children with attention deficit–hyperactivity disorder (ADHD) may be at risk of nutrient deficiency due to the inability to sit through meals. This comparative cross sectional study was therefore carried out to determine the nutritional status and feeding problems of ADHD children aged 4–12 years. **Methods**: Sociodemographic data, anthropometric measurements and 3 day dietary intake record were collected from 54 ADHD children and 54 typical development (TD) children. The Behavioral Pediatrics Feeding Assessment Scale was used to assess feeding problems. **Results**: Mean subject age was 8.6 ± 2.1 years. On anthropometric assessment, 11.1% of the ADHD children had

wasting, while 1.9% had severe wasting. In contrast, none of the TD children had wasting. Approximately 5.6% of the ADHD children had stunting, as compared with 3.7% of the TD children, while none of the TD children had severe stunting compared with 3.7% of the ADHD children. More than half of the ADHD children had mid upper arm circumference (MUAC) below the 5th percentile, indicating undernutrition, compared with only 35.2% of TD children. More than one third of the ADHD children had feeding problems compared with 9.3% of TD children. There was a significant negative relationship between the ADHD children's feeding problems and bodyweight (r = –0338, P = 0.012), body mass index (r = –0322, P = 0.017) and MUAC (r = –0384, P = 0.004). **Conclusion**: Almost half of the ADHD children had suboptimal nutrition compared with 11.1% of the TD children. It is imperative to screen ADHD children for nutritional status and feeding problems to prevent negative health impacts later on.

Nutritional status and quality of life of oncology patients prior to pelvic radiotherapy

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Malaysian Journal of Nutrition, Vol. 23(3), 2017, 361- 373

Introduction: Malnutrition among cancer patients is associated with a higher risk of gastrointestinal toxicity which develops during treatment and may affect quality of life (QOL). Thus, this cross-sectional study aimed to determine the nutritional status and QOL of 30 oncology patients (mean age 50.0±10.7 years) prior to pelvic radiotherapy at Hospital Sultan Ismail, Johor Bahru. **Methods**: Patients were assessed for anthropometry measurements, 24-h diet recall and nutritional status using Scored Patient-Generated Subjective Global Assessment (PG-SGA) questionnaire while the European Organization for Research and Treatment of Cancer Care Quality of Life Questionnaire (EORTC QLQ-C30) was used to assess QOL two weeks prior to the initiation of pelvic radiotherapy. **Results**: Mean Body Mass Index (BMI) of patients was 23.3±3.3kg/m2 and 33% of patients experienced weight loss prior to pelvic radiotherapy. The PG-SGA rating indicated that 63% of patients were at Stage A (well-nourished) and 37% were in Stage B (moderate malnutrition). The PG-SGA numerical score was a significant predictor of QOL, after adjusting for socio-demographic factors (R^2=0.861, p<0.05). **Conclusion**: In general, the low nutritional status of the patients indicates the need for early nutritional assessment, education and intervention in ensuring optimal nutritional status throughout the pelvic radiotherapy treatment.

Prevalence of young adult hypertension in Malaysia and its associated factors: Findings from National Health and Morbidity Survey 2011

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Malaysian Journal of Public Health Medicine, Vol. 16(3), 2016, 274-283

Hypertension is a chronic medical condition and a global public health issue. According to Malaysia's National Health and Morbidity Survey (NHMS) 2006, the prevalence of hypertension among adults aged 18 years and above was 32.2% and had increased slightly in 2011 to 32.7%. However, not much study was done on the prevalence of young adult hypertension in Malaysia. Hence, the aim of this study was to determine this prevalence as well as its associated factors. Data was obtained from the NHMS 2011 study, which utilized a two stage stratified sampling design to conduct a nationwide household survey involving 28,650 individuals. Systolic and diastolic blood pressures, height, weight and blood glucose levels were measured. Binary logistic regression was used to investigate the relationship between prevalence of hypertension and its associated factors. The prevalence of young adult hypertension was 17.3%. After adjusting for other confounding variables, significant association were found in gender [aOR: 1.72 (95% CI: 1.52-1.96)], age [aOR: 1.08 (1.07-1.09)], ethnic groups (Other Bumiputera vs Malays [aOR: 1.55 (1.27-1.88)], obesity (aOR: 4.43 95% CI 3.83 - 5.12) and diabetic status [aOR: 1.75 (95% CI 1.43-2.15)]. Early screening, detection and treatment of hypertension among the high risk young adults group is recommended to reduce the long-term risk of complications.

Vitamin D deficiency in Malaysian adolescents aged 13 years: Findings from the Malaysian Health and Adolescents Longitudinal Research Team study (MyHeARTs)

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Objective: To determine the prevalence of vitamin D deficiency (<37.5 nmol/L) among young adolescents in Malaysia and its association with demographic characteristics, anthropometric measures and physical activity. **Design**: This is a cross-sectional study among Form 1 (year 7) students from 15 schools selected using a stratified random sampling design. Information regarding sociodemographic characteristics, clinical data and environmental factors was collected and blood samples were taken for total vitamin D. Descriptive and multivariable logistic regression was performed on the data. **Setting**: National secondary schools in Peninsular Malaysia. **Participants**: 1361 students (mean age 12.9±0.3 years) (61.4% girls) completed the consent forms and participated in this study. Students with a chronic health condition and/or who could not understand the questionnaires due to lack of literacy were excluded. **Main outcome measures**: Vitamin D status was determined through measurement of sera 25- hydroxyvitamin D (25(OH)D). Body mass index (BMI) was classified according to International Obesity Task Force (IOTF) criteria. Self-reported physical activity levels were assessed using the validated Malay version of the Physical Activity Questionnaire for Older Children (PAQ-C). **Results**: Deficiency in vitamin D was seen in 78.9% of the participants. The deficiency was significantly higher in girls (92.6%, p<0.001), Indian adolescents (88.6%, p<0.001) and urban-living adolescents (88.8%, p<0.001). Females (OR=8.98; 95% CI 6.48 to 12.45), adolescents with wider waist circumference (OR=2.64; 95% CI 1.65 to 4.25) and in urban areas had higher risks (OR=3.57; 95% CI 2.54 to 5.02) of being vitamin D deficient. **Conclusions**: The study shows a high prevalence of vitamin D deficiency among young adolescents. Main risk factors are gender, ethnicity, place of residence and obesity.

Scope 3

Food Intake, Dietary Practices and Physical Activity

Accelerometer-based physical activity intervention study in the workplace: issues and challenges

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International Journal of Physical Education, Sports and Health, Vol. 2(1), 2015, 23-30

Since the majority of adults spend a considerable amount of their time at work, the workplace has been scrutinised in several studies as a setting for physical activity interventions. Although the overall evidence in support of workplace interventions has been mixed, strong evidence suggests the need for individually tailored behaviour change intervention programmes at the workplace. Challenges related to physical activity assessment tools, study design and advocacy to translate evidence into practice were critically reviewed in this paper. Future studies should continue employing more effective strategies and studying employees over a longer period. This review seeks to serve as a reference for future workplace physical activity promotion programmes.

Accelerometer-measured physical activity and its relationship with Body Mass Index (BMI) and Waist Circumference (WC) measurements: A cross-sectional study on Malaysian Adults

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Malaysian Journal of Nutrition, Vol. 23(3), 2017, 397-408

Introduction: Physical activity has been shown to be beneficial for the prevention of obesity and non-communicable diseases. Our contemporary way of life that is technology dependent has significantly reduced physical activity. This study aimed to determine accelerometer-measured physical activity (moderate-to-vigorous physical activity (MVPA)) among adults in high and low walkability neighbourhoods in Penang and Kota Bharu, Malaysia. **Methods**: Participants (n=490) were sampled using multistage sampling method from neighbourhoods with varied levels of walkability using Geographical Information System (GIS). Physical activity was measured objectively using Actigraph GT3X+ accelerometers, worn by the participants on their waists for a period of 5 to 7 days. **Results**: The participants had a mean of 13.5 min/day of MVPA. Total MVPA was significantly higher among participants in high walkability neighbourhoods (19.7 min/day vs. 9.1 min/ day). Results from t-test showed that the time spent on MVPA per day was significantly lower among participants residing in low walkability neighbourhoods. The final model of the MIXED model statistical tests showed that total MVPA was significantly associated with BMI, but not with WC measurements, after adjusting for covariates. **Conclusion**: Most of the participants had very low MVPA and did not achieve the current physical activity recommendations, implying that Malaysian adults residing in these two cities were not physically active to achieve health benefits. Results are suggestive of the importance of the walkability concept in neighbourhoods in encouraging physical activity and healthy body weight among Malaysians.

Adiponectin, leptin and objectively measured physical activity in adults: A narrative review

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Malaysian Journal of Medical Sciences, Vol. 23(6), 2016, 7–24

The objective of this study was to compile and analyse existing scientific evidences reporting the effects of objectively measured physical activity on the levels of adiponectin and leptin. Articles related to the effects of objectively measured physical activity on the levels of adiponectin and leptin were searched from the Medline and PubMed databases. The search was limited to 'objectively measured' physical activity, and studies that did not objectively measure the physical activity were excluded. Only English articles were included in the search and review. A total of 18 articles encompassing 2,026 respondents met the inclusion criteria. The eligible articles included all forms of evidence (eg: cross-sectional and intervention). Seventeen and 11 studies showed the effects of objectively measured physical activity on adiponectin and leptin, respectively. Five and four cross-sectional studies showed the effects of objectively measured physical activity on adiponectin and leptin, respectively. Two out of five studies showed a weak to moderate positive association between adiponectin and objectively measured physical activity, while three out of four studies showed a weak to moderate inverse association between leptin and objectively measured physical activity. For intervention studies, six out of 12 studies involving adiponectin and five out of seven studies involving leptin showed a significant effect between the proteins and objectively measured physical activity. However, a definitive conclusion could not be drawn due to several methodological flaws in the existing articles and the acute lack of additional research in this area. In conclusion, the existing evidences are encouraging but yet not compelling. Hence, further well-designed large trials are needed before the effectiveness of objectively measured physical activity in elevating adiponectin levels and in decreasing leptin levels could be strongly confirmed.

Adverse reactions to foods (ARFS) in children: Parental knowledge, awareness and behavior

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Malaysian Applied Biology Journal, Vol. 46(3), 2017, 97–104

This study aimed to assess parental knowledge, awareness and behaviour on Adverse Reactions to Foods (ARF) and its relation to family's quality of life. In this cross-sectional study, 120 parents of children with documented ARFs in Selangor were recruited. Of these parents, 63.3% and 50.8% exhibited low levels of knowledge and awareness of ARFs, respectively. In terms of dietary practices, 31.7% avoided possible allergenic foods during pregnancy. The study found that 66.7% of children followed the childhood immunization schedule and 32.5% had symptomatic ARFs onset at age 36 months and above. Seafood appeared to be the main cause of ARFs (68%). ARFs appeared to be triggered mainly by environmental factors as reported by 46.7% of respondents. Nearly 56% of parents reported emotional responses associated with caring for ARF children while 8.8% and 17.5% found that ARFs affected relationships with family members and social acquaintances, respectively. A positive association was observed between specific levels of ARF knowledge and parental educational levels ($p < 0.05$). This findings represent an attempt to provide information for public education in a practical manner that can help optimize and sustain health benefits and overall community well-being.

Assessing walking steps and its relationship with nutritional status among adults in Kuala Terengganu

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Malaysian Applied Biology Journal, Vol. 46(3), 2017, 113–121

To date, 10,000 steps per day are extensively promoted as a target for achieving health-related benefits. Despite mounting evidence on the numerous health benefits provided by sufficient physical activities, little is known about physical activity levels in terms of walking steps of adults in Kuala Terengganu and the relationship between activity levels and nutritional status. Therefore, this study was aimed to assess daily walking steps taken as well as the relationship with nutritional status among 100 adults in Kuala Terengganu, Malaysia. Walking activity was assessed using an Omron HJ-005 pedometer, while nutritional status was assessed through BMI, waist circumference, blood pressure, fasting glucose and serum lipid concentration. On average, participants recorded 5,796 (4,186) steps per day, below the recommended target of 10,000 walking steps goal. There was no significant relationship found between number of walking steps and nutritional status. Remarkably, daily walking steps were found to be significantly correlated with the International Physical Activity Questionnaire (IPAQ), where $r = 0.26$, $p < 0.01$, indicating that pedometers are good indicators of physical activity levels. Nonetheless, an awareness program to increase the level of leisure-type physical activities such as walking is much encouraged in this population.

Association between body weight status, psychological well-being and disordered eating with intuitive eating among Malaysian Undergraduate University students

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Intuitive eating, which can be defined as reliance on physiological hunger and satiety cues to guide eating, has been proposed as a healthy weight management strategy. To date, there has not been a published study on intuitive eating in the context of Malaysia. Therefore, this cross-sectional study aims to determine associations between body weight status, psychological well-being and disordered eating behaviors with intuitive eating among undergraduate university students. A total of 333 undergraduate respondents (21.3% males and 78.7% females) from three randomly selected faculties in a public university in Malaysia participated in this study. Respondents completed a self-administered questionnaire which featured socio-demographic characteristics, intuitive eating, self-esteem, body appreciation, general unconditional acceptance, body acceptance by others, body function and disordered eating. Body weight, height, body fat percentage and waist circumference were measured. The results from this study revealed that there was no difference ($t = 0.067$, $p = 0.947$) in intuitive eating scores between males (75.69 ± 7.16) and females (75.62 ± 7.90). Multiple linear regression results have shown that body appreciation ($\beta = 0.385$, $p < 0.001$) and disordered eating ($\beta = -0.168$, $p = 0.001$) were significant predictors of intuitive eating, which accounted for 19.6% of the variance in intuitive eating. Health promotion programs should highlight the importance of enhancing body appreciation and preventing disordered eating behaviors among university students in order to promote intuitive eating as one of the healthy weight management approaches.

Association between isoflavones consumption and cognitive functions and comorbidities among older adults residing in the state of Johor, Malaysia

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Malaysian Journal of Nutrition, Vol. 22(1), 2016, 29-39

Introduction: This two-phase longitudinal study sought to determine the association between isoflavones intake on cognitive function and comorbidities among older adults from the state of Johor, Malaysia. **Methods**: Phase I involved baseline data collection to examine the association between isoflavones intake and cognitive function among 400 respondents aged 60-years and above, recruited through multistage random sampling. Phase 2 determined the association between isoflavones intake at the baseline and comorbidities at an 18-month follow-up. The baseline data collected included information on socio-demographics, health status, andunpometric measurements, and dietary intake using a dietary history questionnaire (DHQ). Each participant's cognitive function was evaluated using a mini mental state examination (MMSE), digit span, digit symbol, and geriatric depression scale (GDS). **Results**: The daily intake of total isoflavones, daidzein, and genistein were 19.1 ±19.7,11.7 ±12.3 and 7.6+8.1 mg/day, respectively. There was no significant association between isoflavones intake, and specific cognitive function including global, memory, executive functions, and depression. However, there was a significant association ($p < 0.05$) between isoflavones intake r=0.131 (95% CI: 0.064-0.199), daidzein intake r0.132 (95% CI: 0.064-0.199), and genistein intake ra0.129 (95% CI: 0.062-0.197) with memory (digit span) after adjustment for age, gender, educational level, and body mass index (11M1). No association was found between isoflavones intake and comorbidities ($p > 0.05$). **Conclusion**: This study found an association between isoflavones intake and memory function, but not with global cognitive, executive functions, depression, and comorbidities. There is a need to promote adequate isoflavones intake in view of its association with memory function.

Association between parents' perception of neighbourhood environments and safety with physical activity of primary school children in Klang, Selangor, Malaysia

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Child: Care, health and development, Vol. 42(4), 2016, 478-485

Background: This study aimed to evaluate parental perception of neighbourhood environments and safety in association with children's physical activity among primary school children in Klang, Selangor, Malaysia. **Methods**: A total of 250 children (9–12 years of age) and their parents participated in this cross sectional study. Physical Activity Questionnaire for Older Children and Neighbourhood Environmental Walkability Scale as well as questions on constrained behaviours (avoidance and defensive behaviours) were used to assess the children's physical activity and parental perception of neighbourhood environment and safety, respectively. **Results**: More than one-third (36.0%) of the children were physically inactive compared with only a small percentage (4.8%) who were physically active, with boys achieving higher physical activity levels than girls (t = 2.564, P = 0.011). For the

environmental scale, parents' perception of land-use mix (access) (r = 0.173, P = 0.006), traffic hazards (r = 0.152, P = 0.016) and defensive behavior (r = 0.024, P = 0.143) correlated significantly with children's physical activity. In multiple linear regression analysis, child's gender (β= 0.226; P = 0.003), parent's education (β= 0.140; P = 0.001), household income (β= 0.151; P = 0.024), land-use mix (access) (β= 0.134; P = 0.011) and defensive behaviour (β= 0.017; P = 0.038) were significantly associated with physical activity in children (R = 0.349, F = 6.760; P < 0.001), contributing 12.2% of the variances in physical activity of the children. **Conclusion**: Results highlight the links between parental perception of neighbourhood environments, safety and constrained behaviours with their children's participation in active play. Interventions aimed to increase actual and perceived safety and reduce perceptions of risk by parents in safe neighbourhoods can be targeted to increase children's physical activity in their local neighbourhoods.

Association between physical activity and health-related quality of life in children: A cross-sectional study

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Health and Quality of Life Outcomes, Vol. 14(2), 2016, 71-76

Background: Research suggests that physical activity plays a role to improve health related- quality of life (QoL), however studies examining the association between physical activity and HRQOL are limited in the paediatric literature. The aim of this study is to explore the relationship between physical activity and HRQoL among Malaysian children. **Methods**: Participants (n = 78 normal weight; 78 obese children) aged 9–11 years completed a validated quality of life (QoL) inventory and wore an accelerometer to objectively measure physical activity for 1 week. **Results**: Psychosocial Health domain and Total QoL (all p < 0.05) were significantly lower for obese compared to normal weight children. Children who spent more time in sedentary behaviour had significantly lower QoL on Psychosocial Health domain and Total QoL except for the Physical Health domain. There was also a strong positive correlation between QoL and moderate-vigorous physical activity (MVPA) indicating that children who are physically active have a better quality of life. **Conclusions**: Physical activity promotion should be emphasised to improve QoL in children.

Association of physical activity with blood pressure and blood glucose among Malaysian adults: A population-based study

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BMC Public Health, Vol. 15(1), 2015, 1205-1211

Background: The health-enhancing benefits of physical activity (PA) on hypertension and diabetes have been well documented for decades. This study aimed to determine the association of PA with systolic and diastolic blood pressure as well as blood glucose in the Malaysian adult population.

Methods: Data were extracted from the 2011 National Health and Morbidity Survey (NHMS), a nationally representative, cross-sectional study. A two-stage stratified sampling method was used to select a representative sample of 18,231 Malaysian adults aged 18 years and above. The PA levels of the respondents were categorised as low, moderate or high according to the International Physical Activity Questionnaire (IPAQ)-short form. Blood pressure and fasting blood glucose levels were measured using a digital blood pressure-measuring device and finger-prick test, respectively. **Results**: Systolic blood pressure (SBP) level was positively associated with PA level ($p = 0.02$) whilst no significant association was noted between PA level and diastolic blood pressure (DBP). In contrast, respondents with low (adjusted coefficient = 0.17) or moderate (adjusted coefficient = 0.03) level of PA had significantly higher blood glucose level as compared to those who were highly active ($p = 0.04$). **Conclusions**: A significant negative association was observed between PA level and blood glucose only. Future studies should employ an objective measurement in estimating PA level in order to elucidate the actual relationship between PA, hypertension and diabetes for the development of effective interventions to combat the increasing burden of premature-mortality and cardiovascular disease-related morbidity in Malaysia.

Associations between socio-demographic characteristics and pubertal status with disordered eating among primary school children in Selangor, Malaysia

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Background and Objectives: To determine the associations between socio-demographic characteristics and pubertal status with disordered eating among primary school children. **Methods and Study Design**: Using a stratified multi-stage sampling, a total of 816 children (282 boys and 534 girls) aged 10 to 11 years from 12 selected primary schools in the state of Selangor, participated in this study. Data were collected on socio-demographic characteristics, pubertal status and disordered eating behaviors. The Pubertal Development Scale and the Children's Eating Attitudes Test (ChEAT) were used to assess pubertal status and disordered eating, respectively. Logistic regression analysis was conducted to determine the risk factors of disordered eating. **Results**: The prevalence of disordered eating was 30.8% (32.8% in boys and 29.7% in girls). However, the sex difference in the prevalence was not statistically significant. Age, ethnicity and pubertal status were significantly associated with disordered eating in univariate logistic regression analysis. Multivariate logistic regression analysis showed that among boys, being either in an advanced or post-pubertal stage (adjusted OR=8.64) and older age group (adjusted OR=2.03) were risk factors of disordered eating. However, among girls, being a Malay (adjusted OR=3.79) or Indian (adjusted OR=5.04) in an advanced or post-pubertal stage (adjusted OR=2.34) and older age group (adjusted OR=1.53) were risk factors of disordered eating. **Conclusion**: This study found one in three children had disordered eating. Since ethnicity and pubertal status were identified as risk factors, ethnicity-specific intervention programs on the prevention of disordered eating among children should take into consideration their pubertal status.

Attitude and ability to overcome barriers in practicing of physical exercise among academy staff in Faculty of Medicine UiTM

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Several studies had highlighted the importance of exercise as a conservative treatment in medical world. The highly increased of the burden of disease especially the Non-communicable disease contributed to the increasing of the needs toward achieving optimum exercise benefits. It is evident that medical practitioners plays important role to implement and promote exercise among general population. Identifying the attitude of academic staff towards physical exercise was crucial in this aspect. **Objectives**: To determine the attitude and ability in overcoming exercise barrier in performing physical exercise in addition to identify the correlation between them among academic staff with and without medical graduated **Methodology**: A cross sectional study had been conducted, from January- September 2015, in two UiTM campuses (Sungai Buloh and Selayang). Sample of 155 academic staff consist of both medical and non-medical graduate was collected. Each participant was given well-structured questionnaire to be answered. Questionnaires contain two domains; the first one consists of six items reflecting either positive (2) or negative (4) attitude toward exercise. The second domain consists of seven items reflecting the ability in overcoming exercise barrier. Five-point-scoring: (1) very much overcome - (5) not at all, were given for each item. In addition, the questionnaire also contains information about the socio-demographic details of each participant. **Result**: The majority (95.5%) having good attitude towards physical exercise. No significant difference in the rate of good attitude between medical (95.7%) and non-medical (93.3%) graduate. There is no correlation between the general attitudes towards exercise with the ability to overcome exercise barriers. Significantly, male shows higher rate (77.4%) of ability of overcoming exercise barrier compare to woman (43.3%). No significant association between other socio-demographic characteristic (age, race, marital status) with neither general attitude towards exercise nor ability in overcoming exercise barrier. **Conclusion**: The majority of academic staff having good attitude. No significant difference between Medical and non-Medical graduate in terms of attitude and ability of overcoming exercise. No significant association between various socio-demographic profile and attitude towards exercise except for gender.

Body somatotype, anthropometric characteristics and physical activity of college-age adults in selected institutions of higher learning in Kelantan, Malaysia

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Introduction: The objective of this cross-sectional study was to determine the body somatotypes, anthropometric characteristics and physical activity levels of young adults. **Methods**: Using a systematic sampling approach, a total of 180 students were recruited from three institutions of higher learning in the state of Kelantan. Body weight, height and other anthropometric dimensions including

skinfold, bone breadth and limb girth were measured to determine their body mass index (BMI) and body somatotypes. Physical activity level was determined using the Short Form - International Physical Activity Questionnaire (IPAQ). **Results**: Almost half (49.4%) of the respondents were with a mean age of 21.5 (1.5), and mean BMI of 22.1 (4.5) kg/m2. The proportion of overweight and obese respondents based on the World Health Organisation (WHO) classification was 17.2% and 6.7%, respectively. In terms of body somatotype, 57.2% and 18.3% of them were classified as endomorphic and mesomorphic somatotype groups respectively, while another 24.4% were ectomorphic. The IPAQ scoring protocol indicated that 35.0% of them achieved high physical activity levels, while 19.3% reported low physical activity levels. There were significantly more endomorphic females, whereas the males significantly dominated the mesomorphic somatotype group. **Conclusion**: Respondents with mesomorphic body somatotype (relative muscularity) were categorised as obese under the BMI classification although their body weight could be due to higher skeletal/muscle mass. The somatotyping method can be used as an additional tool to the conventional BMI indicators for assessing adiposity.

Body weight status and dietary intakes of urban Malay primary school children: Evidence from the family diet study

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Malaysia is experiencing a rise in the prevalence of childhood obesity. Evidence for the relationship between dietary intake and body weight among Malaysian children is limited, with the impact of energy intake misreporting rarely being considered. This paper describes the dietary intakes of urban Malay children in comparison to national recommendations and by weight status. This cross-sectional Family Diet Study (n=236) was conducted in five national primary schools in Malaysia (August 2013–October 2014). Data on socio-demographics, anthropometrics, 24-h dietary recalls, and food habits were collected from Malay families, consisting of a child aged 8 to 12 years and their main caregiver(s). Multivariable analyses were used to assess dietary intake-body weight relationships. The plausibility of energy intake was determined using the Black and Cole method. Approximately three in 10 Malay children were found to be overweight or obese. The majority reported dietary intakes less than national recommendations. Children with obesity had the lowest energy intakes relative to body weight (kcal/kg) compared to children in other weight categories ($F=36.21$, $p<0.001$). A positive moderate correlation between energy intake and weight status was identified ($r=0.53$, $p<0.001$) after excluding energy intake mis-reporters (n=95), highlighting the need for the validation of dietary assessment in obesity-related dietary research in Malaysia.

Caloric restriction, cognitive function and aging: Roles towards biologic system

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The prevalence of mild cognitive impairment (MCI) in Malaysia reached 68% in 2016. Various methods including nutrition, lifestyle and environment are carried out to ensure the sustainability of the health of older adults. Caloric restriction has been discovered to lower mortality and morbidity rate and preserving the health of older adult in order to improve their quality of life. Caloric restriction is also one of the methods that is easier and effective in order to improve the memory and maintaining the health in this group. It also aids in reducing inflammation rate and pruning the action of free radicals present in the body system as a result of the aging process and environmental factors. This situation provides the body less prone to DNA damage and toxin attacks from chronic diseases, nutrition and environment. Therefore, the literature review will provide a clearer concept on implication of calorie restriction in maintaining cognitive function.

Characteristic associated with the consumption of malted drinks among Malaysian primary school children: Findings from the MyBreakfast study

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Background: The consumption of beverages contributes to diet quality and overall nutrition. Studies on malted drinks, one of the widely consumed beverage choices among children in Asia, however, have received limited attention. This study aimed to examine the prevalence of malted drink consumption and explored associations of sociodemographic characteristics, nutrient intakes, weight status and physical activity levels with malted drink consumption among primary school children in Malaysia. **Methods**: Data for this analysis were from the MyBreakfast Study, a national cross-sectional study conducted from April to October 2013 throughout all regions in Malaysia. A total of 2065 primary school children aged 6 to 12 years were included in the present analysis. Data on two days 24-h dietary recall or record, anthropometry, physical activity and screen time were recorded.

Associations between malted drink consumption and related factors were examined using binary logistic regression, adjusting for region, area, gender, ethnicity and household income. **Results**: Among children aged 6 to12 years, 73.5 % reported consuming malted drinks for at least once per week. Consumption of malted drinks was significantly associated with region (χ^2=45.64, p<0.001), gender (χ^2=4.41, p=0.036) and ethnicity (χ^2=13.74, p=0.008). Malted drink consumers had similar total energy intake but higher micronutrient intakes compared to non-consumers. High physical activity level (OR=1.77, 95 % CI=1.06, 2.99) and lower screen time during weekends (OR=0.93, 95 % CI=0.86, 0.99) were independently associated with malted drink consumption among 6 to 9 year-old children, but not among 10 to 12 year-old children. No association was observed between malted drink consumption and weight status. **Conclusions**: Malted drink consumption is prevalent among Malaysian primary school children, particularly higher among boys, indigenous children and those who lived in the East Coast region of Malaysia. Consuming malted drinks is associated with higher micronutrient intakes and higher levels of physical activity, but not with body weight status.

Consumption of Ready-To-Eat cereals (RTEC) among Malaysian children and association with socio-demographics and nutrient intakes - Findings from the MyBreakfast study

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Background: The association between different types of breakfast meals and nutrient intakes has been studied to a lesser extent. **Objective**: This study compared nutrient intakes at breakfast and throughout the day between Malaysian children who consumed ready-to-eat cereals (RTEC) and those who did not. **Methods**: Anthropometric and dietary data for 1955 children aged 6–12 years from the MyBreakfast study were used in the analysis. **Results**: Overall, 18% of the children consumed RTEC at breakfast on at least one of the recall days. RTEC consumption was associated with younger age, urban areas, higher income and education level of parents. Among consumers, RTEC contributed 10% and 15% to daily intakes of calcium and iron respectively and ≥20% to daily intakes of vitamin C, thiamin, riboflavin and niacin. RTEC consumers had significantly higher mean intakes of vitamin C, thiamin, riboflavin, niacin, calcium, iron and sugar but lower intakes of fat and sodium than non-RTEC consumers at breakfast and for the total day. **Conclusion**: Consumption of fortified RTEC at breakfast was associated with lower fat and sodium intakes and higher intakes of several micronutrients both at breakfast and for the total day. However, total sugar intakes appeared to be higher.

Daily physical activity and screen time, but not other sedentary activities, are associated with measures of obesity during childhood

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Childhood obesity is related to low physical activity level and a sedentary lifestyle. The aim of this study was to assess the physical activity level and sedentary behaviour of Malaysian children aged 7 to 12 years and to examine their association with body mass index (BMI), BMI-for-age Z-score (BAZ), body fatness (%BF) and waist circumference (WC). A total of 1736 children, representing all ethnic groups were recruited from six regions of Malaysia. Anthropometric measurements included body weight, height and waist circumference. Body fat percentage (%BF) was assessed using bioelectrical impedance. Physical activity was assessed by a physical activity questionnaire (PAQ) in all children and by pedometers in a subsample (n = 514). PAQ score and pedometer step counts were negatively associated with BMI, BAZ, %BF and WC after adjusting for covariates. Screen time was positively associated with BAZ and WC. However, other sedentary activities were not significantly related with any anthropometric indicators. Strategies to promote active living among children in Malaysia should focus not only on increasing physical activity but also emphasise reduction in sedentary behaviours.

Design of a randomised intervention study: The effect of dumbbell exercise therapy on physical activity and quality of life among breast cancer survivors in Malaysia

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Background: Participation in physical activity has a positive impact on the overall health and quality of life, whereas physical inactivity is associated with a poor prognosis among breast cancer survivors. Despite the health-enhancing benefits of physical activity, the majority of Malaysian breast cancer survivors are not physically active. This paper presents the design of a randomised study to evaluate the feasibility and effect of exercise therapy intervention using light resistance dumbbell exercise to promote active lifestyle and improve the quality of life of breast cancer survivors in Malaysia. **Methods/design**: This is an intervention study of a 12-week exercise therapy that will explore and compare the effects of light resistance and aerobic exercise on physical activity level and quality of life components in 102 female breast cancer survivors. Major eligibility criteria include histologically confirmed diagnosis of breast cancer stages I–III, 3–12 months postdiagnosis, and absence of any disorder contraindicating exercise. Participants will be stratified based on menopausal status (pre-menopause vs postmenopause) and then assigned randomly to one of three groups. Participants in group A will participate in a three-times weekly supervised resistance exercise using light resistance dumbbells; participants in group B will participate in a three-times weekly supervised aerobic exercise;

while participants in group C (control group) will be given aerobic exercise after completion of the intervention. The primary end points include physical activity level and quality of life components. The secondary end points are body mass index, body composition, total caloric intake, and waist-to-hip ratio. **Discussion**: Although there have been many studies of resistance exercise in breast cancer survivors, this is the first study using this specific mode of resistance. Findings will contribute data on the feasibility and effects of light resistance dumbbell exercises, and provide knowledge on the physical activity intervention programme that will maximally promote better overall health and well-being of survivors.

Dietary intake among breast cancer survivors in east coast of Peninsular Malaysia

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A balanced dietary intake plays an important role in the prognosis of breast cancer and is one of the modifiable factors in preventing cancer recurrence. This study aims to determine the dietary intake among breast cancer survivors in East Coast of Peninsular Malaysia. A total of 125 breast cancer survivors, aged 37 to 72 years, with mean duration of survivorship of 6.1 ± 3.9 years were recruited from two main referral hospitals in Terengganu and Kelantan. Majority of the respondents were Malay (94.4%) with a mean BMI of 27.7 ± 5.07 kg/m², and were diagnosed with stage II cancer (66.0%). Dietary intake was estimated using a semi-quantitative food frequency questionnaire (FFQ). The results show that the mean daily intake of energy was 1764 ± 378 kcal/day, protein was 72.38 ± 33.6 g/day (16.5% of energy), carbohydrate was 243.0 ± 62.2 g/day (55% of energy) and fat was 55.8 ± 15.6 g/day (28% of energy). Overall, breast cancer survivors in this study had an adequate daily intake of vitamins and minerals according to Malaysian Recommended Nutrient Intakes (RNI) except for dietary fibre (10.6 ± 4.2 g/day), monounsaturated fatty acids (20.7 ± 5.7 g/day), polyunsaturated fatty acids (8.0 ± 2.2 g/day), calcium (561.0 ± 257.1 mg/day), iron (18.3 ± 7.2 mg/day) and potassium (1813.4 ± 531.1 mg/day) which was lower than the recommendation. Meanwhile, intake of sodium (2592 ± 1697 mg/day), protein (80.4 ± 33.6 g/day), saturated fatty acids (26.9 ± 14.2 g/day), vitamin B2 (1.9 ± 1.1 mg/day) and vitamin C (151.1 ± 149.3 mg/day) exceeded the recommendation by 135.0%, 139.0%, 166.9%, 154.6% and 152.0%, respectively. There was no significant difference in dietary intake between cancer survivors who were diagnosed in the past five years and those who were diagnosed more than five years ago ($p>0.05$) except for fat ($p<0.001$), saturated fatty acid ($p=0.006$), monounsaturated fatty acid ($p=0.005$) and polyunsaturated fatty acid ($p=0.003$). As a conclusion, breast cancer survivors in East Coast of Peninsular Malaysia had an adequate intake of most nutrients except for dietary fibre, monounsaturated fatty acids, polyunsaturated fatty acids, calcium, iron and potassium which was below the recommendation and sodium, protein, saturated fatty acids, vitamin B2, vitamin C which was above the recommendation. The intakes between long-term and short-term survivors were also comparable showing sustained dietary intake throughout survivorship.

Dietary intake among adolescents in a middle-income country: An outcome from the Malaysian Health and Adolescents Longitudinal Research Team Study (the MyHeARTs Study)

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Optimal nutrition is essential for healthy growth during adolescence. This study aims to investigate the baseline nutritional intake of Malaysian adolescents by gender, body mass index, and places of residence, both urban and rural. A *cohort study* was conducted consisting of 794 adolescents (aged 13-years) attending 15 public secondary schools from the Central (Kuala Lumpur and Selangor) and Northern (Perak) Regions of Peninsular Malaysia. Qualified dietitians conducted a 7-day historical assessment of habitual food intakes. Facilitated by flipcharts and household measurement tools, detailed information on portion sizes and meal contents were recorded. Nutritionist Pro™ Diet Analysis software was also used to analyze the dietary records. The mean age of the adolescents was 12.86 ± 0.33 y; the mean energy intake was 1659.0 ± 329.6 kcal/d. Males had significantly (P<0.001) higher energy intake than females (1774.0 ± 369.8 vs 1595.2 ± 320.6 kcal/d); adolescents in rural schools consumed more energy and cholesterol (P<0.001) compared to adolescents in urban schools (1706.1 ± 377.7 kcal/d and 244.1 ± 100.2 mg/d, respectively). Obese adolescents in rural schools consumed more energy and sugar (1987.6 ± 374.0 kcal/d and 48.9 ± 23.0 g/d) (p-value<0.001).The dietary intake of normal weight versus obese adolescents differs by the location of their school. Thus, the implementation of a structured and tailored intervention is recommended to help minimize this nutritional inequality.

Domain-specific physical activity among indigenous overweight and obese communities in Sarawak

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Background: Physical activity is important to maintain health and to prevent non-communicable diseases. **Material/Methods**: We evaluated physical activity in four domains (leisure time, occupational, domestic and transportation ones) and its sociodemographic correlates in 351 adult overweight and obese indigenous people in Sarawak, Malaysia. Physical activity was assessed using the Malay version of the International Physical Activity Questionnaire (IPAQ) long form. The data were analysed using SPSS version 20. **Results**: More than 40% of the respondents (43.5%) were obese. The overall median total MET-minutes were 6180.0 (IQR = 10229.0). A total of 53% of the respondents were moderately active with the majority of them being female (55.6%). The overall median total MET-minutes were low for leisure and transportation domains. Females were more active in the domestic domain, while males in the work and leisure-time domains of physical activity. Younger respondents (< 30 years) had the lowest level of physical activity. There is a significant positive relationship of gender with work, domestic and leisure-time domains of physical activity, and of

occupation with work and leisure-time domains as well as all domains of physical activity. **Conclusions**: Studies on physical activity among overweight and obese adults should examine all domains in order to understand its relationship and weight problem.

Effects of oat bran and jogging on aerobic capacity, lipid profile and antioxidant parameters in young sedentary males

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Problem Statement: Sedentary lifestyle predispose an individual to a number of chronic disease. Adopting a physically healthy lifestyle along with a consumption of nutritional supplementation is a strategy towards improving health related quality of life. **Purpose**: We aimed to investigate the combined effects of oat bran consumption and jogging exercise on aerobic capacity, lipid profile and antioxidant status in young sedentary males. **Methods**: Forty seven sedentary male university students with mean age 20.9 ± 1.7 years were recruited. They were randomly assigned to sedentary control (C), oat bran supplementation alone (O), exercise alone (J) and combined oat bran and exercise (OJ) groups. The participants in O and OJ groups consumed 18 g of oat bran powder which contains 3.6 g of -glucan daily for 8 weeks. The participants in J and OJ groups performed jogging exercise with moderate intensity, i.e. 55% to 70% of their age-predicted HRmax, 30 min per day, 3 days per week for 8 weeks. Participants' body composition, predicted maximal oxygen consumption (VO_2max), lipid profile and antioxidant status were measured pre- and post-tests. **Results**: In the O group, there were significant decreases in total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), increase in superoxide dismutase (SOD) activity and decrease in glutathione peroxidase (GPx) activity. In the J group, there were a significant increase in predicted VO2max and decreases in TC and LDL-C. In the OJ group, there were significant decrease in percentage of body fat, increase in predicted VO_2max, high-density lipoprotein cholesterol (HDL-C) and SOD activity, and decreases in triglycerides (TG) and LDL-C. **Conclusions**: Eight weeks of regular jogging exercise combined with daily oat bran consumption elicited more beneficial effects on improving body composition, aerobic capacity, lipid profiles and SOD activity in young sedentary males.

Effects of post-exercise honey drink ingestion on blood glucose and subsequent running performance in the heat

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Background: Glycogen depletion and hypoglycemia have been associated with fatigue and decrement of performance during prolonged exercise. **Objectives**: This study investigated the effectiveness of Acacia honey drink as a post-exercise recovery aid on glucose metabolism and subsequent running performance in the heat. Patients and Methods: Ten subjects participated in this

randomized cross-over study. All subjects performed 2 trials. In each trial, all subjects went through a glycogen depletion phase (Run-1), 2-hour rehydration phase and time trial running phase (Run-2). In Run-1, subjects were required to run on a treadmill at 65% VO_2max in the heat (31°C, 70% relative humidity) for 60 min. During 2-hour rehydration phase, subjects drank either plain water (PW) or honey drink (HD) with amount equivalent to 150% of body weight loss in 3 boluses (60%, 50% and 40% subsequently) at 0, 30 and 60 min. In Run-2, the longest distance covered in 20 min was recorded for determining running performance. Two-way repeated measured ANOVA and paired t-test were used for analysis. **Results**: Running distance in Run-2 covered by the subjects in the honey drink HD trial (3420 ± 350 m) was significantly ($P < 0.01$) longer compared to plain water PW trial (3120 ± 340 m). In general, plasma glucose, serum insulin and osmolality were significantly ($P < 0.05$) higher in HD compared to PW during the rehydration phase and Run-2. **Conclusions**: These findings indicate that rehydration with honey drink improves running performance and glucose metabolism compared to plain water in the heat. Thus, honey drink can be recommended for rehydration purpose for athletes who compete in the heat.

Effects of short-term step aerobics exercise on bone metabolism and functional fitness in postmenopausal women with low bone mass

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Introduction: The major goal of this study was to determine the effects of short-term group-based step aerobics (GBSA) exercise on the bone metabolism, bone mineral density (BMD), and functional fitness of postmenopausal women (PMW) with low bone mass. **Methods**: Forty-eight PMW (aged 58.2 ± 3.5 years) with low bone mass (lumbar spine BMD T-score of –2.00 ± 0.67) were recruited and randomly assigned to an exercise group (EG) or to a control group (CG). Participants from the EG attended a progressive 10-week GBSA exercise at an intensity of 75–85 % of heart rate reserve, 90 min per session, and three sessions per week. Serum bone metabolic markers (C-terminal telopeptide of type 1 collagen [CTX] and osteocalcin), BMD, and functional fitness components were measured before and after the training program. Mixed-models repeated measures method was used to compare differences between the groups ($\alpha = 0.05$). **Results**: After the 10-week intervention period, there was no significant exercise program by time interaction for CTX; however, the percent change for CTX was significantly different between the groups (EG = –13.1 ± 24.4 % vs. CG = 11.0 ± 51.5 %, $P < 0.05$). While there was no significant change of osteocalcin in both groups. As expected, there was no significant change of BMD in both groups. In addition, the functional fitness components in the EG were significantly improved, as demonstrated by substantial enhancement in both lower- and upper-limb muscular strength and cardiovascular endurance ($P < 0.05$). **Conclusion**: The current short-term GBSA exercise benefited to bone metabolism and general health by significantly reduced bone resorption activity and improved functional fitness in PMW with low bone mass. This suggested GBSA could be adopted as a form of group-based exercise for senior community.

Ethnic differences in the food intake patterns and its associated factors of adolescents in Kelantan, Malaysia

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Nutrients, Vol. 8(9), 2016, 551-554

Objective: The aim of the study was to identify the ethnic differences in dietary patterns and its association with socio-economic, dietary and lifestyle practices among adolescents in Kelantan, Malaysia. **Methods**: A population-based study of 454 adolescents aged 12 to 19 years was included. A validated food frequency questionnaire was used to assess dietary patterns and three dietary patterns were identified based on the principal component analysis method. **Results**: Malay adolescents had significantly higher scores for the Western-based food pattern and local-based food pattern, whereas Chinese adolescents showed higher scores for the healthy-based food pattern. Multivariate analyses show that age and physical activity (PA) levels were positively associated with healthy-based food pattern in Malay (All, $p < 0.001$), whereas higher consumption of eating-out from home (EatOut) ($p = 0.014$) and fast food ($p = 0.041$) were negatively associated. High weekly breakfast skipping ($p < 0.001$) and EatOut ($p = 0.003$) were positively associated with a Western-based pattern, whereas age ($p < 0.001$) and household income ($p = 0.005$) were negatively associated. Higher frequency of daily snacking ($p = 0.013$) was positively associated with local-based food pattern. For Chinese adolescents, age ($p < 0.001$), PA levels ($p < 0.001$) and maternal education level ($p = 0.035$) showed positive associations with the healthy-based pattern, whereas high EatOut ($p = 0.001$) and fast food intakes ($p = 0.001$) were negatively associated. Higher weekly consumption of EatOut ($p = 0.007$), fast food ($p = 0.023$) and carbonated beverages ($p = 0.023$), and daily snacking practice ($p = 0.004$) were positively associated with higher Western-based food pattern, whereas age ($p = 0.004$) was inversely associated. **Conclusion**: This study showed that there were significant differences in dietary patterns and its association factors between Malay and Chinese adolescents. More importantly, these findings suggest that unhealthy dietary and lifestyle practices could increase the risk of adherence to unhealthy Western-based food pattern that is high in fat, sugar and salt contents, and, consequently, increase the risk of developing obesity and metabolic-related disorders during these critical years of growth.

Evaluation of diet quality and its associated factors among adolescents in Kuala Lumpur, Malaysia

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Nutrition Research and Practice, Vol. 9(5), 2015, 511-516

Background/Objectives: This study aims to determine contribution of meal frequency, self-efficacy for healthy eating, and availability of healthy foods towards diet quality of adolescents in Kuala Lumpur, Malaysia. **Subjects/Methods**: This study was conducted among 373 adolescents aged from 13 to 16 years old. Diet quality of the respondents was assessed using the Healthy Eating Index for Malaysians. Meal frequency, self-efficacy for healthy eating, and availability of healthy foods were

assessed through the Eating Behaviours Questionnaire (EBQ), self-efficacy for healthy eating scale, and availability of healthy foods scale, respectively. **Results**: The majority of the respondents (80.7%) were at risk of poor diet quality. Males (mean = 34.2 ± 8.2%) had poorer diet quality than females (mean = 39.9 ± 9.0%) ($t = -5.941$, $P < 0.05$). Malay respondents (mean = 36.9 ± 8.7%) had poorer diet quality than Indian respondents (mean = 41.3 ± 10.0%) ($F = 2.762$, $P < 0.05$). Age ($r = 0.123$, $P < 0.05$), self-efficacy for healthy eating ($r = 0.129$, $P < 0.05$), and availability of healthy foods ($r = 0.159$, $P < 0.05$) were positively correlated with the diet quality of the respondents. However, meal frequency was not correlated with the diet quality of the respondents. Multiple linear regression analysis showed that being a male, being a Malay, low self-efficacy for healthy eating, and low availability of healthy foods contributed significantly towards poor diet quality among respondents. **Conclusions**: In short, sex, ethnicity, self-efficacy for healthy eating, and availability of healthy foods were associated with diet quality among adolescents. Health practitioners should take into consideration of differences in sex and ethnicity during implementation of nutrition-related intervention programs. Self-efficacy for healthy eating and availability of healthy foods should be included as important components in improving diet quality of adolescents.

Evaluation of dietary intake and quality of life on risk of osteoporosis among adults in Universiti Malaysia Terengganu

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Malaysian Applied of Biology Journal, Vol. 46(3), 2017, 123–129

The present study aimed to evaluate the link between dietary intake and quality of life on risk of osteoporosis among adults in Universiti Malaysia Terengganu. This study involved 73 respondents (61.6% students and 38.4% staff) aged 19 to 50 years old. The median BMI among respondents was 23.6 (6.08) kg/m^2, categorized as normal weight. 58% of respondents had normal body weight, while 35.6% respondents were overweight/obese and 6.1% were underweight. Result revealed that serum calcium and phosphorus of respondents were 8.4 (0.65) mg/dL and 3.0 (0.70) mg/dL, respectively. Even though the median calcium intake of respondents was only 46.5% RNI (371.9 mg/day), the calcium concentration in serum achieved 98.8% at reference level. Moreover, 129.2% of phosphorus RDA intake (904.6 mg/day) resulted in 70% of respondents with serum phosphorus at reference level. A majority of calcium and phosphorus rich foods had low frequency consumption score among respondents. BMI and body fat percentage shows no relationship with serum calcium but have a weak reverse relationship with serum phosphorus (ρ=-0.215, p=0.07; ρ:-0.247, p=0.04). Additionally, Physical Health Composite Scale Score (PCS) and Mental Health Composite Scale Score (MCS) of respondents (53.86 (10.00); 52.42±7.44) were average and had a weak relationship with serum calcium (ρ: 0.237, p=0.04) but no relationship with serum phosphorus. Lastly, there was gender difference in terms of association between body fat percentage, BMI, quality of life, phosphorus intake and serum calcium and phosphorus.

Factors affecting participation decision and amount of physical activity among urban dwellers in Malaysia

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Public Health, Vol. 146, 2017, 84-91

Objectives: The rapid rise in the prevalence of physical inactivity-related diseases has become a serious public health issue worldwide. The objective of the present study is to examine the factors affecting participation in physical activity among urban dwellers in Malaysia. **Study design**: This cross-sectional study measures physical activity using a rigorous regression model. **Methods**: Data are obtained from the National Health and Morbidity Survey 2011 (NHMS 2011). A lognormal hurdle model is used to analyse the participation decision and the amount decision of physical activity. **Results**: The results show that income, gender, ethnicity, marital status and employment status are significantly associated with participation decision and amount decision. However, age, insurance and self-rated health only affect participation decision, whereas family size, education and smoking only affect amount decision. **Conclusions**: It can, thus, be concluded that sociodemographic, insurance, lifestyle and health factors play an important role in determining physical activity behaviour among urban dwellers. When formulating policies, special attention must be paid to these factors

Factors associated with participation in physical activity among adolescents in Malaysia

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International Journal of Adolescent and Medical Health, Vol. 28(4), 2016, 419–427

Background: The rising prevalence of non-communicable diseases (NCDs) has become a serious public health issue. Among the multi-factorial drivers behind NCDs are modifiable health risk factors, most notably, physical inactivity. **Objective**: In response to the nearly global policy priority of encouraging regular participation in physical activity, the objective of the present study is to examine the factors that determine participation in physical activity among Malaysian adolescents. **Methods**: Nationally representative data consisting of a large sample size was used. A censored regression model was developed to estimate the likelihood of participation and time spent on physical activity. **Results**: There are significant relationships between physical activity and gender, ethnicity, self-rated academic performance, maternal education, household size and time spent on physical education. **Conclusion**: The present study provides new insights into the factors affecting physical activity participation among adolescents. Specifically, self-rated excellent academic performance, household size and physical education can increase the likelihood of being physically active. Evidence of the present study implies that policy makers should pay special attention to females, Chinese, adolescents with self-rated poor academic performance and adolescents who have low maternal education.

Food intake among older adults with food insecurity in an agricultural settlement at Lubuk Merbau, Kedah (*Pengambilan makanan dalam kalangan warga emas yang mengalami ketakjaminan makanan di Penempatan Pertanian di Lubuk Merbau, Kedah*)

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Jurnal Sains Kesihatan Malaysia, Vol. 15(2), 2017, 29-35

Ketakjaminan makanan dikaitkan dengan pengambilan nutrien yang tidak mencukupi dalam kalangan warga emas. Oleh itu, kajian ini bertujuan untuk menentukan pengambilan makanan dalam kalangan warga emas yang mengalami ketakjaminan makanan di kawasan penempatan pertanian iaitu di FELDA Lubuk Merbau, Kedah. Seramai 70 orang warga emas telah dipilih secara subsampel dari kajian sebenar (n=289: purata umur 69.2 ± 7.4 tahun) untuk mengisi maklumat bekalan makanan selama seminggu. Kajian ini dijalankan melalui lawatan dari rumah ke rumah, dengan responden ditemu ramah untuk mendapatkan maklumat sosiodemografi dan ketakjaminan makanan. Pengambilan makanan direkodkan mengunakan soal selidik bekalan makanan untuk seminggu. Ketakjaminan makanan dinilai menggunakan soal selidik ketakjaminan makanan untuk warga emas. Hasil kajian mendapati seramai 19.7% responden mengalami ketakjaminan makanan. Pengambilan tenaga didapati lebih tinggi dalam kalangan responden wanita dengan ketakjaminan makanan (2329.0 ± 814 kcal/hari) berbanding mereka yang tidak mengalami ketakjaminan makanan (1836 ± 447 kcal/hari) (p< 0.05). Walau bagaimanapun selepas digugurkan responden yang terlebih lapor, pengambilan tenaga antara kedua kumpulan adalah tidak berbeza secara signifikan (1890 ± 208 kcal/hari dan 1643 ± 233 kcal/hari). Jumlah pengambilan makanan dari kumpulan makanan lemak, minyak, gula dan garam adalah tinggi dalam kalangan subjek dengan ketakjaminan makanan (106.6 ± 60.0 g/hari) berbanding dengan mereka yang tidak mengalami ketakjaminan makanan (80.3 ± 30.1 g/hari) (p<0.05). Kesimpulannya, satu perlima daripada responden mengalami ketakjaminan makanan dan dikaitkan dengan pengambilan makanan yang kurang sihat iaitu tinggi lemak, minyak, gula dan garam. Terdapat keperluan untuk merangka program intervensi bagi meningkatkan kualiti diet warga emas yang berisiko mengalami ketakjaminan makanan.

Higher dietary cost is associated with higher diet quality: A cross-sectional study among selected Malaysian adults

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Nutrients, Vol. 9(9), 2017, 1028-1037

Food price is a determining factor of food choices; however its relationship with diet quality is unclear in Malaysia. This study aimed to examine socio economic characteristics and daily dietary cost (DDC) in relation to diet quality in the state of Selangor, Malaysia. Dietary intake was assessed using a Food Frequency Questionnaire (FFQ) and diet quality was estimated using a Malaysian Healthy Eating Index (M HEI). DDC in Malaysian Ringgit (RM) was calculated from dietary intake and national food prices. Linear regression models were fitted to determine associations between DDC and M HEI scores and predictors of diet quality. The mean M HEI score of respondents was 61.31 ± 10.88 and energy

adjusted DDC was RM10.71/2000 kcal (USD 2.49). The highest quintile of adjusted DDC had higher M HEI scores for all respondents (Q1: 57.14 ± 10.07 versus Q5: 63.26 ± 11.54, p=0.001). There were also positive associations between DDC and M HEI scores for fruits (p<0.001) and vegetables (p=0.017) for all respondents. Predictors of diet quality included carbohydrate (β=0290; p<0.001) and fat intakes (β=–0.242; p < 0.001) and energy adjusted DDC (β=0.196; p<0.001). Higher dietary cost is associated with healthy eating among Malaysian adults.

Job stress on abdominal obesity: The moderating effects of anger and overeating behavior

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Malaysian Journal of Nutrition, Vol. 23(3), 2017, 437-448

Introduction: Individual differences pertaining to cognitive and affective processes toward job stress stimuli may influence food choice and intake, leading to overeating and obesity. This study was conducted to determine the relationship between job stress and abdominal obesity with anger as a personality trait and overeating as moderators among male workers in Malaysia. **Methods**: This cross-sectional study involved 492 male employees from 33 private companies in various states in Malaysia. The companies and workers were approached by convenience sampling. Workers who fulfilled the study inclusion criteria completed validated questionnaires assessing job stress, anger as a personality trait and overeating, using the Oldenburg Burnout Inventory-Exhaustion, Spielberger Trait Anger Scale and Three Factor Eating Questionnaire-Uncontrolled, respectively. Weight, height and abdominal circumference were taken for each participant. Moderation effect analyses were conducted based on standard multiple regression. **Results**: For two-way interaction, a significant curvilinear regression equation was found to predict overeating based on job stress as a predictor and anger as a moderator (β=0.93, SE=0.46, t=2.03, p=0.043). High anger was associated with higher overeating behaviour on exposure to high job stress level (F (7, 484) = 9.36, p<0.001, R^2=0.118). For three-way interaction, a significant curvilinear regression equation was found to predict abdominal obesity based on job stress as a predictor and both anger and overeating as moderators (β= -0.73, SE=0.39, t=1.87, p=0.032). High anger trait and high overeating behaviour predict lower abdominal obesity upon exposure to high job stress in contrast to the combined moderation effects of low anger trait and high overeating behaviour (F (14, 477)= 5.93, p<0.001, R2=0.123). **Conclusion**: Effect of job stress on overeating was shown in this study to depend on the level of anger as a personality trait, while the effect of job stress on abdominal obesity depended on the level of anger as a personality trait and overeating behaviour.

Knowledge and attitude on consumption of iron supplement among pregnant women in Kuala Terengganu, Terengganu

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The high prevalence of iron deficiency anemia and low compliance of iron supplement was reported among pregnant women in Malaysia. This study aimed to determine the knowledge and attitude on consumption of iron supplement among pregnant women in Kuala Terengganu. A cross-sectional

study was carried out in government clinics and hospital. Pregnant women aged from 15-49 (n=120) were interviewed using self-administered questionnaires. Descriptive statistics and non-parametric tests were used. Majority of pregnant women consumed iron supplement during the pregnancy (77.5%). Only 18.3% of pregnant women do not consumed iron supplement and another 4.2% not sure whether they consumed iron supplement. The prevalence of anemia in this study was low (19.2%). The level of knowledge and attitude on consumption of iron supplement was high, 58.3% and 54.2%, respectively. The level of knowledge on consumption of iron supplement was highly associated with the consumption of iron supplement ($\chi 2=16.717$, $p< 0.001$). Furthermore, level of attitude on consumption of iron supplement also showed an association with the consumption of iron supplement ($\chi 2=8.449$, $p< 0.01$). The data could serve as an early evidence related to the knowledge and attitude on consumption of iron supplement among pregnant women in Terengganu.

Knowledge, attitude and practice of asthma food taboos and its associated factors among asthmatic patients in Pahang State, Malaysia

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Misconception and outdated beliefs such as food taboos are commonly practiced among asthmatic patients especially in Asia. It will somehow affect the effectiveness of medical treatment of asthma. The objectives of this study was to determine the prevalence of practice of asthma food taboos and its associated factors identify factors among asthmatic patients. A cross sectional study was conducted in a primary health care clinic at Bandar Kuantan, Pahang. There were 400 asthmatic patients recruited in this study by convenience sampling method. The questionnaire comprised of 4 parts; socio-demography, knowledge, attitudes and practice towards asthma food taboos. Data was analyzed by using IBM Statistical Package for Social Science (SPSS) 19. A total of 46% of asthmatic patients were practicing asthma food taboos. Among factors studied, practice of asthma food taboos significant association with ethnicity (p=0.001), level of education (p=0.011) and exposure to health publicity (p=0.045). Results also showed significant association between attitude and practice (p<0.001). No significant difference was observed in the frequency of asthmatic attack between the practice and non-practice group (p=0.356). It is concluded that the practice of asthma food taboos among asthmatic patients is high. Education and health publicity seems to be beneficial in promoting changes of practice and attitude of this taboos.

Knowledge, attitude and practice of healthy eating and associated factors among university students in Selangor, Malaysia

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Healthy eating is one of the ways of disease prevention around the world. The aim of this study was to determine the level of knowledge, attitude and practice of healthy eating and their associated factors among university students in the state of Selangor, Malaysia. A cross sectional study was carried out from May 2012 until February 2013 in one public university and two selected private universities in Hulu Langat District, Selangor. A total of 300 diploma and degree students aged 18 to 25 years old were selected using simple random sampling. Anthropometric measurement and self-administered questionnaire adopted from the Ministry of Health, Malaysia were used as the study tools. The prevalence of good knowledge was 74.0%, good attitude was 80.3%, but good practice was only 22.0%. The factors associated with good knowledge were female gender (POR=0.42, CI 0.25; 0.70), degree study level (POR=2.42, CI 1.30; 4.51) and awareness on the Malaysian Dietary Guideline (MDG) (POR=2.02, CI 1.17; 3.49). Factors associated with good attitude were respondents' place of living in hostel (POR=0.37, CI 0.17; 0.81), awareness on MDG (POR=1.94, CI 1.06; 3.58) and awareness on Malaysian Food Pyramid (POR=3.45, CI 1.49; 7.98). Meanwhile, the only factor associated with good practice was low family income ($p<0.05$). In conclusion, there was a good level of knowledge and attitude of healthy eating among university students in Malaysia, but not in the practice of healthy eating. Further strategies are needed to increase the practice of healthy eating especially among the students of high and middle income family

Knowledge, attitude and practice of osteoporosis among Malay adults in Selangor, Malaysia

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Osteoporosis is a condition in which the bones become brittle and fragile, due to hormonal changes as well as vitamin D and calcium deficiency. Osteoporosis commonly occurs in adult and elderly, however, prevention steps can be taken as early in child and young adult. Therefore, the objective of this study is to determine the level of knowledge, attitude and practice of osteoporosis among Malay adults. A total of 402 respondents have participated in this study with the age of 18 years and above. Data was collected and then analyzed using SPSS version 20.0. T-test and one way ANOVA were used for data analysis. About 50.5% of the participants have moderate knowledge score, 50.2% have good attitude score, but 50.2% have poor practice score. Results revealed that knowledge score is influenced by age and marital status ($p=<0.001$, $p=0.016$), while attitude score is influenced by household income and educational level ($p=0.01$, $p=0.004$). On the other hand, it showed that practice score is influenced by gender, marital status and employment status ($p\leq0.001$, $p=0.005$, $p\leq0.001$ respectively). Knowledge is influenced by age and marital status; attitude is influenced by household income and educational level; practice is influenced by gender, marital status and employment status.

Knowledge, attitudes and behaviours regarding hydration and hydration status of Malaysian national weight category sports athletes

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Problem statement: Dehydration not only may decrease sports performance, it may also put athletes at risk of heat illness and injury. Heat illnesses such as heat cramp and heat stroke are life threatening. Weight category sports athletes are frequently in a state of dehydration as they restrict fluid intake to ensure their body weight within the weight division. **Purpose**: A cross-sectional study was conducted to ascertain the knowledge, attitudes, and behaviours regarding hydration and hydration status of Malaysian national weight category sports athletes. **Approach**: A total of 60 weight category sports athletes from the National Sports Institute of Malaysia, aged between 16 and 35 years, participated in this study. **Results**: This study demonstrated that the mean percentage score for knowledge, attitudes, and behaviours were 68.04±13.97%, 75.06±8.17%, and 75.78±13.79%, respectively. The mean value of urine specific gravity was 1.027±0.01 g/ml, which indicated significant dehydration. Gender was significantly associated with percentage of body weight changes ($p=0.035$), with all females in the hydrated category. The knowledge score was significantly correlated with the attitude score ($r=0.459$, $p<0.001$) and percentage of body weight changes ($r=0.306$, $p=0.018$). The knowledge score was significantly different between athletes from different types of sports ($F=5.202$, $p=0.001$), age groups ($F=3.793$, $p=0.015$), and education levels ($F=3.319$, $p=0.043$). Furthermore, the behaviours score was significantly different among athletes from different age groups ($F=3.382$, $p=0.024$). The mean percentage of body weight changes was significantly higher among males compared to females ($t=3.187$, $p=0.002$), and significantly different between athletes from different types of sports ($F=12.096$, $p<0.001$). **Conclusions**: The findings of this study identify the need for new learning strategies for athletes to improve their knowledge, attitudes, and behaviours with regards to hydration.

Knowledge, Attitudes and Practices on hydration and fluid replacement among endurance sports athletes in National University of Malaysia (UKM)

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The aim of this study was to determine knowledge, attitudes and practices on hydration and fluid replacement among endurance sports athletes in Universiti Kebangsaan Malaysia (UKM). This study was also to identify the relationship among these parameters. A total of 80 UKM endurance sports athletes were involved in this study. Data collection was conducted using anthropometric measurements and questionaires. Anthropometric measurements included height, weight and body composition using bioimpedance method. Socio-demographic information, hydration knowledge, attitudes and practices were collected using questionnaires. The mean age of athletes was 22.0 ± 2.6 years. The mean score for knowledge, attitudes and practices of subjects towards hydration was 74.1 ± 10.1, 60.9 ± 20.3 and 76.1 ± 14.6%, respectively with higher scores indicating positive

hydration knowledge, attitudes and practices. Knowledge did not show a significant correlation with practices (r=0.126, p>0.05) but significant correlation with attitudes (r=0.285, p<0.05). However, attitudes showed a positive significant correlation with practices (r=0.421, p<0.01). Most athletes correctly answered the general hydration questions on the survey but under the assumption regarding usage of salt tables to avoid hydration and thirst is the best indication for dehydration. They are also lacked knowledge regarding appropriate use of sports drinks. The mean score of knowledge, attitudes and practices for subjects with previous nutrition education was not significantly different compared to subjects without nutrition education (p>0.05). Only the mean score of knowledge was significantly different between male and female (p<0.05). Improvement of hydration knowledge, attitudes and practices is the most relevant step to ensure the hydration level of athletes is at its optimum level during training and competition. The results of this study identify specific areas of education for athletes with regard to hydration.

Leptin and calorie intake among different nicotine dependent groups

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Background: Exposure to nicotine via tobacco smoking may influence leptin release and decrease food intake among smokers. However, the effect of nicotine exposure on leptin and food intake among different nicotine dependent groups is unclear. **Objective**: We aimed to measure leptin and calorie intake among different nicotine dependent groups. **Design**: Cross-sectional study. **Setting**: Research department in school of medical sciences. **Patients and methods**: Subjects were selected by purposive (non-probability) sampling and categorized as having low, moderate and high nicotine dependency based on the Fagerstrom Test for Nicotine Dependence (FTND) score. Diet was recorded by interview. Anthropometry, blood pressure, body composition, lipid profile, and physical activity level were measured accordingly. Fasting serum leptin was measured using a commercial ELISA kit. **Main outcome measure(s)**: Nicotine dependency, 24-hour diet, clinical anthropometric and clinical measurements. **Results**: In 107 Malay male smokers leptin concentration was inversely correlated with nicotine dependence. However, body weight, smoking period, blood pressure, body composition, lipid profile and physical activity level were not significantly different among low, moderately and highly dependent smoking groups. Leptin concentration and total calorie intake were also not significantly different among these groups. **Conclusion**: Leptin concentration was inversely correlated with nicotine dependence, but leptin concentration and total calorie intake status were not significantly different among our different nicotine dependency subjects.

Lifestyle and psychological factors associated with body weight status among university students in Malaysia

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This study was conducted to determine the factors associated with body weight status among university students. Socio-demographic, lifestyle, dietary and psychological factors are elements that can impact on students' weight status. The main aim of this study is bringing to light the effects of the abovementioned factors on adult students' weight status. The school of graduate studies of the Universiti Putra Malaysia randomly selected 500 students through iGIMS, however, only 310 Iranian students participated in this study. The data was collected through a 4-section questionnaire and anthropometric measurements such as height and weight were obtained for calculating body mass index (BMI). The results indicated a significant relationship between BMI and energy intake, carbohydrate, protein, fat, physical activity and smoking status, smoking duration, anxiety, age, level of education, gender, marital status and income level of the respondents. Multivariate regression analysis for the prediction of body weight status demonstrated that gender, carbohydrate, age, physical activity, anxiety, income level and smoking status had significant relationships with BMI. In conclusion, the etiology of obesity and overweight is complex and there are a large number of factors it is affected by including energy intake, physical activity, psychological status, environment, culture and economic status. Investigation of the factors associated with body weight status is a necessary consideration in planning obesity interventions.

Motivation to physical exercise: is it diverse with different sociodemographic characteristics particularly the gender?

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Engagement in physical exercise differs with different socio demographic status. Females exhibit lower levels of physical exercise performance, it seems that their motivation to exercise is differ. Various types of motivation that influence exercise performance regularly were recognized. This study aims to determine the relationship between 21 motivating reasons and sociodemographic factors, concentrating more on the gender difference. **Method**: A study was conducted on 501 adults performing exercise. Participants were interviewed using a questionnaire comprises of 21 motivating reasons. Each reason was measured on a fivepoint scale as, strongly disagree (1) to strongly agree (5). The sum, and mean score of all the 21 reasons was used as the dependent variable versus each socio-demographic factor. The mean score of each item was used as the dependent variable versus gender. **Results**: Significant inverse correlations were detected between motivating reasons score with; age (r=-0.122, p=0.007), BMI (r=-0.091, p=0.042), and household income (r=-0.095, p=0.036). Unmarried or free of chronic diseases respondents showed, significantly higher motivating mean score (p=0.032, 0.010 respectively). No significant difference in the mean score with level of education and gender. However, males showed significantly higher means score in two motivating reasons to; have a positive effect on the sex life (4.18 ± 1.01, p<0.001), have more energy to go about the daily chores (4.62 ± .63, p= 0.027). No significant gender difference in the mean score for other motivating reasons. **Conclusion**: young, unmarried, lower income, lower BMI and no chronic illness individuals have higher motivating reasons. Both genders were almost equally motivated in performing exercises.

Non-leisure time physical activity for adult Malaysian and determinant factors

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Malaysian Journal of Public Health Medicine, Vol. 15(2), 2015, 84-93

Non-Leisure Time Physical is the main component of physical activity in Malaysia. The aim of this study is to study the associated factors related to Non-Leisure Time Physical (occupational & travel) in Malaysia. This data is from the Third National Health and Morbidity Survey, consisting of 32,575 respondents. It was a cross-sectional study among Malaysian adult, aged 18 years and was conducted using proportional to the size stratified sampling method. Chi square test and logistic regression model were used to analyse the data. The result showed that non-leisure time physical activity (NLTPA) gives more contribution to total physical activity, as compared to leisure time physical activity with percentage of 64.3% and 35.7% respectively. There was a significant association between NLTPA with age (P<0.001), gender (P<0.001), ethnicity (P<0.001), education (P<0.001), occupation (P<0.001), income (P<0.001), marital status (P<0.001), region (P<0.001) and residence (P<0.001). The main component of physical activity in Malaysia is NLTPA. Promoting NLTPA may have potential to increase physical activity levels in Malaysia.

Nutritional and Physical activity status among adults living in low-cost housing area in Selangor

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Jurnal Sains Kesihatan Malaysia, Vol. 14(2), 2016, 79-88

This study aimed to assess the nutritional and physical activity status among adults living in low-cost housing area. This cross-sectional study involved 115 adults aged from 18 to 59 years old (46 male and 69 female). Anthropometric and body composition measurements of height, weight, body fat percentage, waist and hip circumference were taken. Biochemical measurements included blood glucose, blood cholesterol and blood pressure. Dietary intake was evaluated by interviewing subjects using Food Frequency Questionnaires (FFQ). Physical activity status was determined by interviewing subjects using International Physical Activity Questionnaire (IPAQ). Most of the subjects were found to be mainly on low socioeconomic status and working as blue collar workers. The mean body mass index (BMI) for men and women were 27.3 ± 6.3 kg/m^2 and 28.5 ± 5.3 kg/m^2, respectively. The waist-hip ratio of men and women were 0.92 ± 0.07 and 0.86 ± 0.06, respectively. Mean blood pressure observed was 128.8 ± 18.8 mmHg (systolic) and 78.2 ± 12.1 mmHg (diastolic). Mean blood glucose was reported to be 6.6 ± 3.2 mmol/L while the mean blood cholesterol was 5.2 ± 1.0 mmol/L. Overall energy intake was 2705 ± 603 kcal with the contribution of 53.4% carbohydrate, 13.5% protein and 32.5% fat to overall energy intake. The nutrients that did not achieve Malaysia's Recommended Nutrient Intake (RNI) were calcium (73.1%), thiamine (70.5%), folate (25.0%) and vitamin A (19.6%). The mean physical activity of subjects was 6739.8 ± 8135.6 MET-min/week (high physical activity). In conclusion, the adults living in low-cost housing have unsatisfactory nutritional status yet they have good physical activity level which might be contributed by their occupation.

Nutritional habits among internet users in a Private Malaysian Medical School

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Nutrition especially for young adults is very crucial as they are in transitional phase from adolescent to adulthood. The aim of this survey was to explore the nutritional habits of university students especially those who use internet heavily. An Internet-based survey was performed among 361 young adults' students at private medical university in Kuala Lumpur, Malaysia. A self-administered questionnaire was used to assess student's nutritional habits and internet daily usage. A total of 361 respondents participated in this survey with response rate of 72.2% (361/500). Majority of the respondents were female (65.1%), do not take breakfast daily (55.1%), eating dinner daily (82.3%), do not exercise regularly (59.0%). There was a significant association between gender and internet usage ($p = 0.03$), the association between number of hours on facebook and internet usage was significant ($p<0.001$). In conclusion, more attention should be given to this age group with more education regarding healthy nutritional choices.

Physical activity and body composition among cancer patient at Universiti Kebangsaan Malaysia Medical Center

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Malaysian Journal of Public Health Medicine, Special Vol. 2, 2017, 82-87

Increasing physical activity level during and after treatment is recommended by the American Cancer Society because of the many benefits namely reducing fatigue and improves psychological distress which leads to an improvement in the quality of life. This study is aimed to compare physical activity level and body composition between oncology patients who are still undergoing treatment and those on medical follow-up. Patients were recruited based on convenience sampling from the Oncology Outpatient Clinics of Universiti Kebangsaan Malaysia Medical Center (UKMMC). Anthropometric measurements and body compositions were measured using calibrated tools while physical activity level were assessed using Global Physical Activity Questionnaire (GPAQ). Medical treatment history was obtained from patients medical records. A total of 53 patients (n=38 were undergoing treatment and n=15 was on follow-up) consisting of Malays (54.7%) and Chinese (45.3%) and with mean age of 55.3 ± 9.3 years. Most patients were previously diagnosed with ovarian cancer (39.6%) and colon cancer (18.9%) patients and they were at cancer stage III (18.8%). Body mass index (BMI) and percent fat mass were significantly different ($p<0.05$) between patients undergoing treatment (22.8 ± 2.7 kg/m2 , 28.7 ± 7.2%) and on follow-up (26.2 ± 5.5 kg/m2 , 37.1 ± 11.9%). Majority of the patients undergoing treatment were categorized under low physical activity compared to those on follow-up ($p<0.05$). Physical activity level measured as METS minutes/week is also found to be significantly different ($p<0.05$) between patients on treatment and follow up. As a conclusion, cancer patients

undergoing treatment have low physical activity, with lower BMI and fat mass compared to those on follow-up. This is consistent with their nature of living where during treatment the patients will resting while coping with side effects of treatments.

Physical activity of Malaysian primary school children: Comparison by sociodemographic variables and activity domains

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Asia Pacific Journal of Public Health, Vol. 28(5), 2016, 35–45

This study describes the physical activity of primary school children according to sociodemographic characteristics and activity domains. Using the Malaysian South East Asian Nutrition Surveys data, 1702 children aged 7 to 12 years were included in the analysis. Physical activity was reported as a total score and categorized into low, medium, and high levels based on Physical Activity Questionnaire for Older Children. Higher overall activity scores were found in boys, younger age, non-Chinese ethnicity, and normal body mass index category. Sex, age, and ethnicity differences were found in structured or organized, physical education, and outside-of-school domain scores. Transport-related scores differed by age group, ethnicity, household income, and residential areas but not among the three physical activity levels. Participation of girls, Chinese, and older children were low in overall and almost all activity domains. Sociodemographic characteristics are important factors to consider in increasing the different domains of physical activity among Malaysian children.

Physical activity pattern of Malaysian preschoolers: Environment, barriers, and motivators for active play

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Children's physical activity has been correlated with child characteristics and social or physical environment. This study aimed to compare preschoolers' physical activity among various sociodemographic characteristics and to determine barriers, motivators, and environmental factors for active play. A total of 835 preschoolers were included in this analysis. Time spent on active play, quiet play, and screen time was reported by parents. Boys spent significantly more time on active play and screen time than girls. Time spent on quiet play was highest in East Coast Peninsular Malaysia and lowest in Sarawak. Some 40% of children achieved active play recommendation while 27% exceeded daily screen time recommendation. Most parents reported that their child played actively in the house area; and that the main barrier and motivator to active play were safety and child's enjoyment, respectively. These findings demonstrate that sociodemographic characteristics and environment should be considered in designing physical activity intervention programs.

Physical fitness and metabolic profile among Malay undergraduates of a Public University in Selangor Malaysia

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ASEAN Journal on Science and Technology for Development, Vol. 30(1&2), 2017, 37-43

This study investigated health-related components of physical fitness consisting of morphological fitness (body fat % or BF %; Body Mass Index or BMI; and waist circumference or WC), metabolic fitness (blood glucose, lipid profiles and haemoglobin) and aerobic capacity (VO_2max). This crosssectional study involved 324 undergraduates recruited voluntarily by systematic random sampling from a public university in the city Shah Alam, Selangor Malaysia. The respondents' aerobic capacity was measured by field fitness tests and anthropometric measurements using standard protocols. The mean BMI of respondents was 22.51 ± 4.18 kg/m^2, and majority of the respondents (93%) are within normal range of WC. The prevalence of underweight was 13.5% and overweight/obese was 20.2%. The blood glucose levels of respondents were within the normal range (94.4%) and about 5% of female respondents had moderate anaemia. More than 70% of the males and 25% of the females had poor VO_2 max levels (aerobic capacity). In summary, the present results suggest the necessity of health promotion programme focusing on physical activity and nutrition for university students.

Potential medicinal benefits of *Cosmos caudatus* (Ulam Raja): A scoping review

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Journal of Research in Medical Sciences, Vol. 20, 2015, 1000-1006

Cosmos caudatus is widely used as a traditional medicine in Southeast Asia. *C. caudatus* has been reported as a rich source of bioactive compounds such as ascorbic acid, quercetin, and chlorogenic acid. Studies have shown that *C. caudatus* exhibits high antioxidant capacity and various medicinal properties, including anti-diabetic activity, anti-hypertensive properties, anti-inflammatory responses, bone-protective effect, and anti-microbial activity. This review aims to present the potential medicinal benefits of *C. caudatus* from the available scientific literature. We searched PubMed and Science Direct database for articles published from 1995 to January 2015. Overall, 15 articles related to *C. caudatus* and its medicinal benefits are reviewed. All these studies demonstrated that *C. caudatus* is effective, having demonstrated its anti-diabetic, anti-hypertensive, anti-inflammatory, bone-protective, antimicrobial, and anti-fungal activity in both *in vitro* and animal studies. None of the studies showed any negative effect of *C. caudatus* related to medicinal use. Currently available evidence suggests that *C. caudatus* has beneficial effects such as reducing blood glucose, reducing blood pressure, promoting healthy bone formation, and demonstrating anti-inflammatory and anti-microbial properties. However, human clinical trial is warranted.

Predictors of poor cognitive status among older Malaysian adults: Baseline findings from the LRGS TUA cohort study

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Aging Clinical and Experimental Research, Vol. 29(2), 2017, 173-182

Background: Concepts of successful aging (SA), usual aging (UA), and mild cognitive impairment (MCI) have been developed to identify older adults at high risk of Alzheimer's diseases (AD), however, the predictors have rarely been investigated in a single study. Thus, this study aims to explore the risk factors of MCI as compared to UA and SA among older adults, in a large community based cohort study in Malaysia. **Method**: 1993 subjects from four states in Malaysia were recruited. A comprehensive interview-based questionnaire was administered to determine socio-demographic information, followed by assessments to evaluate cognitive function, functional status, dietary intake, lifestyle and psychosocial status. Risk factors of cognitive impairment were assessed using the ordinal logistic regression (OLR). **Result**: The prevalence of SA, UA and MCI in this study was 11, 73 and 16 % respectively. OLR indicated that higher fasting blood sugar, hyperlipidemia, disability, lower education level, not regularly involved in technical based activities, limited use of modern technologies, lower intake of fruits and fresh fruit juices and not practicing calorie restriction were among the risk factors of poor cognitive performance in this study. **Conclusion**: This study will be a stepping stone for future researchers to develop intervention strategies to prevent cognitive decline.

Predictors of quality of life among hospitalized geriatric patients with diabetes mellitus upon discharge

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Clinical Interventions in Aging, Vol. 11, 2016, 1455–1461

Purpose: Diabetes mellitus is prevalent among older adults, and affects their quality of life. Furthermore, the number is growing as the elderly population increases. Thus, this study aims to explore the predictors of quality of life among hospitalized geriatric patients with diabetes mellitus upon discharge in Malaysia. **Methods**: A total of 110 hospitalized geriatric patients aged 60 years and older were selected using convenience sampling method in a cross-sectional study. Sociodemographic data and medical history were obtained from the medical records. Questionnaires were used during the in-person semistructured interviews, which were conducted in the wards. Linear regression analyses were used to determine the predictors of each domain of quality of life. **Results**: Multiple regression analysis showed that activities of daily living, depression, and appetite were the determinants of physical health domain of quality of life (R^2=0.633, F(3, 67)=38.462; P<0.001), whereas depression and instrumental activities of daily living contributed to 55.8% of the variability

in psychological domain (R^2 =0.558, F (2, 68)=42.953; P<0.001). Social support and cognitive status were the determinants of social relationship (R^2=0.539, F(2, 68) = 39.763; P<0.001) and also for the environmental domain of the quality of life (R^2=0.496, F(2, 68)=33.403; P<0.001). **Conclusion**: The findings indicated different predictors for each domain in the quality of life among hospitalized geriatric patients with diabetes mellitus. Nutritional, functional, and psychological aspects should be incorporated into rehabilitation support programs prior to discharge in order to improve patients' quality of life.

Prevalence and determinants of depressive disorders among community-dwelling older adults: Findings from the towards useful aging study

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International Journal of Gerontology, Vol. 10 (2), 2016, 81-85

Background: Geriatric depressive disorders affect the physical and emotional well-being of older adults. Therefore, this study aims to identify the prevalence of geriatric depressive disorders and their risk factors in a large-scale study comprising community-dwelling older adults in Malaysia. **Methods**: A total of 2264 older adults consisting of 1083 (47.8%) men and 1181 (52.2%) women were recruited in this study. An interview-based questionnaire was used to obtain information on sociodemography, presence of comorbidities, nutritional status, dietary habits, lifestyle, practice of calorie restriction, cognitive function, social support, and psychosocial aspects. Geriatric depressive disorder was confirmed if a participant obtained a score of 5 or more in the Geriatric Depressive Scale. **Results**: The prevalence of depressive symptoms is 16.5%, and it is higher in women (56.6%) than in men (43.4%). Individuals who are at a higher risk of depressive disorders are most likely to be less educated and to have neurotic disorder, a lower score of instrumental activities of daily living , poor fitness level, hypertension, and osteoarthritis. **Conclusion**: Depression affects 16.5% of Malaysian older adults and is associated with factors such as sociodemography, comorbidities, psychosocial function, calorie restriction, physical function, and fitness. There is a need to screen and treat depressive symptoms to prevent their progression to severe mental health problems.

Prevalence and factors influencing fruit and vegetable consumption among Malaysian elderly

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International Journal of Public Health and Clinical Sciences, Vol. 4(1), 2017, 41-52

Background: Fruit and vegetable intake has multiple health benefits in preventing diet related chronic diseases. The objective of this study was to determine the prevalence of inadequate daily fruit and vegetable consumption and it's associated factors among the elderly in Malaysia. **Materials and Methods**: Secondary data from the National Health Morbidity Survey 2011 in Malaysia was used for the statistical analysis. The elderly aged 60 years and above who were living in selected households were recruited into this study. Information on sociodemographic characteristics, fruit and vegetable consumption, self-rated health, and history of chronic diseases were obtained by trained research

team members by face-to face interview. Descriptive analysis and complex sample logistic regression were used in data analysis. **Result**: Respondents comprised of 51.5% females, 61.6% aged between 60 and 69 years old, and 67.9% were married. Half of the respondents (50.0%) ever attended to primary school and more than half of them were living in the urban area (65.0%). This study revealed that 81.9%, 87.6%, and 91.9% of elderly people did not consume adequate fruit, vegetable and combination of fruit and vegetable respectively. Complex sample logistic regression analysis showed that education level, moderate self-rated health status, and being single were significantly associated with inadequate fruit and vegetable consumption. **Conclusion**: Majority of the elderly did not consume adequate fruit and vegetable per day. Therefore, a nutrition policy to encourage healthy eating practices among the elderly in the health facilities of the Ministry of Health Malaysia is recommended to promote the health benefits of consuming fruit and vegetable.

Prevalence and risk factors for sedentary behavior among Malaysian adults

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Malaysian Journal of Public Health Medicine, Vol. 16 (3), 2016, 147-155

This paper aims to determine the prevalence and risk factors associated with sedentary behavior among Malaysian adults. This study analyzed data from the National Health Morbidity Survey III, a cross-sectional nationwide study conducted in 2006. A total participants of 33 385 aged 18 and above were randomly recruited through multistage sampling. Sitting time data were collected using International Physical Activity Questionnaire (IPAQ). Overall prevalence of sedentary behavior was 23.5%. Higher proportion of sedentariness was seen among older ($p<0.05$), Chinese ($p<0.05$), divorcee/widower ($p<0.05$), those who were unemployed ($p<0.05$), those without formal education ($p<0.05$) and participants with diabetes ($p<0.05$), hypertension ($p<0.05$) and dyslipidaemia ($p<0.05$). In multivariable analysis, higher likelihood of being sedentary was observed among those with advancing age above 50 (OR between 1.20 and 2.92), Chinese (OR=1.74, 95% CI: 1.58-1.91), unmarried (OR=1.19, 95% CI: 1.08-1.30), unemployed (OR=1.79, 95% CI: 1.62-1.96) and diabetes patients (OR=1.20, 95% CI: 1.10-1.31). One-eighth of total day time was spent on sitting. Nearly one out of four Malaysian adults was considered sedentary. Age, ethnicity, occupational status, marital status and diabetes were likely to be predictors of being sedentary.

Prevalence of geriatric malnutrition and its associated factors at the Hospital Universiti Sains Malaysia, Kelantan

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Malaysian Journal of Nutrition, Vol. 22(1), 2016, 41-53

Introduction: Identified parameters associated with geriatric malnutrition add greatly to the knowledge of clinical nutrition and facilitate patient-centred nutritional care management. **Methods**: A six-month cross-sectional study with the aims of deterrninine the prevalence of malnutrition and its associated parameters was conducted among hospitalised geriatrics admitted to Hospital USM. A total of 130 (49 men, 81 women) eligible participants with a mean age of 69.7 (6.99) were recruited

for this study. Anthropometric tests, biochemical tests, and subjective global assessments (SGA) were applied in this study to assess the nutritional status of the participants. Meanwhile, socio-demographics, nutritional risk factors, and clinical elements were examined to identify the associated factors of malnutrition. **Results**: The findings of this study revealed that 35.4% of the participants were malnourished based on SGA ratings of B (26.2%) and C (9.2%), with women having a significantly higher proportion (43.5%) compared to men (22 4%) with $p<0.05$. Multivariate analysis revealed that loss of appetite ($p<0.001$), low body mass index (EMI) ($p<0.001$), albumin ($p<0.05$), and surgical procedures ($p<0.05$) were significantly associated with malnutrition. **Conclusion**: The associated parameters were found to be practicable in facilitating the identification process of malnutrition, and thus enable earlier nutritional intervention to improve the overall disease progress.

Prevalence of iron deficiency and its associated risk factors among primary school children in Kelantan

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Iron deficiency anemia (IDA) is the most common micronutrient deficiency that may leads to serious health problems such as poor behavior, cognitive and motor development in children. The main objective of the study was to investigate prevalence of IDA and its associated risk factors of school children. A cross-sectional study was conducted on 249 Malay primary school children (122 males and 127 females), aged 7-9 years old. Venous blood sample was drawn for hemoglobin and serum ferritin analysis. Results revealed that the prevalence of iron deficiency without anemia was 12.6% and 7.7% of the children was found to have iron deficiency anemia. Result showed that birth weight, household size, height, weight and BMI was correlated significantly with iron deficiency based on serum ferritin concentration.

Prevalence of malnutrition among hospitalised adult cancer patients at the National Cancer Institute, Putrajaya, Malaysia

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Malaysian Journal of Nutrition, Vol. 23(2), 2017, 161-174

Introduction: Malnutrition in cancer patients affects the quality of life (QoL) of the patients and brings about adverse outcomes including morbidity and mortality. This study aims to determine the prevalence of malnutrition among cancer patients at the National Cancer Institute (NCI), Putrajaya. **Methods**: A cross-sectional study was conducted among 97 respondents who were admitted to the NCI between August 2014 and January 2015. Information on socio-demographic characteristics, clinical characteristics, anthropometric measurements, dietary intake and biochemical data were obtained. The Malnutrition Screening Tool (MST) was used to identify malnutrition risk, while the Subjective Global Assessment (SGA) determined patients' nutritional status. **Results**: Approximately 61.9% and 43.5% of the patients were malnourished upon admission based on the MST and SGA scores, respectively. Four most common types of cancer among the malnourished patients were

nasopharyngeal (NPC), lung, breast and colorectal cancer. About 56.9% and 21.6% of the malnourished patients, according to MST, were at Stage 4 and Stage 3 cancer, respectively. Meanwhile 69.7% of the malnourished respondents, based on SGA, were at Stage 4 cancer. Mean energy intake was 1463±577 kcal and protein intake was 54±22 g proteins. **Conclusion**: Prevalence of malnutrition in hospitalised cancer patients in the NCI was high, depending on age, body mass index (BMI), tumour location and cancer stage. Early identification of malnutrition status is required for proper nutritional intervention.

Rapid weight loss practices among elite combat sports athletes in Malaysia

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Introduction: This study aimed to (i) determine rapid weight loss (RWL) practices among Malaysian elite combat sports athletes and (ii) examine the relationship between the characteristics of athletes, self-reported history of weight loss, perceived influence on weight loss and RWL practices. **Methods**: This was a cross-sectional study conducted at the Malaysian National Sports Institute among elite combat sports athletes (n=40) recruited via a convenience sampling method. The athletes completed a self-administered validated Rapid Weight Loss Questionnaire. Each response was provided a score and the total RWL score corresponded to the aggressiveness of weight management methods. Partial correlations were used to assess the relationships between total RWL score and independent variables. **Results**: The prevalence of RWL among the athletes was high (92.5%). Training with rubber or plastic suits (62.2%) and meal-skipping (27.0%) were the most common RWL techniques practised by the respondents. Aggressive weight-cutting as depicted by a higher total RWL score that correlated with most weight ever lost, duration taken to lose weight, influence of training colleagues and coaches, BMI, current weight and post-competition weight regain (all $p<0.05$). In contrast, negative correlations were seen between total RWL score, and the age at which the athletes began competing ($p<0.001$), duration of competition ($p<0.001$), age at first participation ($p<0.05$), duration of participation ($p<0.05$) and influence of nutritionists on weight loss ($p<0.05$). **Conclusion**: A high prevalence of aggressive weight loss among elite combat sports athletes and its association with perceived influence of sports professionals, colleagues and actual weight-related characteristics are of great concern

Relationship between body composition and physical fitness of rescue firefighter personnel in Selangor, Malaysia

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Pakistan Journal of Nutrition, Vol. 16(2), 2017, 77-83

Background and Objective: The complexity of study routine and job nature of firefighters require them to be physically fit and to possess good cardiorespiratory capacity, muscle strength and resistance including a good body composition. This study aimed to identify the relationship between body composition and physical fitness of rescue firefighter personnel in Selangor, Malaysia. **Materials and**

Methods: A total of 230 male firefighters aged 20-39 years from 9 randomly selected districts in Selangor participated in this study. Anthropometric measurements, including height, weight, body composition and waist circumference were taken. Individual proficiency performance test was performed using bent knee sit-up, standing broad jump, pull-up, 4×10 m shuttle run and 2.4 km run to assess physical fitness. The VO_2 max test was also conducted to evaluate aerobic fitness. **Results**: This study revealed that 42.6% subjects had normal body weight, 46.5% were overweight and 10.3% were obese. The means of bent knee sit-up test, standing broad jump, pull-up test, 4×10 m shuttle run, 2.4 km run and VO_2 max test were 41.52 ± 7.18 count, 222.41 ± 26.03 cm, 6.93 ± 3.79 count, 10.29 ± 0.86 sec, 13.16 ± 2.84 min and 37.66 ± 5.25 mL kg^{-1} min^{-1}, respectively. Body fat was significantly correlated with bent knee sit-up test ($r=-0.289$, $p<0.001$), standing broad jump ($r=-0.248$, $p<0.001$), pull-up test ($r=-0.450$, $p<0.001$), 4×10 km shuttle run ($r=0.347$, $p<0.001$) and 2.4 km run ($r=0.371$, $p<0.001$). Body mass index exhibited a significant correlation with bent knee sit-up test ($r=-0.272$, $p<0.001$), standing broad jump ($r=-0.234$, $p<0.001$), pull-up test ($r=-0.484$, $p<0.001$), 4×10 km shuttle run ($r=0.430$, $p<0.001$) and 2.4 km run ($r=0.399$, $p<0.001$). Body weight also showed a significant correlation with knee sit-up test ($r=-0.239$, $p<0.001$), standing broad jump ($r=-0.187$, $p<0.01$), pull-up test ($r=-0.491$, $p<0.001$), 4×10 km shuttle run ($r=0.396$, $p<0.001$) and 2.4 km run ($r=0.350$, $p<0.001$). **Conclusion**: A specific training programme should be implemented to improve the body composition components and physical fitness among Malaysian firefighters. The body composition components, such as body fat, body mass index and body weight seem to influence physical fitness among Malaysian firefighters excluding aerobic fitness.

Results from Malaysia's 2016 Report Card on Physical Activity for children and adolescents

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Journal of Physical Activity and Health, Vol. 13(Suppl 2), 2016, S201-S205

Background: The 2016 Malaysia Active Healthy Kids Report Card aims to collect, assess, and grade current and comprehensive data on physical activity (PA) and associated factors in Malaysian children and adolescents aged 5 to 17 years. **Methods**: This report card was developed following the Active Healthy Kids Canada Report Card protocol. The Research Working Group identified the core matrices, assessed the key data sources, and evaluated the evidence gathered for grade assignments. A grade was assigned to each indicator by comparing the best available evidence against relevant benchmark using a standardized grading scheme. **Results**: Overall Physical Activity, Active Transportation, and Sedentary Behavior were assigned the D grade. The lowest grade of F was assigned to Diet, while School and Government Strategies and Investments were graded higher with a B. Five indicators were assigned INC (incomplete) due to a lack of representative data. **Conclusions**: The report card demonstrates that Malaysian children and adolescents are engaging in low levels of PA and active commuting, high levels of screen time, and have extremely low compliance with dietary recommendations. More efforts are needed to address the root causes of physical inactivity while increasing the opportunities for children and adolescents to be more physically active.

Sociodemographic, oral health behaviour, and physical activity: Factors in caries experience among 19-59 years old adults in a Malaysian population

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Makara Journal of Health Research, Vol. 19(2), 2015, 55-60

Dental caries is one of the common diseases which are attributed by many factors. Many from the adult population are afflicted with dental caries. This study aimed to determine the predictors of developing dental caries among adults. Three hundred and thirty four adults participated in this study. Information gathered were their socio-demographic backgrounds, oral health behaviour, physical activity level, body mass index, body fat percentages, visceral fat level, and dental missing filled extracted teeth (DMFX) index. All standard protocols were observed and DMFX was examined using the World Health Organization (WHO) criteria. Prevalence of dental caries was 87.4%, inclusive of 61.3% of female respondents with caries experience. Most of the study participants were overweight. Only consumption of high sugar food (p=0.03) were found between dental caries and oral health behaviours. Regression analysis (p<0.001) showed that older age (p<0.001), regular visits to dental clinic per year (p=0.012), lower education level (p=0.025), and lower physical activity (p=0.008) were significant factors in developing dental caries among in this study population. Older aged adults, frequent appointment with the dentist, lower education in oral health and lower physical activity were possible factors for dental caries presence.

Studying the Family Diet: An investigation into association between diet, lifestyle and weight status in Malaysian families

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Introduction: The contribution of the family environment to childhood obesity in Malaysia is not well known. This paper describes the study, methodology and results of a pilot study to assess the feasibility of conducting a study on diet and lifestyle factors among Malay primary school children and their main caregiver(s) in regard to body weight status. **Methods**: The Family Diet Study used a cross sectional design and targeted a minimum of 200 Malay families at five national primary schools in the Klang Valley, Malaysia using a multi-stage sampling method. Participants were Malay families with children aged 8 to 12 years and their main caregiver(s). Data on socio-demographic, dietary intake, parental child feeding practices, physical activity and anthropometric measures were collected predominantly at schools with follow-up 24-h dietary recalls collected by phone. Details of recruitment, inclusion criteria, assessments and statistical analyses are also discussed. **Results**: Eleven families provided data by answering questionnaires, recalling diet intake and participating in anthropometric measures. The results showed overall feasibility of the study protocol but required some modifications prior to implementation of the main study. Mothers were the main parent involved in family food procurement, preparation and mealtime supervision. Snacking was not commonly reported and fruit and vegetables intakes were generally infrequent. **Conclusion**: The most novel component of this

study was the comprehensive collection of data from both children and their main caregiver(s) within the context of the family. Detailed information on dietary and lifestyle aspects will help to elucidate factors associated with obesity aetiology in Malay children.

The relationship between household income and dietary intakes of 1-10 year old urban Malaysian

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Nutrition Research and Practice, Vol. 9(3), 2015, 278-287

Background/Objectives: Diet plays an important role in growth and development of children. However, dietary intakes of children living in either rural or urban areas can be influenced by household income. This cross-sectional study examined energy, nutrient and food group intakes of 749 urban children (1-10 years old) by household income status. **Subjects/Methods**: Children's dietary intakes were obtained using food recall and record for two days. Diet adequacy was assessed based on recommended intakes of energy and nutrients and food group servings. **Results**: For toddlers, all nutrients except dietary fiber (5.5 g) exceeded recommended intakes. Among older children (preschoolers and school children), calcium (548 mg, 435 mg) and dietary fiber (7.4 g, 9.4 g) did not meet recommendations while percentage of energy from total fat and saturated fats exceeded 30% and 10%, respectively. The mean sodium intakes of preschoolers (1,684 mg) and school children (2,000 mg) were relatively high. Toddlers in all income groups had similar energy and nutrient intakes and percentages meeting the recommended intakes. However, low income older children had lowest intakes of energy ($P < 0.05$) and most nutrients ($P < 0.05$) and highest proportions that did not meet recommended energy and nutrient intakes. For all food groups, except milk and dairy products, all age groups had mean intakes below the recommended servings. Compared to middle and high income groups, low income preschoolers had the lowest mean intake of fruits (0.07 serving), meat/poultry (0.78 serving) and milk/dairy products (1.14 serving) while low income toddlers and school children had the least mean intake of fruits (0.09 serving) and milk/dairy products (0.54 serving), respectively. **Conclusion**: Low socioeconomic status, as indicated by low household income, could limit access to adequate diets, particularly for older children. Parents and caregivers may need dietary guidance to ensure adequate quantity and quality of home food supply and foster healthy eating habits in children.

Trend of physical activity, dietary intake and body composition among women with high breast adiposity

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Merit Research Journal of Medicine and Medical Sciences, Vol. 3(8), 2015, 361-367

This study aims to determine the magnitude of breast adiposity and its predictors among women residing in Klang Valley, Malaysia. Subjects were women aged 30 to 65 years old who participated in health screening at designated community centers. Their breast adiposity was assessed via EIT and extremum value of ≤ 0.2 cu indicated high breast adiposity. They were interviewed to obtain socio-demography, health status and lifestyle data and their body compositions were measured. Result indicated that the magnitude of breast adiposity among subjects was 35.1%. Menopausal status [Adjusted OR: 4.5 (95% CI: 2.7 – 7.2, p<0.05)], body fat [Adjusted OR: 3.0 (95% CI: 1.9 – 4.8)] and low activity score of leisure time activity [Adjusted OR: 5.8 (95% CI: 3.5-9.6, p< 0.05)] were strong predictors of breast adiposity respectively. Therefore, breast adiposity affect at least one third of the subjects and associated with menopausal status, body fat and low physical activity.

Vitamin D and calcium intakes, physical activity, and calcaneus BMC among school-going 13-year old Malaysian adolescents

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Nutrients, Vol. 8(10), 2016, 666-678

Background: Dietary calcium and vitamin D are essential for bone development. Apart from diet, physical activity may potentially improve and sustain bone health. Objective: To investigate the relationship between the dietary intake of calcium and vitamin D, physical activity, and bone mineral content (BMC) in 13-year-old Malaysian adolescents. **Design**: Cross-sectional. **Setting**: Selected public secondary schools from the central and northern regions of Peninsular Malaysia. **Participants**: The subjects were from the Malaysian Health and Adolescents Longitudinal Research Team Cohort study (MyHeARTs). **Methods**: The data included seven-day diet histories, anthropometric measurements, and the BMC of calcaneal bone using a portable broadband ultrasound bone densitometer. Nutritionist Pro software was used to calculate the dietary calcium and vitamin D intakes from the diet histories, based on the Nutrient Composition of Malaysian Food Database guidance for the dietary calcium intake and the Singapore Energy and Nutrient Composition of Food Database for vitamin D intake. **Results**: A total of 289 adolescents (65.7% females) were recruited. The average dietary intakes of calcium and vitamin D were 377 ± 12 mg/day and 2.51 ± 0.12 µg/day, respectively, with the majority of subjects failing to meet the Recommended Nutrient Intake (RNI) of Malaysia for dietary calcium and vitamin D. All the subjects had a normal Z-score for the BMC (−2.00 or higher) with a mean of 0.55 ± 0.01. From the statistical analysis of the factors contributing to BMC, it was found that for those subjects with a higher intake of vitamin D, a higher combination of the intake of vitamin D and calcium resulted in significantly higher BMC quartiles. The regression analysis showed that the BMC might have been influenced by the vitamin D intake. **Conclusions**: A combination of the intake of vitamin D and calcium is positively associated with the BMC.

Whole grain intakes in the diets of Malaysian children and adolescents – Findings from MyBreakfast Study

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Background: Diets rich in whole grain are associated with several health benefits. Little is known however, about whole grain consumption patterns in Malaysia. The aim of this study was to assess whole grain intakes and dietary source in Malaysian children and adolescents. **Methods**: This analysis is from the MyBreakfast study, a national cross sectional study investigating eating habits among primary and secondary school children throughout Malaysia, conducted in 2013. Children (n=5,165) and adolescents (n=2,947) who completed two days of dietary assessment using a food record or recall respectively were included. The whole grain content of foods was estimated mainly through the use of quantitative ingredient declarations on food labels. All wholegrain foods were considered irrespective of the amount of whole grain they contained. **Results**: Overall, only 25% of children and 19% of adolescents were wholegrain consumers. Mean daily intakes in the total sample were 2.3 g/d (SD 5.8 g/d) in children and 1.7 g/d (SD 4.7g/d) in adolescents and in the consumer's only sample, mean intakes reached 9.1 g/d (SD 8.6) and 9.2 g/d (SD 7.1 g/d) respectively. Wheat was the main grain source of whole grain while ready to eat breakfast cereals and hot cereals were the main food contributors. Less than 3% of the children and adolescents reached the US quantitative whole grain recommendation of 48 g/day. **Conclusion**: Whole grain is consumed by only a minority of Malaysian children and adolescents and even among consumers, intakes are well below recommendations. Efforts are needed to firstly understand the barriers to whole grain consumption among Malaysian children in order to design effective health promotion initiatives to promote an increase in whole grain consumption.

Scope 4

Micronutrient

Antenatal iron deficiency in an urban Malaysian population

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Medicine & Health, Vol. 12(1), 2017, 27-33

Iron deficiency anemia is the most common form of anemia in pregnancy. The present study was carried out to determine the prevalence of antenatal anemia and iron deficiency in the Malaysian population and its correlation with sociodemographic and obstetric profile. It was a cross-sectional study conducted at an urban health clinic over a period of six months. A single blood sample was drawn from apparently healthy pregnant mothers at antenatal booking and sent for laboratory assessment of full blood count and serum ferritin as screening tools for anemia and iron status. SPSS version 19.0 was used for statistical analyses. The results showed that out of 250 subjects, 43.6% had anemia and 31.6% had iron deficiency. Whilst 47.7% of subjects with anemia were iron deficient, 19.1% of subjects without anemia were also iron deficient. Serum ferritin correlated negatively with period of gestation at booking ($p<0.001$), with 77.6% of these women not having prior iron supplements. Serum ferritin was also significantly lower among grandmultiparae ($p=0.01$). Iron deficiency was significantly ($p=0.024$) more common among Indians (42.5%) compared to Malays (33.5%) and Chinese (13.0%). In conclusion, continuation of the current practice of routine antenatal iron supplementation is still warranted and justifiable in Malaysia as there is high prevalence of iron deficiency in pregnancy not only in the presence of anemia but also in the presence of normal hemoglobin values.

Beneficial effects of vitamin E in diabetic wound healing

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Research Updates in Medical Sciences, Vol. 5(1), 2017, 12-24

In diabetic condition, wound healing may be impaired or delayed due to high reactive oxygen species (ROS) and low antioxidant levels. Vitamin E is an antioxidant which exerts both systemic and topical effects. The effects of vitamin E on wound healing remains controversial. Numerous studies have been carried out to observe the ability of vitamin E in modulating signal transduction and gene expression. However, the detailed molecular mechanisms are not yet clear. Vitamin E may promote healing by suppressing ROS generation since vitamin E has shown inhibitory effects on activities and expression of ROS-generating enzymes. The effects of vitamin E may depend on its concentration and the presence of oxidants/antioxidants. The objective of this article is to review the role and mechanism of action of vitamin E in wound healing process at cellular and molecular level.

Comparing palm oil tocotrienol rich fraction with α-tocopherol supplementation on oxidative stress in healthy older adults

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Clinical Nutrition ESPEN, Vol. 21, 2017, 1-12.

Vitamin E is a fat-soluble compound and powerful antioxidant that have been shown to protect the cell membranes against damage caused by free radicals. Human vitamin E supplementation studies are usually limited to α-tocopherol but currently tocotrienols are also available. This study aims to compare the effects of tocotrienol rich fraction (TRF) with α-tocopherol (α-TF) supplementation on oxidative stress in healthy male and female older adults aged 50–55 years old. A total of 71 subjects both male and female aged between 50 and 55 years were divided into groups receiving placebo (n=23), α-TF (n=24) and TRF (n=24) for six months. Blood was taken at baseline (month 0), 3 months and 6 months osf supplementation for determination of plasma malondialdehyde (MDA), protein carbonyl, total DNA damage, vitamin D concentration and vitamin E isomers. α-TF supplementation reduced plasma MDA and protein carbonyl in female subjects after 3 and 6 months. TRF supplementation reduced MDA levels in both males and females as early as 3 months while DNA damage was reduced in females only at 6 months. Supplementation with α-TF and TRF increased plasma vitamin D concentration in both males and females after 6 months, but vitamin D concentration in male subjects were significantly higher compared to female subjects in TRF group. Vitamin E isomer determination showed α-TF, α-tocotrienol and α-tocotrienol were increased in both male and female subjects. In conclusion, TRF supplementation effects were different from α-TF in reducing oxidative stress markers and vitamin D levels with a more pronounced effect in female subjects.

DNA damage, copper and lead associates with cognitive function among older adults

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The Journal of Nutrition, Health & Aging, Vol. 21(5), 2017, 539-545

Background: A cross sectional study was conducted in a group of 317 subjects older than 60 in Malaysia, aimed to determine risk factors associated with cognitive impairment in older adults, focusing on trace elements and DNA damage. **Method**: Cognitive decline was determined by Montreal Cognitive Assessment (MoCA). Oxidative stress markers (malondialdehyde-MDA and superoxide dismutase-SOD) were determined and DNA damage was assayed using Alkaline Comet Assay. Toenail samples were taken and analyzed using ICP-MS to determine trace element levels. **Results**: A total of 62.1 % of subjects had cognitive impairment. Subjects with cognitive impairment had significantly higher levels of MDA and DNA damage as compared to the group with normal cognitive function; MDA (2.07 ± 0.05 nmol/L vs 1.85 ± 0.06 nmol/L) ($p<0.05$) and DNA damage (% Tail Density, 14.52 ± 0.32 vs 10.31 ± 0.42; Tail Moment, 1.79 ± 0.06 vs 1.28 ± 0.06) ($p<0.05$ for all

parameters). However, the level of SOD among subjects with cognitive impairment (6.67 ± 0.33 u.e/min/mg protein) was lower than the level among those with normal cognitive functions (11.36 ± 0.65 u.e/min/mg protein) ($p<0.05$). Multiple logistic regression revealed the predictors for cognitive impairment among the subjects were DNA damage (Adjusted odd ratio [OR], 1.37; 95% confidence interval [CI], 1.18-1.59), level of trace elements in toenails namely, lead (OR, 2.471; CI, 1.535-3.980) and copper (OR, 1.275; CI, 1.047-1.552) ($p<0.05$). **Conclusion**: High levels of lead and copper can lead to increase in oxidative stress levels and are associated with DNA damage that eventually could be associated with cognitive decline.

Effects of dietary vitamin C and E supplementation on exercise-induced muscle damage among young Kelantan weightlifters

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It has been hypothesized that markers of oxidative stress and muscle damage induced by weightlifting training could be decreased by supplementing subjects with dietary vitamin C and E. Hence, this study was carried out to invistigate the effects of dietray vitamin C and E supplementation on oxidative stress and muscle damage markers among male and female weightlifters in Kelantan state, Malaysia. For this purpose, thirty two trained weightlifters were recruited and randomly assigned into two groups. The supplement group (n=16, 16.5± 2.2 years of age, 162.2 ± 10.4 cm of height, 65.7 ± 26.1 kg of body weight) was given 500 mg of vitamin C and 400 IU of vitamin E per day, while the placebo group (n=16, 15 ± 1.7, 162.2 ± 10.4 cm, 61.5 ± 13.9 kg accordingly) was given maltodextrine, zero calorie per day for 6 weeks. The following parameters were measured before and after intervention to detect the effects of supplementation: muscle circumferernce of mid-upper arm and calf, serum creatine kinase (CK), lactate dehydrogenase (LDH) and urinary thiobarbituric acid reactive substances (TBARS). Data was expressed as median and interquartile at $p < 0.05$. There were no significant effects ($p>0.05$) of dietary vitamin C and E supplementation on the muscle damage markers, CK and LDH, as well as on oxidative stress markers through urinary TBARS analysis, when the two study groups were compared. These results indicated that vitamin C and E were not effective in ameliorating markers of muscle damage and oxidative stress induced by weightlifting training. It might be possible that these weightlifters already have acquired protection, both structurally and biochemically, resulting from chronic exposure to weightlifting training.

In vitro bioaccesibility of calcium, iron and zinc from breads and bread spreads

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The in vitro bioaccessibility of calcium, iron and zinc of breads added with different bread spreads was determined. The mineral contents were assessed by flame atomic absorption spectrophotometer and expressed in fresh weight (mg/100 g). For the mineral bioaccessibility determination, in vitro gastrointestinal digestion was applied. Among the bread samples, calcium content of wholemeal

bread with chocolate hazelnut spread ranked the highest (159.96 ± 0.869 mg/100 g). For iron, white bread with chocolate hazelnut spread (6.92 ± 0.411 mg/100 g) showed highest iron content while for zinc, white bread with peanut butter was the highest (1.82 ± 0.015 mg/100 g). For calcium bioaccessibility, white bread with orange marmalade ranked the highest (39.33 ± 4.865%) while wholemeal bread with peanut butter (14.70 ± 0.265%) showed the lowest. The application of orange marmalade spread onto wholemeal bread increased the iron bioaccessibility significantly (9.73 ± 1.387%). The acidic properties attributed by organic acids found in orange marmalade may favour both calcium and iron absorption. The zinc bioaccessibility of white bread alone remained the highest (20.63 ± 3.536%) while wholemeal bread added with peanut butter (5.90 ± 1.137%) showed the lowest. Overall, the addition of bread spreads particularly peanut butter and chocolate hazelnut spread had increased mineral contents of the bread samples. However, the presence of mineral enhancers (organic acids) and inhibitors (phytate and polyphenols) played some significant role in influencing the mineral bioaccessibility.

Iodine status after a 3-year Universal Salt Iodisation in Sarawak, Malaysia

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Introduction: Following the reveal of borderline iodine sufficiency among the Sarawakians from the 2008 National Iodine Deficiency Disorders (IDDs) survey, a mandatory universal salt iodization (USI) was implemented in Sarawak thereafter. This study aimed to determine the current status of USI in Sarawak after a 3-year implementation of USI from 2008 to 2011. **Methods**: The IDD survey was conducted between Jun 2011 to July 2011 involving six districts in Sarawak (Sarikei, Mukah, Kapit, Sibu, Bintulu and Miri). The schools were selected via multistage proportionate-to-population size sampling technique and the children were randomly selected via systematic sampling. A total of 19 schools and 661 children were recruited into the survey. Thyroid size was determined by palpation and was and graded according to the classification of the World Health Organization (grade 0-2). The iodine excretion level in spot morning urine was measured using inhouse microplate method. The urinary iodine concentration (UIC) values were compared by Kruskal-Wallis test and Chi-square tests were used to compare categorical variables. **Results**: A total of 610 school children were participated in the study (92.3%). The TGR of grade 1 and 2 was found to be 0.3% (n=2). Overall the median UIC level was 154.2 (IQR, 92.7 - 229.8) µg/L, with the highest median UIC been observed in Sarikei [178.0 (IQR, 117.6 - 308.9) µg/L], followed by Mukah [174.8 (IQR, 99.0 - 224.3) µg/L)], Miri [158.6 (IQR, 92.3 - 235.4) µg/L], Sibu [147.0 (IQR, 89.8 - 221.4) µg/L], Bintulu [142.3 (IQR, 52.8 - 245.1) µg/L] and Kapit [131.0 (IQR, 88.6 - 201.9) µg/L]. One in every ten child was of iodine deficient (UIC < 50µg/L) while a third of the child (32%) were of adequate level of UIC. **Conclusion**: The present findings indicate that the mandatory USI successfully improves the iodine level of children in Sarawak. However, regular and proper monitoring of the UIC level in the communities is needed to prevent excessive iodine intake.

The effectiveness of tocotrienol rich fraction and alpha tocoferol with combination of vitamin C in the management of Systemic Inflammatory Response Syndrome (SIRS)

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The pathophysiology of systemic inflammatory response syndrome (SIRS) had been described to involve various strong oxidative reactions affecting the status and progress of the patients. Antioxidant therapy had been suggested in many studies involving SIRS management. The objective of this study was to compare the role of vitamin E Tocotrienol and vitamin E Tocopherol combined with vitamin C as antioxidant therapy in the management of critically ill patients diagnosed with SIRS, admitted to the intensive care unit and high dependency wards of Universiti Kebangsaan Malaysia Medical Centre (UKMMC). It was a single blind randomized clinical trial with a total of 72 patients in which 44.4% Malays, 34.7% Chinese, 19.4% Indians and 1.4% others with 59.7% males and 40.3% females were recruited. Patients in TRI E group received Tocotrienol with Vitamin C while TOCO group received Tocopherol with Vitamin C and a control group did not receive any antioxidant. The clinical parameters (heart rate, respiratory rate, systolic blood pressure) showed improvements with significant difference at the end of study (post-intervention) as compared to admission (pre-intervention).Whereas, the sepsis (temperature, PCT, CRP and WBC) and oxidative stress (8OHdG/Creatinine) parameters showed improvements with significant difference at the end of study (post-intervention) as compared to admission (pre-intervention). The TRI E group showed obvious improvement in clinical, sepsis and oxidative stress parameters, as compared to TOCO and control groups. This study showed that Vitamin E Tocotrienol and Vitamin E Tocopherol in combination with Vitamin C demonstrated significant improvement in the clinical and laboratory parameters during the management of SIRS. Therefore, Vitamin E in combination with Vitamin C had therapeutic benefits in the treatment of critically ill patients with SIRS.

Vitamin D is significantly associated with total testosterone and sex hormone-binding globulin in Malaysian men

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The Aging Male, Vol. 18(3), 2015, 175-179

Objective: Cross-sectional studies in the Caucasian population have shown a significant relationship between vitamin D and testosterone levels, but data in the Asian population are limited. This study aimed to determine the association between vitamin D and testosterone levels in Malaysian men. **Methods**: Chinese and Malay men (n=382) aged 20 years or above residing in the Klang Valley, Malaysia were recruited. Their fasting blood was collected for serum testosterone, sex hormone binding globulin (SHBG) and 25-hydroxyvitamin D (25(OH)D) assays. Relationship between 25(OH)D and testosterone levels was analyzed using multiple regression analysis. Testosterone and SHBG levels among subjects with different vitamin D status were compared using univariate analysis. Confounders such as age, ethnicity and body mass index (BMI) were adjusted. **Results**: 25(OH)D was significantly and positively associated with total testosterone and SHBG levels before and after adjustment for age and ethnicity ($p<0.05$). Only association with SHBG remained significant after further adjustment for BMI ($p<0.05$). Total testosterone and SHBG values displayed an increasing trend from subjects with vitamin D deficiency to those with optimal level ($p<0.05$). The trend was attenuated after adjustment for BMI ($p>.05$). **Conclusion**: 25(OH)D is significantly associated with total testosterone and SHBG in Malaysian men but this association is BMI-dependent.

Scope 5

Overweight and Obesity

A randomised controlled trial comparing the use of omega-3 polyunsaturated fatty acid supplements versus very low calorie dietary restriction in obese Malaysian patients awaiting bariatric surgery

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Annals of Laparoscopic and Endoscopic Surgery, Vol. 2(1), 2017, 112-119

Background: A large liver can be a bariatric surgeon's nightmare as it interferes with the operative field particularly during posterior fundal and hiatal dissection. Various methods have been employed to achieve hepatic volume reduction (HVR) prior to surgery. This study aims to compare the effect of omega-3-polyunsaturated fatty acid (PUFA) supplements and very low calorie diet (VLCD) restriction on hepatic volume. **Methods**: A total of 52 obese patients were randomized into two groups. For various reasons only 41 patients were included for final analysis; VLCD group (n=20) and omega-3-PUFA group (n=21). MRI volumetry of liver, weight, and serum alanine transaminase (ALT) levels were measured at enrollment and again at 4 weeks. **Results**: Mean HVR of VLCD group and omega-3-PUFA group at day-30 was 37.10 ± 15.76 and 34.88 ± 9.99 cm3. Comparative analysis of HVR between the two groups showed no statistical difference (P=0.29). Similarly there was no statistical difference in ALT levels of both groups. Significant weight loss (kg) was noted in both VLCD and omega-3-PUFA group, measuring up to 2.21 ± 2.29 and 2.85 ± 4.62, although no statistical difference was noted when compared between the two (P=0.58). **Conclusions**: Pre-operative hepatic volume and weight reduction were noted in both groups with no superiority of one modality over the other. As dietary restriction is often confronted with non-compliance, omega-3-PUFA does appear to be a more attractive alternative. A larger study including cost effectiveness analysis may be able to further ascertain the economic impact and feasibility of pre-bariatric surgery omega3-PUFA supplementation in a developing economy such as Malaysia.

A randomized control trial intervention to combat childhood obesity in Negeri Sembilan: The Hebat! Program

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World Academy of Science, Engineering and Technology International Journal of Medical and Health Sciences, Vol 11(11), 2017, 140

This study aims to develop and evaluate an intervention to improve eating habits, active lifestyle and weight status of overweight and obese children in Negeri Sembilan. The H.E.B.A.T! Program involved children, parents, and school and focused on behaviour and environment modification to achieve its goal. The intervention consists of H.E.B.A.T! Camp, parent's workshop and school-based activities. A total of 21 children from intervention school and 22 children from control school who had BMI for age Z-score ≥ +1SD participated in the study. Mean age of subjects was 10.8 ± 0.3 years old. Four phases were included in the development of the intervention. Evaluation of intervention was conducted through process, impact and outcome evaluation. Process evaluation found that intervention program was implemented successfully with minimal modification and without having any technical problems. Impact and outcome evaluation was assessed based on dietary intake, average step counts, BMI for age z-score, body fat percentage and waist circumference at pre-intervention (T0), post intervention 1 (T1) and post-intervention 2 (T2). There

was significant reduction in energy (14.8%) and fat (21.9%) intakes (at p< 0.05) at post-intervention 1 (T1) in intervention group. By controlling for sex as covariate, there was significant intervention effect for average step counts, BMI for age z-score and waist circumference (p < 0.05). In conclusion, the intervention made an impact on positive behavioural intentions and improves weight status of the children. It is expected that the HEBAT! Program could be adopted and implemented by the government and private sector as well as policy-makers in formulating childhood obesity intervention.

Abdominal obesity indicators: Waist circumference or waist-to-hip ratio in Malaysian adults population

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International Journal of Preventive Medicine, Vol. 7:82, 2016, 81-5

Background: Waist circumference (WC) is an accurate and simple measure of abdominal obesity as compared to waist–hip ratio (WHR). The aim of this study was to determine the correlation between body mass index (BMI) with WC and WHR and suggest cutoff points for WC among Rural Malaysian adults. **Methods**: A cross sectional study was conducted among 669 respondents from three villages in Tanjung Karang, located in the district of Kuala Selangor. Data collection was carried out by guided questionnaires and anthropometric measures. **Results**: The prevalence of abdominal obesity for BMI was almost similar for both gender across Caucasian and Asian BMI cutoff points. Based on Caucasian cutoff points, the prevalence of abdominal obesity for WC was 23.8% (male) and 66.4% (female) while for WHR was 6.2% (male) and 54.2% (female). Asian cutoff points gave higher prevalence of abdominal obesity compared to that of WC among male respondents and WHR for both genders. WC showed strong and positive correlation with BMI compared to WHR (in male WC r=0.78, WHR r=0.24 and in female WC r=0.72, WHR r=0.19; P<0.001). Receiver operating characteristic curve analysis suggested WC cutoff points of 92.5 cm in men and 85.5 cm in women is the optimal number for detection of abdominal obesity. **Conclusions**: WC is the best indicator as compared with WHR for abdominal obesity for Malaysian adults.

Adverse effects on insulin secretion of replacing saturated fat with refined carbohydrate but not with monounsaturated fat: A randomized controlled trial in centrally obese subjects

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Journal of Clinical Lipidology, Vol. 10, 2016, 1431–1441

Background: Current dietary guidelines recommend the replacement of saturated fatty acids (SAFAs) with carbohydrates or monounsaturated fatty acids (MUFAs) based on evidence on lipid profile alone, the chronic effects of the mentioned replacements on insulin secretion and insulin sensitivity are however unclear. **Objective**: To assess the chronic effects of the substitution of refined carbohydrate or MUFA for SAFA on insulin secretion and insulin sensitivity in centrally obese subjects. **Methods**: Using a crossover design, randomized controlled trial in abdominally overweight men and women, we compared the effects of substitution of 7% energy as carbohydrate or MUFA for SAFA for a period of 6 weeks each. Fasting and postprandial blood samples in response to corresponding SAFA, carbohydrate, or MUFA-enriched meal-challenges were collected after 6 weeks on each diet treatment for the assessment of outcomes. **Results**: As expected, postprandial nonesterified fatty acid suppression and elevation of C-peptide, insulin and glucose

secretion were the greatest with high-carbohydrate (CARB) meal. Interestingly, CARB meal attenuated postprandial insulin secretion corrected for glucose response; however, the insulin sensitivity and disposition index were not affected. SAFA and MUFA had similar effects on all markers except for fasting glucose-dependent insulinotropic peptide concentrations, which increased after MUFA but not SAFA when compared with CARB. **Conclusion**: In conclusion, a 6-week lower-fat/higher-carbohydrate (increased by 7% refined carbohydrate) diet may have greater adverse effect on insulin secretion corrected for glucose compared with isocaloric higher-fat diets. In contrast, exchanging MUFA for SAFA at 7% energy had no appreciable adverse impact on insulin secretion.

Assessing stages of readiness to lose weight among overweight and obese adolescents using trans-theoretical model

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Obesity and Control Therapy, Vol. 4(1), 2017, 1-11

Introduction: Assessing the individual's level of readiness to change will help in losing weight and targeting for an ideal body weight. This study was aimed to determine the readiness to lose weight among overweight and obese adolescents using Trans Theoretical Model (TTM) assessment tool. **Methods**: A cross-sectional study was conducted among 631 adolescents aged 13 to 19 years whose screened as overweight or obese (body mass index for age with z-score of ≥ 1 SD from WHO Reference 2007). Samples were selected using multistage random sampling from secondary level schools of two urban districts. The students had completed the translated and validated TTM constructs questionnaire and were categorized according to five stages of readiness to lose weight. One way ANOVA and MANOVA were used to analyze the relationship between stages of readiness to lose weight according to TTM assessment tool. **Results**: Majority of the adolescents are in the action stage (40.3%) followed by contemplation stage (26.5%), preparation stage (15.5%), maintenance (11.4%) and the least in precontemplation stage (6.3%). Significant differences across the stages of readiness to lose weight were identified in all processes of change, pros of decisional balance, physical activity and nutrition self-efficacy with $p<0.001$ and temptation of high-fat and high calorie foods ($F=2.88$, p value $=0.022$). **Conclusion**: The significant differences found across the stages of readiness to lose weight using TTM model are useful in tailoring types of weight management interventions.

Association between nutrient adequacy and psychosocial factors with overall rate of weight loss after bariatric surgery

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This was a cross-sectional study that investigated the relationship between nutrient intake and psychosocial factors with the overall rate of weight loss after bariatric surgery among patients who had undergone sleeve gastrectomy in University Kebangsaan Malaysia Medical Centre (UKMMC). Forty-three subjects (15 men and 28 women) were recruited for this study. Subjects completed assessment questionnaires including the Binge Eating Scale (BES), Beck Depression Inventory (BECK), Family Support Questionnaires, and the Index of Peer Relation (IPR). Results showed that the median overall rate of weight loss was 4.3±5.5 kg/month, which was lower when compared to the rate of weight loss at three months which was 5.0±5.6 kg/month. Pre-operative weight was the predictor of overall rate of weight loss ($p<0.05$, $R^2=0.52$). Binge eating disorder (BED) and depression were also closely associated with each other after bariatric surgery ($p<0.001$, $R^2=0.46$).

Subjects with good compliance to dietary advice had lower scores on the binge eating scale. The mean caloric and protein intake was very low, only 562±310 kcal/day and 29.6±16.1 g/day. The intake of vitamin A, B-1, B-2, B-3, B-12, C, folate, and iron met the Malaysian Recommended Nutrient Intake (RNI). However, the RNI for calcium, zinc, selenium, vitamin D, and vitamin E was not met. In conclusion, although bariatric surgery had many health benefits, several factors hindered weight loss after bariatric surgery. Health care professionals should closely monitor patients after bariatric surgery.

Association of BMI with risk of CVD mortality and all-cause mortality

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Objective: To determine the relationship between BMI and risk of CVD mortality and all-cause mortality among Malaysian adults. **Design**: Population-based, retrospective cohort study. Participants were followed up for 5 years from 2006 to 2010. Mortality data were obtained via record linkages with the Malaysian National Registration Department. Multiple Cox regression was applied to compare risk of CVD and all-cause mortality between BMI categories adjusting for age, gender and ethnicity. Models were generated for all participants, all participants the first 2 years of follow-up, healthy participants, healthy never smokers, never smokers, current smokers and former smokers. **Setting**: All fourteen states in Malaysia. **Subjects**: Malaysian adults (*n* 32 839) aged 18 years or above from the third National Health and Morbidity Survey. **Results**: Total follow-up time was 153 814 person-years with 1035 deaths from all causes and 225 deaths from CVD. Underweight (BMI<18·5 kg/m^2) was associated with a significantly increased risk of all-cause mortality, while obesity (BMI ≥30·0 kg/m^2) was associated with a heightened risk of CVD mortality. Overweight (BMI=25·0–29·9 kg/m^2) was inversely associated with risk of all-cause mortality. Underweight was significantly associated with all-cause mortality in all models except for current smokers. Overweight was inversely associated with all-cause mortality in all participants. Although a positive trend was observed between BMI and CVD mortality in all participants, a significant association was observed only for severe obesity (BMI≥35·0 kg/m^2). **Conclusions**: Underweight was associated with increased risk of all-cause mortality and obesity with increased risk of CVD mortality. Therefore, maintaining a normal BMI through leading an active lifestyle and healthy dietary habits should continue to be promoted.

Child-report and parent-report of health-related quality of life among 9-11 years old obese school children in Terengganu, Malaysia

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Malaysian Journal of Public Health Medicine, Special Vol. (2), 2017, 20-31

Obese children had impaired psychosocial status as they generally tend to be socially isolated, have poor self-esteem, anxiety, mood disorder (depression and bipolar disorder) and eating disorder. The aim of this study was to investigate the child-report and parent-report of HRQoL among 9-11 years old obese school children

in Malaysia and to determine the associated factors of HRQoL among obese children in Malaysia. This study was a cross sectional study involving 101 obese Malay primary school children aged 9-11 years old from eleven primary schools in Kuala Terengganu which were selected via convenience sampling. Height and weight of the respondents were measured and their BMI was calculated. Health-related quality of life (HRQoL) was measured using PedsQL version 4.0. The mean age of the respondents was 10.02 ± 0.82 years old with mean BMI z-score was 3.01 ± 0.60. There were significance differences between boys and girls in; 1) emotional domain score for child-report QoL (p=0.019) using paired t-test and 2) psychosocial domain score for parent-report QoL (p=0.025). Regression analysis found that age and gender were the associated factors for Psychological Health for obese children (p<0.005). Being obese had negative effects on children's quality of life. Various strategies interventions should be done to improve the HRQoL of these obese children. A multidisciplinary approach in schools must be organized to encourage a healthy lifestyle as part of routine among the school children.

Correlation between prehypertension and obesity indices among young adults

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Malaysian Journal of Public Health Medicine, Vol. 16(3), 2016, 235-240

Prehypertension is a new classification for blood pressure level. It is defined as not being on hypertensive medication and having systolic pressure of 120-139 mmHg and/or diastolic pressure 80-89 mmHg. Prehypertension increased the risk of morbidity and mortality from non-communicable diseases. The objective of this study was to estimate the prevalence of blood pressure status among the young adult population and its associated the risk factors. A cross-sectional study was conducted between January until December 2012, among young adults aged 18 to 40 years old from four villages in Hulu Langat district, Selangor. This study involved 535 individuals with 247 males and 288 females. From the study, 49.5% was found to have prehypertension. Body mass index was a significant risk factor (adjusted odds ratio (OR) 1.06, 95%CI 1.02, 1.11). Sex difference in correlate of various obesity indices indicated that there was weak but significant correlation between BMI and diastolic blood pressure among male. There is need to design more preventive programs that target young adults as focus subject in order to prevent its progression from prehypertension to clinical hypertension thus halt premature clinical cardiovascular diseases development.

Do low vegetables and fruits intake contribute to overweight status of healthy reproductive age of Malay women in Selangor?

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Pakistan Journal of Nutrition, Vol. 14 (12), 2015, 994-1001

Overweight and obesity posed major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer. Prevalence of overweight and obesity among adults especially women show an increasing trend. The aim of this study was to determine the prevalence of overweight among healthy reproductive age of Malay women in Selangor and to determine whether low vegetables and fruits intake contribute to overweight among them. A cross-sectional study was conducted among adult women in selected urban and rural areas in Selangor. Simple random sampling was used in selecting participants. Inclusion criteria for the participants are Malay, within reproductive age (15-45 years old) and healthy (without any chronic diseases). Data were collected using a questionnaire-guided interview. A total of 630 respondents

were recruited in this study. The respondent's mean age was 39.6 ± 3.697 years old. The prevalence of overweight among the respondents was 61.0%; in which 37.8% were categorized as pre-obese and 23.2% were obese. Prevalence of overweight was higher in those above 40 years old, had lower education level, unemployed, married, having children, ever breast-feed, not using contraceptive and having low intake of vegetables and fruits. There was a significant association between marital status and overweight with OR 2.88 (CI 1.56-5.31; p=0.001). As a conclusion, the prevalence of overweight in this study was high particularly among married women. Low vegetables and fruits intake did not contribute to the overweight status of healthy reproductive age of Malay women in this study.

Dynamics of Diabetes and Obesity: An Alarming Situation in the Developing Countries in Asia

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Mini Review Medicine Chemical, Vol. 16(15), 2016, 1258-1268

The incidence of diabetes in developing countries in Asia has increased over the last few years. The economic development is radically changing the lifestyle of the younger generation who prefer to embrace the western lifestyle of eating high calorie fast food with minimal physical exercise. Previously, the rate of diabetes was very low but it is increasing at an alarming rate in the developing countries in Asia. Admittedly, there is paucity of literature on the prevalence of patients with type-1 diabetes in Asian developing countries due to lower field surveys and lack of quantitative data. Few contributing factors such as body mass index (BMI) and its relation with obesity and diabetes, energy dense diet, excessive caloric intake, sedentary behaviors, lifestyle and family history, gene and genomewide association of diabetes, genes and gene polymorphisms are being discussed especially with regard to the Asian population. Dynamics of the diabetes and obesity was depicted for the population of Asian developing countries with special emphasis on China and India. Diabetes has become widespread among the low-income communities. Hence, it is necessary to develop appropriate healthcare policies in order to mitigate this rampant epidemic before it is too late.

Effect of exercise on pulmonary function test in obese Malaysian patients

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La Clinica Terapeutica, Vol. 166(3), 2015, 16-20

Background and Aims: Obesity has taken the 21st century by storm, posing negative effects on of the various facades of health, healthcare and global economy. With regards to pulmonary performance, numerous studies have proven the detrimental effects of obesity while reinstating the positive effects of weight loss on overall pulmonary function. However, effects of exercise on pulmonary function and correlation between changes in pulmonary function test with weight loss have yet to be described. We performed a prospective interventional study to determine the effects of regular exercise on Pulmonary Function Tests (PFT) and ascertain the relationship between weight loss and change in PFT in obese patients. **Materials and Methods**: Twenty-five obese patients were enrolled, giving an 80% power of study. Baseline weight and PFT consisting of FEV1, FVC, TLC, mean ERV and VC were recorded prior to commencement of the 8 week long Standard Exercise Regimen (SER). PFT and weight were recorded again at the end of 8

weeks. **Results**: All parameters of the PFT studied improved significantly with exercise. The participants lost an average of 1kg of body weight post-exercise ($p<0.0005$). The correlations between mean changes in weight and PFT were negligible. **Conclusion**: A period of supervised regular exercise improves the pulmonary function of obese patients and this improvement is independent of the amount of weight loss. Hence, SER should be recommended to all obese patients, especially when bariatric surgery is desired.

Effect of internet-based intervention on obesity among adolescents in Kuala Lumpur: A school-based cluster randomised trial

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The Malaysian Journal of Medical Sciences: MJMS, Vol. 22(4), 2015, 47-56

Background: Co-morbidities in adulthood is a significant problem and is associated with obesity during adolescent. **Methods**: This 3-months randomised controlled trial was aimed at determining the effectiveness of having internet-based intervention (obeseGO!) toward obesity among adolescents in Kuala Lumpur. Forty seven students were assigned randomly to the obeseGO! (intervention) group for internet-based intervention i.e., information on healthy lifestyle and diet were provided via the internet. Fifty students were assigned to the control group, where pamphlets containing health education were provided to these students. The measurement of body mass index (BMI), waist circumference, and the body fat percentage was taken at baseline and after 12 weeks of intervention. **Results**: The multivariate analysis of variance (MANOVA) analysis found that obeseGO! Had a small effect in reducing BMI, waist circumference and body fat percentage. **Conclusion**: The internet-based obesity intervention program may be an effective medium for promoting healthy diet and physical activity among the obese adolescents.

Effect of probiotic Microbial Cell Preparation (MCP) on fasting blood glucose, body weight, waist circumference, and fecal short chain fatty acids among overweight malaysian adults: A pilot randomised controlled trial of 4 weeks

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Introduction: Probiotic microbial cell preparation (MCP) supplementation is one of the approaches to modulate alterations in gut microbiota (GM). This double-blind randomized controlled trial investigated the effect of 4 weeks of MCP supplementation on fasting blood glucose levels (FBG), body weight (BW), waist circumference (WC), and faecal short chain fatty acids (SCFA) among 24 healthy and overweight (with BMI ≥ 23 kg/m^2) Malaysian adults. **Methods**: Twenty-six subjects were randomised to receive either MCP (n=12) or placebo (n=14), twice daily, for 4 weeks. The probiotic powder contained a mix of six strains namely, *Lactobacillus acidophilus, Lactobacillus lactis, Lactobacillus casei, Bifidobacterium longum, Bifidobacterium bifidum* and *Bifidobacterium infantis* (3.0 x 1010 cfu). FBG, BW, WC, WHR, faecal SCFA, physical activity levels and dietary intake were measured and changes were determined using repeated measures ANOVA. **Results**: Twenty-four subjects successfully completed the 4-week study period. Changes in FBG, BW, WC and SCFA were not significantly different between the groups. Only subjects in the MCP group significantly

reduced their energy intake compared to baseline (1671 ± 476 vs 1386 ± 447 kcal, P=0.045). **Conclusion**: A 4-week supplementation of the MCP mix powder did not have significant effects on the variables studied. However, the significant reduction in dietary energy intake in the MCP group suggests the potential of probiotics as an adjuvant to dietary therapy for weight loss.

Effects of brisk walking and resistance training on cardiorespiratory fitness, body composition, and lipid profiles among overweight and obese individuals

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The purpose of this study was to determine the effects of brisk walking and resistance training on cardiorespiratory fitness, body composition and lipid profiles in overweight and obese individuals. 54 overweight and obese male and female participants, aged between 21 to 55 years old were recruited for this study. The participants were age-, gender- and weight-matched before being randomly assigned into 3 groups, with 18 participants per group. The brisk walking group was required to brisk walk 3 times a week at an intensity of 60-70% of their respective age-predicted maximum heart rate for 8 weeks. Resistance training group performed the resistance training which involved 3 sets of 8 exercise stations, 3 times a week and 45 minutes per session. For each station, 8-15 repetitions of upper and lower body exercises were carried out by using dumbbells. The control group was asked to continue with their daily routine without participating in any other forms of physical training. Body composition, lipid profiles and cardiorespiratory fitness of the participants were measured at pre, mid and post-intervention. Results showed that there was greater improvement in cardiorespiratory fitness for brisk walking and resistance training groups ($p<0.01$) at post-intervention compared to pre-intervention value. There were also significant improvements in percentage of body fat, body mass index (BMI), waist-hip ratio (WHR), and free fat mass in the brisk walking group. Similarly, participants in the resistance training group had significant improvement in BMI, WHR, fat mass and HDL-cholesterol. Hence, it is concluded that both brisk walking and resistance training for 8 weeks were appropriate exercise modalities to reduce some of the cardiovascular risk factors among overweight and obese individuals.

Food consumption among overweight and obese working Malay women in urban settings

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Background: The Malaysian Dietary Guideline 2010 (MDG) helps Malaysian to objectively estimate their food consumption. This study looks into the type of food consumed in a group of overweight and obese Malays women and the influences of their socio demographic characteristics. **Methods**: This cross-sectional study was conducted among 140 Malay women with body mass index (BMI) ≥25.0 kg/m^2, working in public offices in two urban areas in Malaysia. Their food consumption was monitored using a 7- day self-administered food diary developed based on MDG 2010. The mean numbers of servings were compared to the servings recommended in the MDG 2010 for women who

were not physically active, and then the association with socio demographic characteristics was tested using independent t test. **Results**: Their food consumption compared to MDG recommendations were as follows: 79.8% for carbohydrate, 24.8% for vegetables and fruits, 112.5.0% for protein and 124.0% for milk and dairy products. The consumption of fruits and vegetables was higher in the higher education group (P=0.03), of protein was higher in the high income group (P=0.02) and of milk and dairy product was higher in the younger age group (≤40 year old) (P=0.05). **Conclusions**: Their consumption of protein and dairy product was higher but the consumption of carbohydrate and vegetables and fruits, was lower than the recommended quantity. The type of food consumption was influenced by respondents' education level, income and age group.

Food security: Effect on peroxisome proliferator-activated receptor gamma (PPARγ) and BMI among young adult

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Food security status is a method used to differentiate food secure and food insecure experience. Throughout our lives, nutritious food and lifestyle are closely related with most lifestyle-associated illness. This study investigated young adults in both groups to determine molecular changes on gene expression of peroxisome proliferator-activated receptor-gamma (PPARγ). PPARγ plays an important role in adipocyte differentiation, fatty acids, and insulin sensitivity. Increase of PPARγ expression help to improve metabolic indices in dysregulated metabolism associated with obesity, diabetes, and cardiovascular disease. There are no significant differences (P>0.05) of PPAR expression and BMI for both groups. However, expression of PPARγ is detected in earlier amplification for food insecure group. Mean of BMI (20.70± 3.025) is also slightly higher in food insecure group than food secure. Conclusively, there are some effects on expression of PPARγ and BMI based on food security status.

Gender and racial differences in the cardiovascular risk factors among overweight and obese rural adults, Kuching and Samarahan Division, Sarawak, Malaysia

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Objective: This study aimed to determine whether gender and ethnic differences had an effect on cardiovascular risk factors in overweight and obese rural adults in Sarawak. **Design and Setting**: This was a cross-sectional study conducted in rural communities in Kuching and Samarahan division, Malaysia. Data was obtained using a set of questionnaire (sociodemographic data and physical activity), measurement of blood pressure, height, weight (body mass index, BMI), body fat percentage, fasting blood sugar, and lipid profile from three ethnic groups—Iban, Malay, and Bidayuh. Analysis of data was done using SPSS version 23.0. **Results**: A total of 155 respondents participated in the study (81.6% response rate). The levels of physical activity, BMI status, body fat, hypercholesterolemia, and hyperglycemia were similar across the three ethnic groups and both females and males. Iban and Bidayuh had significant higher Atherogenic Index of Plasma (AIP) when compared to the Malay (Bidayuh OR=0.30, 95% CI 0.12, 0.78; Iban OR=0.29, 95% CI

0.12, 0.69). **Conclusions**: The relationship between cardiovascular risk factors varied according to ethnic groups and gender. A better understanding of these differences would help in the design and implementation of intervention programme for the prevention of cardiovascular disease.

Her shape' intervention programme for obese women with high breast adiposity

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Background and Objectives: Nutrition and physical activity interventions is beneficial in reversing obesity. However far too little attention has been paid to the effect of these interventions on breast tissues. Thus, the aim of this study was to explore the effect of a home-based dietary and physical activity intervention (the Her Shape Program) on metabolic parameters, blood biomarkers and adiposity at the breast. **Methods and Study Design**: A randomized controlled study was conducted on obese women with high breast adiposity (<0.1 Sm–1), aged 40-60 years in Klang Valley, Malaysia. Subjects were assigned to intervention (n=16) and control group (n=15). Intervention group received a home based health education package with close monitoring weekly, personal diet consultation and physical training in group. Assessment was ascertained at three time points; baseline, weeks 8 and 16. Outcome measures were the energy intake, physical activity, body composition, blood tests, blood biomarkers and electrical impedance tomography (EIT) quantitative values. Analyses were done using 2-way repeated measures ANOVA. **Results and Conclusions**: All subjects completed the program without any drop-out. The HSI group had 100% compliance towards the intervention program; their energy intake was reduced for approximately 35% and their activity score was increased for approximately 11%. A significant interaction effect was found in body weight, body mass index (BMI), total cholesterol/HDL, vitamin C intake and matrix metallopeptidase 9 (MMP-9) ($p<0.05$). Interestingly, their EIT extremum values were also significantly increased indicating a reduction of breast adiposity. The intervention program was successful in improving body composition, physical activities, MMP9 and breast adipose tissue composition.

Managing obesity in Malaysian schools: Are we doing the right strategies?

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Malaysian Journal of Public Health Medicine, Vol. 15(2), 2015, 75-83

The evolution in lifestyle and dietary habits of the Malaysian people that have taken place over the last few decades can be largely attributed to both family and social environment. These factors are known to affect the nutritional status of the community, in both children and adults. Reduced physical activity and changes in their diet have been one of the contributing factors to the rising prevalence of overweight and obesity. However, in Malaysia, in which nutrition transition has been a norm, it is worrying when the trends of overweight and obesity have been rising steadily over the years especially among children. Although numerous strategies to control obesity in Malaysia have been taking place, many had shown little effect. Analysing strategies implemented at national level is thus crucial in order to ascertain reasons for the shortfalls

of these strategies especially among children. Obesity most commonly begins as early as the ages of 5 and 6 years, or during adolescence. Obesity is indeed a major public health concern due to its huge negative impact on the society at large which is well supported by evidence-based literatures. Managing this issue is complex and holistic approach is thus crucial in reducing its incidence and prevalence.

Measuring factors influencing progression across the stages of readiness to lose weight among overweight and obese adolescents

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Epidemic incidence of obesity has become one of the public health priorities in disease control prevention. The study aims to determine the prevalence of readiness stages to lose weight among the overweight and obese adolescents and its influencing factors. A cross-sectional study was conducted on 631 adolescents of body mass index for age with z-score > 1 SD based on World Health Organization growth reference chart. The stages of readiness to lose weight were assessed using Trans-Theoretical Model. Intrinsic and extrinsic factors were collected using self-administered questionnaire. Majority of the respondents were in the action stage (40.3%) followed by contemplation (26.5%), preparation (15.5%), maintenance (11.4%) and pre-contemplation (6.3%). Ordinal regression analysis identified significant factors influencing progression across the stages of readiness to lose weight: no junk foods sold in school canteens (p=0.005), TV viewing time ≤2 hours (p=0.001), high physical activity means score (p<0.001) and family encouragement on healthy eating (p=0.010). Majority of adolescents who were overweight and obese were at the action stage of weight reduction. Focusing on extrinsic factors help to improve the effectiveness of weight management intervention.

Measuring the daily activity of lying down, sitting, standing and stepping of obese children using the ActivPAL™ activity monitor

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This study describes the patterns of objectively measured sitting, standing and stepping in obese children using the activPAL™ and highlights possible differences in sedentary levels and patterns during weekdays and weekends. Sixty-five obese children, aged 9–11 years, were recruited from primary schools in Terengganu, Malaysia. Sitting, standing and stepping were objectively measured using an activPAL™ accelerometer over a period of 4–7 days. Obese children spent an average of 69.6% of their day sitting/lying, 19.1% standing and 11.3% stepping. Weekdays and weekends differed significantly in total time spent sitting/lying, standing, stepping, step count, number of sedentary bouts and length of sedentary bouts ($p < 0.05$, respectively). Obese children spent a large proportion of their time sedentarily, and they spent more time sedentarily during weekends compared with weekdays. This study on sedentary behaviour patterns presents valuable information for designing and implementing strategies to decrease sedentary time among obese children, particularly during weekends.

Metagenome: Differences in the gut microbiota among healthy, obese and type 2 diabetes adults

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The association between gut microbiota composition with pathogenesis of metabolic diseases namely obesity and type 2 diabetes are increasingly recognized. The aim of the study was to identify the diversity of gut microbiota phylum and families in the gut of healthy, obese and type 2 diabetes adults with metagenomic approach. Six healthy subjects, five obese subjects and five type 2 diabetes subjects of similar inclusion and exclusion criteria were recruited. The different bacterial phyla and families in the stool sample were analyzed with metagenomic analysis. The median (IQR)% of relative abundance for each phylum and families were analyzed. The obese subjects had higher Bacteroidetes 63.50(21.55)% with lower Firmicutes 27.00(13.55)%, meanwhile, the type 2 diabetes subjects also had higher Bacteroidetes 66.50(39.00)% with lower Firmicutes 27.70(19.35)%. These findings shows that there are differences in the gut microbiota composition in the healthy, obese and type 2 diabetes adults which may influence the development of obesity and type 2 diabetes.

Obesity related hypertension - gender specific analysis among adults in Tanjung Karang, Selangor, Malaysia

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Malaysian Journal of Public Health Medicine, Vol. 15(1), 2015, 41-52

Obesity is a major health concern and the growing rate raises important issues specific to concurrent rise of the related diseases especially hypertension. This study aimed to determine the relationship between hypertension and obesity based on body mass index and waist circumference besides relevant sociodemographic factors according to gender specific analysis. The analysis is important to determine in depth insight of two genders. This cross-sectional study was conducted among community in Tanjung Karang, Selangor, Malaysia in 2009 and included a total of 439 male and 668 female respondents aged 18-59 years old. Data was collected by interview-guided questionnaire and anthropometric measurements. SPSS version 21.0 was used for analysis of the relationship between socio demographic factors, smoking, body mass index and waist circumference with hypertension. Finally logistic regression analysis was used to assess the predictors of hypertension according to gender. The prevalence of hypertension was 25.5% in males and 23.1% in females, giving a total of 24%. Significantly higher prevalence of hypertension was found in overweight and obese categories (42.2% and 60.5% in males; 39.5% and 48.9% in females). Those with abdominal obesity also had significantly greater risk in having hypertension (41.6% in males and 33.2% in females). The logistic regression analysis indicated that age, high BMI and abdominal obesity were significantly associated with hypertension in women, and on the other hand age and BMI only for men. Both obesity and abdominal obesity are significantly important predictors of hypertension in females but BMI obesity only in males. Effective weight management strategies targeting obese people and abdominally obese women should be implemented in order to prevent hypertension and related cardiovascular diseases.

Perspective on obesity problems and associated factors to reduce weight among overweight and obese housewives: A qualitative study

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Journal of Womens Health, Issues and Care, Vol. 5(6), 2016, 1-6

Introduction: The World Health Organization has declared obesity a global epidemic. In Malaysia the prevalence of obesity has reached an upward trend. Findings from the National Health and Morbidity Survey 2011 indicated that obesity among women was higher as compared to men and mean Body Mass Index among housewives was highest compared to other job categories. The aim of this qualitative study was to explore perspective on obesity problems and to gain a better understanding on barriers and facilitators to reduce weight among housewives in order to develop a weight loss intervention package. **Methodology**: This qualitative survey is part of the "My Body is Fit and Fabulous at Home" (MyBFF@Home) which involved in-depth interviews with 28 overweight and obese housewives in low cost flats around Klang Valley. Housewives were sampled purposively and data were analysed using thematic analysis. Themes and subthemes were also coded, explored and refined using the NVIVO software. **Results**: Five main themes associated with obesity problems emerge from the analysis that included 'personal feelings, beliefs, lifestyles, life issues and effort to reduce weight'. Housewives perceived that their body size were big or too big and felt dissatisfied with their weight. Six main barriers were identified which included support, attitude, safety, environment, time and life issues such as finance and health problems. Self-motivation, lifestyle, mindset, appealing figure, family and peer support were identified as facilitators to motivate housewives to reduce weight. **Conclusion**: These findings provided tools useful to develop strategies to empower housewives to reduce and to sustain their weight loss over a period of time.

Prevalence and determinants of overweight, obesity, and type 2 diabetes mellitus in adults in Malaysia

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This systematic review aimed to examine trends in overweight, obesity, and type 2 diabetes mellitus (T2DM) among Malaysian adults, and to identify its underlying determinants. A review of studies published between 2000 and 2012 on overweight, obesity, and T2DM was conducted. The Cochrane library of systematic reviews, MEDLINE, EMBASE, Biosis, Scopus, and MyJurnal digital database were searched. According to national studies, the prevalence of overweight increased from 26.7% in 2003 to 29.4% in 2011; obesity prevalence increased from 12.2% in 2003 to 15.1% in 2011, and T2DM prevalence was reported as 11.6% in 2006 and 15.2% in 2011. Distal determinants of increased risk of overweight, obesity, and T2DM were as follows: female, Malay/Indian ethnicity, and low educational level. The limited number of studies on proximal determinants of these noncommunicable diseases (NCDs) indicated that an unhealthy diet was associated with increased risk, whereas smoking was associated with decreased risk. However, more studies on the proximal determinants of overweight, obesity, and T2DM within the Malaysian context are needed. Overall, our findings provide insights for designing both future investigative studies and strategies to control and prevent these NCDs in Malaysia.

Prevalence and socio-demographic determinant of overweight and obesity among Malaysian adult

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International Journal of Public Health Research, Vol. 6(1), 2016, 661-669

Introduction: Overweight and obesity is a major public health problem in Malaysia. This study aims to determine the prevalence of overweight and obesity among the Malaysian adult population and their association with socio-demographic characteristics (gender, ethnic, and age groups). **Methods**: A total of 17,257 adults aged 18 years and older (8,252 men, 9,005 women) were assessed for BMI status, with a response rate of 97.8%, through a household survey from the National Health and Morbidity Survey (NHMS), conducted in all states of Malaysia in 2011. **Results**: All socio-demographic factors were consistently associated with higher chance of being overweight (except gender and location) and obesity (except location and household income). The identified risk of overweight were Indian (aOR: 1.8, 95% CI: 1.2-2.8), aged 50-59 years (aOR: 2.8, 95% CI: 2.0-3.9), widower (aOR: 1.6, 95% CI: 1.3-2.0), subject with secondary education (aOR: 1.2, 95% CI: 1.0-1.4), Homemaker/unpaid worker (aOR: 1.3, 95% CI: 1.1-1.4), and with high household income group (aOR: 1.3, 95% CI: 1.2-1.6). The identified risk of obesity were women (aOR: 1.4, 95% CI: 1.2-1.6), Indian (aOR: 1.7, 95% CI: 0.9-3.2), aged 30-39 years (aOR: 3.6, 95% CI: 2.4-5.5), widower (aOR: 1.2, 95% CI: 0.9-1.6), subjects with primary education (aOR: 1.2, 95% CI: 0.9-1.6), Homemaker/unpaid worker (aOR: 1.3, 95% CI: 1.1-1.6), and with middle household income group (aOR: 1.3, 95% CI: 1.2-1.6). **Conclusions**: Our data indicate a high prevalence of overweight and obesity in the population. Several sociodemographic characteristics are associated with both overweight and obesity. This study highlights the serious problem of overweight and obesity among Malaysia adults. Documentation of these problems may lead to research and policy agendas that will contribute both to our understanding and to the reduction of these problems

Replacing sugar sweetened beverages with plain water improves body composition among female youth

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Sugar-sweetened beverage (SSB) intake is considered an important contributing factor to obesity in youth. Replacing SSB with calorie-free beverage has potentially reduced energy intake and obesity prevention; however the health outcomes remain unclear. We evaluated the effect of the substitution of plain water for SSBs with incident of obesity in female youth. We conducted a two months intervention on plain water intake. A total of 43 overweight female (age 22.0 ± 2.6 years) were randomly assigned to Intervention (n=23) and Control (n= 20) groups. The intervention regime consists of increasing intake of daily plain water consumption, and avoiding SSB. However, intake of 1 serving of fresh milk per day is allowed. Body composition measurements, diet history questionnaires (DHQ),

SF-36 and goal-adjustment scale (GAS) questionnaires were ascertained at baseline and week 8. There was a significant increase ($p<0.001$) in plain water intake in the Intervention group as compared to the Control group. With respect to body composition, there was a significant intervention effect in body weight ($p<0.05$) and BMI ($p<0.01$). It was shown that both body weight and BMI improved in the Intervention group as compared to Control. Both waist circumference and body fat percentage revealed significant group effect ($p<0.05$). No significant intervention effect was found on both SF-36 and GAS items. Replacing SSB with plain water is effective in improving body composition among youth. There is a need to conduct a larger scale study with longer duration and measuring biochemical parameters for further research.

Self-perception and quality of life among overweight and obese rural housewives in Kelantan, Malaysia

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Health and Quality of Life Outcomes, Vol. 13(1), 2015, 19-26

Introduction: Obesity, in the past was perceived to be the problem of the rich, but recent studies have reported that the problem of obesity is a worldwide problem and rural population is no less affected. Self-perceived health and weight appropriateness is an important component of weight-loss and eating behaviors and may be mediated by local, social and cultural patterning. In addition to the quality of life assessment, it should therefore be an important focal point for the design and implementation of clinical and public health policies. **Methods**: The present study was carried out to assess the self-perception of weight appropriateness as well as the quality of life of overweight and obese individual among the rural population particularly among housewives. A total of 421 respondents participated in the study which consisted of 36.6% in the overweight and 63.4% in the obese categories. **Results**: the analysis of the survey revealed that self-perception regarding obesity among respondents show common similarities, particularly in self reporting on health, dietary habit and also the concept of beauty and a beautiful body. Character and behavior are highly regarded in evaluating a person's self-worth in society. The results on the quality of life using the ORWELL 97 instrument show that the quality of life of respondents was moderate. Most of the respondents were aware of their body weight and indicated an intention to lose weight but also reported themselves as healthy or very healthy. **Conclusion**: The results of the survey indicated that perception on obesity did not differed very much between respondents, in fact there existed a lot of similarities in their perception about health, quality of life, personal health and self-satisfaction with own body. However, their quality of life was within the normal or moderate level based on the ORWELL 97 assessment. Even though most of the respondents were aware of their body weight and indicated an intention to lose weight they also reported themselves as healthy or very healthy, suggesting that public health messages intended for rural housewives need to be more tailored to health-related consequences of fatness.

Serum osteocalcin in subjects with metabolic syndrome and central obesity

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Aims: The aim of this study was to determine if osteocalcin is related to adiposity and hyperglycaemia in metabolic syndrome irrespective of the presence of diabetes mellitus. **Methods**: This was a cross sectional study of 90 patients (59 men and 31 women) with metabolic syndrome as defined by the International Diabetes Federation criteria. Based on medical history 50 out of 90 patients had a diabetes. Anthropometric data were collected and blood taken for measurement of osteocalcin, fasting lipids, fasting glucose and insulin resistance (using homeostatic model assessment index, HOMA-IR). **Results**: Osteocalcin correlated negatively with fasting glucose (r= -0.366, p< 0.001) and HOMAIR (r= -0.305, p< 0.05) but not with waist circumference (r= 0.079), body mass index (r = 0.028), total cholesterol (r= 0.061) or triglycerides (r= 0.009). Diabetics had higher HOMA-IR (p< 0.01) and lower osteocalcin levels (p< 0.01) than non-diabetics. Among diabetics, osteocalcin correlated with glucose only (r= -0.341, p= 0.015). In nondiabetics, osteocalcin correlated with HOMA-IR (r= -0.359, P= 0.023) via insulin (r= -0.402, p= 0.010). Patients with impaired fasting glucose levels (5.6 – 6.9 mmol/l) had the same HOMA-IR as diabetics (p= 0.076) but not low osteocalcin (p= 0.025). Conclusions: In this cross-sectional study of subjects with metabolic syndrome and central obesity, low osteocalcin was associated with diabetes but not adiposity.

Sex differences in correlates of obesity indices and blood pressure among Malay adults in Selangor, Malaysia

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Background: Obesity is a risk factor for many chronic diseases and related morbidity and mortality. It is imperative to identify the best index of obesity which has the strongest relationship to blood pressure in various populations. The main aim of this study was to determine the sex differences in correlates of four frequently used obesity indices among Malaysians. **Method**: A cross-sectional study which recruited 1 530 Malay respondents was conducted in four villages in a district of Selangor state, Malaysia from June until October 2011. Blood pressure and anthropometric indices were recorded using a structured data sheet and data were analysed using SPSS version 17.0. **Results**: The body mass index cut-off point for the general population shows more overweight than obese respondents for both sexes (male [overweight: 30.7%, obese: 13.8%]), (female [overweight: 32.8%, obese: 21.8%]). The body mass index cutoff point for Asians shows more overweight males compared with obese male respondents (35.8% vs 26.1% respectively) and more obese female compared with overweight female respondents (36.1% vs 32.9% respectively). There were more respondents with abdominal obesity by Asians' cut-off point for waist circumference across sexes. Almost half of the male respondents have abdominal obesity by waist circumference with both cut-off points. Female respondents according to Asians' cut-off point have a higher prevalence of abdominal obesity by waist-to-hip ratio compared with women categorised by the general population cut-off point (76.3% vs 55.1% respectively). The majority of the respondents across sexes have a high prevalence of

abdominal obesity by waist-to-height ratio. Males had significantly higher mean values for systolic blood pressure, diastolic blood pressure and waist-to-hip ratio compared with female respondents, while females had a significantly higher mean for body mass index and waist-to-height ratio compared with male respondents. There was no significant mean difference for WC between sexes. All indices of obesity were significantly and positively correlated with both systolic blood pressure and diastolic blood pressure. The waist-to-height ratio shows the strongest correlates with systolic blood pressure across sexes (male: r=0.291 and female: r=0.294) compared with diastolic blood pressure. Waist circumference correlates most strongly with diastolic blood pressure among male respondents (r=0.266) and body mass index correlates most strongly with diastolic blood pressure among female respondents (r=0.250). **Conclusion**: Waist-to-height ratio performed better than BMI, WC and WHR for its correlates with systolic blood pressure across sexes. Diastolic blood pressure correlates most strongly with waist circumference among male respondents and it correlates most strongly with body mass index among female respondents. The waist-to-height ratio could be a simple and effective tool to screen for high blood pressure among the Malay population. Future research might look into a sex-specific abdominal obesity index for screening of cardiovascular risk factors.

Sociodemographic determinants of obesity among 12 years old school adolescents in Kuala Terengganu and Besut districts, Malaysia

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Malaysian Journal of Public Health Medicine, Special Vol. 2, 2017, 11-19

Worldwide prevalence of obesity among children and adolescents increased substantially over decades. Addressing potential risk factors of obesity among adolescents is very important for a successful intervention program in this population. The present study aimed to identify the sociodemographic determinants of obesity among school adolescents in Terengganu. A cross-sectional survey involving 3,798 school adolescents age 12 years old from 136 government primary schools in Kuala Terengganu and Besut districts were carried out from November 2014 to June 2015. For the purpose of this paper, the data for 2,842 school adolescents classified as either normal BMI (< +1SD) (n=2,305) or obese (+2SD) (n=537) based on WHO cut-off points were taken for analysis. Sociodemographic information on subjects and their parents were obtained from self-reported questionnaire. Anthropometric measurements were conducted by Physical Education teachers and uploaded into a specific developed database. The prevalence of obesity was relatively high in both genders in this study. Binary logistic regression analysis found gender, parental BMI, household income, household size and maternal working status were independently associated with obesity among school adolescents in this population. In the final model, being male, having working mother, and having obese parents were identified to be potential risk factors for obesity whilst having large household size lower the risk of obesity among these adolescents. Prevention programs are needed to increase awareness about the risk factors of obesity in adolescent and interventions should now focus on family member as well mainly the parents.

Systematic review on the prevalence of overweight and obesity among adolescents in Malaysia 1990-2014

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EC Nutrition, Vol. 2(6), 2015, 474-481.

Overweight and obesity among adolescents if not intervened early will cause adverse health problems once they enter into adulthood. The aim of this systematic review is to describe the trend from 1990 until December 2014 on the prevalence of overweight and obesity among adolescents in Malaysia. Articles from four databases: PubMed, Science Direct, ISI Web of Science and Cochrane Library were searched. The articles underwent two stages of screening using standardized five-score quality assessment forms which emphasized: sample size, sampling frame and selection techniques. As a result, 26 studies were reviewed with most sample size varying from 100 to 699. Only three studies had fulfilled the score 1 criteria with more than 1,000 respondents which employed a random selection technique. The age for adolescents involved in this review was between 7 to 19 years. The prevalence of overweight ranges between 4.5 to 69.0% and obesity ranges between 3.5 to 16.0% for both genders. Only five studies reported ethnic differences in the prevalence of overweight and obesity. It is recommended that action should be taken by all stakeholders to minimize the escalating trend of overweight and obesity among adolescents in Malaysia.

The effect of the Malaysian Food Guideline guidance on a group of overweight and obese women during Ramadan

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Saudi Medical Journal, Vol. 36(1), 2015, 40-45

Objectives: To determine the effect of imparting knowledge of the Malaysian Food Guideline (MFG) on a group of overweight and obese women during Ramadan. **Methods**: This intervention study was conducted during the months of Ramadan 2011. A group of 84 Malay Muslim women with a body mass index (BMI) ≥25 kg/m^2 were recruited. Prior to Ramadan, the respondents were educated regarding MFG, and how to monitor and record their daily food intake in a food diary. Their quantity of food intake, BMI, blood pressure (BP), blood lipid profile, and fasting blood sugar (FBS) were measured before Ramadan as a baseline. Their quantity of food intake was then measured again in the third week, whereas their BMI, BP, blood lipid profile, and FBS were determined on the fourth week of Ramadan. **Results**: At baseline, compared with the MFG recommendations, the intake of protein (107.5%), and milk and dairy products (133%) was higher, whereas the intake of carbohydrates (78.5%), and vegetables and fruits (44.4%) was lower. During Ramadan, carbohydrate intake, BMI, high density lipoprotein-cholesterol (HDL-C) and low density lipoprotein-cholesterol (LDL)-C (all p=0.000), triglyceride (p=0.005), and FBS (p=0.002) were reduced, but the TC/HDL-C ratio was increased (p=0.000). **Conclusion**: A month-long Ramadan fast guided by the knowledge of MFG resulted in certain positive changes in this group of respondents. These changes can be a good start for health improvement, provided that they are followed-up after Ramadan.

Trend on fast food consumption in relation to obesity among Selangor urban community

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Procedia-Social and Behavioral Sciences, Vol. 202, 2015, 505–513

This study examined the frequency and characteristics of fast food consumption, and obesity prevalence among community members who attended health centres in the Gombak District. In total, 1173 Malaysian adults were interviewed based on a structured questionnaire. Fast food consumption was higher for mostly young Malays and significantly associated with age, ethnicity, number of children in the household, and perception of their general health in a multivariate model. 21.3% of respondents were obese. However, it was not associated with frequenting fast food restaurants. The high prevalence of fast food consumption points for the need to further educate the community in making healthier life options.

Voluntary fasting to control post-ramadan weight gain among overweight and obese women

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Sultan Qaboos University Medical Journal, Vol. 15(1), 2015, e98–104

Objectives: This study aimed to examine the effectiveness of an Islamic voluntary fasting intervention to control post-Ramadan weight gain. **Methods**: This study was conducted between July and November 2011. Two weight loss intervention programmes were developed and implemented among groups of overweight or obese Malay women living in the Malaysian cities of Putrajaya and Seremban: a standard programme promoting control of food intake according to national dietary guidelines (group B) and a faith-based programme promoting voluntary fasting in addition to the standard programme (group A). Participants' dietary practices (i.e., voluntary fasting practices, frequency of fruit/vegetable consumption per week and quantity of carbohydrates/protein consumed per day), body mass index (BMI), blood pressure, fasting blood high-density lipoprotein cholesterol (HDL-C) and total cholesterol (TC):HDL-C ratio were assessed before Ramadan and three months post-Ramadan. **Results**: Voluntary fasting practices increased only in group A (P <0.01). Additionally, the quantity of protein/carbohydrates consumed per day, mean diastolic pressure and TC: HDL-C ratio decreased only in group A (P<0.01, 0.05, 0.02 and <0.01, respectively). Frequency of fruit/vegetable consumption per week, as well as HDL-C levels, increased only in group A (P=0.03 and <0.01, respectively). Although changes in BMI between the groups was not significant (P=0.08), BMI decrease among participants in group A was significant (P <0.01). **Conclusion**: Control of post-Ramadan weight gain was more evident in the faith-based intervention group. Healthcare providers should consider faith-based interventions to encourage weight loss during Ramadan and to prevent post-Ramadan weight gain among patients.

Scope 6

Diet Related Non-Communicable Disease

A randomized pilot study on the effects of combined tocotrienol-tocopherol mixed fraction and vitamin C on inflammatory status and lipid profile in statin-treated high risk patients

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Previous studies have suggested that combination of Tocotrienol tocopherol mixed fraction (TTMF) vitamin E and vitamin C supplementation act synergistically in vivo to enhance their anti-oxidant properties. However, additional effects beyond that of anti-oxidation of combined vitamin E and vitamin C in statin-treated high coronary risk patients remains unclear. The aim of this study was to investigate pleiotropic effects of TTMF and vitamin C on inflammatory biomarkers and lipid profile in statin-treated high coronary risk patients. This was a pilot, randomized, double-blind, placebo controlled clinical trial. Twenty nine high coronary risk hypercholesterolaemic subjects were randomized into TTMF+C (160 mg TTMF, 75% tocotrienol: 25% alpha-tocopherol plus 500mg vitamin C) intervention or placebo groups for 12 months. Blood samples were collected at entry, baseline, 2 weeks, 3, 6 and 12 months post-randomization for analysis of inflammatory biomarkers [(high sensitive C-reactive protein (hsCRP), interleukin-6 (IL-6), tumour necrosis factor alpha (TNFα)] and serum lipid profile [Total cholesterol (TC), low density lipoprotein cholesterol (LDL-c), high density lipoprotein cholesterol (HDL-c) and triglycerides (TG)]. There was no significant difference observed between TTMF+C and placebo groups with regards to percent change of hsCRP, IL-6 and TNF-α concentrations ($p>0.05$) and TC, LDL-c, TG and HDL-c ($p>0.05$) at baseline, 2 weeks, 3, 6 and 12 months of intervention. There was also no significant change seen in the mean concentration of all inflammatory biomarkers and serum lipid profile between TTMF+C and placebo groups at all timelines. TTMF and vitamin C supplementation did not significantly improve the inflammatory status and lipid profile. This could in part be contributed to the masking effect of statin's pleiotropic properties and the possibility of alpha tocopherol in the TTMF mixture attenuating the beneficial effects of pure tocotrienols.

Association of serum adiponectin levels with metabolic syndrome risk factors in Malay adults

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World Nutrition Journal, Vol 1(1), 2017, 17-22

Introduction: This study aimed to investigate the relationship between serum adiponectin and metabolic syndrome in adults living in rural Malaysia. **Methods**: A total of 299 Malay adults (men=124; women = 175) with a mean age 48.8 (11.7) years were recruited. Measurements for waist circumference and blood pressure were taken before drawing an overnight fasting blood samples. Biochemical tests for triglycerides, HDL cholesterol, glucose and serum adiponectin concentration

were measured. **Results**: Our results show that the adiponectin level in the subjects with metabolic syndrome was significantly lower than those without metabolic syndrome ($p < 0.05$). Among the metabolic syndrome risk factors, adiponectin level was significantly associated with hypertriglyceridemia and reduced HDL cholesterol ($p < 0.001$). **Conclusion**: The outcome from this study which highlights the association of hypoadiponectinemia with risk factors of metabolic syndrome in Malay adults, suggests that the reduced level of adiponectin may play a pivotal role in the development of metabolic syndrome in this ethnic group.

Cardiovascular risk factors among Malaysian diabetic patients

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International Archives of Medicine, Vol. 9(102), 2016, 1-7

Background: Diabetes mellitus is a major health problem that can lead to micovascular and macrovascular complications mainly cardiovascular diseases which is an important cause of morbidity and mortality among diabetic patients. **Aims**: The aim of this research is to discover the common health problems among Malaysian diabetic patients and to identify the predictors for cardiovascular diseases among those patients. **Study Design**: Cross sectional study. **Methods**: A retrospective review analysis of the records of diabetic patients who attended Hospital Universiti Sains Malaysia in 2010 was conducted. Two hundred and forty five diabetic patients' records were reviewed and analysed. **Results**: Cardiovascular diseases were reported in 19.6% among the diabetic patients. Those with cardiovascular disease have a longer duration of diabetes than those without cardiovascular disease (P=0.03). Total cholesterol level was higher among diabetics with cardiovascular disease than in those without cardiovascular disease (P=0.02). High density lipoprotein cholesterol level was lower among diabetics with cardiovascular disease (P=0.01). **Conclusion**: Predictors of cardiovascular disease were family history of premature cardiovascular disease, age risk, total cholesterol, low high density lipoprotein cholesterol, and duration of diabetes.

Compliance to dietary counselling in controlling blood lipid and its barriers among dyslipidemic individuals

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International Journal of Advanced Science Engineering Information Technology, Vol. 6(5), 2016, 697-702

Dyslipidemia is a risk factor causing cardiovascular disease and compliance to dietary counselling results in an improved lipid profile. The present study aimed to assess the compliance to dietary counselling and its barriers among dyslipidemic individuals attending dietary follow-ups counselling in Diet Clinic of Universiti Kebangsaan Malaysia Medical Centre (UKMMC). A cross sectional study

using the convenience sampling technique was conducted from May to June 2012. Data on food intake, lifestyle habits, physical activity level and barriers in adhering to dietary counselling were collected using interview-based questionnaires. Anthropometric measurements were conducted, while blood lipid profile and medical information were obtained from medical records. The results showed that non-compliance is prevalent among dyslipidemic patients who received dietary counselling. Most subjects (81%) were unable to achieve at least four of the therapeutic lifestyle change dietary recommendations as outlined by National Cholesterol Education Program Adult Treatment Panel III. Factors such as time, food taste and price have been reported as the main barriers to comply towards dietary counselling. A significantly higher proportion of those in non-compliance group did not meet total fat ($p< 0.001$) and saturated fat ($p< 0.001$) recommendations as compared to the compliance group. In conclusion, acknowledgements of barriers while providing dietary education are necessary to improve dyslipidemic patients' compliance with controlling blood lipid.

Cost effectiveness of exercise intervention and lifestyle counselling in prevention and control of diabetes mellitus: A review

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International Journal of Pharma and Bio Sciences, Vol. 6(4): (B), 2015, 566-576

Demographic transition, combined with urbanization and industrialization, has drastically changed global lifestyles. Consequently, lifestyle-related diseases like diabetes have emerged as major public health problems in all over the world. The increasing prevalence of diabetes mellitus has led to an unprecedented epidemic of death and disability worldwide. Despite this, little is known about what constitutes cost effective (CE) exercise intervention and lifestyle counselling to prevent and control diabetes within the global population. The objective of this paper was to assess the cost-effectiveness literature of exercise intervention and lifestyle counselling to prevent and control diabetes mellitus and improve the health status of the people. A systematic review has been done based on the published literature on cost effectiveness of exercise interventions to prevent and control diabetes mellitus. PubMed, Google Scholar, Scopus and Science Direct were searched in regards to identify cost effectiveness evaluation of exercise intervention and lifestyle counselling for preventing and controlling diabetes mellitus among populations around the world. In this review 5 studies reporting on exercise intervention and lifestyle counselling were included. Most of the studies were from the developed countries. 10 of the 12 exercises and lifestyle counselling interventions included in the analysis were found to be cost-effective by the respective studies. In the case of gestational diabetes it has been seen from the studies that any kind of exercise intervention and lifestyle counselling did not contribute towards cost effectiveness. Apart from that, every form of physical exercises was shown to be consistently cost-effective in the included studies. It has been observed in this review that only a small number of studies examined the cost-effectiveness of exercise intervention and lifestyle counselling to prevent and control diabetes in the world. Given the opportunities and benefits, it is an area where the health economics and public health fields can play an important role in improving the health of millions of people, fighting with the non-communicable metabolic disorder, named diabetes.

Diabetes mellitus and diet: few important facts to ponder
(Kencing manis dan diet: Beberapa fakta penting untuk direnungi bersama)

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Jurnal Sains Kesihatan Malaysia, Vol. 13(1), 2015, 33-37

Kencing manis (DM) adalah penyakit metabolik yang bercirikan hiperglisemia, di mana adanya gangguan dalam pengeluaran atau tindakan insulin atau gabungan kedua-duanya. Biasanya, terdapat beberapa faktor seperti faktor genetik, obesiti, gaya hidup tidak sihat, aterosklerosis dan juga tabiat pemakanan yang salah yang menyebabkan atau memburukkan DM. Biasanya, individu yang terlibat tidak mengambil berat tentang kesihatannya dan kesan daripada komplikasi DM ini boleh mendatangkan maut. Komplikasi DM melibatkan sistem kardiovaskular, otot, endokrin, buah pinggang dan sistem saraf di dalam badan. Rawatan komplikasi DM bukan sahaja mahal tetapi ia juga menjadi beban kepada keluarga yang terjejas. Kajian ini membincangkan cabaran yang dihadapi dalam menangani DM dengan mengambilkira diet dan tabiat pemakanan. Pengetahuan daripada pengambilan makanan yang betul juga boleh membantu memerangi komplikasi DM dan ini dapat menangani kadar kematian dan morbiditi.

Diabetic ketoacidosis at diagnosis of type 1 diabetes mellitus in Malaysian children and adolescents

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Malaysian Family Physician: The Official Journal of The Academy of Family Physicians of Malaysia, Vol 10(3), 2015, 11-18

Background: Diabetic ketoacidosis (DKA) is a late presentation of newly diagnosed type 1 diabetes mellitus (DM) in children. The aim of this study was to determine the clinical characteristics of type 1 DM at presentation so that appropriate actions can be taken to promote early diagnosis. **Methods**: This was a retrospective cohort review from a patient registry database. Data on all patients younger than 20 years old diagnosed with type 1 DM who had been registered with the Malaysian Diabetes in Children and Adolescents Registry (DiCARE) from its inception in 2006 until 2009 were analysed. **Results**: The study included 490 children and adolescents, out of which 57.1% were female. The mean (SD) age at diagnosis was 7.5 (3.7) years, which increased from year 2000 to 2009 [6.6 (3.3) years to 9.6 (3.5) years; p = 0.001]. An increasing percentage of DKA at diagnosis was observed from year 2000 (54.5%) to year 2009 (66.7%), which remained high and leveled between 54.5% and 75.0%. DKA was more common in patients with normal weight (p = 0.002) with no significant

association with age, gender, ethnicity and status of family history of diabetes mellitus. **Conclusion**: An increasing trend of age at diagnosis of patients with type 1 DM was observed. Besides that, proportion of DKA at diagnosis had remained high over the past decade. This study found that normal weight was associated with status of DKA, thus more detailed investigations are required to determine the risk factors for DKA.

Effects of adding tocotrienol-tocopherol mixed fraction and vitamin C supplementation on coronary risk biomarkers in patients with hypercholesterolaemia with moderate coronary risk

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This study was a prospective clinical trial to investigate the effects of adding combined tocotrienol - tocopherol mixed fraction (TTMF) and vitamin C (TTMF+C) supplementation on coronary biomarkers in non -statin and statin treated patients with hypercholesterolaemia (HC) with moderate coronary risk. A total of 35 patients were randomised at baseline into one of two groups, (G1) TTMF+C (320 mg TTMF plus 500mg vitamin C) alone daily and (G2) TTMF+C (320mg TTMF plus 500 mg vitamin C) plus atorvastatin 10 mg daily. The entire supplementation were taken for 12 months. Fasting serum samples were taken at baseline, 2weeks, 3months, 6months and 12months post-randomisation and analysed for inflammatory biomarkers; high sensitivity C reactive protein (hsCRP) and interleukin -6 (IL6). Combination of TTMF and vitamin C supplementation leads to neutral effects on lipid profiles and inflammation; with no ad ded benefit in statin-treated HC patients with moderate coronary risk. This neutral effects may be attributed to the tocopherol composition in TTMF which could possibly attenuate any potential beneficial effects of tocotrienols. Clinical studies using puretocotrienols in the absence of tocopherols would further confirm this.

Effects of adding tocotrienol-tocopherol mixed fraction and vitamin C on inflammatory status in hypercholesterolaemic patients in the low coronary risk category

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Biomedical Research and Therapy, Vol. 3(3), 2016, 557-566

Aim: This study is designed to investigate the effects of tocotrienol-tocopherol mixed fraction (TTMF), vitamin C and combined TTMF-vitamin C supplementations on serum lipids and biochemical markers of inflammation and endothelial activation in hypercholesterolemic subjects in the low-risk category. **Materials and Methods**: 78 hypercholesterolaemic subjects (total cholesterol of ≥ 5.2 mmol/L and low-density lipoprotein 3.4 – 4.9 mmol/L) in the low cardiovascular risk category according to the NCEP-ATP3 criteria were recruited. They were randomized into four treatment combination groups for a period of twelve months; (1) receiving TTMF and vitamin C, (2) receiving TTMF and placebo, (3) receiving vitamin C and placebo, and (4) receiving placebo for both. Serum fasting lipid profiles and levels of high-sensitivity C-reactive protein, interleukin-6, tumour necrosis factor-α, intercellular adhesion molecule, vascular cell adhesion molecule, E-selectin and homocysteine were measured at entry and multiple time points post-randomisation. **Results**: There were no significant differences in percentage changes of lipid profiles and inflammatory markers between treated and placebo groups for either single or combined antioxidants supplementations. **Conclusion**: TTMF, vitamin C and combined TTMF-vitamin C supplementations have neutral effects on lipid profiles and biochemical markers of inflammation and endothelial activation in low risk subjects, suggesting that they offer no added advantage in the low cardiovascular risk group.

Effects of substituting palm olein with carbohydrates on insulin sensitivity: A review

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Journal of Oil Palm Research, Vol. 28(3), 2016, 241-246

The role of palm olein on insulin resistance, which predisposes to disease progression of type 2 diabetes, is unclear. This article summarises the effects of substituting palm olein with carbohydrates on insulin sensitivity. Two intervention studies have reported conflicting findings. The RISCK (Reading, Imperial, Surreys, Cambridge and King's) study suggested that saturated fat-enriched diet consisting of mainly palm oil and milk fat did not differ from both high and low glycemic carbohydrates on insulin sensitivity in subjects at risk of developing metabolic syndrome. However, another study reported reduced insulin sensitivity after a diet enriched with palm olein and butter compared with high carbohydrate intake. No epidemiological data exist in this context. More clinical trials using solely palm olein in this area are needed. Further well-controlled large scale studies are needed to furnish the information on palm olein replacement with carbohydrates in diabetes prevention.

Efficacy of ascorbic acid (Vitamin C) and/ N-Acetylcysteine (NAC) supplementation on nutritional and antioxidant status of male chronic obstructive pulmonary disease (COPD) patients

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Antioxidant therapy has a potential to be introduced as therapeutic modality for chronic obstructive pulmonary disease (COPD) patients. This study aimed to determine the effect of antioxidant supplementation [ascorbic acid and N-Acetylcycteine (NAC)] on nutritional and antioxidant status in male (RCT) was conducted at two medical centers in Kuala Lumpur, Malaysia. Seventy-nine subjects were recruited and randomly divided into four trial arms (i.e., NAC, vitamin C, NAC + vitamin C and control groups) for six mo. The primary outcomes was changes in body mass index by estimating power of 90% and significance level of $p<0.05$. Repeated Measure ANOVA showed that there was a significant interaction effect on BMI ($p= 0.046$) and carbohydrate intake ($p= 0.030$), especially in the NAC group. Plasma glutathione (GSH) increased significantly in all intervention groups, especially in vitamin C ($p= 0.005$). A single supplementation of NAC or vitamin C improved nutritional and antioxidant status of subjects.

Nutrition and breast cancer risk: Review of recent studies

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Malaysian Journal of Public Health Medicine, Vol. 16 (1), 2016, 75-80

The association between nutrition and cancer in general had been a controversial issue between scientists in the last three decades, because some argued that there is a relationship and some nutrients can help in preventing cancer occurrence, although this has not been a consistent finding by other studies. Studies were identified through a systematic review of literature available on PubMed in between 1st January 2010 to 31st December 2013. We included all studies that assessed nutrition or diet with occurrence or mortality of breast cancer. Out of 42 articles, we included 8 articles in our screening and discussion. Among these 8 studies, there were 2 case-controls, 3 cohort and 3 randomized control trials (RCT) studies. Although most studies reported that nutrition is associated with decreased risk, some reported the contrary, whereas others reported no relation. It was demonstrated a conflict between the included papers in regards of the association between nutrition and breast cancer. These finding needs to be re-evaluated in future studies.

Nutritional status, glycemic control and its associated risk factors among a sample of type 2 diabetic individuals: A pilot study

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Journal of Research in Medical Sciences, Vol. 20(1), 2015, 40–46

Background: The prevalence of type 2 diabetes is increasing in Malaysia, with most patients poorly controlled. Hence, this study aimed to determine nutritional and metabolic status as well as blood pressure of Malaysian patients with type 2 diabetes mellitus and identify associated risk factors for poor glycemic control. **Materials and Methods**: A total of 104 type 2 diabetic patients were recruited and completed a questionnaire covering socio-demographic status, 3-day diet records, and physical

activity. Anthropometry and glycemic control parameters, lipid profile and blood pressure were also measured. **Results**: Subjects were on average 56.7 ± 9.9 years old with a mean duration of diabetes of 6.5 ± 5.0 years. The mean hemoglobin A1c of the subjects was 7.6% ± 1.4%, with only 20.2% achieving the target goal of <6.5% with no significant differences between genders. The mean body mass index was 26.9 ± 4.7kg/m2, with 86.5% either were overweight or obese. Only 10.6% of the subjects exercised daily. The proportions of macronutrients relative to total energy intake were consistent with the recommendations of most diabetes associations. The adjusted odds of having poor glycemic control were 3.235 (1.043-10.397) (P<0.05) higher among those who had high density lipoprotein cholesterol levels below the normal range. Those taking one or two types of oral anti-diabetic drugs had 19.9 (2.959-87.391) (P<0.01) and 14.3 (2.647-77.500) (P<0.01) higher odds of poor glycemic control respectively compared to those who were being treated by diet alone. **Conclusion**: Poor glycemic control was prevalent among Malaysian diabetic patients, and this could be associated with low levels of HDL and being treated with oral anti-diabetes agents.

Profiles and factors associated with poor glycemic control among impatients with diabetes mellitus type 2 as a primary diagnosis in a teaching hospital

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Indian Journal of Community Medicine, Vol. 41(3), 2016, 208–212

Context: Diabetes mellitus is a growing health problem in most countries. In Malaysia, there was an increase in prevalence over the years. This makes diabetes also a growing concern in Malaysia, which warrants strengthening of the prevention and control programme. **Aims**: This paper aims to describe the profiles of diabetes mellitus type 2 in tertiary setting and to identify the risk factors for high level of HbA1c among the study population. The findings will give a glimpse on current status of diabetes in our country and may reflect the achievement of the country in combating this disease. **Settings and Design**: A cross-sectional study was conducted in UKM Medical Centre. **Methods and Material**: Medical records of patient with E11 ICD-10 code were collected using Case Report Form. **Statistical Analysis Used**: Descriptive analysis done of mean and median while test of association were done using Spearman correlation and logistic regression. **Results**: The results showed that majority of inpatients of DMT2 showed mean age of 58.8 + 12.6 years and most were males (56.7%) with secondary level of education (41.7%). Median duration of disease was 12.0 + 11.0 years with median HbA1c level of 8.9 ± 4.4%. Only small proportion of patients achieved the desired level of HbA1c<6.5% (21.3%) and significant association was found with tertiary level of education [AOR=0.10, 95% CI=0.01-0.96] and with type of anti-diabetic therapy [AOR=15.90, 95% CI=1; 2.03-124.30]. **Conclusions**: In conclusion, diabetes mellitus type 2 inpatients still showed unsatisfactory glycemic control and holistic approach using health education should be advocated continuously in the future in view of education being one of the predictors for the good HbA1c outcome.

Relationship between quality of life and nutritional status in colorectal cancer patients undergoing chemotherapy

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Malaysian Journal of Nutrition, Vol. 23(3), 2017, 375-384

Introduction: Malnutrition is associated with poorer outcomes following treatment for colorectal cancer (CRC). This study evaluates the relationship between nutritional status using scored Patient Generated-Subjective Global Assessment (PG-SGA) with the validated European Organisation for Research and Treatment of Cancer questionnaire (EORTC-QLQ C30) which consists of five functional scales, three symptoms scales and one item of global health/quality of life (QOL). **Methods**: A total of 42 CRC patients at oncology outpatient clinics from two hospitals in Malaysia participated in the study from March 2011 to March 2012. The participants were classified as either well-nourished (PG-SGA A) or malnourished (PG-SGA B and C). **Results**: The majority of patients were Chinese, male, with a mean age of 57.1 ± 9.8 years and had been diagnosed with stage 2 CRC. Well-nourished patients had statistically significantly better QOL scores on symptom scales: fatigue ($p< 0.001$), nausea and vomiting ($p< 0.05$), and pain ($p< 0.001$) compared to malnourished patients. PG-SGA was strongly correlated with the main domains of the QOL: global health status ($r= -0.395$, $p<0.05$), fatigue ($r= 0.816$, $p< 0.001$), nausea and vomiting ($r= 0.730$, $p<0.001$) and pain ($r=0.629$, $p<0.001$). The better the nutritional status (lower total mean score of PG-SGA), the higher the QOL (high mean score of global health status). **Conclusion**: The scored PG-SGA is suitable for use as a nutrition assessment tool to identify malnutrition and it is associated with QOL among this population.

Sociodemographic factors associated with multiple cardiovascular risk factors among Malaysian adults

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BMC Public Health, Vol. 15(1), 2015, 68-75

Background: To determine the prevalence and sociodemographic correlates of multiple risk factors for cardiovascular disease (CVD) among Malaysian adults. **Methods**: We analysed data on 1044 men and 1528 women, aged 24–64 years, participants in the Non Communicable Disease Surveillance 2005/2006, a nationally representative, population-based, cross-sectional study. Prevalence of obesity, high blood pressure, dyslipidaemia, hyperglycemia, physical inactivity, smoking, risky drinking, low vegetable and fruit intake were determined and multivariable logistic regression was used to identify sociodemographic factors associated with having ≥3 of these cardiovascular disease risk factors. **Results**: The response rate was 84.6% (2572/3040). Overall, 68.4% (95% CI: 63.2, 73.1) had at least three risk factors. Among men, older age and Indian ethnicity were independently associated with having ≥3 CVD risk factors; while among women, older age, low education, and housewives were more likely to have ≥3 CVD risk factors. **Conclusion**: The prevalence of cardiovascular risk factors clustering among Malaysian adults is high, raising concerns that cardiovascular disease incidence will

rise steeply in the near future if no immediate preventive measures are taken. The current national health education and promotion programmes pertaining to modifiable risk factors can be further improved by taking into account the sociodemographic variation in CVD risk factors clustering.

Tocotrienol and cancer metastasis

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International Union of Biochemistry and Molecular Biology, Vol. 42(2), 2016, 149–162

Tumor metastasis involves some of the most complex and dynamic processes in cancer, often leading to poor quality of life and inevitable death. The search for therapeutic compounds and treatment strategies to prevent and/or manage metastasis is the ultimate challenge to fight cancer. In the past two decades, research focus on vitamin E has had a shift from saturated tocopherols to unsaturated tocotrienols (T3). Despite sharing structural similarities with tocopherols, T3 strive to gain scientific prominence due to their anti-cancer effects. Recent studies have shed some light on the anti-metastatic properties of T3. In this review, the roles of T3 in each step of the metastatic process are discussed. During the invasion process, signaling pathways that regulate the extracellular matrix and tumor cell motility have been reported to be modulated by T3. Although studies on T3 and tumor cell migration are fairly limited, they were shown to play a vital role in the suppression of angiogenesis. Furthermore, the anti-inflammatory effect of T3 could be highly promising in the regulation of tumor microenvironment, which is crucial in supporting tumor growth in distant organs.

Traditional cardiovascular risk-factors among healthcare workers in Kelantan, Malaysia

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We conducted a cross sectional study of cardiovascular risk factors among healthcare workers at four government hospitals in Kelantan, Malaysia. We randomly selected 330 subjects fulfilling the following study criteria: those who had been working for at least one year at that health facility, Malaysians citizens and those with some form of direct contact with patients. We conducted an interview, obtained physical measurements, a fasting blood sugar and fasting lipid profiles among 308 subjects. The mean age of the subjects was 43.5 years, 82% were female; 30.8%, 14.3%, 10.4%, 1.3% and 1.6% of the subjects had dyslipidemia, hypertension, diabetes mellitus, a history of stroke and a history of ischemic heart disease, respectively. Forty-two percent of subjects had at least one medical condition. The mean body mass index (BMI) was 27.0 kg/m^2 (SD=4.8) and 24.3% had a BMI > or =30 kg/m^2. The mean systolic and diastolic blood pressures were 121.5 mmHg (SD=14.0) and 76.5 mmHg (SD=9.7), respectively and the mean waist-hip ratio was 0.84 (SD=0.1). The mean fasting blood sugar, total cholesterol, triglyceride, high density lipoprotein and low density lipoprotein were 5.8 mmol/l (SD=2.4), 5.5 mmol/l (SD=1.0), 1.4 mmol/l (SD=0.9), 1.5 mmol/l (SD=0.3) and 3.5 mmol/l (SD=0.9), respectively. Our study population had a smaller proportion of hypertension than that of the general Malaysian population. They had higher fasting total cholesterol, slightly lower fasting blood sugar, with

a large proportion of them, obese and had diabetes. Immediate intervention is needed to reduce the traditional cardiovascular risk factors in this population.

Undiagnosed type 2 diabetes mellitus and its risk factors among Malaysians: Findings of a nationwide study

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International Journal of Public Health Research, Vol. 6(1), 2016, 677-684

Introduction: The prevalence of Type 2 diabetes mellitus (T2DM) is increasing worldwide and many of these affected individuals remain unidentified. Undiagnosed T2DM may impose substantial public health implications because these individuals remain untreated and at risk for complications. The objective of this study was to determine the national prevalence of undiagnosed T2DM and to identify the associated risk factors. **Methods**: A nationwide cross-sectional study was conducted involving 17,783 respondents. Two-stage stratified sampling design was used to select a representative sample of the Malaysian adult population. Structured validated questionnaires with face to face interviews were used to obtain data. Respondents, who claimed that they were not having diabetes, were then asked to perform a fasting blood glucose finger-prick test by Accutrend GC machine. **Results**: The prevalence of undiagnosed T2DM was 8.9% (n=1587). The highest percentage of undiagnosed T2DM was found among males (10.2%), 55-59 years old (13.4%), highest education attainers of primary school (11.1%), Indians (10.3%), married (10.3%), working (8.9%) and living in the urban areas (9.2%). Multivariate analyses showed that factors associated with undiagnosed T2DM were gender, age group, ethnicity, marital status, obesity and hypertension. **Conclusion**: This study found an increasing trend of undiagnosed T2DM in Malaysia compared to 2006. This finding is alarming as risk factors associated with undiagnosed diabetes were related to most of the socio-demographic factors studied. Therefore, early diabetic screening is crucial especially among adults aged 30 and above to prevent more serious complications of this disease.

Variations in diabetes prevalence in low, middle, and high income countries: Results from the prospective urban and rural epidemiological study

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Diabetes Care, Vol 39, 2016, 780-787

Objective: The goal of this study was to assess whether diabetes prevalence varies by countries at different economic levels and whether this can be explained by known risk factors. **Research Design and Methods**: The prevalence of diabetes, defined as self-reported or fasting glycemia ‡7 mmol/L, was documented in 119,666 adults from three high-income (HIC), seven uppermiddle-income (UMIC), four lower-middle-income (LMIC), and four low-income (LIC) countries. Relationships between diabetes and its risk factors within these country groupings were assessed using multivariable analyses. **Results**: Age- and sex-adjusted diabetes prevalences were highest in the poorer countries and lowest in the wealthiest countries (LIC 12.3%, UMIC 11.1%, LMIC 8.7%, and HIC 6.6%; P < 0.0001). In the overall population, diabetes risk was higher with a 5-year increase in age (odds ratio 1.29 [95% CI 1.28–1.31]), male sex (1.19 [1.13–1.25]), urban residency (1.24 [1.11–1.38]), low versus high education level (1.10 [1.02–1.19]), low versus high physical activity (1.28 [1.20–1.38]), family history of diabetes (3.15 [3.00–3.31]), higher waist-to-hip ratio (highest vs. lowest quartile; 3.63 [3.33 3.96]), and BMI (‡35 vs. <25 kg/m^2; 2.76 [2.52–3.03]). The relationship between diabetes prevalence and both BMI and family history of diabetes differed in higher- versus lower-income country groups (P for interaction < 0.0001). After adjustment for all risk factors and ethnicity, diabetes prevalences continued to show a gradient (LIC 14.0%, LMIC 10.1%, UMIC 10.9%, and HIC 5.6%). **Conclusions**: Conventional risk factors do not fully account for the higher prevalence of diabetes in LIC countries. These findings suggest that other factors are responsible for the higher prevalence of diabetes in LIC countries.

What are the direct medical costs of managing type 2 diabetes mellitus in Malaysia?

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Introduction: An economic analysis was performed to estimate the annual cost of diabetes mellitus to Malaysia. **Methods**: We combined published data and clinical pathways to estimate cost of follow-up and complications, then calculated the overall national cost. Costs consisted of diabetes follow-up and complications costs. **Results**: Patient follow-up was estimated at RM459 per year. Complications cost were RM 42,362 per patient per year for nephropathy, RM 4,817 for myocardial infarction, RM 5,345 for stroke, RM3,880 for heart failure, RM5,519 for foot amputation, RM479 for retinopathy and RM4,812 for cataract extraction. **Conclusion**: Overall, we estimated the total cost of diabetes as RM2.04 billion per year for year 2011 (both public and private sector). Of this, RM1.40 billion per year was incurred by the government. Despite some limitations, we believe our study provides insight to the actual cost of diabetes to the country. The high cost to the nation highlights the importance of primary and secondary prevention.

Scope 7

Nutrient and Non-nutrient Components in Foods

Amount and types of sugars in selected commercial and traditional kuih in Klang Valley, Malaysia

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International Food Research Journal, Vol. 22(6), 2015, 2642-2649

The aim of this study was to determine the specific content and type of sugars in selected commercial and traditional kuih in Klang Valley. The selection of the kuih was based on the validated Food Frequency Questionnaire (FFQ) for sugar. The selected commercial kuih was doughnut coated with sugar (Big Apple) while the ten traditional kuih samples consisted of kuih bingka ubi, kuih kasui, kuih keria, kuih koci, kuih lapis, kuih lopes, kuih onde-onde, kuih sagu, kuih seri muka and kuih talam. The doughnut coated with sugar (Big Apple) was purchased from Big Apple Donuts and Coffee franchise at two different locations, while the traditional kuih were randomly bought from stalls, cafeterias and restaurants around Kuala Lumpur and Rawang. The types and amount of sugar were determined using High-Performance High Chromatography (HPLC) with a refractive index (RI) detector. Results showed that doughnut coated with sugar (Big Apple) has the highest starch content (22.6 ± 0.3 g/100g) and kuih keria contained the highest available carbohydrate (41.5 ± 1.7 g/100g), comprising of 24.2 ± 2.4 g/100g total sugar and 17.3 ± 0.7 g/100g of starch. The least available carbohydrate content was found in kuih talam (20.0 ± 0.5 g/100g), which was 50% lower than the one in kuih keria. Major individual sugars detected in all kuih samples were consisted of sucrose (60.0%), glucose (16.2%), fructose (14.0%), maltose (9.5%) and lactose (0.3%). Majority of the kuih samples (90.9%) in this study can be categorized as medium sugar while only kuih keria was categorized as high sugar. Based on the two main ingredients (sugar and flour) used in the preparation of kuih, results showed that all kuih samples can be categorized as medium sugarmedium starch. In conclusion, this study served as a guideline by locals in selecting kuih of different sugar levels.

Anti-obesity and antioxidant activities of selected medicinal plants and phytochemical profiling of bioactive compounds

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The present study describes the screening of eight herbs namely *Cosmos caudatus, Pluchea indica, Lawsonia inermis, Carica papaya, Piper betle, Andrographis paniculata, Pereskia bleo,* and *Melicope lunu* based on their antiobesity and antioxidant activities. Out of all tested herbs, *Cosmos caudatus* demonstrated excellent anti-obesity and antioxidant potential with pancreatic lipase inhibitory effect (21.7 ± 1.3%) and DPPH radical scavenging activity (IC_{50} value of 31.98 ± 1.22 µg/mL). *Cosmos caudatus* was selected for further studies and extracting solvent composition with best anti-obesity and antioxidant potential was identified. Hundred percent *Cosmos caudatus* ethanolic extract was

found to be the most effective and showed highest anti-obesity and antioxidant activities. Moreover, metabolite profiling of Cosmos caudatus extract was also carried out using UHPLC-MS/MS. The analysis depicted the presence of quercetin-3-rhamnoside, catechin, kaempherol, kaempherol glucoside, quercetin, quercetin-3-glucoside, quercetin-O-pentoside, quercetinrhamnosyl galactoside, quinic acid, 1-caffeyolquinic acid, monogalloyl glucose, and procyanidin B1. Results revealed *Cosmos caudatus* as promising medicinal plant for the development of new functional food with prodigious applications in obesity.

Chemical properties and fatty acid composition of *Mangifera panjang* and *Mangifera indica* kernel fats

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Malaysian Journal of Nutrition, Vol. 21(3), 2015, 355-363

Introduction: This study aimed to determine chemical properties and fatty acid composition of kernel fats of *Mangifera pajang* (MP) and *Mangifera indica* (MI), and compare the results with that of cocoa butter from literature. **Methods**: Chemical properties of the extracted crude fats were determined for iodine value, peroxide valueand saponification value using AOAC methods, whereas acid value of the mango kernelswas determined based on AOCS method. Saturated fatty acid (SFA), monounsaturated fatty acid (MUFA) and polyunsaturated fatty acid (PUFA) were also determined using gas chromatography-flame ionisation detection method. **Results**: The results showed that kernel fats of MI and MP had low chemical values. The fatty acid compositions of MP kernel fat comprised 55.4%, 39.3% and 5.3% of SFA, MUFA and PUFA, respectively. The total PUFA of MP kernel fat (5.3%) was lower than the total PUFA of MI kernel fat (6.1%). **Conclusion**: Due to the similarity of the fatty acid composition between mango kernel fat and cocoa butter, it is suggested that the kernel fat of MP has potential as a substitute for cocoa butter or hydrogenated fat in confectionary products.

Cholesterol and alpha-tocopherol contents of fish and other seafood from the Straits of Malacca

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International Food Research Journal, Vol. 22(4), 2015, 1494-1500

This study was conducted to determine the cholesterol and alpha-tocopherol contents of 20 marine fish and four other seafood from the Straits of Malacca. Cholesterol and alphatocopherol contents of the fish and other seafood were determined using high-performance liquid chromatography. The results showed that most of the fish contained low amounts of cholesterol, except sixbar grouper (*Epinephelus fasciatus*), long-tailed butterfly ray (*Gymnura* sp.), yellowstripe scad (*Selaroides*

leptolepis), cuttlefish (*Sepia officinalis*), large-scale tongue sole (*Cynoglossus arel*), and longtail shad (*Hilsa macrura*) that contained high amounts of cholesterol (119.39-353.97 mg/100 g wet samples). Indian mackerel (*Rastrelliger kanagurta*), giant seaperch (*Lates calcarifer*), prawn (*Metapenaeus affinis*), and moonfish (*Trachinotus blochii*) had high alpha-tocopherol contents (462-989 μg/100 g wet sample). Regular consumption of fish and other seafood is highly recommended partly due to the high alphatocopherol content. Due to the high cholesterol in certain types of fish, consumption of the fish fillets of sixbar grouper, long-tailed butterfly ray, yellowstripe scad, cuttlefish, and large scale tongue sole should be <100 g per day and <50 g per day for longtail shad. Validation of the analytical method also showed a high accuracy and reproducibility of the HPLC method.

Comparison of heavy metal levels in natural spring and bottled drinking water in Klang Valley, Malaysia

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A spring is a result of karsts topography where surface water has infiltrated the earth's surface recharge area, becoming part of groundwater and emerges from below to become natural spring water. From few observations, local people tend to consume this water directly for many health reasons. The objective of the study was to determine the concentration of lead (Pb) and cadmium (Cd) in natural water resources and bottled drinking water sources, and compared with the existing standard. This field assessment was carried out in 2014 as part of the educational module for public health master student. About 13 water samples were collected directly from the tubing into the pre-washed sample bottle and rinse with the sampling water in the field. Sample preservation was achieved by acidifying to pH less 4.0 with nitric acid (HNO_3). Samples were stored in a cooler with temperature between 0 to 4oC. Heavy metals were analysed by standard method for graphite furnace atomic absorption spectrophotometer (GFAAS) with Zeeman's correction. Pb and Cd content were analysed from 13 samples which consists of eight natural spring water and five flavoured bottled drinking water. The result showed that Pb content in spring water ranges between 1.8 and 37.3 ppb, while the Cd content in spring water ranges between 3.0 and 23.0 ppb. In the commercialised drinking water, the amount of Pb ranges between 0.4 and 2.6 ppb, while the content of Cd ranges between 0.8 and 7.0 ppb. This study indicates that there are high content of Pb and Cd in most of the natural spring water points and some bottled drinking water that are available within Klang Valley. In the absence of any specific point sources, the possibility of urban area and high traffic source leading to run off as well as rock types may result in variations observed. Hence, very worrying, especially that these sources of water were consumed directly as drinking water or eye drops without knowing its content. Further tests, coupled with supportive soil and conductivity studies, are required to test all possible similar natural sources to safeguard the health of people.

Dietary fiber and total phenolic content of selected raw and cooked beans and its combinations

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Beans are distinctive among a diverse and broad class of legumes. Certain health products claimed their products are high in dietary fibers and total phenolic content (TPC) because they applied bean combinations. This study aimed to determine the dietary fibers and TPC of raw and cooked beans and its combinations. Individual beans studied were kidney bean, mung bean and chickpea. Bean combinations were done by mixing each of the homogenized beans flour in the ratio of 1:1 (w/w) and 1:1:1 (w/w/w). Dietary fibers were determined using enzymatic gravimetrical method whereas TPC was determined spectrophotometrically. Results showed the insoluble dietary fiber (IDF), soluble dietary fiber (SDF), total dietary fiber (TDF) and TPC for individual raw beans varied from 20.52 to 26.61 g/100 g, 1.20 to 2.45 g/100 g, 22.08 to 27.81 g/100 g and 0.48 to 1.04 mg GAE/g, respectively. For raw bean combinations, the IDF, SDF, TDF and TPC varied from 20.74 to 23.96 g/100 g, 2.3 to 2.50 g/100 g, 23.05 to 26.46 g/100 g and 0.80 to 0.85 mg GAE/g, respectively. No significant different (p > 0.05) in IDF and SDF for raw bean combinations and individual raw beans. Meanwhile, certain raw bean combinations contained significant higher ($p < 0.05$) TDF and TPC than individual raw beans. The IDF, SDF, TDF and TPC for individual cooked beans varied from 14.49 to 26.30 g/100 g, 1.40 to 2.02 g/100 g, 15.88 to 28.31 g/100 g and 0.57 to 1.20 mg GAE/g, respectively. For cooked bean combinations, the IDF, SDF, TDF and TPC varied from 15.73 to 23.03 g/100 g, 1.73 to 2.36 g/100 g, 17.46 to 24.95 g/100 g and 0.61 to 1.08 mg GAE/g, respectively. After cooking, the IDF, SDF, TDF and TPC of certain beans combinations were significantly higher ($p \leq 0.05$) than individual beans. This study supports the proposal that bean combinations can possibly be used as a method to increase the amount of dietary fibers and TPC.

Effect of oyster mushroom (*Pleurotus sajorcaju*) addition on the nutritional composition and sensory evaluation of herbal seasoning

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The present study was conducted to investigate the effect of oyster mushroom (*Pleurotus sajorcaju*, PSC) addition to partially replace coconut milk powder on nutritional composition and sensory values of Herbal Seasoning (HS). This study evaluates the nutritional composition, dietary fibre and sensory acceptance of HS that processed using six different formulations with different levels of PSC powder, namely 0% (A), 20% (B), 40% (C), 60% (D), 80% (E) and 100% (F). The use of PSC powder substantially brought down the fat content of HS. The fat content of PSC-based HS was ranged from 13.82 ± 0.84% to 8.16 ± 0.74%. The protein content showed an increasing trend in line with increasing of PSC powder ranging from 7% to 12%.Substitution of coconut milk powder with PSC powder resulted in significantly higher ($p<0.05$).The panels preferred HS formulated with PSC powder since its enhance colour and viscosity attributes of the products. In brief, HS formulated with more than 40% PSC powder is recommended since it has significant nutrients and palatably accepted by sensorial panellists.

Effect of *Pleurotus Sajor-Caju* addition on proximate compositions, total dietary fiber and acceptance of herbal seasoning stored at 0 and 6 month

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Convenience food is highly demanded in the current market. The purpose of the present study is to investigate the effect of *Pleurotus sajor-caju* (PSC) powder addition on proximate composition, total dietary fibre (TDF) and sensory acceptability of herbal seasoning (HS) stored at 0 and 6 months. A total of six formulations with different percentage of PSC powder at 0, 20, 40, 60, 80 and 100% were used. The addition of different percentage of PSC powder showed an increment in moisture, ash and protein content, while the fat content and carbohydrate were decreased during 0 month of storage. Addition of PSC powder resulted in significant higher (p<0.05) TDF content (15.0-23.0%) in 0 month. However, the content of TDF was reduced at 6 months (8.0-15.3%). The sensorial panels prefer HS formulated with PSC powder in enhancement of colourand viscosities attributes of the products for 0 month. However, after storage for 6 months, aroma and colour acceptance influenced the acceptability of HS. In brief, HS formulated with more than 80% PSC powder is recommended, since it has significant nutritional values and palatably accepted by sensorial panellists throughout the shelf life study conducted.

Effects of brown rice powder addition on nutritional composition and acceptability of two selected Malaysian tradisional rice-based local kuih

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The present study was conducted to investigate the effects of brown rice (BR) powder addition on the proximate composition, total dietary fibre content and acceptability of some selected Malaysian traditional rice-based local kuih. Two types of kuih samples, namely Kuih Lompang (KL) and Kuih Talam Pandan (KTP) were prepared at the levels of either 0%, 10%, 20% or 30%. The kuih samples were analyzed for nutritional composition and sensory acceptance. There was significant increase in total dietary fibre content (from 2.64 g/100 g to 3.15 g/100 g) and protein content (from 2.36% to 2.51%) with the incorporation of 90% BR powder in the KL formulation. The moisture (from 36.79% to 36.83%), ash (from 1.11% to 1.21%) and fat (from 8.51% to 8.73%) content were not significantly affected for all percentages of BR powder addition. For KTP, the addition of BR powder at the level of 90% significantly increased the total dietary fibre (from 2.77 g/100 g to 3.45 g/100 g), fat (from 5.73% to 6.95%) and moisture (from 64.10% to 64.12%) content as compared to the control (0%). However, the protein content was not significantly affected (from 3.41% to 3.59%). On the other hand, there was no significant difference for all sensory attributes of KL formulated with 30-90% of BR powder as compared to the control (0%). The sensory score of KTP added with 30-90% BR powder received significantly lower sensory score compared to the control sample (0%) for appearance, colour, firmness, adhesiveness, chewiness, taste and overall acceptance attributes. In summary, sensory evaluation showed that all BR-incorporated KL were acceptable, while only 30% addition of BR powder in KTP was acceptable. Thus, BR powder is potentially used in improving the nutritional composition of KL. However, further study is needed to improve palatability aspect of KTP formulated with BR powder.

Evaluation of brans of different rice varieties for their antioxidative and antihyperglycemic potentials

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The aim of this study was to compare the antioxidant and antihyperglycaemic potentials of bran extracts of seven traditional rice varieties against those of three commercial varieties. The total polyphenolic content and antioxidant activities, the amylase and α-glucosidase inhibitory potentials of the rice bran extracts were studied in vitro using relevant assays. The results showed that the rice bran extracts of traditional varieties namely, *Beras merah* and *Beras hitam* displayed significantly higher a-glucosidase inhibition (96.56 and 81.52%) and a-amylase inhibition (88.44 and 84.27%) than the other varieties. Being high in polyphenolic content, they tended to display better anti-oxidant capacities than the commercial varieties. Hence, brans of traditional rice varieties such *Beras merah* and *Beras hitam* could be potentially useful as raw materials for nutritional supplements and natural anti-diabetic agents.

Evaluation of mutagenic profile of shrimp paste extracts by using AMES test

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Shrimp paste (belacan) has been used as a condiment in many Malaysian cooking. This study aimed to determine the mutagenicity of aqueous extract of shrimp paste from three different places in Pulau Pinang, Malaysia (Balik Pulau, Juru and Pulau Aman) by using Ames test. The test was performed using *Salmonella typhimurium* strain, TA98 and TA100, in presence and absence of S9 metabolic activation system. Five concentrations of the samples tested were 50, 25, 12.5, 6.25 and 3.125 mg/ml. Macronutrients and mineral content of shrimp paste tested were complied with the Malaysian food act 1983 and Recommended Nutrient Intake (RNI) 2005. Ames test result of shrimp paste from all three places showed number of revertant colonies did not exceed the value of double-fold of negative control either in presence and absence of S9. No significant difference ($p>0.05$) was found for each concentration tested on the number of revertant colonies between TA 98 and TA 100.

Extracts of peel and different parts of MD2 Pineapple as potent nutraceuticals

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MD2 pineapple [*Ananas comosus* L.] flesh is usually eaten fresh, whereas the peel and core are disposed as waste. The peel and core as by-products are believed to be a potential source of antioxidants, which remained unproven. This study aimed to investigate the antioxidant properties of MD2 pineapple parts using 80% ethanol as an extracting solvent. The mixture of peel, flesh, and core was also tested to understand its total phenolics and antioxidant activities. Total phenolic content

(TPC) was determined using the Folin-Ciocalteu reagent method, while total flavonoid content (TFC) was determined using the aluminium chloride colorimetric method. Total antioxidant activities were estimated by the DPPH free radical scavenging assay and ferric ion reducing antioxidant power (FRAP) assays. The pineapple flesh had the highest moisture content, while the peel had the lowest. The results showed that the TPC of the samples (mean ± SD) ranged from 6.14 ± 0.07 to 8.31 ± 0.28 mg gallic acid equivalent/g dry weight and TFC ranged from 2.63 ± 0.14 to 5.46 ± 0.26 mg quercetin equivalent/g dry weight with the pineapple peel having the highest TPC and TFC values. The TPC values were significantly different among various sample parts, but those of pineapple flesh and core did not significantly differ. EC_{50} values obtained from the DPPH assay ranged between 37.25 ± 2.70 µg/mL and 54.68 ± 3.65 µg/mL and there were no significant differences among the samples except for the peel. The result also showed that the EC_{50} values of the flesh, core, and mixture of pineapple samples were significantly higher than the gallic acid standard. The FRAP values for all samples ranged from 1.033 ± 0.53 to 1.25 ± 0.25 mM Fe^{2+}/g dry weight with the pineapple peel having the highest FRAP value; it was significantly higher than the other parts. Additionally, the pineapple peels had the EC50 and FRAP values comparable with the gallic acid standard. The result of Pearson's correlation analysis revealed that there were significant correlations between the total phenolics and antioxidant activities (p<0.05). In short, the MD2 pineapple peel possesses the higher total phenolics and antioxidant activities than the other pineapple parts and can be considered as a new source of natural antioxidants.

Fractionation and biological activities of water-soluble polysaccharides from Sclerotium of Tiger Milk Medicinal Mushroom, *Lignosus Rhinocerotis* (Agaricomycetes)

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This study investigated antioxidant and anti-inflammatory properties, and the direct cytotoxic effect of *Lignosus rhinocerotis* fractions, especially the polysaccharide fraction, on nasopharyngeal carcinoma cells. *L. rhinocerotis* crude extract was obtained through hot water extraction. The precipitate saturated with 30% ammonium sulfate was purified with ion-exchanged chromatography. Gel permeation chromatography multiangle laser light scattering analysis equipped with light scattering and UV signals revealed two district groups of polymers. A total of four peaks were observed in the total carbohydrate test. Fraction C, which was the second region of the second peak eluted with 0.3 M NaOH, showed the highest integrated molecular weight, whereas fraction E had the lowest integrated molecular weight of 19,790 Da. Fraction A contained the highest β-D-glucan content. Enzymatic analysis showed that most of the polysaccharide fractions contained β-1-3 and β-1-6 skeletal backbones. The peak eluted with 0.6 M NaOH was separated in fraction D (flask 89-92) and fraction E (93-96). The results showed that fraction E expressed higher antioxidant activities than fraction D whereas fraction D expressed higher chelating activity than fraction E. The extract saturated with 30% ammonium sulfate exhibited higher reducing power than the extract saturated with 100% ammonium sulfate. Fractions D and E significantly inhibited the secretion of tumor necrosis factor- in lipopolysaccharide-stimulated RAW 264.7 macrophages in a dose-dependent manner. There was no apparent difference in the viability of cells exposed or unexposed to *L. rhinocerotis fractions*.

Glycaemic index of commercially available brown rice in East Coast of Peninsular Malaysia

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Rice is a staple routine food of huge world population including Malaysian. Two brown rice varieties commercially available in East Coast of Peninsular Malaysia were investigated for its Glycemix Index values (GI). The total dietary fiber contents of Long grain specialty 1 (LGS1) and Long grain specialty 2 (LGS2) were 4.19g and 4.79g/100g and significantly higher than white rice which had low dietary fiber (0.15g/100g). Both LS1 and LS2 brown rice samples had 21 % amylose content. The LS1 brown rice had GI value of 64±6.3 while LS2 had GI value of 72±6.6. The difference between mean iAUC of LS1 and LS2 was statistically significant (p=0.6). The iAUC value of LS1 was 110 mmol.min/L while iAUC value of LS2 was 127 mmol.min/L. LS1 could be categorized as having Medium GI while the LS2 was found to have High GI values. The main factors which influence the GI value of rice are specifically the chemical properties such as amylose content and gelatinization process.LS1 could be categorized as having Medium GI while the LS2 was found to have high GI values.

Glycaemic index values and physicochemical properties of five brown rice varieties cooked by different domestic cooking methods

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Background: The prevalence of diabetes has increased dramatically in recent decades in the regions where people excessively consume white rice. Due to higher nutritional values and bioactive components, low to medium glycaemic index (GI) brown rice could be a potential alternative to white rice in these regions. **Methods**: Five varieties, Chiang (CH), Sungyod (SY), Lepnok (LP) from Thailand, Long grain specialty 1 (LS1) and Long grain specialty 2 (LS2) from Malaysia were tested for GI. Ten test foodswere prepared from 5 varieties by 2 cooking techniques (pressure cooker, PC and rice cooker, RC). Overnight fasted 10healthy subjects were fed with 25 g glucose as a reference food (RF) on 3 occasions and amount equivalent to 25 g available carbohydrate portion of test food (TF) on 1 occasion in separate days. Fasting and post-prandial capillary blood glucose was measured via finger-prick methods at 0, 15, 30, 45, 60, 90 and 120 min, and the incremental area under curve (iAUC) was determined. The GI of each TF was calculated as percentage of incremental area under curve (iAUC) of TF over RF. **Results**: The mean GI values of SY (72 –81, high), CH and LP (59 –65, medium) and LS1and LS2 (64 –73, medium to high) for cooking were discovered by PC and RC methods. The GI did not vary significantly (p>0.05) among varieties as well as between cooking methods. GI showed a significant negative correlation with the amylose content (r=–0.70, p<0.05) and significant positive

correlation with cold peak viscosity (r=0.80, p<0.01).**Conclusions**: All five rice varieties irrespectively of the cooking method used are classified as medium to high GI foods. Medium GI varieties could have potential of being used in diabetic diet. Cooking methods did not significantly alter the glycaemic characteristics of the studied varieties. Amylose content and pasting properties can be used for predicting GI of brown rice. It is urgent to explore low GI brown rice varieties in these regions.

Identification of phenolic compounds in polyphenols-rich extract of Malaysian cocoa powder using the HPLC-UV-ESI—MS/MS and probing their antioxidant properties

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The antioxidant components of cocoa powder, which is rich in polyphenols, were isolated using column chromatography and high performance liquid chromatography. Polyphenolic compounds were then characterized by high-performance liquid chromatography/Ultraviolet and electronspray ionization—tandem mass spectrometry (HPLC-UV-/ESI-MS-MS). As a result, five phenolic compounds were detected. In this study we also investigated scavenging or the total antioxidant capacity (%) of cocoa polyphenol (CP) fractionated from cocoa powder extract. 114.0 mg/g of gallic acid –equivalent phenolics and 94.3 mg/g catechin- equivalent flavonoids were quantified in this extract. Their free radical-scavenging activity was assessed by 1,1-diphenyl-2-picrylhydrazyl radical (DPPH) assay, -carotene bleaching test, and xanthine oxidase inhibitory activity (OX). Total antioxidant capacity (TAC) was further assessed against the myoglobin-induced oxidation of 6-hydroxy-2, 5, 7, 8-tetramethylchroman-2-carboxylic acid (ABTS) and expressed as Trolox equivalent. A high correlation between TAC and phenolic contents indicated that phenolic compounds from cocoa were a major contributor of antioxidant activity (0.967≤r≤1.00). CP extract had significantly (P<0.05) potential antioxidant activities with various concentrations. These results suggest that Polyphenols-rich cocoa extract possess prominent medical properties and can be exploited as natural drug to treat free radical associated diseases.

Impact of phytic acid on nutrient bioaccesibility and antioxidant properties of dehusked rice

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Whole grains consumption promotes health benefits, but demonstrates controversial impacts from phytic acid in meeting requirements of good health. Therefore, this study was aimed to determine the

nutrient bioaccessibility and antioxidant properties of rice cultivars named BAdan^ or BBario^ and deduce the nutritional impact of phytic acid. Majority of the dehusked rice in the collection showed an acceptable level of in-vitro starch digestibility and in-vitro protein digestibility, but were poor in antioxidant properties and bioaccessibility of minerals (Ca, Fe and Zn). The drawbacks identified in the rice cultivars were due to relatively high phytic acid content (2420.6 ± 94.6 mg/100 g) and low phenolic content (152.39 ± 18.84 g GAE/g). The relationship between phytic acid content and mineral bioaccessibility was strongest in calcium (r=0.60), followed by iron (r=0.40) and zinc (r=0.27). Phytic acid content did not significantly correlate with in-vitro starch digestibility and in-vitro protein digestibility but showed a weak relationship with antioxidant properties. These suggest that phytic acid could significantly impair the mineral bioaccessibility of dehusked rice, and also act as an important antioxidant in nonpigmented rice. Bario rice cultivars offered dehusked rice with wide range of in-vitro digestibility of starch and protein, and also pigmented rice as a good source of antioxidants. However, there is a need to reduce phytic acid content in dehusked rice for improved mineral bioaccessibility among Bario rice cultivars.

Influence of geographical origins on the physicochemical properties of Hass avocado oil

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A study was conducted to compare the physicochemical properties of Hass avocado oil from different geographical locations (Mexico, Australia, United States and New Zealand). Regardless of geographical origins, Hass avocado pulp was characterized by high lipid content (61.27–62.66%). Among Hass avocados of different origins examined, avocado oil of New Zealand origin exhibited the lowest saponification value. The *L**, *a** and *b** values for avocados of New Zealand origin were higher than others, translating into the oil being the lightest in color and containing more red and yellow pigments. The predominant fatty acids in the Hass avocado oil were oleic (42.59–50.97%) and palmitic (20.61–25.63%) acids, whereas the predominant triacylglycerols (TAGs) were OOO (21.41–34.69%) and POO (19.65–24.68%), where O and P denote oleic and palmitic acids, respectively. The melting curves of Hass avocado oil displayed three endothermic peaks, whereas the crystallization curves displayed two endothermic peaks. Hass avocado oil of New Zealand origin contained a significant amount of natural pigments and unsaturated compounds (unsaturated fatty acids and tri-unsaturated TAGs) than Mexico, Australia and United States origins.

Kappaphycus alvarezii found in the waters of Langkawi and Sabah, Malaysia

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Proximate composition and amino acid content of red seaweeds, *Kappaphycus alvarezii*, from Langkawi and Sabah in Malaysia were determined in order to evaluate their potential nutritional value.

The crude fibre content of seaweed from Sabah (at 8.95%) was found to be significantly higher than that of Langkawi (at 7.86%) (P<0.05). The two seaweeds from Langkawi and Sabah respectively contained lipids (1.06, 0.97% dry weight), ash (16.305, 17.18% fresh sample), proteins (6.24, 6.89% dry weight) and moisture (80.87, 81.86% fresh sample) (P>0.05). Total 17 amino acids were found in both seaweeds, aspartic acid, gulamic acid, leucine are the major constituent and followed by. This study showed that *Kappaphycus alvarezii* from both habitats contained different amount of some of the essential amino acid and proximate composition it can be used as ingredients to improving nutritive value in human diets.

Micronutrients, antioxidant activity, and tocochromanol contents of selected pigmented upland rice genotypes

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Pigmented rice genotypes have high nutritive value compared to white rice genotypes. These genotypes contain high levels of micronutrients and antioxidant compounds, such as polyphenols, tocochromanols and oryzanol. In this experiment, 42 pigmented rice genotypes obtained from the International Rice Research Institute (IRRI) were evaluated to determine micronutrient content, antioxidant activity and vitamin E content. The results revealed that the micronutrient content, antioxidant activity and tocochromanol content of all genotypes varied. Iron (Fe) was the most abundant micronutrient followed by Zn, Mn and Cu. The antioxidant DPPH scavenging effect among all genotypes ranged from 31.85 to 98.45%. The tocotrienol content was higher than tocopherol in grains of selected pigmented rice genotypes. Among rest of genotypes, IR3257-13-56, IR5533-14-1-1 and Khao gam (niaw) contained high micronutrient content and antioxidant properties compared to others. These genotypes could also be potentially used further for breeding program to improve the rice plant with high micronutrient content and antioxidant properties.

Molecular docking analysis of *Carica papaya* Linn constituents as antiviral agent

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Carica papaya (papaya) fruits are available throughout the world and it is well accepted as food or as a quasi-drug. Aqueous papaya leaves extract have been used as treatment for dengue fever. This prompted us to carry out the docking study on these nine selected ligands (phyto-constituents of papaya) which are carpaine, dehydrocarpaine I and II, cardenolide, p-coumaric acid, chlorogenic acid, caricaxanthin, violaxanthin and zeaxanthin. These phytoconstituents were evaluated on the docking behaviour of dengue serotype 3 RNA-dependent RNA polymerase (RdRp); influenza A (H1N9) virus neuraminidase (NA); chikungunya virus glycoprotein (E3-E2-E1) and chikungunya virus non-structural protein2 (nsP2) protease using Discovery Studio Version 3.1. In addition, molecular physicochemical, drug-likeness, ADMET (Absorption, Distribution, Metabolism, Excretion and Toxicity) and TOPKAT (Toxicity Prediction by Komputer Assisted Technology) analyses were done. The molecular physicochemical analysis revealed that cardenolide and *p*-coumaric acid (2 ligands) complied with Lipinski's rule of five. Dehydrocarpaine II, cardenolide, caricaxanthin, violaxanthin and zeaxanthin all the five ligands were predicted to have plasma protein binding (PPB) effect. Docking studies and binding free energy calculations revealed that *p*-coumaric acid exhibited very least binding energy irrespective of its target protein. Hence, the results of this present study exhibited the potential of these nine ligands as antiviral agent.

Mood, cognitive function and quality of life improvements in middle aged women following supplementation with polygonum minus extract

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Polygonum minus is a plant rich in flavonoids and antioxidants beneficial for reducing oxidative stress and lipid peroxidation in neuronal membranes. This randomized, double-blind, placebo-controlled study evaluated the potential benefits of P. minus extract (LineMinusTM) towards improving cognitive function, mood status and quality of life. Thirty five middle-aged women (35-55 years old) were randomized into intervention (n=17) and control group (n=18). Two capsules of P. minus (250 mg) or placebo (100 mg maltodextrin) each were taken once daily for six weeks. Cognitive tests, mood and anthropometric measurements were measured at baseline, week 3 and week 6, whilst biomarkers were measured at baseline and week 6. Parameters related to mood and quality of life including energy/fatigue, social functioning and general health significantly improved from baseline to week 6 in the intervention group ($p<0.05$). Mean score for cognitive tests (i.e. digit span, comprehensive trail making test (CTMT) and three domains of CNS vital sign (CNSVS)] improved significantly in both intervention and control groups ($p<0.05$). There was a significant decrease of mean uric acid, estimated glomerular filtration rate (eGFR), total cholesterol and glycated hemoglobin (HbA1C) in the intervention group from baseline to week 6. P. minus supplementation has the potential to improve mood and quality of life and no adverse effects were reported by the participants after 6 weeks supplementation.

Nutrient compositions and total polyphenol contents of selected dried fruits available in Selangor, Malaysia

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Dried fruits contained higher amount of energy and nutrient density compared to the fresh ones. This study was conducted to determine and compare the content of nutrients and polyphenols in dried dates, raisin, apricot and fig. Dried fruit samples were bought from three different stores in Selangor and analyzed in triplicates. AOAC (1997) standard methods were used for proximate analyses. The total sugar and polyphenol contents were determined using Dubois and Folin-Ciocalteu methods, respectively. Highest moisture content was found in dried apricots (35.26%) while the lowest one was in Mariami dates (21.68%). Dried apricots also contained highest total ash content (4.54%) while Safawi dates have the lowest one (2.45%). Dried figs contained the highest crude protein (3.93%) and fat contents (4.02%) while Safawi dates have lowest protein (2.57%) and fat (0.09%) contents. Total carbohydrates were highest in Safawi dates (72.81%) and lowest in dried apricots (56.09%). Highest total sugar content found in Mariami dates (48.61%) and lowest in dried apricots (10.35%).

Total phenolic content in golden raisin contained significantly ($p < 0.001$) highest polyphenol content (562.15 mg GAE/100 g) than others while dried figs have the lowest one (151.04 mg GAE/100 g). Dried fruits analyzed in this study contained high nutrients and polyphenol contents which are suitable to be consumed as an alternative for snack, with a caution on the portion size due to the high sugar content.

Nutrient content in selected commercial rice in Malaysia: An update of Malaysian food composition database

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There is an increase need and demand to update Malaysian Food Composition Database (FCD) which was last updated in 1997. The current FCD program was designed to expand the quantity and improve the quality of the existing database. The present work was aimed to determine the nutrient content of commercial rice products from three rice varieties classified as raw and processed foods, namely Basmati, Siam, and Fragrant rice. A total of six brands from each type of rice were sampled from a local supermarket within Klang Valley. Analyses were carried out for 27 nutrients that include proximate (Energy, Water, Protein, Fat, Carbohydrate, Total Dietary Fibre, and Ash), minerals (Magnesium, Calcium, Sodium, Iron, Zinc, and Copper), water soluble vitamins (C, B1, B2, B3, B6 and B9), fat soluble vitamins (A and E), total sugar, fatty acids (total saturated fat, total monounsaturated fat and total polyunsaturated), trans-fatty acids, and cholesterol. The three rice varieties were found to contain comparable nutrient levels except for vitamin C, B1, A, E and total sugar which were not detected in all samples. The fatty acid (total saturated, total monounsaturated, and total polyunsaturated) as well as trans-fatty acid were detected at very low levels. Cholesterol was not detected in all samples. These findings can be utilised in raising public awareness and assistance to better estimate nutrient contents and intake depending on the varieties of rice.

Nutritional composition and antioxidant activities of non-polar and polar extracts of germinated brown rice

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The objective of this study was to investigate the nutritional compositions and antioxidant activities (AA) of non-polar and polar extracts of germinated brown rice (GBR). Nutritional compositions such as moisture, ash, carbohydrate, fat, protein and fibre were determined. Energy and minerals content were determined by using bomb calorimetry and Atomic Absorption Spectroscopy (AAS), respectively. Total phenolic content (TPC) and total flavonoid content (TFC) of the extracts were determined by Folin-Ciocalteu method and aluminium chloride colorimetric method. The AA was determined using 2,2-diphenyl1 picrylhydrazyl (DPPH) and [2,2'-Azinobis(3-ethylbenzothiazoline-6-sulfonic acid)]

diammonium salt (ABTS) radical scavenging capacity assay, ferric reducing antioxidant potential (FRAP) assay, and β-carotene bleaching assay. Total energy content of GBR sample was 390.95±11.31 kcal/100g and carbohydrate (54.30±1.04 g/100 g) was the most abundant nutrient. The predominant minerals in the GBR sample were sodium, potassium and magnesium. The polar extract showed significantly higher ($p<0.05$) level in TPC, TFC and AA than non-polar extract except in β-carotene bleaching assay. Positive and strong correlations ($r>0.90$, $p<0.001$) existed between antioxidants (TPC and TFC) and AA. Therefore, polar extract was better than non-polar extract. The nutritional composition of GBR also provided an update for food composition database.

Nutritional composition and colour analysis of cholesterol-reduced egg yolk powder

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Dietary cholesterol should be limited to less than 200 mg/day. A single large egg yolk contains approximately 275 mg of cholesterol. Thus, consumption of a single egg yolk exceeds the recommended daily intake of cholesterol. This study was focused on determination of the effect of addition of increasing amount of β-cyclodextrin (β-CD) to encapsulate cholesterol in egg yolk. The quality of cholesterol-reduced egg yolk powder was evaluated by determining its nutritional composition and colour analysis. Increasing amount of β-CD (0– 15 mM) was added in liquid egg yolk and the encapsulated cholesterol in the form of precipitate was removed. The supernatant was dried and the end product; cholesterol-reduced egg yolk powder (CREYP) was analyzed for moisture content, total lipid, fatty acids content, protein and colour. There were no significant difference ($p>0.05$) in term of total solid content. However, protein content of CREYP was significantly ($p<0.05$) reduced up to 7 mM -CD and no further significant reduction was noticed with further addition of β-cyclodextrin. The appearance of the powder became lighter in colour as validated using chromameter; *L*, a*, b*, C** and ho values. The results obtained from this study indicate that cholesterol can be successfully removed from egg yolk. However, slight reduction in protein content was observed. Nutritional composition of CREYP was minimally affected with the removal of encapsulated cholesterol. Therefore, cholesterol reduced egg yolk powder can be utilized as an essential ingredient in any egg yolk based products.

Nutritional composition of selected commercial biscuits in Malaysia

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The objective of this study was to determine the nutrient composition of selected commercial biscuits in Malaysia. A total of six brands from each type of biscuit (chocolate chip, corn, cracker with sugar, vegetable flavoured cracker, cream filled, oatmeal, shortbread and fully coated chocolate wafer) and five brands of wholemeal crackers were sampled from local supermarkets in the Klang Valley. The

total energy content in commercial biscuits was ranging from 453.30 to 499.25 kcal/100 g. Carbohydrate was the major macronutrient in commercial biscuits ranging from 56.86 to 66.07 g/100 g. The highest protein content was found in the wholemeal crackers (9.92 g/100 g) and the lowest protein content was found in the cream filled biscuits (5.65 g/100 g). Fat content lay in the range of 16.89 to 25.75 g/100 g. The major minerals detected in biscuits were sodium, followed by calcium and magnesium. The vitamin content in A and E of the biscuits examined was almost comparable. Small quantities of trans fatty acids were detected in all biscuits in the range of 0.02 to 0.68 g/100 g. These findings indicate that Malaysian commercial biscuits are a good source of carbohydrate (34.12-39.64 g per serving), calcium (26.09-384.67 g per serving), magnesium (10.42-37.24 g per serving) and contain low proportion of trans fatty acids (0.01-0.41 g per serving).

Nutritional values and amino acid profiles of *Clinacanthus nutans* (belalai gajah/ sabah snake grass) from two farms in Negeri Sembilan, Malaysia

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The objective of the study was to determine the content of moisture, ash, protein, fat, carbohydrate, crude fibre, total sugar and amino acid profile for the medicinal herb *Clinacanthus nutans*. Three-month-old Sabah Snake Grass/Belalai Gajah (*C. nutans*) was collected from You Dun Chao Herb Farm (YDC) and Yik Poh Ling Herb Farm (YPL) in Negeri Sembilan, Malaysia. All the experiments were conducted in triplicate. Total crude fibre was found significantly higher in the stem samples. A comparison of non-shaded and shaded samples from YDC revealed higher ($p<0.05$) moisture, protein, ash, total crude fibre and total sugar content in the shaded samples for both leaves and the stem. Total fat was higher ($p<0.05$) in the shaded leaves than in the non-shaded leaves but it was the opposite for the stem. In comparing non-shaded samples from the two different farms for moisture, protein, ash, fat and total sugar content, the YPL leaves and stems showed significantly higher amounts than the YDC samples. The leaves of *C. nutans* contained more amounts of all essential and non-essential amino acids than the stem. Aspartic acid exhibited significantly higher amounts in both leaves (3.48, 1.08 and 2.13% of dry weight sample for YPL, YDC non-shaded and shaded samples, respectively) and stem (2.17, 0.95 and 1.96% of dry weight sample for YPL, YDC non-shaded and shaded samples, respectively) than the other amino acids. Geographical factors and planting conditions revealed different nutritive composition.

Nutritional, Phytochemical and Pharmacological Properties of *Canarium odontophyllum* Miq. (Dabai) Fruit

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Canarium odontophyllum Miq. fruit, popularly recognized as dabai fruit in Sarawak, is a seasonal fruit found in the tropical rainforest of East Malaysia. A dabai fruit can be divided into several anatomical parts,and different parts of the fruit have different valuable phytochemicals. Due to the lack of promotion, dabai fruit is viewed as nutritionally inferior fruit by the public. On the contrary, the fruitis

rich in nutrients such as protein, fat, carbohydrates, sodium, calcium and iron. Many phytochemicals have been detected from different parts of dabai fruit, and these molecules have been linked to beneficial properties such as hypolipidemic, anti-atherosclerotic, anti-cholinesterase, antimicrobial and potentially anti-diabetic. The aim of this articleis to review research studies on this fruit in order to provide adequate baseline information for commercial exploitation as well as for future studies.

Nuts and their co-products: The impact of processing (roasting), bioavailability, and health benefits – A comprehensive review

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Nuts serve as important healthful snacks worldwide. They are highly desirable due to the presence of numerous essential macro- and micronutrients and health-promoting phenolic compounds (polyphenols). Nuts are usually consumed either as raw (natural) or as roasted. In addition, nuts and their co-products have been demonstrated to be rich sources of phenolic compounds that possess various health-beneficial properties. Therefore, inclusion of these phenolic compounds from nut co-products into the human diet is highly recommended as these may provide inexpensive sources of natural antioxidants for use as functional food ingredients and nutraceuticals. Hence, the phenolic compositions and antioxidant activities of nuts (natural and roasted) and their co-products (such as skin, hard shell, hull, and pellet) are discussed in detail. The impact of processing (roasting) on nut phenolics and antioxidant activities are highlighted. The bioavailability and health benefits of the phenolic compounds from nuts, especially their co-products are also discussed. Research findings from the existing literature published within the last 10 years have been compiled and summarised.

PCDD and PCDF exposures among fishing community through intake of fish and shellfish from the Straits of Malacca

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Background: Exposure to PCDD/PCDF (dioxin and furan) through consumption of fish and shellfish is closely related to the occurrence of skin diseases, such as chloracne and hyperpigmentation. This study aimed to determine the exposure of PCDD/PCDF and its congeners in fish and shellfish obtained from different regions of the Straits of Malacca among the fishing community. **Methods**: The risk of fish and shellfish consumption and exposure to PCDD/PCDF among fishermen living in coastal areas of the Straits were evaluated based on a cross-sectional study involving face to face interviews, blood

pressure and anthropometric measurements, and administration of food frequency questionnaires (FFQ). Skin examination was done by a dermatologist after the interview session. Determination of 17 congeners of PCDD/ PCDF in 48 composite samples of fish and shellfish was performed based on HRGC/HRMS analysis. **Results**: The total PCDD/PCDF in the seafood samples ranged from 0.12 to 1.24 pg WHO-TEQ/g fresh weight (4.6-21.8 pg WHO-TEQ/g fat). No significant difference found for the concentrations of PCDD/PCDF between the same types of seafood samples obtained from the three different regions. The concentrations of the most potent congener, 2,3,7,8-TCDD in the seafood samples ranged from 0.01 to 0.11 pg WHO-TEQ/g FW (1.9 pg WHO-TEQ/g fat). A positive moderate correlation was found between the fat contents and concentrations of PCDD/PCDF determined in the seafood samples. The total PCDD/PCDF in all seafood samples were below the 1 pg WHO-TEQ/g fresh weight, with the exception of grey eel-catfish. The respondents had consumed fish and shellfish with the amounts ranging between 2.02 g and 44.06 g per person per day. The total PCDD/PCDF exposures through consumption of fish and shellfish among the respondents were between 0.01 and 0.16 pg WHO-TEQ/kg BW/day. With regard to the two PCDD/PCDF-related skin diseases, no chloracne case was found among the respondents, but 2.2 % of the respondents were diagnosed to have hyperpigmentation. **Conclusion**: Intake of a moderate amount of fish and shellfish from the area is safe and does not pose a risk for skin diseases. An over-consumption of seafood from the potentially polluted area of the Straits should be monitored in future.

Phenolic content and free radical scavenging activity of herbal seasoning enriched with oyster mushroom (*Pleurotus sajor- caju*) powder

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Mushrooms have received great attention for their health benefits due to their polyphenols content and the related antioxidant activity. Edible mushrooms are known as low calorie functional foods that suit to the design of healthy diet food patterns. The aim of this work is to evaluate the antioxidative activity of methanolic extracts of the herbal seasoning (HS) enriched with *Pleurotus sajorcaju* (PSC) powder in different assays, namely, 2,2-diphenyl-1-picryhydrazyl (DPPH) free radical scavenging activity, ferric reducing scavenging power (FRAP) and total phenolic content (TPC). Chemical compositions were determined by standard AOAC methods. Six different formulations with different levels of PSC powder at 0% (A), 20% (B), 40% (C), 60% (D), 80% (E) and 100% (F) to substitute coconut milk powder were used in this study. The methanolic extracts of HS (F) showed the highest antioxidant activity in scavenging DPPH free radicals (54%) than the control treatment HS (A) (43%). Meanwhile, the reducing capacities of PSC powder incorporated at different levels were in the range of 23.57 – 60.52 mg ascorbic acid equivalents (AAEs)/g extract. Among all samples, HS (F) had the highest total phenolic content [1,823.84 ± 0.84 mg gallic acid equivalents (GAEs)/g]. Overall, the antioxidant activities in DPPH and FRAP increased with increasing concentration of PSC powder in the formulations. The high content of ash which was recorded in PSC based HS might be contributed by some minerals present in PSC powder in the HS. This study indicated that PSC powder exerts some antioxidative capacities, thus it can be potentially used as a natural antioxidant in processed food products.

Physical, rheological and textural characterization of herbal seasoning enriched with oyster mushroom (*Pleurotus sajor-caju*) powder

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The influence of oyster mushroom (*Pleurotus sajor-caju*, PSC) powder on the physical properties of herbal seasoning (HS) was investigated. The pH, total solid, viscosity, rheology and texture of semi solid HS containing different PSC powder level (0%, 20%, 40%, 60%, 8%, 100% w/w) of coconut milk powder were measured. The pH of the products were in the range of 4.05 - 4.15. Rheological behavior was characterized by oscillatory rheometry. Stress sweep, frequency sweep and steady stress experiments were conducted to study the behavior of the products. The products showed non Newtonian characteristic or shear thinning. All samples were G'> G" showed the gel like network. In addition, the back extrusion rig texture analysis showed the correlation among the samples were also studied. Total substitution of PSC powder (100% w/w) in the formulation resulted more viscous product and the combination of the coconut milk powder and PSC powder showed the best spreadability and flow to the product characteristics. No added PSC powder (0% w/w) showed the least viscous products and the less moduli among the samples studied. The present study suggested the incorporation of more than 40% PSC powder to replace coconut milk powder give better flowability and not affect the viscosity of the products.

Physico-chemical characteristics of watermelon in Malaysia

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Watermelon (*Citrullus lanatus*) is a popular fruit among Malaysians. Red-fleshed seeded and seedless, and yellow-fleshed watermelons are mostly selected as a dessert and available throughout the year in local markets. Therefore, this study was focused to determine the nutritional and physico-chemical characteristics of these watermelons. Red-fleshed seedless watermelon contained 89.7 ± 4.3% moisture, while red-fleshed seeded and yellow-fleshed watermelon had 87.5 ± 2.6% and 87.0 ± 2.7% respectively. No significant differences were observed for most nutritional and physico-chemical analysis between samples. However, there were significant differences for colour determination (L^*, a^* and b^*) and amount of sucrose among the samples. Yellow-fleshed watermelon showed L^* = 50.0 ± 6.9, a^* = 5.8 ± 2.0, b^* = 32.6 ± 8.8, red-fleshed seedless showed L^* = 43.4 ± 3.5, a^* = 25.1 ± 4.4, b^* = 15.2 ± 4.1 and red-fleshed seeded showed L^* = 38.2 ± 5.1, a^* = 19.4 ± 7.3, b^* = 15.3 ± 6.6. Total sugar contents determined by high performance liquid chromatography (HPLC) showed that red fleshed seedless, red-fleshed seeded and yellow-fleshed watermelon consisted of glucose, fructose and sucrose. Amount of total sugar for red-fleshed seedless, red fleshed seeded and yellow-fleshed watermelon were 95.0 ± 25.2 mg/g, 113.8 ± 31.6 mg/g and 100.6 ± 25.5 mg/g respectively. There was positive and strong correlation between total soluble solid with total sugar (r^2 = 0.75). The results indicated that different varieties of watermelon had different nutritional contents and physico-chemical characteristics.

Phytochemical analysis and anti-inflammatory effect of kenaf and roselle seeds.

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Introduction: Both kenaf (*Hibiscus cannabinus*) and roselle (*Hibiscus sabdariffa*) belong to the *Malvaceae* family. **Method**: In this study, the phytochemical analysis and anti-inflammatory activity of kenaf seed oil (KSO), kenaf seed extract (KSE), roselle seed oil (RSO) and roselle seed extract (RSE) were investigated. **Results**: The flavonoids content present in the roselle seed oil (RSO), roselle seed extract (RSE), kenaf seed oil (KSO) and kenaf seed extract (KSE) ranged from 52.94Â ± 7.31 mg catechin/100g of sample (KSE) to 290.05Â±12.04 mg catechin/100 g of (RSE); phenolic content ranged from 108.46Â ± 6.40mg GAE/ 100g of sample (RSO) to 229.65Â ± 7.91 mg GAE/ 100g of sample (RSE); saponin content ranged from 68.14Â ± 3.46 mg saponin/ 100 g of sample (KSO) to 98.50Â ± 2.44 mg saponin/ 100g of sample (RSE); terpenoid content ranged from 148.76Â ± 9.69 mg linaloo1/100g of sample (KSO) to 294.74Â ± 16.14 mg linaloo1/100g of sample (RSE); and alkaloid content ranged from 17.40Â ± 1.346%/g (KSO) to 46.95Â ± 1.792%/g (RSE). The results showed that KSE, RSO and RSE significantly inhibited (p<0.05) inflammation compared to the control. **Conclusion**: The present study demonstrates that KSE, RSO and RSE exhibit potent anti-inflammatory property and offer potential for use as a therapeutic regiment in managing inflammatory conditions.

Phytochemicals and medicinal properties of indigenous tropical fruits with potential for commercial development

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Hundreds of fruit-bearing trees are native to Southeast Asia, but many of them are considered as indigenous or underutilized. These species can be categorized as indigenous tropical fruits with potential for commercial development and those possible for commercial development. Many of these fruits are considered as underutilized unless the commercialization is being realized despite the fact that they have the developmental potential. This review discusses seven indigenous tropical fruits from 15 species that have been identified, in which their fruits are having potential for commercial development. As they are not as popular as the commercially available fruits, limited information is found. This paper is the first initiative to provide information on the phytochemicals and potential medicinal uses of these fruits. Phytochemicals detected in these fruits are mainly the phenolic compounds, carotenoids, and other terpenoids. Most of these phytochemicals are potent antioxidants and have corresponded to the free radical scavenging activities and other biological activities of the fruits. The scientific research that covered a broad range of in vitro to in vivo studies on the medicinal potentials of these fruits is also discussed in detail. The current review is an update for researchers to

have a better understanding of the species, which simultaneously can provide awareness to enhance their commercial value and promote their utilization for better biodiversity conservation.

Preliminary studies on *Acalypha indica*: Proximate analysis and phytochemical screening

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Objective: This study aims to evaluate the proximate composition and phytochemicals content of *Acalypha indica*. **Methods**: The dried samples of root, leaves, stem and whole plant were analysed for protein, total fat, ash, moisture, water activity and crude fibre according to guideline by Association of Official Analytical Chemist. The phytochemicals content were based on standard method**. Results**: The proximate analysis showed that the leaves contain the highest moisture (9.49%), ash (12.83%) and protein (23.98%). The root contains the highest carbohydrate (76.33%), crude fibre (42.05%) and gross energy (1453.94 kJ) content. The root also showed the lowest total fat (0.54+0.17%) and water activity (0.51+0.00 Aw). Besides that, the secondary metabolite such as alkaloid was identified in dried whole plant while tannin was detected in dried leaves and dried whole plant. The triterpenes, steroid and flavonoids were a presence in all samples analysed. **Conclusion**: The present of nutrition and phytochemicals support the traditional use of *Acalypha indica* as an alternative treatment for curing certain health conditions.

Production of antihypertensive elastin peptides from waste poultry skin

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Poultry by-products are not often processed into high-value products. Chicken skin can be considered as one of the most under-utilized by-products and usually been removed for its stigma of high fat content. However, considering that it contains 10-22% protein, poultry skin could be utilized to produce elastin, which is often being incorporated in the production of functional food, cosmetics industry and regenerative medicine. Extracting elastin provides a huge challenge but even bigger opportunities as it has been proven beneficial in the production of functional food. In this study, water-soluble elastin was successfully extracted from broiler and spent hen skin using four different solvents including NaCl, acetone, NaOH and oxalic acid (solubilizing liquid) prior to freeze-drying. The extracted elastin was tested to confirm the purity using amino acid profiling. The water-soluble elastin was analyzed for ACE inhibitory and SDS-PAGE test. It was evident that extracted methods produced high quality elastin comparable to that of commercial elastin, with low amount of Methionine and Histidine. ACE inhibitory activity is present in chicken skin hydrolysate. The ultra-filtrated elastin fraction of broiler and spent hen skin hydrolysate with size ≤3KDa has highest ACE inhibitory activity. The results of the study are the first report on the elastin extracted from broiler and spent hen skin hydrolysis with commercial enzymes could provide the peptides with ACE inhibitory activities. In conclusion, elastin from poultry skin could be a potential new source of natural antioxidant and antihypertensive ingredient for use in food, drinks and cosmetics application.

Purification and identification of antioxidative peptides from the protein hydrolysate of oil palm (*Elaeis guineensis* Jacq.) kernel protein

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Plant proteins play essential roles in human nutrition. Oil palm fruit is the most important oilseed crops globally where its kernel is obtained as waste after palm oil production. Our previous study demonstrated that oil palm kernel protein hydrolysate (OPKH) obtained after pepsin-pancreatin hydrolysis showed strong antioxidant activity. Hence, our aim in the present study is to purify and identify the antioxidative peptides from OPKH in this study. First, the OPKH was purified sequentially by ultrafiltration, followed by reversed-phase (analytical) and semi-preparative HPLC to collect the bioactive fractions. Subsequently, antioxidant capacities (ACs) of the purified peptides from OPKH were evaluated using ferric reducing antioxidant power (FRAP), β-carotene-linoleate bleaching (BCB) assay and 2,2'-azino-bis(3-ethylbenzthiazoline-6-sulphonic acid) (ABTS) radical scavenging activity assay. In relation, the amino acid compositions of the purified peptide fractions were also determined. Finally, the amino acid sequence of the antioxidative peptide was identified by ESI/MS/MS coupled with Q-TOF LC/MS and PEAKS studio software using de novo sequencing. Nine active fractions (F1F9) were collected and purified. Fraction F6 showed the highest AC. Fraction F6 was collected and rechromatographed on the same analytical column where three sub-fractions (F6a, F6b and F6c) were obtained. Three antioxidative peptides, Val-Val-Gly-Gly-Asp-Gly-Asp-Val (VVGGDGDV), Val-ProVal-Thr-Ser-Thr (VPVTST) and Leu-Thr-Thr-Leu-Asp-Ser-Glu (LTTLDSE) in this fraction F6 were identified using MS/MS. The molecular masses of the peptides VVGGDGDV, VPVTST and LTTLDSE were 717.34, 602.3 and 777.37 Da, respectively. The three peptides did not show any similarity with other antioxidant peptides listed in BLAST database of NCBI. In conclusion, we have purified three novel peptides with ACs from OPKH. We expect that these active peptides may be useful as ingredients for food products and nutraceutical applicants.

Quality characteristics of *Pleurotus sajor-caju* powder: study on nutritional compositions, functional properties and storage stability

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Sains Malaysiana, Vol. 45(11), 2016, 1617–1623

Pleurotus sajor-caju (PSC) is an oyster mushroom widely consumed in Asian countries and successfully cultivated in Malaysia. This study aimed to determine nutritional compositions, functional properties and storage stability of PSC powder based on storage temperature. Fresh PSC was dried using low heat air blow technique and ground into fine powder. Nutritional analyses of PSC powder were conducted following AOAC methods. Functional properties were also determined accordingly. For storage stability study, four portions of PSC powder were stored at temperature of -20, 4, 25 and 35°C

separately, and then studied parameters were investigated at time 0, 3 and 6 months. PSC powder contains appreciable amounts of protein (22.41%), ash (7.79%), dietary fibre (56.99%) and β-glucan (3.32%) but low content in sucrose (0.19%) and fat (2.30%). It also possesses notable functional properties such as water holding capacity, oil holding capacity, swelling capacity and emulsifying activity. Storage stability study showed that PSC powder exhibited lower moisture content and L* colorimetric value. Meanwhile higher water activity level with increasing storage temperature but no significant difference in pH value and microbial counts were detected. Besides, storage temperature at -20, 25 and 35°C jeopardized the original colour properties of PSC powder. The best storage temperature for PSC powder is 4°C. PSC powder has the potential to be a safe and as an alternative dietary fibre rich ingredient in food industry due to its nutritional, functional and storage stability properties.

Reduction of postprandial blood glucose in healthy subjects by buns and flatbreads incorporated with fenugreek seed powder

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Purpose: This study aimed to determine whether fenugreek seed powder could reduce the glycemic response and glycemic index (GI) when added to buns and flatbreads. **Methods:** In a randomised, controlled crossover trial, ten healthy human subjects (five men, five women) were given 50 g glucose (reference food, twice); buns (0 and 10 % fenugreek seed powder); and flatbreads (0 and 10 % fenugreek seed powder) on six different occasions. Finger prick capillary blood samples were collected at 0, 15, 30, 45, 60, 90 and 120 min after the start of the meal. The palatability of the test meals was scored using Likert scales. **Results:** The incremental areas under the glucose curve value of buns and flatbreads with 10 % fenugreek (138 ± 17 mmol × min/L; 121 ± 16 mmol × min/L) were significantly lower than those of 0 % fenugreek bun and flatbreads (227 ± 15 mmol × min/L; 174 ± 14 mmol × min/L, P = <0.01). Adding 10 % fenugreek seed powder reduced the GI of buns from 82 ± 5 to 51 ± 7 (P < 0.01) and to the GI of flatbread from 63 ± 4 to 43 ± 5 (P < 0.01). **Conclusions:** These results suggest that replacing 10 % of refined wheat flour with fenugreek seed powder significantly reduces the glycemic response and the GI of buns and flatbreads. Thus, fenugreek powder may be a useful functional ingredient to reduce postprandial glycemia.

Sodium and potassium contents in selected salts and sauces

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The study was undertaken to determine and compare the sodium and potassium contents in selected salts (table salt, coarse salt, French sea salt, Himalayan pink salt and bamboo salt) and sauces (light soy sauce, sweet soy sauce, chili sauce, tomato sauce and mayonnaise). Findings of the present study showed that the sodium content of salts was highest in table salt (35870.0 mg/100 g) and lowest in French sea salt (31235.0 mg/100 g), whereas the potassium content was highest in bamboo salt (399.4 mg/100 g) and lowest in table salt (43.7 mg/100 g). There was no significant difference between sodium amounts of the salts. Bamboo salt was significantly higher in potassium than other salts. The ranking of sodium and potassium in sauces was similar, where light soy sauce contained the highest amount (4402.0 and 395.4 mg/100 g) and mayonnaise contained the least (231.3 and 63.6 mg/100 g). Both sodium and potassium contents of light soy sauce were significantly higher than other sauces. Bamboo salt is a better choice instead of other salts in terms of the potassium level. Among sauces, although light soy sauce is high in potassium; however, its high sodium has offset the beneficial effect of potassium.

Stability of blended palm oils during potato frying

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The aim of this study was to determine hydrolytic stability [acid value (AV)] and oxidative stability [peroxide value (PV) and conjugated dienes (CD)] of selected blended oils during potato frying. The blended oils were prepared by blending palm oil with corn oil (POCO), sesame oil (POSO) and rice bran oil (PORBO). Blended vegetable oils were prepared in a ratio of 1 to 1 (v/v) and tested for 0, 10 and 20 times after frying potato. AV and PV were determined by titration method, while CD was determined using the spectrophotometric method. Increasing frequency of oil frying contributed to increased level of AV in all blended oils. PVs were increased in all samples, with most noticeable increment observed in POSO, followed by PORBO and POCO. CD levels of the blended oils were also increased after 20 times of potato frying compared with the unused oil and after 10 times of frying. POCO was the most stable oil in terms of hydrolytic and oxidative stabilities. It is most suitable for deep-fat frying of potato chips and industrial application.

The nutritional composition of fruit jams in the Malaysian market

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Journal of the Saudi Society of Agricultural Sciences, Vol. 16(1), 2017, 89–96

Fruit jams are preserved fruits and sugars normally canned or sealed for long-term storage. Jam making involves the disruption of the fruit tissue followed by heating with added water and sugar to

activate its pectin before being put into containers. Processes that expose foods to high levels of heat may cause some nutrient loss. Hence, the objective of this study was to evaluate the nutritional composition of four commonly consumed fruit jams that are available in the Malaysian market. Different brands (n = 6) of each type of fruit jams (grape, apricot, blueberry and strawberry) were sampled from supermarkets in Klang Valley, Malaysia. The sampling method used was stratified random sampling. The fruit jams were analyzed for the presence of 27 important nutrients using Association of Official Agricultural Chemists (AOAC) official methods of analysis. This study showed that fruit jams are a good source of energy and carbohydrate. The fruits jams have very low levels of fatty acids. Fruit jams may provide an affordable and convenient source of energy and carbohydrate. The data can be utilized to contribute to the enhancement of Malaysia Food Composition Database

The nutritional composition of mayonnaise and salad dressing in the Malaysian market

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Sains Malaysiana, Vol. 46(1), 2017, 139–147

Mayonnaise and salad dressing are fast becoming popular condiments for Malaysian. The aim of this study was to obtain the nutritional composition of mayonnaise and salad dressing commercially available in the Malaysian market. The data will be used to update the Malaysian Food Composition Database which was last updated in 1997. A total of six brands from each type of mayonnaise and salad dressing were sampled from local supermarkets in the Klang Valley and analysed using standard methods. The validity of test data was monitored with the application of internal quality controls in line with the requirements of ISO 17025. The energy contents of mayonnaise and salad dressings were up to 626.40 kcal/100 g. Our findings were also in agreement with the energy labelling on the packaging. Sodium was high in mayonnaise and salad dressing because it is used in the final mixture of both condiments to improve their characteristics for certain reasons. Mayonnaise and salad dressing have been identified as potent sources of vitamin A and vitamin E and both condiments were found to contain high levels of these antioxidants. It can be concluded that this study are useful not only in providing information on the nutritional content of several commercial types of mayonnaise and salad dressing, but also in improving the public understanding of healthy food choices.

Therapeutic effects of vinegar: A review

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Current Opinion in Food Science, Vol. 8, 2016, 56–61

Vinegar is a natural product derived from a process of fermentation. Carbohydrates-rich foods are excellent sources of substrate to produce vinegar. Vinegar is mainly used as an ingredient in food preparation due to its taste and aroma. It is one of the most famous folk medicines used to fight infections. Several studies have showed vinegar has a potential to ameliorate obesity, diabetes, cardiovascular disorders, cancer and microbial infections. Daily intake of a drink containing 15 mL

vinegar (750 mg of acetic acid) was reported to improve lifestyle-related diseases, such as hypertension, hyperlipidemia, and obesity. The presence of acetic acid and other components in vinegar could be responsible for its therapeutic effect. This paper reviews recent studies on therapeutic values of vinegar derived from different food sources. Possible mechanisms of therapeutic action of vinegar are also discussed.

Using fish sauce as a substitute for sodium chloride in culinary sauces and effects on sensory properties

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Historically, fish sauce has been a standard condiment and ingredient in various Southeast Asian cuisines. Moreover, fish sauce imparts umami taste, which may enhance perceived saltiness in food. This quality suggests that fish sauce may be used as a partial substitute for sodium chloride (NaCl) in food preparation, which may present a valuable option for health-conscious and salt-restricted consumers. However, the degree to which NaCl can be decreased in food products without compromising taste and consumer acceptance has not been determined. We hypothesized that NaCl content in food may be reduced by partial replacement with fish sauce without diminishing palatability and consumer acceptance. Preparations of 3 types of food were assessed to test this hypothesis: chicken broth (n=72); tomato sauce (n=73); and coconut curry (n=70). In the first session, the percentage of NaCl that could be replaced with fish sauce without a significant change in overall taste intensity was determined for each type of food using the 2-Alternative Forced Choice method. In the second session, subjects rated 5 samples for each food with varying NaCl and/or fish sauce content on 3 sensory attributes: deliciousness; taste intensity; and saltiness. Our results demonstrate that NaCl reduction was possible in chicken broth, tomato sauce, and coconut curry at 25%, 16%, and 10%, respectively, without a significant loss ($P<0.05$) in deliciousness and overall taste intensity. These results suggest that it is possible to replace NaCl in foods with fish sauce without reducing overall taste intensity and consumer acceptance.

Valorization of *Dacryodes rostrata* fruit through the its oil characterization of its oil

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Food Chemistry, Vol. 235, 2017, 257-264

Dacryodes rostrata (kembayau) is an important food and oil resource for local communities in Borneo, but it is not commonly known to wider community. The objective of this work is to valorize kembayau fruit by evaluating the characteristics of the oil from the fruit. In this study, the physicochemical characteristics and the lipophilic essential nutrient; the fatty acid composition, vitamin E and beta-carotene content of oils obtained from the peel, pulp and seeds of kembayau fruits were studied. The pulp of the kembayau fruit contained highest proportion of oil, followed by peel and seed. Kembayau fruit contained vitamin E and had trace amount of beta-carotene. Besides, kembayau fruit oils were not toxic to BRL3A cells, provided hepatoprotection and reversed lipid peroxidation in paracetamol-induced toxicity. Our results suggest that kembayau can be a potential source for cooking oil as the physicochemical characteristics are comparable with commercial source such as oil palm.

Varieties, production, composition and health benefits of vinegars: A review

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Food Chemistry, Vol. 22, 2017, 1621-1630

Vinegars are liquid products produced from the alcoholic and subsequent acetous fermentation of carbohydrate sources. They have been used as remedies in many cultures and have been reported to provide beneficial health effects when consumed regularly. Such benefits are due to various types of polyphenols, micronutrients and other bioactive compounds found in vinegars that contribute to their pharmacological effects, among them, antimicrobial, antidiabetic, antioxidative, antiobesity and antihypertensive effects. There are many types of vinegars worldwide, including black vinegar, rice vinegar, balsamic vinegar and white wine vinegar. All these vinegars are produced using different raw materials, yeast strains and fermentation procedures, thus giving them their own unique tastes and flavours. The main volatile compound in vinegar is acetic acid, which gives vinegar its strong, sour aroma and flavour. Other volatile compounds present in vinegars are mainly alcohols, acids, esters, aldehydes and ketones. The diversity of vinegars allows extensive applications in food.

Scope 8

Clinical Nutrition/ Intervention

Anomalous association of salivary amylase secretion with the postprandial glycaemic response to starch

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BMC Nutrition, Vol. 2(1), 2016, 50-59

Background: This study is an investigation as to whether salivary amylase secretory rates are correlated with the magnitude of postprandial glycaemic responses to starch ingestion in healthy young Malaysian adults. **Methods**: Fasting unstimulated and stimulated salivary amylase secretory rates were measured and ranked for 54 participants. Subjects (n=5) with amylase activities below the median and subjects (n=5) with amylase activities above the median were selected for subsequent carbohydrate challenge tests. Following an overnight fast, the postprandial glycaemic responses of these subjects were assessed to 50 g carbohydrate bolus challenges; glucose (n=2), maltose (n=1) and starch (n=1), tested in random order. Blood glucose concentrations were estimated before each carbohydrate challenge and at half-hour intervals thereafter for 2 h. The magnitude of each glycaemic response was estimated from the area under the curve (AUC). **Results**: High amylase secretors responded to the consumption of a starch bolus with significantly lower AUCs than low amylase secretors (267 +/– 64 vs. 159 +/– 72 mmol/L*120 min, p=0.037; mean +/– SD). However, the glycaemic responses to maltose and glucose did not differ significantly between the two groups. These findings confirm that subjects with higher salivary amylase secretory rates have better glycaemic tolerance to a starch challenge than subjects with lower salivary amylase secretory rates. **Conclusion**: Low amylase secretion should be considered as a potential prognosticator for impaired glucose tolerance to dietary starch in young Malaysian adults.

Effect of *Cosmos caudatus* (ulam raja) supplementation in patients with type 2 diabetes: Study protocol for a randomized controlled trial

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BMC Complementary and Alternative Medicine, Vol. 16, 2016, 84-91

Background: Type 2 diabetes mellitus is a major health threat worldwide. *Cosmos caudatus* is one of the medicinal plants used to treat type 2 diabetes. Therefore, this study aims to determine the effectiveness and safety of *C. caudatus* in patients with type 2 diabetes. Metabolomic approach will be carried out to compare the metabolite profiles between *C. Caudatus* treated diabetic patients and diabetic controls. **Methods and design**: This is a single-center, randomized, controlled, two-arm parallel design clinical trial that will be carried out in a tertiary hospital in Malaysia. In this study, 100 patients diagnosed with type 2 diabetes will be enrolled. Diabetic patients who meet the eligibility criteria will be randomly allocated to two groups, which are diabetic *C. caudatus* treated(U) group and diabetic control (C) group. Primary and secondary outcomes will be measured at baseline, 4, 8, and 12 weeks. The serum and urine metabolome of both groups will be examined using proton NMR spectroscopy. **Discussion**: The study will be the first

randomized controlled trial to assess whether *C. caudatus* can confer beneficial effect in patients with type 2 diabetes. The results of this trial will provide clinical evidence on the effectiveness and safety of *C. caudatus* in patients with type 2 diabetes.

Effect of microbial cell preparation on renal profile and liver function among type 2 diabetics: a randomized controlled trial

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BMC Complementary and Alternative Medicine, Vol. 15, 2015, 433

Background: The beneficial effect of probiotics on renal profile and liver function has been reported among patients with chronic kidney disease and fatty liver respectively. However, its effect on renal profile and liver function among type 2 diabetic individuals has not been fully understood. To investigate the effect of microbial cell preparation on renal profile and liver function tests among type 2 diabetic individuals. **Methods**: A randomized, double-blind, parallel-group, controlled clinical trial was conducted on a total of 136 type 2 diabetics age 30-70 years old in a teaching hospital in Kuala Lumpur, Malaysia. Subjects were randomly assigned to receive microbial cell preparation (N=68) or a placebo (N=68) for 12 weeks. The outcomes measured at baseline, week 6, and week 12 and included changes in renal profile (Sodium, Potassium, Urea, Creatinine, Glomerular Filtration Rate), and liver function tests (Albumin, Total Protein, Alkaline Phosphatase, Alanine Aminotransferase, Aspartate Aminotransferase). Intention to treat (ITT) analysis was performed on all the recruited subjects, while per protocol (PP) analysis was conducted on those who completed the trial with good compliance. **Result**: The urea levels significantly declined in the probiotic group. Serum urea levels reduced from 4.26 mmol/L to 4.04 mmol/L in Probiotic Group while it increased in Placebo Group from 4.03 mmol/L to 4.24 mmol/L. These changes were significant between groups in ITT analysis (p = 0.018). Other parameters did not change significantly between groups. **Conclusion**: 12 weeks supplementation with daily dosage of 6 × 1010 Colony Forming Units of multi-strain microbial cell preparation significantly improved urea levels.

Effect of multi-strain probiotics (multi-strain microbial vell preparation) on glycemic control and other diabetes-related outcomes in people with type 2 diabetes

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European Journal of Nutrition, Vol. 56(4), 2017, 1535-1550

Aim: Evidence of a possible connection between gut microbiota and several physiological processes linked to type 2 diabetes is increasing. However, the effect of multi-strain probiotics in people with type 2 diabetes remains unclear. This study investigated the effect of multi-strain microbial cell preparation-also refers to multi-strain probiotics-on glycemic control and other diabetes-related outcomes in people with type 2 diabetes. **Design**: A randomized, double-blind, parallel-group, controlled clinical trial. **Setting**: Diabetes

clinic of a teaching hospital in Kuala Lumpur, Malaysia. Participants: A total of 136 participants with type 2 diabetes, aged 30-70 years, were recruited and randomly assigned to receive either probiotics (n=68) or placebo (n=68) for 12 weeks. **Outcomes**: Primary outcomes were glycemic control-related parameters, and secondary outcomes were anthropomorphic variables, lipid profile, blood pressure and high-sensitivity C-reactive protein. The Lactobacillus and Bifidobacterium quantities were measured before and after intervention as an indicator of successful passage of the supplement through gastrointestinal tract. **Statistical analysis**: Intention-to-treat (ITT) analysis was performed on all participants, while per-protocol (PP) analysis was performed on those participants who had successfully completed the trial with good compliance rate. Results: With respect to primary outcomes, glycated hemoglobin decreased by 0.14 % in the probiotics and increased by 0.02 % in the placebo group in PP analysis ($p<0.05$, small effect size of 0.050), while these changes were not significant in ITT analysis. Fasting insulin increased by 1.8 μU/mL in placebo group and decreased by 2.9 μU/mL in probiotics group in PP analysis. These changes were significant between groups at both analyses ($p<0.05$, medium effect size of 0.062 in PP analysis and small effect size of 0.033 in ITT analysis). Secondary outcomes did not change significantly. Probiotics successfully passed through the gastrointestinal tract. **Conclusion**: Probiotics modestly improved HbA1c and fasting insulin in people with type 2 diabetes.

Enteral glutamine supplementation in surgical patients with head and neck malignancy: A randomized controlled trail

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Head & Neck, Vol. 37(12), 2015, 1799-1807

Background: Glutamine supplementation is a novel approach to perioperative nutritional management. **Methods**: This study was a prospective randomized clinical trial of effects of enteral glutamine supplementation in surgical patients with head and neck malignancy in a tertiary center. This study measured the effects of supplementation within 4 weeks of the postoncologic surgical period in relation to fat-free mass, serum albumin, and quality of life scores. **Results**: The study population consisted of 44 patients. There was significant difference in serum albumin ($p<0.001$), fat-free mass ($p<0.001$), and quality of life scores ($p<0.05$) between control and interventional groups. Significant correlation exists between fat-free mass and quality of life score difference in our study population ($p<0.05$). **Conclusion**: Enteral glutamine supplementation significantly improves fat-free mass, serum albumin, and quality of life scores postoperatively and maintenance of lean body mass correlated with improved postoperative outcomes in terms of the patient's quality of life.

For the empower-par investigators effectiveness of the empower-par intervention in improving clinical outcomes of type 2 diabetes mellitus in primary care: A pragmatic cluster randomized contolled trial

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BMC Family Practice, Vol. 17(1), 2016, 157-174

Background: The chronic care model was proven effective in improving clinical outcomes of diabetes in developed countries. However, evidence in developing countries is scarce. The objective of this study was to evaluate the effectiveness of EMPOWER-PAR intervention (based on the chronic care model) in improving clinical outcomes for type 2 diabetes mellitus using readily available resources in the Malaysian public primary care setting. **Methods**: This was a pragmatic, cluster-randomised, parallel, matched pair, controlled trial using participatory action research approach, conducted in 10 public primary care clinics in Malaysia. Five clinics were randomly selected to provide the EMPOWER-PAR intervention for 1 year and another five clinics continued with usual care. Patients who fulfilled the criteria were recruited over a 2-week period by each clinic. The obligatory intervention components were designed based on four elements of the chronic care model i.e. healthcare organisation, delivery system design, self-management support and decision support. The primary outcome was the change in the proportion of patients achieving HbA1c < 6.5%. Secondary outcomes were the change in proportion of patients achieving targets for blood pressure, lipid profile, body mass index and waist circumference. Intention to treat analysis was performed for all outcome measures. A generalised estimating equation method was used to account for baseline differences and clustering effect. **Results**: A total of 888 type 2 diabetes mellitus patients were recruited at baseline (intervention: 471 vs. control: 417). At 1-year, 96.6 and 97.8% of patients in the intervention and control groups completed the study, respectively. The baseline demographic and clinical characteristics of both groups were comparable. The change in the proportion of patients achieving HbA1c target was significantly higher in the intervention compared to the control group (intervention: 3.0% vs. control: –4.1%, P<0.002). Patients who received the EMPOWER-PAR intervention were twice more likely to achieve HbA1c target compared to those in the control group (adjusted OR 2.16, 95% CI 1.34–3.50, P<0.002). However, there was no significant improvement found in the secondary outcomes. **Conclusions**: This study demonstrates that the EMPOWER-PAR intervention was effective in improving the primary outcome for type 2 diabetes in the Malaysian public primary care setting.

How many meals should you skip before undergoing a colonoscopy? A randomized controlled trial: Association between duration of abstinence from solid food to cleanliness of the bowel in patients undergoing elective colonoscopy

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Open Access Surgery, Vol. 8, 2015, 9-20

Purpose: An ideal cleansing regime to prepare a clean colon is important for yielding best results during colonoscopy. Many centers practice strict dietary modifications – ie, skipping more than one solid meal 1 or 2 days before the procedure with the consumption of a bowel cleansing agent. No formal studies have been performed to determine how long a patient should withhold solid meals during bowel preparation prior to an outpatient colonoscopy. **Materials and methods**: A randomized prospective controlled trial was carried out with patients who underwent elective colonoscopy at a tertiary general hospital in Malaysia for

7 months' duration. Patients were randomized into one of two groups. Group A patients abstained from a solid diet for 24 hours (the last solid meal was breakfast the day before the colonoscopy). Group B patients abstained from a solid diet 14 hours prior to the colonoscopy (the last solid meal was dinner the day before the colonoscopy). We standardized the time for the oral intake of sodium phosphosoda in both groups. The Boston Bowel Preparation Scale was used to grade the cleanliness between the two groups and a score ≥2 was taken as clean bowel preparation. **Results**: A total of 178 patients (each arm had 89 patients) were recruited for this study. Group A showed a mean bowel cleanliness score of 3. Group B showed a mean bowel cleanliness score of 2.5. However, there was a significant difference in bowel cleanliness between the groups (P≤0.05). **Conclusion**: Abstinence of solid food for either 24 hours or 14 hours prior to the colonoscopy both produced clean bowel preparation scores. Patients who can afford to skip more meals should stop solid food intake at 24 hours prior to colonoscopy. However, for patients who are not able to fast for long, they should be allowed to take solid food up to 14 hours prior to the procedure, thus reducing the need to over-starve them.

Impact of a pharmacist led diabetes mellitus intervention on HbA1c, medication adherence and quality of life: A randomised controlled study

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Saudi Pharmaceutical Journal, Vol 24(1), 2016, 40-48

Malaysia is situated in Western Pacific region which bears 36.17% of total diabetes mellitus population. Pharmacist led diabetes interventions have been shown to improve the clinical outcomes amongst diabetes patients in various parts of the world. Despite high prevalence of disease in this region there is a lack of reported intervention outcomes from this region. The aim of this study was to evaluate the impact of a pharmacist led intervention on HbA1c, medication adherence, quality of life and other secondary outcomes amongst type 2 diabetes patients. Method: Type 2 diabetes mellitus patients (n = 73) attending endocrine clinic at Universiti Kebangsaan Malaysia Medical Centre (UKMMC) were randomised to either control (n = 36) or intervention group (n = 37) after screening. Patients in the intervention group received an intervention from a pharmacist during the enrolment, after three and six months of the enrolment. Outcome measures such as HbA1c, BMI, lipid profile, Morisky scores and quality of life (QoL) scores were assessed at the enrolment and after 6 months of the study in both groups. Patients in the control group did not undergo intervention or educational module other than the standard care at UKMMC. Results: HbA1c values reduced significantly from 9.66% to 8.47% (P = 0.001) in the intervention group. However, no significant changes were noted in the control group (9.64–9.26%, P = 0.14). BMI values showed significant reduction in the intervention group (29.34–28.92 kg/m^2; P = 0.03) and lipid profiles were unchanged in both groups. Morisky adherence scores significantly increased from 5.83 to 6.77 (P = 0.02) in the intervention group; however, no significant change was observed in the control group (5.95–5.98, P = 0.85). QoL profiles produced mixed results. Conclusion: This randomized controlled study provides evidence about favourable impact of a pharmacist led diabetes intervention programme on HbA1c, medication adherence and QoL scores amongst type 2 diabetes patients at UKMMC, Malaysia.

Impact of diabetes-specific nutritional formulas versus oatmeal on posprandial glucose, insulin, GLP-1 and postprandial lipidemia

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Diabetes-specific nutritional formulas (DSNFs) are frequently used as part of medical nutrition therapy for patients with diabetes. This study aims to evaluate postprandial (PP) effects of 2 DSNFs; Glucerna (GL) and Ultra Glucose Control (UGC) versus oatmeal (OM) on glucose, insulin, glucagon-like peptide-1 (GLP-1), free fatty acids (FFA) and triglycerides (TG). After an overnight fast, 22 overweight/obese patients with type 2 diabetes were given 200 kcal of each of the three meals on three separate days in random order. Blood samples were collected at baseline and at 30, 60, 90, 120, 180 and 240 min. Glucose area under the curve ($AUC_{0–240}$) after GL and UGC was lower than OM ($p<0.001$ for both). Insulin positive $AUC_{0–120}$ after UGC was higher than after OM ($p=0.02$). GLP-1 $AUC_{0–120}$ and $AUC_{0–240}$ after GL and UGC was higher than after OM ($p<0.001$ for both). FFA and TG levels were not different between meals. Intake of DSNFs improves PP glucose for 4 h in comparison to oatmeal of similar caloric level. This is achieved by either direct stimulation of insulin secretion or indirectly by stimulating GLP-1 secretion. The difference between their effects is probably related to their unique blends of amino acids, carbohydrates and fat.

Incorporation of dietary fibre-rich oyster mushroom (*Pleurotus sajor-caju*) powder improves postprandial glycaemic response by interfering with starch granule structure and starch digestibility of biscuit

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Food Chemistry, Vol. 227, 2017, 358-368.

The purpose of this study was to determine the effects of *Pleurotus sajor-caju* (PSC) powder addition at 0, 4, 8 and 12% levels on the nutritional values, pasting properties, thermal characteristics, microstructure, *in vitro* starch digestibility, *in vivo* glycaemic index (GI) and sensorial properties of biscuits. Elevated incorporation levels of PSC powder increased the dietary fibre (DF) content and reduced the pasting viscosities and starch gelatinisation enthalpy value of biscuits. The addition of DF-rich PSC powder also interfered with the integrity of the starch granules by reducing the sizes and inducing the uneven spherical shapes of the starch granules, which, in turn, resulted in reduced starch susceptibility to digestive enzymes. The restriction starch hydrolysis rate markedly reduced the GI of biscuits. The incorporation of 8% PSC powder in biscuits (GI = 49) could be an effective way of developing a nutritious and low-GI biscuit without jeopardizing its desirable sensorial properties.

Isokinetic exercise training on improvement in muscular strength in knee osteoarthritis: A meta-analiytic review

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International Journal of Pharma and Bio Sciences, Vol 7(3), 2016, 263–274

Osteoarthritis is a disease with destruction of cartilage and damage of the subchondral bone. The prevalence of osteoarthritis has been on the rise due to increase in the elderly population. Isokinetic training has been used to improve the strength of muscles and to measure the peak torque of muscle in normal individuals and in patients with orthopaedic crises. Isokinetic exercises are frequently used in the management of

osteoarthritis of knee; however the true effect remains unknown. Therefore the objective of the review was to determine the magnitude of the effect of isokinetic training on strength in patients with osteoarthritis of knee. An extensive literature search was done on Web of Science, ProQuest, PubMed, Ebscohost, and CINAHL between 1990 and 2014. Ten articles measuring the effect of isokinetic training on osteoarthritis of knee were included and methodologically assessed. Data from the trials were extracted based on the demographic characteristics, outcomes measured, isokinetic training protocol and the other interventions used. Standardized effect sizes with 95%confidence interval (CIs) were calculated from the pre-intervention and post intervention means of the isokinetic training group and other intervention group. About five articles were analysed for improvement in strength. Pooled analysis of the results from the articles included favoured isokinetic training as a modality for improving strength. Isokinetic training was found to be beneficial in improving the strength of muscle in patients with osteoarthritis. Yet there is no definitive evidence to confirm the beneficial effects of isokinetic training on osteoarthritis of knee.

Lifetime physical activity and breast cancer: A case-control study in Kelantan, Malaysia

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Asian Pacific Journal of Cancer Prevention, Vol 17(8), 2016, 4083-4088

Background: Physical inactivity has been identified as the fourth leading risk factor for global mortality and is associated with increased breast cancer diagnosis and recurrence. **Purpose**: To examine the association between adult lifetime physical activity and breast cancer risk in a case-control analysis. **Materials and Methods**: This study involved 122 cases of breast cancer and 121 controls in the state of Kelantan in Malaysia. A comprehensive measure of lifetime physical activity was used to assess occupational, household, and recreational/sports activity. For every type of activity, a metabolic equivalent (MET) score was assigned using the compendium of physical activities. MET-hours/week per year for all types of activities at different levels of intensities for different age groups were calculated. Logistic regression analysis was used to estimate odds ratios between various measures of physical activity and breast cancer risk. **Conclusions**: The mean MET-hours/week per year for all activities were 120.0 and 132.9 of MET-hours/week per year for cases and controls respectively. Household activities accounted for about 70% of the total lifetime physical activities. Only about 2.5% of the total lifetime physical activities were in the form of recreational/sports. This study found no association between lifetime occupational and recreational/ sports physical activities with breast cancer risk among Kelantanese women. However, higher intensity lifetime household activities seemed to significantly reduce risk of breast cancer.

Safety assessment of tocotrienol supplementat ion in subjects with metabolic syndrome: A randomized control trial

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Journal of Oil Palm Research, Vol. 28(1), 2016, 34-43

Previous studies have reported that tocotrienols (T3) possess many distinct properties such as antioxidants, cardioprotective, neuroprotective, anti-cancer, anti-inflammatory and anti-angiogenic, which are beneficial for the improvement of human health. Howver, there is limited data available on the safety assessment of T3 compared to tocopherols (T). A randomized, double-blinded, cross-over and placebo-controlled human clinical trial was conducted to determine the safety and tolerance of T3 supplementation in 31 subjects with metabolic syndrome. The subjects were supplemented with tocotrienol-rich fraction (TRF) 200 mg or placebo capsules twice daily for two weeks followed by a post-intervention visit. Results showed that T3 supplementation had no significant adverse effect on the red blood cell (RBC), white blood cell (WBC) and platelet counts between TRF ($5.10 \pm 0.78 \times 10^{12}$ litre^{-1}, $7.35 \pm 1.59 \times 10^{9}$ litre^{-1}, $279.45 \pm 73.86 \times 10^{9}$ litre^{-1}, respectively) and placebo interventions ($5.13 \pm 0.76 \times 10^{12}$ litre^{-1}, $7.25 \pm 1.95 \times 10^{9}$ litre^{-1}, $267.45 \pm 68.72 \times 10^{9}$ litre^{-1}, respectively). Measures of serum aspartate aminotransferase (AST), serum alanine aminotransferase (ALT) and albumin did not differ between TRF (25.68 ± 10.72 IU litre^{-1}, 38.26 ± 24.74 IU litre^{-1}, 43.61 ± 2.26 g litre^{-1}, respectively) and placebo interventions (27.39 ± 16.44 IU litre^{-1}, 42.23 ± 33.58 IU litre^{-1}, 43.68 ± 2.15 g litre^{-1}, respectively). This study indicated that supplementation with T3 at the dosage of 400 mg per day for 14 days did not induce haematoxicity and hepatotoxicity in subjects with metabolic syndrome.

The effects of anti-obesity intervention with orlistat and sibutramine on microvascular endothelial function

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Clinical Hemorheology and Microcirculation, Vol 59(4), 2015, 323-334

Introduction: Obesity is associated with impaired microvascular endothelial function. We aimed to determine the effects of orlistat and sibutramine treatment on microvascular endothelial function, anthropometric and lipid profile, blood pressure (BP), and heart rate (HR). **Methods**: 76 subjects were recruited and randomized to receive orlistat 120mg three times daily or sibutramine 10mg daily for 9 months. Baseline weight, BMI, BP, HR and lipid profile were taken. Microvascular endothelial function was assessed using laser Doppler fluximetry and iontophoresis process. Maximum change (max), percent change (% change) and peak flux (peak) in perfusion to acetylcholine (ACh) and sodium nitroprusside (SNP) iontophoresis were used to quantify endothelium dependent and independent vasodilatations. **Results**: 24 subjects in both groups completed the trial. After treatment, weight and BMI were decreased for both groups. AChmax, ACh % change and ACh peak were increased in orlistat-treated group but no difference was observed for sibutramine-treated group. BP and total cholesterol (TC) were reduced for orlistat-treated group. HR was reduced for orlistat-treated group but was increased in sibutramine-treated group. **Conclusion**: 9 months treatment with orlistat significantly improved microvascular endothelial function. This was associated with reductions in weight, BMI, BP, HR, TC and low density lipoprotein cholesterol. No effect was seen in microvascular endothelial function with sibutramine.

The influence of selenium status on body composition, oxidative DNA damage and total antioxidant capacity in newly diagnosed type 2 diabetes mellitus: A case control study

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Selenium is involved in the complex system of defense against oxidative stress in diabetes through its biological function of selenoproteins and the antioxidant enzyme. A case-control study was carried out to determine the association of plasma selenium with oxidative stress and body composition status presented in Type 2 Diabetes Mellitus (T2DM) patient and healthy control. This study involved 82 newly diagnosed T2DM patients and 82 healthy controls. Plasma selenium status was determined with Graphite Furnace Atomic Absorption Spectrometry. Body Mass Index, total body fat and visceral fat was assessed for body composition using Body Composition Analyzer (TANITA). Oxidative DNA damage and total antioxidant capacity were determined for oxidative stress biomarker status. In age, gender and BMI adjustment, no significant difference of plasma selenium level between T2DM and healthy controls was observed. There was as a significant difference of Oxidative DNA damage and total antioxidant capacity between T2DM patients and healthy controls with tail DNA% 20.62 [95% CI: 19.71,21.49] (T2DM), 17.67 [95% CI: 16.87,18.56] (control); log tail moment 0.41[95% CI: 0.30,0.52] (T2DM), 0.41[95% CI: 0.30,0.52] (control); total antioxidant capacity 0.56 [95% CI: 0.54,0.58] (T2DM), 0.60 [95% CI: 0.57,0.62] (control). Waist circumference, BMI, visceral fat, body fat and oxidative DNA damage in the T2DM group were significantly lower in the first plasma selenium tertile (38.65-80.90 g/L) compared to the second (80.91-98.20 g/L) and the third selenium tertiles (98.21-158.20 g/L). A similar trend, but not statistically significant, was observed in the control group.

Virgin olive oil, palm olein and coconut oil diets do not raise cell adhesion molecules and thrombogenicity indices in healthy Malaysian adults

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European Journal of Clinical Nutrition, Vol. 69, 2015, 712–716

Background/Objectives: Effects of high-protein diets that are rich in saturated fats on cell adhesion molecules, thrombogenicity and other nonlipid markers of atherosclerosis in humans have not been firmly established. We aim to investigate the effects of high-protein Malaysian diets prepared separately with virgin olive oil (OO), palm olein (PO) and coconut oil (CO) on cell adhesion molecules, lipid inflammatory mediators and thromobogenicity indices in healthy adults. **Methods**: A randomized cross-over intervention with three dietary sequences, using virgin OO, PO and CO as test fats, was carried out for 5 weeks on each group consisting of 45 men and women. These test fats were incorporated separately at two-thirds of 30% fat calories into high-protein Malaysian diets. **Results**: For fasting and nonfasting blood samples, no significant differences were observed on the effects of the three test-fat diets on thrombaxane B2 (TXB2), TXB2/PGF1 ratios and soluble intracellular and vascular cell adhesion molecules. The OO diet induced significantly lower (P<0.05) plasma leukotriene B4 (LTB4) compared with the other two test diets, whereas PGF1 concentrations were significantly higher (P<0.05) at the end of the PO diet compared with the OO diet. **Conclusion**: Diets rich in saturated fatty acids from either PO or CO and high in monounsaturated oleic acid from virgin OO do not alter the thrombogenicity indices—cellular adhesion molecules, thromboxane B2 (TXB2) and TXB2/prostacyclin (PGF1) ratios. However, the OO diet lowered plasma proinflammatory LTB4, whereas the PO diet raised the antiaggregatory plasma PGF1 in healthy Malaysian adults. This trial was registered at clinicaltrials.gov as NCT 00941837.

Scope 9 | A

Food Science and Technology

Food Safety and Quality

A conceptual model of food hygiene and safety: Implication for future research

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Procedia-Social and Behavioral Sciences, Vol. 201, 2015, 121-127

This study presents conceptual models that explain the food hygiene and food safety towards culinary student undergo the culinary internship. The respondents were among the culinary students during culinary internship. Both qualitative and quantitative techniques will use as systematic tools to test and validate the model. Through a series of descriptive and inferential statistic some meaningful insights on the issues of interest were obtained. Finding will reveal new dimensions of knowledge, attitudes and practice effects competencies in particular recognized as contributory factors that positively or negatively influenced the job performance of a future chef.

Comparison and challenges in the implementation of Halal Food Laws in Malaysia, the Netherlands and United States of America

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The term "Halal Laws" in this paper relate to the laws of consumer protection in terms of Halal product. Halal laws are crucial, since it regulates an industry that is worth an estimated of USD 2.3 trillion, annually. The Halal laws in Malaysia are a national, legislated law. Meanwhile, the United States of America (USA) also have Halal laws, but it is legislated on a state level. Not all states recognise the Halal laws in the USA. Alternatively, the Netherlands do not have Halal laws or Halal related laws. Therefore, local Muslims depend on the integrity of local Halal certifier for Halal foods. This paper summarises the Halal laws differences in these 3 countries including Halal laws offenses and penalties. This paper also summarises the challenges of implementing the Halal laws in these three countries.

Confusion determination of critical control point (CCP) via HACCP decision trees

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Hazard analysis and CCP determination are the backbones of HACCP development and implementation. The rest of HACCP principles depend on these two principles. A decision tree is used to assist in determining the CCP. There are two types of decision trees used in the HACCP system that is decision trees for raw material/packaging material and process step. Various methods of the decision

tree used in HACCP systems not only have advantages, but it can also contribute to the confusion in its application by practitioners. Although the decision tree is just a tool to help determine the CCP, its use is a significant impact on the HACCP team, consultants and decision-making authority in determining the CCP and sensitive raw materials in a structured manner.

Critical limits for the control points for *halal* poultry slaughter

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Poultry Science, Vol. 96(6), 2017, 1970-1981

This study proposes critical limits (CL) for control points for *halal* slaughter (CPHS). Previously, 6 control points (CP) were determined, and CL for these 6 CPHS are suggested based on: 1) a literature survey for the CL for CP 1 (poultry breeding, rearing, and poultry feed) and CP 2 (welfare of poultry during transportation and lairage); 2) a field survey of slaughter plants in Kuantan (Malaysia) for CP 3 (immobilization), CP 4 (slaughter), CP 5 (time for full bleed-out), and CP 6 (washing and packaging); and 3) controlled experiments to refine the CL for CP 3, 4, and 5. The CL for CP 1 focused on stress reduction during rearing and use of substances that could compromise poultry meat wholesomeness. The CL for CP 2 emphasizes humane best-practices for handling poultry during lairage. The CL for CP 3 suggests a gap of 5 s between 2 shackles if only one shackler is employed and shackling times of <1 min for live chickens. In countries permitting water-bath electrical stunning of halal poultry, the stunning current needed to induce unconsciousness must be defined for the breed and bird size but not cause any chicken deaths. The CL for CP 4 mandates the recitation of the tasmiyah (the invocation), which if done for every chicken, will require ≥5 s between stunning and neck cutting. The CL for CP 4 also includes information about the slaughter knife. In CP 5 the recommended minimum time between neck cutting and scalding is 9.5 min. Finally, the CL for CP 6 emphasizes good supply chain hygiene and zero adulteration from *haram* species and substances.

Developing control points for *halal* slaughtering of poultry

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Halal (permissible or lawful) poultry meat production must meet industry, economic, and production needs, and government health requirements without compromising the Islamic religious requirements derived from the *Qur'an* and the *Hadiths* (the actions and sayings of the Prophet Muhammad, peace and blessings be upon him). *Halal* certification authorities may vary in their interpretation of these teachings, which leads to differences in *halal* slaughter requirements. The current study proposes 6 control points (CP) for *halal* poultry meat production based on the most commonly used *halal* production systems. CP1 describes what is allowed and prohibited, such as blood and animal manure,

and feed ingredients for *halal* poultry meat production. CP 2 describes the requirements for humane handling during lairage. CP 3 describes different methods for immobilizing poultry, when immobilization is used, such as water bath stunning. CP 4 describes the importance of intention, details of the halal slaughter, and the equipment permitted. CP 5 and CP 6 describe the requirements after the neck cut has been made such as the time needed before the carcasses can enter the scalding tank, and the potential for meat adulteration with fecal residues and blood. It is important to note that the proposed halal CP program is presented as a starting point for any individual *halal* certifying body to improve its practices.

Efficient *halal* bleeding, animal handling, and welfare: A holistic approach for meat quality

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Meat Science, Vol. 121, 2016, 420-428

Traditional *halal* slaughter and other forms of religious slaughter are still an issue of debate. Opposing arguments related to pre-slaughter handling, stress and pain associated with restraint, whether the incision is painful or not, and the onset of unconsciousness have been put forward, but no consensus has been achieved. There is a need to strike a balance between *halal* bleeding in the light of science and animal welfare. There is a paucity of scientific data with respect to animal welfare, particularly the use of restraining devices, animal handling, and efficient *halal* bleeding. However, this review found that competent handling of animals, proper use of restraining devices, and the efficient bleeding process that follows *halal* slaughter maintains meat eating quality. In conclusion, *halal* bleeding, when carried out in accordance with recommended animal welfare procedures, will not only maintain the quality and wholesomeness of meat but could also potentially reduce suffering and pain. Maintained meat quality increases consumer satisfaction and food safety

Factors impacting the formation of 3-MCPD esters and glycidyl esters during deep fat frying of chicken breast meat

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The effect of the frying temperature, frying duration and the addition of NaCl on the formation of 3-monochloropropane-1,2-diol (3-MCPD) esters and glycidyl esters (GE) in palm olein after deep frying was examined in this study. The eight frying systems were deep-fat frying (at 160 and 180 °C) of

chicken breast meat (CBM) (with 0, 1, 3 and 5% sodium chloride, NaCl) for 100 min/day for five consecutive days. All oil samples collected after each day were analyzed for 3-MCPD ester, GE, and free fatty acid (FFA) contents, specific extinctions at 232 and 268 nm (K_{232} and K_{268}), p-anisidine value (pA), and fatty acid composition. There was a significant ($p<0.05$) decrease in the 3-MCPD esters and a significant ($p<0.05$) decrease in the GE with the increasing of the frying duration. There were significant ($p<0.05$) increases in the 3-MCPD esters formed when the concentration of NaCl increased from 0 to 5%. The addition of NaCl to the CBM during deep frying had no significant effect on the GE generation. The FFA contents, K_{232} and K_{268} and pA showed that all the frying oils were within the safety limit.

Food hygiene and safety among culinary intern: Questionnaire for FHS quality

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Procedia - Social and Behavioral Sciences, Vol. 222, 2016, 299–305

This study aims to assess the new dimensions set of questionnaire regarding on knowledge, attitudes, and practices concerning FHS issues among culinary intern in Malaysia. This study will specifically design to those culinary intern who had done their culinary internship. Culinary internship is as part of their training whereby students able to gain appropriate knowledge and applied in the commercial kitchen. This empirical study can be used in understanding the current situation of food hygiene practice and safety among culinary intern in exploring proper strategies for improving FHS quality.

Human health risk assessment of heavy metals in shellfish from Kudat, Sabah

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Malaysian Journal of Nutrition, Vol. 22(2), 2016, 301-305

Introduction: Shellfish is likely to be contaminated with heavy metals brought about by various environmental factors such as climate change, bioaccumulation of environmental contaminants and imbalanced natural ecosystem. **Methods**: Shellfish were selected for heavy metal detection as they are mainly consumed by the locals in Kudat. Arsenic, Cadmium, Chromium, Nickel, and Plumbum (As, Cd, Cr, Ni, and Pb) content in clam (*Meretrix* spp.), scallop (*Amusium pleuronectes*) and conch (*Strombus canabrium*) were determined by the US EPA 200.3 acid digestion method and Inductively Coupled Plasma Mass Spectrophotometer (ICP-MS). Risk assessment was calculated to assess the total exposure of heavy metals among the population of Kudat. **Results**: Among all the heavy metals, studied, As was found to have the highest concentration and this was found in scallop with the concentration level being 18.93±5.30 g/g compared to claim and conch. Estimated daily intake of the heavy metals by the population ranged from 0.60-6.82 g/ day/ kg for As, 0.02-1.58 g/day/kg for Cd, 0.37-0.94 g/day/kg for Cr, 0.16-0.61 g/day/ kg for Ni and 0.10-0.25 g/day/kg for Pb based on previous calculation to exposure. The hazard quotient of As and Cd in scallop was greater than 1.0. No acceptable exposure level for these shellfish has been previously reported. The rate of consumption

of these metals did not exceed the standards prescribed in the Food Act 1983 and Food Regulations 1985. **Conclusion**: Based on this study, it is concluded that the exposure to heavy metals risk from the consumption of these shellfish among the population in Kudat, Sabah is at an acceptable level.

Hygiene practices and food safety knowledge for biological, chemical and physical hazards

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The Social Sciences, Vol. 11(19), 2016, 4633-4637

Food hygiene and safety are two related issues that have gained currency in most of the world's health conscious communities. People have become more conscious of the food they consume and are also increasingly vigilant about food safety considerations. The purpose of this study is to examine food hygiene practices and food safety perspectives among 18 students of a culinary degree program. Their knowledge of biological, chemical and physical hazards that may affect hygiene practices are recorded and described via their participation in a series of interviews, observations and photo taking at their workstations. The results show a lack of knowledge of potential food hazards that could contribute to poor food handling thus leading to food hygiene and safety issues.

Implementation of the hazard analysis and critical control point (HACCP) in Malaysia

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Journal of Engineering and Applied Sciences, Vol. 11(8), 2016, 1774-1778

HACCP System is a food safety assurance system through 7 principles to control the biological, chemical and physical hazards. HACCP system in Malaysia is executed based on the MS 1480: 2007-Hazard Analysis Critical Control Point and prerequisite programmes according to MS 1514: 2009-Good Manufacturing Practice (GMP) For Food. The involvements of Small and Medium Enterprises (SMEs) play a significant role in the food processing sub-sector in the country. A wide range of certification schemes has been developed for HACCP and GMP which involves ministries, government agencies and the private sector. Various guidelines as a reference also developed by ministries and government agencies involved in the certification programs offered to SMEs. Development of quality assurance programs and food safety are intended to meet the level of achievement of the SMEs in the provision of quality and safe food.

Misinterpretations of the HACCP MS 1480: 2007 towards Food Safety System Certification

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Environment-Behaviour Proceedings Journal, Vol. 1(2), 2016, 15-21

Hazard Analysis Critical Control Point (HACCP) is a food safety system through seven principles to control a biological, chemical and physical hazard. Principles 1 and 2 are the backbones of the HACCP system. However, there are some misinterpretations in practice HACCP Principles 1 and 2 of the identification stage, analysis of hazards, control measures and CCP determination. The usage of a multi-hazard analysis form without a standard format has led to inconsistencies in the analysis of hazard analysis; determination of controls and subsequent determination of CCP affect the implementation of HACCP document and product safety to the consumers.

Polychlorinated biphenyl and heavy metal exposures among fishermen in the Straits of Malacca: Neurobehavioural performance

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Asia Pacific Journal of Clinical Nutrition, Vol. 24(3), 2015, 515-523

The aim of this study was to determine the level of exposure to polychlorinated biphenyls (PCBs) and selected heavy metals among fishermen via dietary intake of fish and other seafood from the eastern coast along the Straits of Malacca. This study determined the neurobehavioural performances (based on neurobehavioural core test battery scores) of the fishermen and evaluated the correlations between scores of neurobehavioural core test battery and exposure factors. Ninety fishermen participated in the study. The total fish intakes of the fishermen were measured using a set of food frequency questionnaires. The PCBs contents in the seafood samples ranged between 0.2 and 0.6 pg/g fresh sample. The concentrations of mercury (Hg), arsenic (As), cadmium (Cd), and lead (Pb) in the seafood samples were 1.1-5.4, 0.3-4.4, 0.6-36.1, and 0.02-0.3 µg/g fresh sample, respectively. The PCBs, Hg, As, Cd, and Pb exposures of the fishermen was estimated to be 2.8, 0.02, 4.5, 0.09, and 0.5 pg/kg body weight/day, respectively. PCB and heavy metal exposures through dietary intake of fish and seafood were within the tolerable daily limits. The results of neurobehavioural core test battery revealed that the neurobehavioural performances of the fishermen were not affected due to PCB and heavy metal intoxication. No correlations were found between the exposure and neurobehavioural performance among the fishermen. These data are useful for policy makers to assure the safety and quality of seafood in relation to sea pollution. Although the levels of exposure were low, periodic assessment of the quality of fish and fish products is required due to the polluted seawater.

Screening of aflatoxin M1 occurrence in selected milk and dairy products in Terengganu, Malaysia

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Food Control, Vol. 73(Part B), 2017, 209-214

The study was conducted to screen the occurrence of aflatoxin M_1 (AFM_1) in 53 selected milk and dairy product samples (11 liquid milk, 12 powdered milk, 8 3-in-1 beverages, 6 condensed sweetened milk, 2 evaporated milk, 7 cultured milk drink, 5 yogurt and 2 cheese samples). These samples were purchased from selected markets in Terengganu, Malaysia in January 2014 based on a questionnaire survey among 212 respondents on the types and brands of milk and dairy products that were frequently consumed. Based on the responses, 53 milk and dairy products were purchased and the competitive enzyme-linked immune-absorbent assay (ELISA) method was used to determine the level of AFM_1 in the samples. Of 53 samples, 19 samples were positive with AFM_1 (35.8%) ranging from 3.5 to 100.5 ng/L. Although 4/53 (7.5%) of the tested samples had the contamination level greater than the European Commission (EC) limit (>50 ng/L), the contamination levels were still below the Malaysia Food Regulation 1985 limit (less than 500 ng/L). This study provided a pioneering data on the occurrence of AFM_1 in milk and dairy products in Malaysia.

The confusion of design and facilities in Good Manufacturing Practice Requirements among industries in Malaysia

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Environment-Behaviour Proceedings Journal, Vol. 1(3), 2016, 156-167

Food manufacturing operations need to fulfil regulatory requirements related to hygiene and Good Manufacturing Practice (GMP) to successfully market their products as safe and high quality products. GMP is a component of the food safety system to ensure the control of public hygiene and environmental conditions of the food production process. This study aims to investigate the confusion over design and facilities elements among food industries through qualitative technique. Design and facilities elements lay a firm foundation for GMP to ensure food hygiene and should be used in conjunction with each specific code of hygiene practice and guidelines.

The food hygiene's knowledge, attitudes and practices between urban and suburban adolescents

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Procedia-Social and Behavioral Sciences, Vol. 234, 2016, 36-44

An independent samples t-test was conducted to examine whether there was a significant difference between urban and suburban about the impact of parental influences towards food hygiene practices. The test revealed that there are no statistically significant difference between urban and suburban (t=0.779, df=394.29, p>0.001). Urban adolescents (M=19.615, SD=3.024) reported significantly equal with the overall parental influences suburban adolescents (M=19.390, SD=2.743). The result indicates that similar parental influences due to increased food safety awareness and information communication technology can be easily passed down to their children.

Scope 9 | B

Food Science and Technology

Food Methodology and Analysis

Analytical approaches of determining monosaccharides from alkaline-treated palm fiber

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Malaysian Journal of Analytical Sciences, Vol. 19(1), 2015, 46-54

Monosaccharides in oil palm empty fruit bunch fiber (EFB) were determined by methanolysis and acetylation. Three types of EFB samples, namely untreated EFB, EFB pretreated with hot water and EFB pretreated with hot water followed by 10% (w/w) sodium hydroxide (NaOH) aqueous solution were used. The FTIR spectrum indicated the disappearance and shifting of aromatic and carbonyl functional groups, syringyl propane unit, guaisacyl propane unit and C-H lignin. The filter cake undergone methanolysis and alditol acetate treatments to detect the composition of reducing sugars. Gas chromatography flame ionization detector (GC-FID) analysis was conducted to determine the type and quantity of reducing sugars produced. Acetylation produced two types of monosaccharides namely glucose and galactose whereas methanolysis detected only one type of monosaccharide, which was xylose. The extracted monosaccharides obtained from hot water pretreatment followed by 10 % (w/w) NaOH aqueous solution treatment analysed by methanolysis and acetylation were 178.4 mg/g xylose and 29.9 mg/g glucose respectively. About 0.76 mg/g xylose was extracted from hot water pretreated EFB fiber by methanolysis. Acetylation detected monosaccharides in untreated EFB and identified as glucose with the amount of 19.15 mg/g, whereas monosaccharides from hot water pretreated EFB fiber were identified as glucose and galactose at 6.32 mg/g and 2.83 mg/g respectively.

Application of chromatographic and infra-red spectroscopic techniques for detection of adulteration in food lipids: A review

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Journal of Food Chemistry & Nanotechnology, Vol. 2(1), 2016, 32-41

Adulteration of oils and fats is an important commercial issue, which needs intervention from regulatory agencies. Tremendous amount of research has been carried out during the past several decades to address this, starting from classical methods to more sophisticated instrumental techniques. Instrumental techniques based on chromatography and infrared spectroscopy have received particular attention from researchers worldwide since they are fast and efficient. Majority of the past studies suggested the use of assays based on fatty acids, triacylglycerol components, minor constituents, and spectral characteristics as they are really useful to determine the adulteration of food lipids. A discussion on the specificity and sensitivity of these assays in solving adulteration issues of oils and fats is timely. Hence, the purpose of this review is to present an update of the current literature in this topic and provide some directions for future research.

Application of response surface methodology for optimizing the deodorization parameters in chemical refining of kenaf seed oil

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Separation and Purification Technology, Vol. 184, 2017, 144-151

Kenaf seed oil has been suggested to be used as edible oil but there is limited information available about the optimal parameters to produce refined kenaf seed oil. Response surface methodology was used to study the effects of the temperature (180–260 °C) and time (0.5–2.5 h) in the deodorization stage of the refining process for kenaf seed oil. Free fatty acids, p-Anisidine value, total color difference, and tocopherol and tocotrienol contents were measured. Well-fitting models were successfully generated for the responses of free fatty acids (R^2=0.9619, p<0.0001), *p*-Anisidine value (R^2=0.9867, p=0.0014), total color difference (R^2=0.9997, p<0.0001), and tocopherol and tocotrienol contents (R^2=0.9758, p<0.0001). The optimum parameters were recommended at a temperature of 220 °C and a time of 1.5 h. These optimum parameters produced refined kenaf seed oil with free fatty acids of 0.036%, peroxide value of 0 meq/kg, *p*-Anisidine value of 6.67, color of L=7.58, a=–2.48, b=3.29, and tocopherols and tocotrienols contents of 39.69 mg/100 g. There were no significant differences (p>0.05) between experimental and predicted values, indicating the adequacy of the well-fitting models.

Application of stable isotope signatures in food traceability

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Jurnal Sains Nuklear Malaysia, Vol. 28(1), 2016, 34-38

Stable isotope analysis has widely been used to trace the origin of organic materials in various fields, such as geochemistry, biochemistry, archeology and petroleum. In past a decade, it has also become an important tool for food traceability study. The globalisation of food markets and the relative ease with which food commodities are transported through and between countries and continents, means that consumers are increasingly concerned about the origin of the foods they eat. The natural abundance isotope variation such as carbon, nitrogen, hydrogen and oxygen are use as geographic tracers or marker to determine the geographic origin of fruits, crop, vegetables and food products from animal. The isotopic compositions of plant materials reflect various factors such as isotopic compositions of source materials and their assimilation processes as well as growth environments. This paper will discuss on stable carbon and nitrogen isotopic compositions in rice, advantages, limitations and potential of other analysis applications that can be incorporated in food traceability system.

Authentication of butter from lard adulteration using high-resolution of nuclear magnetic resonance spectroscopy and high-performance liquid chromatography

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Food authentication is an interesting issue for all parties in the food industry, including the fats and oils industry. Some unethical players try to blend high quality foods, such as butter, with lower ones like lard, therefore, the analytical methods capable of analyzing the adulteration practices must be developed. This study used proton nuclear magnetic resonance spectroscopy in combination with high-performance liquid chromatography for the authentication of butter from lard adulteration. The identification of triacylglycerol composition of lard as a chemical marker for halal authentication is analyzed using high-performance liquid chromatography and high resolution nuclear magnetic resonance spectroscopy. The suitability of proton nuclear magnetic resonance provides a high-performance approach for determination butter adulterated with lard in their entirety of all proton bearing components. Peaks in the region of 2.60–2.84 ppm show special characteristics only present in lard. Only lard has its own unique characteristics which only polyunsaturated fatty acids would give signals 7 at 2.63 that corresponded to the chemical shift of the double-allylic methylene protons. In the same way, the intensity of signal at 2.63 ppm, due to methylenic protons in a position to two double bonds, that is to say, due to the linoleic group. Furthermore, we also correlate some signals between ^{1}H and ^{13}C-NMR spectra for the confirmation of signals.

Comparison of vitamin C content in citrus fruits by titration and high performance liquid chromatography (HPLC) methods

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Vitamin C is one of the essential vitamins for human and animal. Many methods were developed for the determination of vitamin C such as spectrophotometry, electrophoresis, titration, and high performance liquid chromatography (HPLC). This study aims to compare vitamin C content of citrus fruits (orange, grapefruit, lemon, lime, kaffir lime and musk lime) using indophenol titration and HPLC-PDA methods. In the titration method, orange has the highest vitamin C content (58.30 mg/100g) followed by grapefruit (49.15 mg/100g), lemon (43.96 mg/100g), kaffir lime (37.24 mg/100g), lime (27.78 mg/100g) and musk lime (18.62 mg/100g). While, in the HPLC method orange also leads with the highest vitamin C content (43.61 mg/100g) followed by lemon (31.33 mg/100g), grapefruit (26.40

mg/100g), lime (22.36 mg/100g), kaffir lime (21.58 mg/100g) and musk lime (16.78 mg/100g). Orange is the best source of vitamin C while musk and kaffir lime have lower content. Significant differences were observed in vitamin C of samples by both methods. Both methods are suitable for the determination of vitamin C, however HPLC method is more accurate, precise and specific.

Detection of *Sarcocyst* in meat from local markets in Selangor: highlighting the use of crude sample in PCR

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Journal of Clinical and Health Sciences, Vol. 1(2), 2016, 18-21

Introduction: *Sarcocystis* spp. are obligate intracellular protozoan parasites which cause meat-borne parasitic disease. In Malaysia, *sarcocystosis* is seen as a potential emerging food-borne zoonosis after a series of large outbreak of human infections. Humans acquire infection either by ingestion of cyst in raw or undercooked infected meat or from *sporocysts* in contaminated food and water. The goal of this study is to identify the presence of *sarcocystis* parasites in meat of cattle, buffaloes, sheep and goats collected from local markets in Selangor, Malaysia. **Methods**: A total of 64 skeletal muscles samples (57 cattle, 2 buffaloes, 4 goats and 1 sheep) were collected from local markets. The samples were cut randomly into three pieces, squashed firmly between two glass slides and then examined microscopically for the presence of cysts. **Results**: Three samples of meat (4.69%) from cattle (1), buffalo (1) and sheep (1) were found to be positive for cysts. The cysts were confirmed by PCR as *sarcocystis* sp. **Conclusion**: The results showed low prevalence of *Sarcocystis* infection in meat collected from local markets. However, since there is a transmission among the livestock, extra precaution should be taken in consideration to prevent the spreading of *sarcocystosis* from animals to human.

Determination of DPPH free radical scavenging activity: Application of artificial neural networks

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Food Chemistry, Vol. 194, 2016, 705–711

A new computational approach for the determination of 2,2-diphenyl-1-picrylhydrazyl free radical scavenging activity (DPPH-RSA) in food is reported, based on the concept of machine learning. Trolox standard was mix with DPPH at different concentrations to produce different colors from purple to yellow. Artificial neural network (ANN) was trained on a typical set of images of the DPPH radical reacting with different levels of Trolox. This allowed the neural network to classify future images of any sample into the correct class of RSA level. The ANN was then able to determine the DPPH-RSA of cinnamon, clove, mung bean, red bean, red rice, brown rice, black rice and tea extract and the results were compared with data obtained using a spectrophotometer. The application of ANN correlated well to the spectrophotometric classical procedure and thus do not require the use of spectrophotometer, and it could be used to obtain semi-quantitative results of DPPH-RSA.

Determination of porcine gelatin in edible bird's nest by competitive indirect ELISA based on anti-peptide polyclonal antibody

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Food Control, Vol. 59, 2016, 561-566

Competitive indirect enzyme-linked immunosorbent assay (ELISA) was developed for rapid detection of porcine gelatin in edible bird's nest (EBN). Three ELISAs were developed by using polyclonal rabbit antibodies against porcine species-specific amino acid sequences of collagen a2 (I) chain (pAb1 and pAb2) and a1 (I) chain (pAb3). The limit of detection (IC_{15}) of the three ELISAs was 0.033, 0.082 and 0.052 mg/mL respectively. The median inhibitory concentration (IC_{50}) of pAb1, pAb2 and pAb3 was 0.265, 0.394 and 0.228 mg/mL respectively, as well as able to recognise porcine and bovine gelatins. pAb1 showed slight cross-reactivity with cave nest and egg white, while pAb2 exhibited slight cross-reactivity with blood cave nest and egg white. No cross-reactivity was observed with EBNs and egg white for pAb3. The recoveries of porcine gelatin spiked EBNs were in the range of 62.8e125.4% with intra- and inter-day coefficient of variants (CVs) of 2.9-5.4% and 4.7-9.6% respectively when using pAb3. Taking into account all abovementioned factors, pAb3 appeared sufficient for EBN authentication.

Development of antipeptide enzyme-linked immunosorbent assay for determination of gelatin in confectionery products

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International Journal of Food Science and Technology, Vol. 51, 2016, 54–60

The gelatin sources have become a controversial issue with regard to religious and health concern. Thus, the aims of this study were to develop and evaluate the efficiency of polyclonal antibodies against peptide immunogen of collagen 2(I) chain for determination of gelatin sources in confectionery products by competitive indirect enzyme-linked immunosorbent assay (ELISA). Collagen 2 (I) chain protein showed resistance against heat treatment and detectable in certain commercial products when analysed by sodium dodecyl sulphate–polyacrylamide gel electrophoresis (SDS-PAGE). The established ELISA exhibited low cross-reactivity to fish and chicken gelatin. The IC_{50} value was 0.39 lg mL^{-1}, and the limit of detection (IC_{10}) was 0.05 lg mL^{-1}. There were no false-positive results from forty-eight commercially processed products. The present method is useful for determination of gelatin in confectionery products.

Development of photostimulated luminescence technique for detecting irradiated food

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Jurnal Sains Nuklear Malaysia, Vol. 27(1), 2015, 7-13

The exposure of food to ionizing radiation is being progressively used in many countries to inactivate food pathogens, to eradicate pests and to extend shelf-life of food. To ensure free consumer choice, irradiated food will be labeled. The availability of a reliable method to detect irradiated food is important to enforce legal controls on labeling requirements, ensure proper distribution and increase consumer confidence. This paper reports on the preliminary application of photo stimulated luminescence technique (PSL) as a potential method to detect irradiated food and perhaps be used for monitoring irradiated food on sale locally in the near future. Thus this study will be beneficial and relevant for application of food irradiation towards improving food safety and security in Malaysia.

Differentiation of fatty acid composition of butter adulterated with lard using gas chromatography mass spectrometry combined with principal componenet analysis

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Jurnal Teknologi, Vol. 78(2), 2016, 171-177

Butter is high priced product; as a consequence, butter can be subjected for adulteration with low price components such as lard. The presence of lard in any products is not allowed for Muslim and Jewish, therefore, its presence must be identified. Gas chromatography-mass spectrometry was successfully used to detect and discriminate butter from adulterated with lard. Results were presented in the form of chromatogram. Principal component analysis (PCA) was used to interpret the data and provided a good grouping of samples with 55.8% of the variation accounted for by PC 1 and 21.5% were accounted for by PC 2. All the lard containing samples formed a separate group from the samples that were free of lard. This method can be developed into a rapid method for detecting the presence of lard in food samples for Halal authentication.

Differentiation of fractionated components of lard from other animal fats using different analytical techniques

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Sains Malaysiana, Vol. 46(2), 2017, 209–216

A study was conducted to differentiate fractionated components of lard namely lard olein (LO) and lard stearin (LS) from other common animal fats. Lard fractions and animal fats were analyzed using differential scanning calorimetry (DSC), elemental analyzer–isotope ratio mass spectrometry (EA-IRMS), gas chromatography mass spectrometry (GC-MS) and Fourier transform infrared spectroscopy (FTIR). Overlay of FTIR spectra did not help to pinpoint any characteristic feature to distinguish either LO or LS from other animal fats, but overlay of DSC cooling curves helped a successful discrimination. The determination of δ13C from EA-IRMS showed that the values corresponding to the fractionated components of lard were significantly ($p<0.05$) different from those of the other common animal fats. GC-MS analysis showed that direct comparison of overall fatty acid data was not able to discriminate LO and LS from other animal fats, but the application of principal component analysis (PCA) to fatty acid data helped a successful discrimination.

Differentiation of partial acylglycerols derived from different animal fats by EA-IRMS and GCMS techniques

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Grasas y Aceites, Vol. 67(2), 2016, 136-143

A study was carried out to compare partial acylglycerols of lard with those of chicken fat, beef fat and mutton fat using Gas Chromatography Mass Spectrometry (GC-MS) and Elemental Analysis–Isotope Ratio Mass Spectrometry (EA-IRMS). Mono-(MAG) and di-(DAG) acylglycerols of animal fats were prepared according to a chemical glycerolysis method and isolated using column chromatography. The fatty acid composition and ^{13}C carbon isotope ratio of MAG and DAG derived from individual animal fat were determined separately to establish their identity characteristics. The results showed that the ^{13}C values of MAG and DAG of lard were significantly different from those of MAG and DAG derived from chicken fat, beef fat and mutton fat. According to the loading plots based on a principle component analysis (PCA), fatty acids namely stearic, oleic and linoleic were the most discriminating parameters to distinctly identify MAG and DAG derived from different animal fats. This demonstrated that the EA-IRMS and the PCA of fatty acid data have considerable potential for discriminating MAG and DAG derived from lard from other animal fats for Halal authentication purposes.

Effects of accelerated storage on the quality of kenaf seed oil in chitosan-coated high Methoxyl pectin-alginate microcapsules

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Journal of Food Science, Vol. 81(10), 2016, C1-C6

The objective of this research was to study the oxidative stability and antioxidant properties of microencapsulated kenaf (*Hibiscus cannabinus* L.) seed oil (MKSO) produced by co-extrusion technology upon accelerated storage. The combination of sodium alginate, high methoxyl pectin, and chitosan were used as shell materials. The oxidative stability of the kenaf seed oil was determined by iodine value, peroxide value, *p*-Anisidine value, total oxidation (TOTOX), thiobarbituric acid reactive substances assay, and free fatty acid content. Total phenolic content, 2,2-azinobis (3-ethylbenzothiazoline-6-sulphonic acid) cation radical-scavenging assay and 2,2-diphenyl-1-picrylhydrazyl radical scavenging assay were used to examine the antioxidant properties of oils. Oxidative stability tests showed that bulk kenaf seed oil (BKSO) was oxidized significantly higher ($P<0.05$) than MKSO. The total increment of TOTOX value of BKSO was 165.93% significantly higher ($P<0.05$) than MKSO. Co-extrusion technology has shown to be able to protect kenaf seed oil against lipid oxidation and delay the degradation of natural antioxidants that present in oil during storage.

Enzyme immunoassay for the detection of porcine gelatine in edible bird's nest

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Food Additives & Contaminants: Part A, Vol. 32(7), 2015, 1023–1028

Porcine gelatine is a common adulterant found in edible bird's nests (EBNs) used to increase the net weight prior to sale. This study aimed to develop indirect enzyme-linked immunosorbent assays (ELISAs) for porcine gelatine adulteration using anti-peptide polyclonal antibodies. Three indirect ELISAs were developed (PAB1, 2 and 3), which had limits of detection (LODs) of 0.12, 0.10 and 0.11 $\mu g\ g^{1}$, respectively. When applied to standard solutions of porcine gelatine, the inter- and intra-assays showed coefficients of variation (CVs) less than 20% and were able to detect at least 0.5 ng μg^{1} (0.05%) porcine gelatine in spiked samples. The proposed ELISA offers attractions for quality control in the EBN industry.

Fat soluble vitamin and carotenoid analysis in cooking oils by Ultra-Performance Convergence Chromatography

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Food Analytical Methods, Vol. 10(4), 2017, 1087-1096

In the current study, a rapid ultra-performance convergence chromatography (UPC^2) method for the determination of seven fat-soluble vitamins (vitamin A: retinol, retinyl acetate; vitamin D: ergocalciferol, cholecalciferol; vitamin E: α-tocopherol; vitamin K: phylloquinone, menaquinone) and three carotenoids (lutein, lycopene, β-carotene) in various cooking oils was developed. Fat-soluble vitamins could be separated within 8 min on a UPC2 system with a BEH column (3.0 × 100 mm, 1.7 m) at 50 °C, using a gradient elution with a mobile phase of carbon dioxide and 2-propanol (99.9:0.1/99.2:0.8/99.9:0.1), at a flow rate of 2 mL/min and the automatic back pressure regulator (ABPR) set to 1800 psi. Carotenoids were separated within 3 min on a similar UPC^2 system with an HSS C18 SB column (3.0 × 100 mm, 1.8 m) at 40°C, under isocratic conditions with a mobile phase of carbon dioxide and ethanol (75:25; *v/v*). The flow rate was set to 1.5 mL/min and the ABPR to 1800 psi. The limits of detection (LODs) and quantification (LOQs) were ranging between 0.01 and 1.17 g/mL and from 0.05 and 3.59 g/mL for fat-soluble vitamins while carotenoid detection limits fell in the range of 0.03–0.11 g/mL and of 0.10–0.38 g/mL, respectively. The results showed excellent linearity for both methods (R^2 0.9993–0.9999). A recovery study with standard addition technique into a selected coconut oil sample resulted in more than 90 % recovery for retinyl acetate, retinol, and vitamin K_1 and K_2, whereas the recovery for vitamin D_2 and D_3 ranged between 70 and 80 %. The lowest recovery of 68–70 % was found for -tocopherol while almost comparable recovery rates above 80 % were observed for all three carotenoids.

Halal analysis of raw materials, ingredients and finished bakery products using PCR and gene chip southern-hybridization for detection of porcine DNA

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International Food Research Journal, Vol. 22(5), 2015, 1883-1887

This study was conducted to investigate the sensitivity and detection of porcine DNA in raw materials, ingredients and finished bakery products by polymerase chain reaction (PCR) - southern hybridization on chip analysis. A total of 20 samples (n=20*3) with three replicates for each samples were obtained from a bakery factory located in Bangi, Selangor from January to December 2012. The sensitivity level of PCR-southern hybridization on chip was 0.001 ng. The species-specific oligonucleotide primers used in PCR-southern hybridization were targeted on the mitochondria DNA (mtDNA) of *cytochrome* b (*cyt* b) gene sequence, namely *cty* b biotin-labeled oligonucleotide primers. The amplicon from PCR amplification was 276 bp in size. None of the raw materials, ingredients and finished bakery product samples was positive towards porcine DNA, except for the positive control. The results in the present study demonstrated that the PCR- southern-hybridization technique on the gene chip (Olipro™ Porcine gene chip) is a sensitive tool for monitoring the porcine component in highly processed ingredients and finished bakery products.

Inhibitory effect of chocolate components toward lard detection in chocolate using real time PCR

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An identification method of lard in chocolates using real-time polymerase chain reaction was developed to address Halal authentication. However, PCR detection of lard in chocolate has been in vain. In order to investigate the inhibitory effect exerted by each of the chocolate components, four basic chocolate components: sugar, milk powder, cocoa butter and cocoa powder were adulterated with lard and examined using porcine-specific real-time PCR assay. The results discovered cocoa powder, as the only component that prevents DNA extraction of lard in chocolate. No substantial PCR inhibition was detected thus confirms the cocoa powder's inhibition on DNA extraction of lard from lard-adulterated chocolate. This finding will expedite new research to develop a method to dissociate the lard from the lard-cocoa powder complex, which will have high potential to be applied as a pre-treatment of the chocolate prior to the DNA extraction and PCR.

Rapid detection of lard in chocolate and chocolate-based food products using Fourier transform infrared spectroscopy

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Fourier transform infrared (FTIR) spectroscopy, in combination with attenuated total reflectance (ATR) and partial least square (PLS) regression was used to detect the addition of lard in chocolate formulation. The spectral bands associated with lard, cocoa butter and their blends (ranging from 0–10% of lard in cocoa butter) were recorded, interpreted and identified. A semi-quantitative approach is proposed to measure the percent of lard in blends on the basis of spectral data of the band at the frequency in the region 4000–400 cm^{-1} using the equation y=1.0144x–0.0644. The coefficient of determination (R^2) was 0.9892 with a standard error of 0.4504. The fingerprints of functional groups in cocoa butter and pure lard enable FTIR spectroscopy to be widely used to authenticate the adulteration in food and pharmaceutical analysis. The results showed that FTIR method is versatile, efficient and accurate, and suitable for routine quality control analysis with the result within 2 minutes using sample of less than 2 ml. In this paper, the potential of FTIR spectroscopy as a rapid analytical tool for the quantitative determination of adulterant especially lard in chocolate is demonstrated.

Sensitivity of polymerase chain reaction (PCR)-southern hybridization and conventional PCR analysis for Halal authentication of gelatin capsules

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LWT-Food Science and Technology, Vol. 63(1), 2015, 714-719

Halal authentication of gelatin capsules was conducted using polymerase chain reaction (PCR)-southern hybridization on chip and conventional PCR analysis. The primers used in PCR-southern hybridization were targeted on mitochondria DNA (mtDNA) of cytochrome b (*cyt* b) gene and its amplicon was 276 bp. In conventional PCR, three pairs of mtDNA primers targeted cyt b, cytochrome oxidase II (COII) and ATP6 gene were tested, resulting of 398, 212 and 83 bp amplicons, respectively. Of 20 brands examined using PCR-southern hybridization, 6 capsules (C1-C6) were found to be porcine DNA positive but none were positive using conventional PCR method. The sensitivity of each primer in the detection of porcine DNA was 0.25 ng (*cyt* b), 0.1 ng (COII), 0.001 ng (Olipro™ Chip) and 0.0001 ng (ATP6). Results demonstrated that the PCR-southern hybridization on chip was useful and reliable for verifying porcine DNA in gelatin capsules compared to conventional PCR.

Targeting double genes in multiplex PCR for discriminating bovine, buffalo and porcine materials in food chain

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Food Control, Vol. 73, 2017, 175-184

Beef, buffalo and pork are the major meat of economic, religious and health concern. Current methods to authenticate these materials in food chain are based on mainly single gene targets which are susceptible to break down by food processing treatments. We, for the first time, described here a double gene targeting short-amplicon length multiplex polymerase chain reaction assay for discriminating bovine, buffalo and porcine materials in a single assay platform. The advantage of the assay is evidenced in terms of fidelity, cost and time since it is highly unlikely that two different targets would be missing even in a decomposed specimen. Detection of multiple targets in a single assay definitely saves analytical cost and time. Mitochondrial cytochrome b (cytb) and ND5 genes were targeted and six different targets (length: 90-146 bp), two for each of cow (120 and 106bp), buffalo (90 and 138bp) and pig (73 and 146bp), were amplified from raw, boiled, autoclaved and microwaved cooked meat under pure and mixed matrices. The detection limit was 0.02 ng DNA under pure states and 0.1% meat in binary mixtures and meatball products. Screening of Malaysian meatball products revealed all beef products were buffalo positive in which 35% were totally replaced. In contrast, all pork products were found uncontaminated from beef and buffalo.

Scope 9 | C

Food Science and Technology

Food Processing and Preservation

Active packaging of fish gelatin films with Morinda citrifolia oil

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Food Bioscience, Vol. 16, 2016, 66-71

Active packaging is of interest in helping to prevent autoxidation process in foods. *Morinda citrifolia* contains a wide range of antioxidants such as ascorbic acid, terpenoids, and polyphenols. The purpose of this study was to determine the potential of *Morinda citrifolia* as a natural antioxidant in an active packaging film. Fish gelatin films incorporated with 1–3% of *Morinda citrifolia* oil (MO) were used to prepare antioxidant films. It was found that the incorporation of MO would not affect the thickness and solubility of gelatin films, independent of concentration. However, the solubility ranging from 13.4% to 13.8% might be considered low for these films. As for the mechanical properties, Young's modulus and elongation at break were not affected significantly by incorporation of 1–3% MO ($p>0.05$). As for the tensile strength, fish gelatin film incorporated with 1–3% MO showed a higher value than control ($p\leq0.05$). The opacity between the samples and control varied statistically with the highest value with films containing 3% oil ($p\leq0.05$). However, increasing the MO concentrations would decrease the water vapor permeability ($p>0.05$). DPPH (2,2-diphenyl-1-picrylhydrazyl) was used to determine the antioxidant activity and the result increased significantly ($p\leq0.05$) from 9% to 16% with the increase of oil concentration, suggesting MO incorporation in films as potential means of active packaging.

Cassava starch edible film incorporated with lemongrass oil: Characteristics and application

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International Journal on Advanced Science, Engineering and Information Technology, Vol 6(2), 2016, 216-220.

The objective of this research is to evaluate the effect of the addition of lemongrass essential oil (LGO) on the characteristics and antimicrobial properties of cassava starch based films. Edible films were prepared from a mixture of cassava starch and glycerol. LGO was added to edible films as natural antimicrobial agent. There was a reduction in tensile strength of edible film because of incorporation of LGO. The presence of LGO also caused to a reduction in roughness of the edible film. The experimental results showed that *Trichoderma* and *Penicillium* was not appear upon the film until the third day of incubation. Meanwhile, the use of edible films containing LGO as antimicrobial agents caused to a reduction in microbial counts of meat during storage.

Characteristics and controlled release behaviour of microencapsulated kenaf seed oil during in-vitro digestion

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Journal of Food Engineering, Vol. 182, 2016, 26-32

Kenaf seed oil is rich in polyunsaturated fatty acids (PUFA) and monounsaturated fatty acids (MUFA), which are susceptible to lipid oxidation. This study aimed to evaluate the potential of carboxymethylcellulose, maltodextrin and soy lecithin to be used as wall materials to microencapsulate kenaf seed oil. Emulsion was prepared at core/wall ratio of 1:3. The emulsion prepared was spray dried at 160 °C inlet temperature and physical characteristics of microencapsulated kenaf seed oil (MKSO) including microencapsulation efficiency (MEE) were carried out. An *in-vitro* digestion was carried out to examine the oil release behaviour of MKSO. The changes in oxidative stabilities, antioxidant stabilities and bioactive compounds of bulk kenaf seed oil (BKSO) and MKSO before and after digestion were evaluated. This combination of wall materials was successfully improved the bioaccessibility of kenaf seed oil and delivered the oil to be released during intestinal digestion. Digested MKSO had lower lipid oxidation value, lower loss of antioxidant activities and lower degradation of bioactive compounds compared to digested BKSO. This study indicated that microencapsulation of kenaf seed oil with carboxymethylcellulose, maltodextrin and soy lecithin offered an effective protection to kenaf seed oil during digestion.

Combined effects of added beta glucan and black tea in breads on starch functionality

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Bread and tea are usually consumed separately, but there may be different food-matrix interactions and changes in starch characteristics when they are combined in bread. This study developed breads (white bread, WF; black tea, BT; beta glucan, βG; beta glucan plus black tea, βGBT) and determined their starch functionalities. Breads were developed using a standard baking recipe and determined their starch characteristics. There was no significant difference in starch hydrolysis between BT and WF but βGBT reduced early (10 min) starch hydrolysis compared with βG. The starch granules in βG and βGBT were elliptical and closely packed together. These results suggest that the addition of beta glucan and black tea to bread preserved the elliptical starch granules and lowered short-term starch hydrolysis.

Comparative study of crude and refined kenaf *(Hibiscus Cannabinus L.)* seed oil during accelerated storage

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This study assessed the changes of antioxidant activity and bioactive compounds of crude and refined kenaf seed oil during accelerated storage at 65°C for 24 days. 2,2-Diphenyl-1-picrylhydrazyl and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) radical scavenging assays were used to determine their antioxidant activity. The changes of phenolic, tocopherol, and phytosterol contents during the storage were also studied. The phenolic content and antioxidant activity of refined oil were significantly lower than those of crude oil after the accelerated storage. There was a decrease of 72.5% tocopherol content and 31.1% phytosterol content in the crude oil and a decrease of 67% tocopherol content and 12.1% phytosterol content in the refined oil during the accelerated storage. There was no significant difference in tocopherol and phytosterol contents for crude and refined oils after the storage. The rate of degradation of tocopherol and phytosterol contents in refined oil was slower than that in crude oil during the storage.

Compatibility of selected plant-based shortening as lard substitute: Microstructure, polymorphic forms and textural properties

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A study was carried out to determine the compatibility of three plant-based shortening mixtures to lard shortening (LD) in terms of microstructure, polymorphic forms, and textural properties. The shortenings of binary, ternary, and quaternary fat mixtures were prepared according to a standard procedure by blending mee fat (MF) with palm stearin (PS) in a 99:1 (w/w) ratio; avocado fat (Avo) with PS and cocoa butter (CB) in a 84:7:9 (w/w) ratio; palm oil (PO) with PS, soybean oil (SBO) and CB in a 38:5:52:5 (w/w) ratio, respectively. The triacylglycerol composition, polymorphic forms, crystal morphology, and textural properties of the shortening were evaluated. This study found that all three plant-based shortenings and LD shortening were similar with respect to their consistency, hardness and compression and adhesiveness values. However, all plant-based shortening was found to be dissimilar to LD shortening with respect to microstructure.

Composition and thermal analysis of ternary mixtures of avocado fat: palm stearin: cocoa butter (Avo: PS: CB)

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Avocado fat is a semi-solid substance with potential functional lipid characteristics. A study was carried out to evaluate the effect of addition of palm stearin and cocoa butter on the solidification behavior of avocado fat to formulate a mixture to become similar to lard. A total of three mixtures were prepared: avocado fat: palm stearin: cocoa butter (88:7:5), avocado fat: palm stearin: cocoa butter (86:7:7), avocado fat: palm stearin: cocoa butter (84:7:9; w/w), and identified by the mass ratio of avocado fat to palm stearin and cocoa butter. The fat mixtures were compared with lard in terms of the fatty acid and triacylglycerol compositions using gas chromatography and high-performance liquid chromatography, thermal properties using differential scanning calorimetry and solid fat content using p-nuclear magnetic resonance. Although there were considerable differences between lard and the fat mixtures with regard to fatty acid and triacylglycerol compositions, some similarities were seen with regard to thermal properties and solid fat content profile. Of all the fat mixtures, avocado fat:palm stearin:cocoa butter (84:7:9) displayed closer similarity to lard with respect to thermal transitions at –3.59°C and its solid fat content profile showed the least difference to that of lard throughout the temperature range measured.

Deodorizing *Morinda citrifolia* (mengkudu) strong odor juice by -cyclodextrin-organic acids inclusion

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Morinda citrifolia (noni) which is locally known as *mengkudu* in Malaysia, is a small evergreen tree usually found growing in open coastal regions at sea level and in forest areas. It has been reported to have various therapeutic effects, including having anticancer activities, in clinical practices and laboratory animal models. However, consumers mostly avoid consuming *mengkudu* products due to *mengkudu* s sensory properties such as a strong rancid-like odor that is released when the mengkudu fruit is fully ripe. Therefore, this study was conducted to determine the effectiveness of β-cyclodextrin in deodorizing the unpleasant odors in *mengkudu* juice which are mainly caused by medium chain fatty acids such as hexanoic acid, octanoic acid and decanoic acid. Initially, the optimal molar ratio for the encapsulation of hexanoic, octanoic and decanoic acid by β–cyclodextrin was constructed as a model system prior to the encapsulation of the juice. The formation of inclusion complex between all acids and β-cyclodextrin was verified by means of differential scanning calorimetry (DSC). Next, four dry weight ratios of *mengkudu* juice to β–cyclodextrin (1:0.5, 1:1, 1:1.5 and 1:2) were selected to determine the degree of the effectiveness of -cyclodextrin in encapsulating unpleasant odors via gas chromatography-mass spectrometry (GC-MS). Based on the results, inclusion complex formation was confirmed by DSC through the disappearance of a melting point for pure acid, and shifting to a lower melting point from the pure β–cyclodextrin after the encapsulation process. Moreover, there were significant differences observed between hexanoic acid and octanoic acid content in the *mengkudu*

juice before and after adding β-cyclodextrin ($p<0.05$). On the other hand, the results obtained from GC-MS and sensory evaluation had contributed to an optimum entrapment of fatty acids at the optimal dry weight ratio of 1:0.5 (dry weight of *mengkudu*: β-cyclodextrin). Hence, the ability of β-cyclodextrin as a masking agent has been proven to be able to reduce the odor-based fatty acids in *mengkudu* juice.

Development of a methane-free, continuous biohydrogen production system from palm oil mill effluent (POME) in CSTR

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This study aimed to develop the start-up experiment for producing biological hydrogen in 2 L continuous stirred tank reactor (CSTR) from palm oil mill effluent (POME) by the use of mixed culture sludge under non-sterile conditions. Besides using different source of starter culture, the effects of acid treated culture and various operating temperature from 35 °C to 55 °C were studied against the evolved gas in terms of volumetric H2 production rate (VHPR) and soluble metabolite products (SMPs). The formation of methane was closely observed throughout the run. Within the studied temperature, VHPR was found as low as 0.71 L/L.d and ethanol was the main by-products (70-80% of total soluble metabolites). Attempts were made to produce biohydrogen without methane formation at higher thermophilic temperature (45-55 °C) than the previous range. The average of 1.7 L H_2 of 2 L working volume per day was produced at 55 °C with VHPR of 1.16 L/L.d. The results of soluble metabolites also are in agreement with the volatile fatty acids (VFAs) which is higher than ethanol. Higher VFAs of 2269 mg/L was obtained with acetic acid being the main by-product. At this time methanogen has been deactivated and no methane was produced. From this study, it can be concluded that thermophilic environment may offer a better option in a way to eliminate methane from the biogas and at the same time improving hydrogen production rate as well.

Development of a palm olein oil-in-water (o/w) emulsion stabilized by a whey protein isolate nanofibrils-alginate complex

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An oil-in-water (o/w) emulsion is a system where the oil droplets are dispersed within a watery phase. The most important function of emulsions is their ability to incorporate lipophilic components into food matrices. Thus, it is crucial to develop an emulsion that is highly stable. This work was aimed at developing a palm olein o/w emulsion stabilized by a whey protein isolate nanofibrils-alginate complex,

as well as evaluating the influence of oil load and the homogenization process (both pressure and cycle) on the characteristics of the o/w emulsions. Emulsions were analyzed for droplet size, zeta potential, viscosity, creaming stability, and morphology. The results showed that an increase in oil load led to a larger droplet size, less negative zeta potential, and emulsions that were more viscous and less stable. On the other hand, increasing homogenization pressure and the number of homogenization cycles resulted in a smaller droplet size, more negative zeta potential, and emulsions that were less viscous and more stable. Emulsions with a smaller droplet size and better stability resulted from lower oil load, high homogenization pressure and more homogenization cycles.

Diacylglycerol-enriched oil production using chemical glycerolysis

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Diacylglycerol (DAG)-enriched oils have been drawing increased global attention from researchers and food manufacturers. The production of DAG-enriched oils have been investigated extensively because of its health benefit. DAG is commonly produced chemically through glycerolysis processes. This paper attempts to review and summarize the chemical glycerolysis methods for DAG-enriched oils production. The critical process parameters of the DAG synthesis are also presented and discussed. In addition, a process intensification for DAG-enriched oils production has been developed with an objective of reducing required temperature with better reaction yields, and also lowering energy requirement and cost of processing.

Practical applications: Diacylglycerol (DAG) has been widely used at different purity levels as an additive for enhancing fats' plasticity, an emulsifier and stabilizer in food as well as in medicine and cosmetic industries. DAG can be produced chemically through a glycerolysis process. Chemical production of DAG oil avoids a number of complex steps required in the enzymatic method. Important parameters in chemical glycerolysis must be fully considered to gain a better performance of chemical glycerolysis.

Effect of *Aloe vera* (*Aloe barbadensis Miller*) gel on the physical and functional properties of fish gelatin films as active packaging

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Present study was conducted to investigate the feasibility of the combination of fish gelatin and *Aloe* gel in producing composite films and to determine the effect of *Aloe* gel concentrations (1, 3, 5, 7 and 9% wt/wt) on the physical properties and antioxidant activity of the composite films. The moisture content of the composite films was proportional to the concentration of *Aloe* gel. Also, the water solubility and tensile strength of the films decreased with increasing Aloe gel concentration. However, *Aloe* gel did not cause any significant effect ($p \geq 0.05$) on thickness, water vapour permeability (WVP)

and colour of the composite films. The gelatin/*Aloe* composite films exhibited smooth surface microstructures similar to non-composite gelatin film when observed under scanning electron microscope (SEM). The gelatin/*Aloe* composite films also showed concentration dependant ABTS and DPPH radical scavenging activities.

Effect of blender and blending time on color and aroma characteristics of juice and its freeze-dried powder of *Pandanus amaryllifolius* Roxb. Leaves (pandan)

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The color and aroma properties of *Pandanus amaryllifolius* Roxb. leaves (pandan) were studied by mechanical extraction using normal and turbo blade blenders under different blending times (60–180 s). The extracted juice was freeze-dried into powders and its aroma components were measured in a solid-phase microextraction using gas chromatography/mass spectrometry (SPME-GC/MS) analysis. The turbo blade blender provided maximum color pigment of greenness and yellowness at blending time of 90 s as compared to the normal blender that required 180 s. In GC-MS analysis, the major component, 2-acetyl-1-pyrroline, was found to be one time higher in the freeze-dried pandan juice samples obtained from turbo blade blender than normal blender. Other components including the cis-3-hexanal, 2-methylene-4-pentenenitrile and 1,2,4-trimethylbenzene were also detected in the samples. In conclusion, the turbo blade blender is more effective than normal laboratory blender in terms of color extraction, particle size reduction and the aroma retention.

Effect of chemical refining on the quality of kenaf (*Hibiscus cannabinus*) seed oil

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Crude kenaf seed oil was obtained by solvent extraction and chemically refined using industrial refining process, which includes degumming, neutralization, bleaching, and deodorization. The changes in physical characteristics, oxidation indexes, antioxidant activity, bioactive compounds, and fatty acid composition were determined after each stage of refining. The results obtained showed that there was no significant difference in the specific gravity of kenaf seed oil, but there was a significant increase in the refractive index and a significant decrease in the a* and b* values in the color determination after the refining. Peroxide value decreased from 2.64 to 0.55 meq/kg, *p*-Anisidine value increased from 2.41 to 3.41, TOTOX value decreased from 7.70 to 4.51, and free fatty acids decreased from 1.72 to 0.61 after the whole refining process. There was a removal of 64.5% of total phenolic content, 65.3% of total carotenoid content, 22.5% of phytosterol content and high retention of tocopherol

content in kenaf seed oil after refining. Kenaf seed oil showed an increasing of 84.5% and 58.6% in DPPH• value and ABTS•+ value, respectively. Oleic acid was found in the largest amount in the refined kenaf seed oil (35.1%), followed by linoleic acid (32.3%) and palmitic acid (21.9%). There was a slight increase in unsaturated fatty acids and a slight decrease in saturated fatty acids after refining. This work showed that the chemical refining process offers an improvement in the quality of kenaf seed oil.

Effect of cream fermentation on microbiological, physicochemical and rheological properties of *L. helveticus*-butter

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The primary objective of this study was to evaluate the physicochemical and rheological properties of butter produced by *Lactobacillus helveticus* fermented cream. The incorporation of putative probiotic–the *L. helveticus*, to ferment cream prior to butter production was anticipated to alter the nutritional composition of butter. Changes in crude macronutrients and the resultant modification relating to textural properties of butter induced upon metabolic activities of *L. helveticus* in cream were focused in this research. Fermented butter (LH-butter) was produced by churning the cream that was fermented by lactobacilli at 37 °C for 24 h. Physicochemical analysis, proximate analysis and rheology properties of LH-butter were compared with butter produced using unfermented cream (control). LH-butter showed a significantly ($P<0.05$) higher fat content and acid value; lower moisture and ash; and was softer than the control. Cream fermentation modified nutritional and textural properties of butter in which LH-butter contained higher health beneficial unsaturated fatty acids than the control and thus rendered the product softer. Its enrichment with probiotics could thus further enhance its functional property.

Effect of different degree of deacetylation, molecular weight of chitosan and palm stearin and palm kernel olein concentration on chitosan as edible packaging for cherry tomato

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The palm stearin and palm kernel olein (PSPKOo) blend (at 31%) was incorporated into chitosan of different degree of deacetylation (DD) (85 and 95%) and molecular weight (MW) (100,000 and 300,000 Da) to form films, and the films were evaluated in terms of particle size, diameter and stability of emulsion, as well as thickness and tensile strength. The chitosan with 85% DD (MW 300,000 Da)

and 31% PSPKOo blend resulted in the strongest film, while this chitosan varied with 15.5 and 31% of PSPKOo blends compared to physical properties of film. Emulsion blend containing 85% DD (MW 300,000 Da) and 31% PSPKOo blend of chitosan gave the biggest particle size, highest viscosity and the most stable emulsion, resulting in the thickest film with the highest tensile strength (TS) and elastic modulus (EM). The film was applied on cherry tomato and stored at 20 °C for 9 days. The chitosan film with 85% DD (MW 300,000 Da) and 31% PSPKOo blend was the most effective in reducing weight loss and maintaining firmness and redness of cherry tomato compared to the other two films. Hence, palm stearin (PS) showed potential to be used as a moisture barrier in fruit coating.

Effect of domestic cooking methods on physicochemical, nutritional and sensory properties of different varieties of brown rice from Southern Thailand and Malaysia

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Consumption of brown rice is increasing on account of higher nutritional components such as vitamins, minerals, fibres and antioxidants than white rice. However, the effect of domestic cooking methods on nutritional attributes of brown rice is not well-characterized. Hence, this study aimed to investigate the effect of cooking methods; pressure cooker (PC) and rice cooker (RC) on physicochemical, nutritional and sensory properties of brown rice from five different varieties: Sungyod (SY), Chiang (CH), and Lepnok (LP) of Thai and long grain LS1 and LS2 of Malaysian origin. Peak viscosity (PV) and final viscosity (FV) among uncooked samples were significantly different except for LS1 and LS2. Between cooking methods, protein content (8.17–10.14%) was significantly different ($p<0.05$) except in SY, LS1 and LS2 varieties whereas fat (1.74–2.71%) and ash content (1.15–1.46%) showed significant difference ($p < 0.05$) only in LP and SY varieties. Loss of iron was significantly higher in RC method than PC method but zinc and thiamine was insignificant. The LS1 and LS2 cooked in PC was significantly softer ($p<0.05$) than cooked in RC. Hardness of PC cooked rice was correlated with PV ($r=–0.965$), breakdown viscosity ($r=–0.973$), setback viscosity ($r=–0.944$) at $p<0.01$ and pasting temperature ($r=0.89$, $p<0.05$) of uncooked brown rice flours. Overall, PC was found better over RC in terms of cooking time, textural properties, nutrients and sensory attributes.

Effect of ion exchange resin weight and extract flow rate on the properties of starfruit (*Averrhoa carambola* L.) extract

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This research was carried out to determine the effect of resin weight and extract flow rate during deacidification on the oxalic acid content, physicochemical and antioxidative properties of starfruit extract. Nine treatments which consisted of different combinations of resin weight (3, 5 and 8 g) and flow rate (6, 9, and 12 ml/min) were carried out. Parameters measured were oxalic acid content, pH, total polyphenol content, vitamin C and free radical scavenging activity (DPPH). Increasing the weight

of resin and decreasing the flow rate increased the pH of starfruit juice. The pH of starfruit juice increased from 3.6 for control to 9.9 for sample deacidified with 8 g of resin at flow rate of 6 ml/min. Oxalic acid content of starfruit juice showed a significant ($p<0.05$) reduction with deacidification. Deacidified samples showed significant decrease ($p<0.05$) in total polyphenol content, vitamin C and free radical scavenging activity compared to control. However, different combinations of resin weight and flow rate during deacidification did not have any significant effect ($p>0.05$) on total polyphenol content, vitamin C content and free radical scavenging activity of starfruit juice.

Effect of microwave pretreatment on stability of kenaf (*Hibiscus cannabinus* L.) Seed oil upon accelerated storage

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The aim of this study was to investigate the oxidative stability, antioxidant activity and fatty acid composition of 2 minutes microwave pre-treated kenaf seed oil (MKSO) in comparison with the untreated kenaf seed oil (KSO) under accelerated storage for 24 days. Results obtained on oxidative stability for both KSO and MKSO by the end of storage with PV were 9.83 meq O_2/kg and 8.97 meq O_2/kg, respectively; p-Anv were 17.28 and 13.48, respectively; TOTOX value of 36.94 and 31.42, respectively; IV value were measured 84.50 g of I_2/ 100 g and 84.34 g of I_2/ 100 g oil, respectively; FFA value of 5.67 mg KOH/100g oil and 5.14 mg KOH/100g oil, respectively. Aside from that, the antioxidant activity in MKSO was better than KSO. For the fatty acid composition, the oleic and linoleic acids were affected significantly throughout storage for both KSO and MKSO. MKSO presented a better overall oxidative stability, antioxidant activity and retained higher content of MUFA and PUFA significantly ($p<0.05$) upon accelerated storage.

Effect of plasticizers on the physicochemical properties of *Kappa-Carrageenan* films extracted from *Eucheuma cottonii*

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The physicochemical properties of -carrageenan films extracted from *Eucheuma cottonii* (*E. cottonii*) incorporated with different concentrations and types of plasticizers were studied. Glycerol, sorbitol, and polyethylene glycol-300 (PEG-300) in the range of 10-60% were used as plasticizers. The results showed that the thickness and moisture content (MC) of films increased significantly ($p\leq0.05$) with the increase in plasticizer concentration. Sorbitol-plasticized films had the lowest values. Sorbitol-plasticized films have better mechanical properties and the lowest water vapor permeability (WVP), solubility and water uptake ratio (WUR) compared with glycerol and PEG-plasticized films ($p\leq0.05$). Fourier transform infrared (FTIR) spectra showed the intermolecular reactions between -carrageenan and the plasticizers in the films. Scanning electron microscopy (SEM) observations indicated that sorbitol-plasticized films have a compact structure, even at the highest concentration. The melting

temperature (Tm) of films decreased ($p \leq 0.05$) with an increase in the plasticizer concentration. Here, the glycerol-plasticized films had the lowest values. X-ray diffraction (XRD) showed broad and narrow peaks of the un-plasticized -carrageenan film at 2 =20.0° and 2 =8.4°, respectively. The intensity of the broad peak increased and the narrow peak disappeared as the concentration of plasticizers increased. In conclusion, films from *E. cottonii* successfully produced with sorbitol as the plasticizer exhibited good physical properties as packaging films.

Effects of deodorisation methods on volatile compounds, chemical properties and antioxidant activities of fucoidan isolated from brown seaweed (*Sargassum* sp.).

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Fucoidan is a unique marine algae derivative that exhibit many bioactivities. However, the distinct unpleasant odour limits its application in food products. In the present study, fucoidans were deodorised using three different methods; activated carbon, (F_{ac}), ion exchange resin (F_{resin}) and calcium carbonate (F_{CaCO3}). Subsequently, the effects of deodorisation on the chemical properties (FTIR, fucose and sulphate content), volatile compound compositions (GC-MS) and antioxidant activity (total phenolic content, DPPH, superoxide and hydroxyl radical scavenging) of fucoidan were evaluated. A total of 46 volatile compounds were successfully identified in all samples using headspace-solid phase microextraction (HS-SPME) and analysed using gas chromatography mass spectrometry (GC-MS). It was found that 2,4-bis(1,1-dimethylethyl)phenol was one of the odour active compounds in F_{sar}, which reduced significantly after deodorisation. All deodorised samples showed no significant ($p>0.05$) differences in fucose, sulphate content and total phenolic content from that of F_{sar} except for F_{resin}. In terms of antioxidant activity, the DPPH scavenging activity in FCaCO3 (3%) was significantly higher, ($p<0.05$) compared to that of F_{sar}. All deodorised fucoidans were observed to show significantly higher ($p<0.05$) superoxide anion scavenging activity compared to that of Fsar. Hydroxyl radical scavenging activity of F_{resin} (1:100), Fresin (3:100), and F_{CaCO3} (5%) showed a significant increase ($p<0.05$) compared to F_{sar}. Overall results confirm that the deodorisation methods were successful in reducing the odour and did not alter its chemical compositions, while in some cases, enhance the antioxidant activities.

Effects of different precipitation method on physicochemical properties and antioxidant activities of alginates from *Sargassum* sp

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Sains Malaysiana, Vol. 46(10), 2017, 1807-1816

Alginate is an anionic structural polysaccharide that is found in the matrix of brown algae and normaly used as gelling, emulsifying and stabilizing agents in food industry. The aim of this research was to determine the effects of different alginate precipitation methods towards its physicochemical properties and antioxidant activity. In this research, alginate was extracted from *Sargassum* sp. using two different precipitation methods, where alginates were precipitated using calcium salt and acid (sample A), and also precipitated using acid and ethanol (sample B). The extraction yield of alginates

were 28.16% and 18.24% for sample A and sample B, respectively. ATR-FTIR analysis showed that the polysaccharides extracted from *Sargassum* sp. were indeed alginates. The physicochemical characteristics determined were colour, viscosity, gelling activity and free radical DPPH scavenging activity and were compared with commercial alginate (Sigma-Aldrich). Extracted alginates were yellow brownish in colour and have pseudoplastic viscosity with sheer thinning behaviour. Gelling activities of both sample (A & B) were significantly different, ($p<0.05$) compared to that of commercial alginate. Meanwhile, the scavenging activity of DPPH free radical in sample A was higher than commercial alginate (20.10 ±3.84 & 11.89 ±3.12). Overall, precipitation method of sample A was better than sample B due to higher yield of alginate, higher antioxidant activity and almost similar physicochemical properties to commercial alginate.

Effects of drying methods, solvent extraction and particle size of Malaysian brown seaweed, *Sargassum* sp. on the total phenolic and free radical scavenging activity

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This study was conducted to evaluate the effect of different drying methods, particle size and extraction solvent on the antioxidant properties of Malaysian brown seaweed *Sargassum* sp. Oven-, sun- and freeze-dried method were employed in this study and the obtained dried seaweed were passed through two sieve size of 2.00 mm and 0.25 mm prior to extraction with boiling water (infusion technique) and aqueous ethanol (50%). *Sargassum* sp. was evaluated for their total phenolic content (TPC) which were determined by spectrophotometry using FolinCiocalteu assay and expressed as gallic acid equivalent (GAE) in mg/g dry weight (dw) and free radical scavenging assay were used stable DPPH (2,2-diphenyl-1-picrylhydrazyl) reagent. TPC and DPPH radical scavenging activity (RSA) showed a significant higher ($P<0.05$) for oven dried samples with particle size of 0.25 mm in hot water extraction. A significant and positive high Pearson's correlations was observed between TPC and DPPH assay for particle size study ($r=0.88$) and solvent extraction study ($r=0.81$) which indicated that phenolics compound were main contributor of antioxidant activity in *Sargassum* sp. extracts. A strong free radical scavenging activity and higher phenolics contents in *Sargassum* sp. suggested that it has great potential in the food industry as a functional food ingredient.

Effects of enzymatic hydrolysis on the antioxidant activity of water-soluble elastin extracted from broiler and spent hen skin

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Poultry by-products are great economic sources that need to be exploited. Poultry skin could be utilized to extract protein particularly elastin, which is often incorporated in the production of functional food, cosmetic industry or medicine due to its antioxidative properties. In this study, water-soluble elastin

was successfully extracted from broiler and spent hen skin and analysed for antioxidant activities including DPPH (1,1-diphenyl-2-picryl hydrazyl), ABTS and metal chelating activity. Antioxidant activity of elastin extracted from broiler skin hydrolysed by Alcalase (EBA) and Elastase (EBE) also elastin extracted from spent hen skin hydrolyzed by Alcalase (ESA) and Elastease (ESE). The EBE, EBA, ESE and ESA had higher DPPH (16-30, 19-35, 29-48 and 31-50%, respectively), ABTS activity (73-79, 60-79, 67-79 and 72-79 %, respectively), and Fe2+ chelating activity (65-69, 50-56, 71-77 and 62-70 %, respectively). This concluded that water-soluble elastin is a bioactive component that could potentially be used in the formulation of functional foods, nutraceuticals, cosmetic and pharmaceutical industry.

Effects of fermentation time and pH on soursop (*Annona muricata*) vinegar production towards its chemical compositions

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Sains Malaysiana, Vol. 46(9), 2017, 1505–1512

Vinegar is a liquid product that undergoes both alcoholic and acetous fermentation of sugar (carbohydrate) sources. Soursop (*Annona muricata*) is easily available in Malaysia throughout the year. However, it is also highly perishable and has a short shelf-life. Therefore, in this research, soursop was used in the production of vinegar, to increase its utilisation and reduce wastage. The objectives of this research were to determine the effects of fermentation time and pH on soursop vinegar using a 3 × 5 factorial design and to determine its chemical compositions. It was found that pH and fermentation time showed significant ($p<0.05$) effects on the reduction of sugar content and the production of acetic acid, while only fermentation time showed a significant effect on the production of ethanol. The interaction between factors did not exhibit any statistical significance ($p>0.05$). It was evident that the sugar concentration reduces over time and it was inversely proportional to the ethanol and acetic acid concentrations, due to the conversion of sugar to ethanol and subsequently acetic acid. It was found that higher pH (pH 5.5) gave significantly ($p<0.05$) higher acetic acid production in the vinegar, while pH has no significant ($p>0.05$) effect on ethanol production. There were no significant differences ($p>0.05$) in vitamin C content in all vinegar samples. Thus, it can be established that at fermentation time of 120 h and pH 5.5, more sugar was used and more ethanol and acetic acid were produced.

Effects of gamma irradiation on microbiological quality, protein and amino acid profile of edible bird nest powder

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Kasetsart Journal-Natural Science, Vol. 49(6), 2015, 880-894

The effect of gamma irradiation was determined on the microbiological quality and amino acid profile of edible bird nest (EBN) powder. Seven doses of irradiation were used: 0.0 (control), 1.0, 2.0, 5.0, 7.5, 10.0, 20.0 and 30.0 kGy. The total plate count (TPC) of EBN samples that were inhibited or had TPC<100 colony forming units (CFU).g^{-1} at 20.0 kGy was determined. An irradiation dose of 5.0 kGy was required to reduce the coliform and *Staphylococcus aureus* counts to below 100 CFU.g^{-1} and the yeast and mold counts to below 1,000 CFU.g^{-1}, while for *Escherichia coli*, 1.0 kGy was sufficient to inhibit or reduce the count to below 100 CFU.g^{-1}. *Salmonella* spp. was not detected in any sample. A minimum irradiation dose of 20 kGy was required to sterilize the EBN powder samples most effectively. The pH and water activity values of the samples were in the ranges 8.34–8.90 and 0.621–0.674, respectively. The microbiological quality changes of irradiated samples were caused by the gamma irradiation alone. Gamma irradiation at doses as high as 10.0 and 20.0 kGy did not produce significant changes in the amino acid profiles of the EBN samples compared to the non-irradiated samples. Gamma irradiation improved the microbiological quality of the EBN samples without affecting their amino acid profiles.

Effects of microwave pre-treatment on the quality of kenaf (*Hibiscus cannabinus* L.) seed oil

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Journal of Food Science and Engineering, Vol. 5, 2015, 14-21

The main aim of this study was to explore the effects of microwave pre-treatment on quality of kenaf seed oil by observing the changes in oil yield, oxidative stability, fatty acid components, tocopherols, antioxidant activities and color intensity of kenaf seed oil. Microwave pre-treatment on kenaf seeds did affect the quality of the extracted oils. Microwave pre-treatment increased the extracted oil yields significantly ($P < 0.05$). Moreover, the roasted oils showed a significant increase in oxidative stability, antioxidant stability and colour of kenaf seed oils. In terms of fatty acids composition, microwave roasting had greater effect on oleic acids (C18:1) and linoleic acids (C18:2), as roasting increased the oleic acid content but decreased linoleic acid. There was no significant difference in the palmitic acids (C16:0) and stearic acids (C18:0) ($P>0.05$). A significant decrease ($P<0.05$) in the iodine value of the oils was found. In conclusion, kenaf seed oil roasted for 2 min had better oil quality if compared to the unroasted oil, as microwave pre-treatment improved the oil yield, oxidative stability and antioxidant activities of kenaf seed oil.

Effects of temperature and NaCl on the formation of 3-MCPD esters and glycidyl esters in refined, bleached and deodorized palm olein during deep-fat frying of potato chips

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The effects of frying duration, frying temperature and concentration of sodium chloride on the formation of 3-monochloropropane-1,2-diol (3-MCPD) esters and glycidyl esters (GEs) of refined, bleached and deodorized (RBD) palm olein during deep-fat frying (at 160 °C and 180 °C) of potato chips (0%, 1%, 3% and 5% NaCl) for 100 min/d for five consecutive days in eight systems were compared in this study. All oil samples collected after each frying cycle were analyzed for 3-MCPD esters, GEs, free fatty acid (FFA) contents, specific extinction at 232 and 268 nm (K_{232} and K_{268}), p-anisidine value (pAV), and fatty acid composition. The 3-MCPD ester trend was decreasing when the frying duration increased, whereas the trend was increasing when frying temperature and concentration of NaCl increased. The GEs trend was increasing when the frying temperature, frying duration and concentration of NaCl increased. All of the oil qualities were within the safety limit.

Estimation of ginger bioactive compound solubilities in hot compressed water and enhancement with entrainer

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Knowledge concerning the solubility of ginger bioactive compounds in hot compressed water (HCW) is important for designing an extraction process with water as a green solvent. The solubilities of 6-gingerol and 6-shogaol in hot compressed water are calculated using the conductor-like screening model for real solvent (COSMO-RS) method to study the potential of water as a solvent. The comparison indicates that the calculated solubility is at a higher concentration for the binary system of 6-gingerol + water and 6-shogaol + water when compared to the HCW extraction. This illustrates the performance of the HCW extraction, which has not reached the equilibrium condition, and gives an opportunity to explore the options for further improving the process. The availability as well as the thermo-labile nature of the bioactive compounds are factors that must be considered for the improvement of HCW as a solvent. The solubilities of 6-gingerol and 6-shogaol in aqueous ethanol solutions are also calculated by the COSMO-RS method to study the entrainer effect of ethanol. The calculations with ethanol as entrainer indicate that the molecular cavity and contact interaction are changed so as to increase the solubilities. Based on the calculations, the suitable amount of ethanol as an entrainer is estimated to be 0.02 mole fraction for both 6-gingerol and 6-shogaol with an improved solubility of 1.86 and 1.76 times, respectively. In general, the addition of the entrainer will improve the recovery and operating parameters at a milder operating condition. This approach may be applied to other bioactives and will further strengthen the use of water as a solvent in natural extracts.

Evaluation of mycelia growth, morphology and yield for low dose gamma irradiated grey oyster mushroom *Pleurotus Sajor-Caju*

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Mycelium growth and yield of irradiated grey oyster mushroom *Pleurotus sajor-caju* by gamma rays was investigated due to effects of irradiation. In order to establish the effect, mycelium of *P. sajor-caju* was irradiated by gamma rays at dose 0.1 to 0.6 kGy with dose rate 0.227 Gy sec^{-1} at the radiation facility in Malaysian Nuclear Agency. The radiation effects were evaluated on growth rate of irradiated mycelia, induction of different mycelia types, colonization period on substrate, size of fruit bodies and mushroom yields. The results shown that growth rate of irradiated mycelium were slightly slower than the control and decreased as the dose increased. Irradiation was found can induced more fruit bodies with no significant different on size of fruit bodies. The mushroom yield represented by BE of irradiated mycelium is higher than control and increased as the dose increased. Irradiation was found sufficient to increase the yield of mushroom and it is directly to support local mushroom industry.

Extraction optimization and characterization of collagen from chicken (*Gallus gallus domesticus*) Feet

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Previous studies have proved that chicken (*Gallus gallus domesticus*) feet can be one of the alternative sources of collagen. Besides of less risk of diseases and can be accepted by all religions, chicken feet also have high potential as a low cost of collagen source. Method of collagen extraction also plays an important role to obtain high percentage of end yield and the quality of collagen extracted. Optimization of collagen extraction was investigated by using three different soaking methods; 0.5 mol/L acetic acid with 0.1% bromelain, 0.5 mol/L acetic acid with 0.1% papain and 5% lactic acid for 36 hours. Various properties such as percentage of end yield, concentration of protein, pH, swelling percentage and SDS-PAGE patterns of collagen from chicken feet were evaluated in order to determine the best method of extraction and potential of bromelain to improve collagen extraction. No significant different ($P > 0.05$) have been recorded between all three methods used in this research which indicated that all treatments were not affected the pH, swelling percentage, percentage of end yield and concentration of extracted collagen. However, lactic acid method was showed the highest percentage of end yield and concentration with reading of 30.04% and 11.66 mg/ml respectively. Type I collagen has been determined as major component of collagen from chicken feet based on the result of SDS-PAGE. It also proven that bromelain has same potential as papain in order to improve protein digestion.

Fabrication of fucoxanthin-loaded microsphere (F-LM) by two steps double-emulsion solvent evaporation methods and characterization of fucoxanthin before and after

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Microencapsulation is a promising approach in drug delivery to protect the drug from degradation and allow controlled release of the drug in the body. Fucoxanthin-loaded microsphere (F-LM) was fabricated by two step w/o/w double emulsion solvent evaporation method with poly (L-lactic-coglycolic acid) (PLGA) as carrier. The effect of four types of surfactants (PVA, Tween-20, Span-20 and SDS), homogenization speed, and concentration of PLGA polymer and surfactant (PVA), respectively, on particle size and morphology of F-LM were investigated. Among the surfactants tested, PVA showed the best results with smallest particle size (9.18 μm) and a smooth spherical surface. Increasing the homogenization speed resulted in a smaller mean F-LM particle size [*d*(0.50)] from 17.12 to 9.18 μm. Best particle size results and good morphology were attained at homogenization speed of 20 500 rpm. Meanwhile, increased PLGA concentration from 1.5 to 11.0 (% w/v) resulted in increased F-LM particle size. The mean particle size [*d*(0.5)] of F-LM increased from 3.93 to 11.88 μm. At 6.0 (% w/v) PLGA, F-LM showed the best structure and external morphology. Finally, increasing PVA concentration from 0.5 to 3.5 (% w/v) resulted in decreased particle size from 9.18 to 4.86 μm. Fucoxanthin characterization before and after microencapsulation was carried out to assess the success of the microencapsulation procedure. Thermo gravimetry analysis (TGA), glass transition (*Tg*) temperature of F-LM and fucoxanthin measured using DSC, ATR-FTIR and XRD indicated that fucoxanthin was successfully encapsulated into the PLGA matrix, while maintaining the structural and chemical integrity of fucoxanthin.

Heat stability of fatty acids of selected blended palm oils during potato frying

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The study aimed to determine the hydrolytic stability of free fatty acid (FFA) and fatty acid composition (FAC) of selected palm oil (PO) blended with corn oil (POCO), sesame oil (POSO), and rice bran oil (PORBO). The blended POs were tested for their stability and fatty acid changes of the unheated oils after 10 and 20 times of potato frying. The FAC was determined using gas chromatography. As the oils were being heat treated for 0-20 times, the most significant changes were the increased in SFA and MUFA levels, and the reduction of PUFA that observed in the blended POs. The blended oils also had increased FFA contents after 20 times of potato frying. POCO was the most stable blended oil in terms of hydrolytic stability. The findings suggest that there is an improve in the quality of PO after blended with vegetable oils, especially its FAC.

Improvement of eggless cake structure using ultrasonically treated whey protein

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Food Bioprocess Technol, Vol. 8 (3), 2015, 605–614

Ultrasound treatment was applied on whey protein concentrate suspension prior to foaming and being mixed into batter for eggless cake baking. The improvement of batter and baked cake made using ultrasound treated whey protein were measured in terms of aeration, rheological and textural properties. Baked cakes formulated with untreated whey protein suspension at varying concentrations between 10 and 20 % were compared with ultrasound treated whey protein up to 25 min at 60 % amplitude. Visualized images of aerated cake products using x-ray tomography technique supported the findings of improved batter in terms of density decrease by 5 %, and viscosity, consistency index, storage modulus, and loss modulus increase by 31, 57, 33, and 21 %, respectively. For baked cakes, volume increase was 18 %, and density, hardness, and chewiness decrease was 18, 65, and 64 %, respectively, when compared to those made using untreated whey protein. Image analysis presented a higher number of smaller gas cells in the aerated baked cakes structure using ultrasound treated whey protein.

Improvement of physical stability of kenaf seed oil-in-water nanoemulsions by addition of ß-cyclodextrin to primary emulsion containing sodium caseinate and Tween 20

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In this study, kenaf *(Hibiscus cannabinus* L.) seed oil-in-water nanoemulsions stabilized with sodium caseinate, Tween 20 and ß-cyclodextrin complexes were produced using high pressure homogenizer. Emulsifying conditions, including concentration of optimized emulsifier mixtures and the addition sequence of ß-cyclodextrin (ß-CD) were studied. In addition, process parameters, namely homogenization pressure (16,000-28,000 psi) and homogenization cycles (3-5 cycles) were optimized to produce high physical stability of kenaf seed oil-in-water nanoemulsions. Emulsifier concentration of 10% (w/w) with b-CD on the primary emulsion was successfully optimized, which showed great enhancement on the stability of kenaf seed oil-in-water nanoemulsions to environmental stresses. The optimized process parameters was found to be 28,000 psi for 4 cycles, which produced nanoemulsions with 122.2 nm, 0.147, and -46.6 mV of particle size, PDI, and zeta-potential, respectively. It showed good stability for up to 6 weeks of storage at 25 °C ± 2 °C. The present study showed that the production of stable kenaf seed oil-in-water nanoemulsions using high pressure homogenizer is feasible and potential for large scale manufacturing.

Improvement of physical stability properties of kenaf (*Hibiscus cannabinus* L.) seed oil-in-water nanoemulsions

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Industrial Crops and Products, Vol 80, 2016, 77-85

Kenaf seed oil-in-water nanoemulsions were optimised using simplex centroid mixture design with three components (sodium caseinate, gum Arabic and Tween 20). In addition, the main, binary and ternary interaction effects among these three selected emulsifiers on physical stability were also studied. The mixture design showed a good fit to the predicted model with $R^2 > 0.89$, 0.82, and 0.73 for mean particle size, polydispersity index (PDI) and zeta-potential, respectively. The optimum proportion of emulsifier mixtures was 64.9% (w/w) SC, 6.4% (w/w) GA, and 28.7% (w/w) T20 that predicted to produce mean particle size of 126.82 nm, PDI of 0.16 and zeta-potential of –43.47 mV. The experimental value obtained was 121.22 nm, 0.16 and –39.63 mV for mean particle size, PDI, and zeta-potential, respectively. No significant difference ($p > 0.05$) between the experimental and predicted values, indicating the suitability of the mixture design for optimising and developing stable kenaf seed oil-in-water nanoemulsions. The optimised formulation was stable at both chill (4 °C) and room temperature (25 °C) over 1 month of evaluation. The results have important implications for the development of stable kenaf seed oil-based nutraceutical products. It can be added into beverages such as dairy products to improve the nutrition value of the beverage.

In situ enzymatic synthesis of polar lipid emulsifiers in the preparation and stabilisation of aerated food emulsions

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Food Biophysics, Vol 12(3), 2017, 323-338

We report on the direct incorporation of a lipase derived from *Rhizomucor miehei*, into aeratable food emulsion formulations, with the objective of enzymatically generating polar lipid fractions during processing, and which are able to demonstrate equivalent functionality to chemically synthesised monoglycerides. Findings showed that the lipolysis of palm oil-in-water emulsions produced a combination of predominantly oleic monoglyceride and palmitic fatty acid fractions. The extent of hydrolysis was able to be controlled through concentration of enzyme, reaction time, and reaction temperature. Hydrolysis was terminated via inactivation of the enzyme through high heat treatment of emulsions. Emulsion properties, notably stability under shear, were seen to be highly dependent on the extent of lipolysis. When applied to model whipping and ice cream formulations, lipolytic generation of polar lipids was shown to promote both partial coalescence and fat globule adsorption to bubble surfaces, generating structures equivalent to those produced by use of commercial emulsifiers. Product properties, such as physical stability and material properties showed variation according to the extent of lipolysis. Our results demonstrated that enzymatic lipolysis of emulsions under controlled conditions could be optimised to deliver requisite droplet functionality for the structuring and stabilisation of aerated food emulsions. Findings are of significance, not only when

considering the potential for replacement of chemically derived emulsifiers in such formulations, but also from the perspective that this approach can readily be incorporated into existing manufacturing process operations.

Interaction of antioxidants and organic acid from noni (*Morinda citrifolia* L.) juice with ion exchange resins during deodorization via deacidification

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Der Pharma Chemica, Vol 7(9), 2015, 9-21

The unpleasant odour of noni (*Morinda citrifolia* L.) fruit has been a longstanding problem which is caused by octanoic acid. Deodorization of that compound have been performed using deacidification process. Deacidification of the octanoic acid using ion exchange resin was able to reduce the unpleasant odor but resulted in a reduction of beneficial antioxidant activities. Thus, this study was conducted to determine the effects of different types and weight of resin on the adsorption of octanoic acid and antioxidant compounds in noni juice during deacidification. Three types of weak base anion exchange resins (Amberlite IRA 67, Duolite A7 and Amberlite IRA 96) of different resin weight (0, 5, 10%, w/v) were used. The treated noni juice was analyzed for pH, antioxidant activity, total phenolic content (TPC), individual phenolic compounds and octanoic acid content. Deacidification of noni juice using the resins significantly ($p<0.05$) decreased the octanoic acid content compared to fresh juice where Amberlite IRA 67 gave the maximum reduction of octanoic acid followed by Duolite A7 and Amberlite IRA 96. The results indicated that deacidification of noni juice using 10% of resin weight (w/v) gave higher percentage of antioxidant activity (DPPH and FRAP) and total phenolic content (TPC). Results also showed a similar trend when different weight of resin was used where Amberlite IRA 67 > Duolite A7> Amberlite IRA 96 for DPPH, FRAP, TPC and antioxidant compounds.

Intracellular biosynthesis of Au and Ag nanoparticles using ethanolic extract of *Brassica Oleracca* L. and studies on their physicochemical and biological properties

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Journal of Environmental Sciences, Vol 29, 2015, 151-157

In this present study, we reported broccoli (*Brassica oleracea* L.) as a potential candidate for the synthesis of gold and silver nanoparticles (NPs) in green chemistry method. Synthesized Q6 nanoparticles are evaluated using its antimicrobial efficacy for different human pathogenic organisms. The physico-chemical properties of gold nanoparticles were analyzed using different analytical techniques such as a UV–Vis spectrophotometer, Field Emission Scanning Electron Microscopy, energy dispersive X-ray spectroscopy, X-ray diffraction and a Fourier Transform Infrared spectrophotometer. In addition, gold and silver NP antimicrobial efficacy was checked by disk diffusion assay. UV–Vis color intensity of the nanoparticles was shown at 540 and 450 nm for gold and silver nanoparticles

respectively. Higher magnification of the Field Emission Scanning Electron Microscopy image shows the variable morphology of the gold nanoparticles in spherical, rod and triangular shapes as well as silver nanoparticles were seen in spherical shapes. The average spherical size of the particles was observed in 24–38 nm for gold and 30–45 nm for silver NPs. X-ray diffraction pattern confirmed the presence of gold nanoparticles and silver nanoparticles which were crystalline in nature. Additionally, the functional metabolites were identified by the IR spectrum. IR spectra show phenols, alcohols, Q7 aldehydes (sugar moieties), vitamins and proteins in the broccoli extract which are accountable to synthesize the nanoparticles. In contrast, gold and silver NPs inhibited the growth of the tested bacterial and fungal pathogens at the concentration of 50 g/mL respectively. In addition, broccoli mediated gold and silver nanoparticles have shown potent antimicrobial activity against human pathogens.

In-vitro evaluation of kenaf seed oil in chitosan coated-high methoxyl pectin-alginate microcapsules

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Industrial Crops and Products, Vol 76, 2015, 230-236

Kenaf seed oil was encapsulated using co-extrusion technology with the shell formulation of high methoxyl pectin (HMP)-alginate solution and a chitosan coating was applied additionally on the microcapsules. An *in vitro* digestion was used to simulate the human gastrointestinal (GI) digestion to examine the oil release behavior of chitosan-coated microencapsulated kenaf seed oil (CMKSO) and non-coated microencapsulated kenaf seed oil (NMKSO). The changes in antioxidant activities and bioactive compounds of kenaf seed oil in CMKSO before and after digestion were evaluated. The best CMKSO with the highest microencapsulation efficiency was obtained from the concentration of 0.1% w/v chitosan solution, which was hardened through one-step process. The results showed that CMKSO was more resistant to simulated gastric fluid than NMKSO. There was 83.33% of kenaf seed oil released from CMKSO after simulated digestion. Enzymatic breakdown of the GI digests decreased the total phenolic content (47.5% decrease) and phytosterols content (35.4% decrease), but increased their 2,2-diphenyl-1-picrylhydrazyl (DPPH•) radical scavenging activity (145.1% increase), 2,2-azinobis (3-ethylbenzothiazoline-6-sulphonic acid) diammonium salt ($ABTS^{\bullet+}$) (120.9% increase) radical scavenging activity, and tocopherols content (32.1% increase), compared to the undigested kenaf seed oil. This work showed that the microencapsulation of kenaf seed oil with HMP-alginate and a chitosan coating offers an effective controlled release delivery system.

Kenaf (*Hibiscus cannabinus* L.) seed oil-in-water Pickering nanoemulsions stabilised by mixture of sodium caseinate, Tween 20 and ß-cyclodextrin

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Food Hydrocolloids, Vol 52, 2016, 934-941

The limit application of functional kenaf (*Hibiscus cannabinus* L.) seed oil in food and pharmaceutical industry owing to the poor water solubility and low storage stability can be overcome by the development of kenaf seed oil-in-water Pickering nanoemulsions. In this study, oil-in-water Pickering nanoemulsions were produced to investigate its stability by optimising emulsifier mixtures, namely sodium caseinate (SC), Tween 20 (T20) and ß-cyclodextrin (ß-CD). The interaction effects of SC and T20 on the formation of Pickering nanoemulsions with ß-CD was studied and found synergistic effect among them that enhanced the stability of Pickering nanoemulsions. The optimum proportion of emulsifier mixtures obtained by employing simplex centroid mixture design was found to be 57.9% (w/w) SC, 27.6% (w/w) T20, and 14.5% (w/w) ß-CD, which produced Pickering nanoemulsion with mean particle size of 155.53 nm, PDI of 0.07 and zeta-potential of -46.67 mV. These experimental values were in accordance with the predicted value, indicating the adequacy of the fitted models. The mixture design was found to be a valuable tool to optimise and study the interaction effects of different components for the development of stable Pickering nanoemulsions.

Microencapsulation of kenaf seed oil by co-extrusion technology

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Journal of Food Engineering, Vol 175, 2016, 43-50

The aim of this study was to evaluate the effect of different processing parameters such as different flow rates for shell and core feed, vibrational frequencies, drying methods and shell formulations on the characteristics of microencapsulated kenaf seed oil (MKSO) by using co-extrusion technology. Optical microscopy revealed that the MKSO produced at vibrational frequency of 500 Hz and coreeshell flow rate of 0.2e7.2 mL/min (for 1.5% alginate) and 0.2e7.0 mL/min (for high methoxyl pectin (HMP)- enhanced alginate) appeared to be the best processing conditions and the MKSO exhibited the highest microencapsulation efficiency at these conditions. Besides that, freeze drying presented as a better drying method to dry the MKSO than air drying. HMP-enhanced alginate seems as a better shell formulation to produce MKSO with a smaller size (450e575 mm), having a stable water activity (0.280) against oxidative deterioration, and higher microencapsulation efficiency (76.62%) but less spherical in the shape of MKSO compared to 1.5% alginate. It was demonstrated that production of MKSO by coextrusion is possible and that the process is stable and reproducible.

Modification of chicken feet gelatine with aqueous sweet basil and lemongrass extract

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WT-Food Science and Technology, Vol 77, 2017, 72-79

The effects of aqueous extracts of sweet basil leaves and lemongrass stem at different levels (0, 1, 1.5, 2, 2.5 and 3 ml/100 g dry gelatin) on the physical and rheological properties of chicken feet gelatin gels were investigated. Chicken feet gelatin gels cross-linked by plant extracts were more turbid than control, had reduced water holding capacity (WHC) and swelling ratio. Nevertheless, the increase in gel strength, thermal stability, and elastic modulus was found with increasing plant extract levels and increased the stability of gelatin within a certain concentration range of plant extracts. Complex viscosity (η^*) values of gelatin with and without addition of plant extracts were decreased with increasing temperature. Therefore, plant extract at an appropriate level could act as a natural gel enhancer of chicken feet gelatin.

Morphological characterizations and sensorial properties of yeast bread (bun) formulated with different particle sizez f cornlettes (*Zea mays* L.)

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Annals of Microscopy, Vol 15, 2016, 25-30

Cornlettes or immature corn which is one of the commonly consumed vegetable by Malaysian populace contains high dietary fiber in dried form. Presently, cornlettes have been introduced in enhancing nutrition-al qualities of baked-based products. This study aims to investigate the influence of different particle size (45, 125 and 250 μm) of cornlettes on morphological characterizations of bun. Scanning electron micro-scopically observation showed that at higher magnification, there are compact particles of wheat flour and dietary fibers especially bun formulated with larger particle size of cornlettes. In addition microstructure of cornlettes with oily particles intact were clearly seen. Dietary fiber of cornlettes was seen able to absorb fat molecules. All sensory attributes of bun formulated with CLP were not significantly different with the control bun. Addition of 250 μm PS of CLP in bun resulted in yielding softer and elastic bun. In brief, bun added with 250 μm particle size of cornlettes is recommended in the preparation of high fiber and palatable bun.

New coating material for producing virgin coconut oil (VCO) microcapsules

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Food Research, Vol 1(1), 2017, 15-22

The aim of this work was to investigate the microencapsulation efficiency (MEE) of different grades of broken rice (RB) and breadfruit (BB)-based maltodextrin as a coating material, using virgin coconut oil (VCO) as a model system. The VCO was generally found to be well microencapsulated using BB, RB or commercial (COM) maltodextrin at a core/wall material ratio of 1:3. In comparison to a different dextrose equivalent (DE) group, both RB and BB maltodextrins with DE values of 10-14 showed higher MEE values (84.81-94.39%) than maltodextrins with DE value of 15-19 (78.23-79.65%). Low DE value maltodextrins were shown higher glass transition temperatures than high DE value maltodextrins under the same moisture content. Both RB and BB maltodextrins were found to be compatible with COM maltodextrin as shown in the microstructure appearance when viewed with a scanning electron microscope (SEM).

Optimisation of functional cabbage drinks with lime juice using Response Surface Methodology (RSM)

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Journal of Tropical Agriculture and Food Science, Vol 45(2), 2017, 225-235

Functional beverages have become popular due to its appeal to consumers who are seeking specific health benefits in their foods and beverages. Thus, a new functional beverage from cabbage extract with rich alkaloid content was developed. The acceptability of the cabbage drink was with respect to the initial cabbage extract concentrations (5.0%, 12.5% and 20.0%) and lime juice as natural flavour (0%, 2.0% and 4.0%). A central composite design (CCD) was applied to study the response pattern for monitoring sensory quality and acceptability as well as its physico-chemical properties of the formulated cabbage drink. In Response Surface Methodology (RSM), both sensory evaluation with hedonic rating scale and Quantitative Descriptive Analysis (QDA) were used as the response factors to identify the best ratio of cabbage extract to lime juice. Quantitative Descriptive Analysis indicated that 13.93% cabbage extract incorporated with 3.36% of lime juice resulted in a sensory score of 5.37, 5.04 and 5.36 for taste, aroma and overall acceptability respectively. The addition of juice also successfully improved the taste of the cabbage drink. The pH and total soluble solid for the optimum formulation was 2.67 and 9.62 °Brix respectively. The formulated cabbage drink has further raised the functional value of the product through alkaloid content, particularly amounting to 518.4 ppm with 81% antioxidant activity measured via DPPH assay.

Optimization and rheological properties of chicken ball as affected by κ-carrageenan, fish gelatin and chicken meat

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LWT-Food Science and Technology, Vol 66, 2016, 79-85

A Central Composite Rotatable Design (CCRD) was adopted in the optimization of chicken ball with the addition of fish gelatin (1e5 g/100 ml), carrageenan (1e4 g/100 ml), and chicken breast meat (55e65 g/100 g) on textural properties (hardness, elasticity, cohesiveness, and chewiness), cooking gain, and water holding capacity (WHC). For each response, a second-order polynomial model was developed using multiple linear regression analysis. Applying desirability function method, optimum conditions for chicken ball were found to be carrageenan concentration of 1.28 g/100 ml, fish gelatin concentration of 4.62 g/100 ml, and chicken meat concentration of 60.52 g/100 g. At this optimum point, hardness, elasticity, cohesiveness, chewiness, cooking gain, and WHC were found to be 62.59 N, 0.79 mm, 0.625, 30.495 N mm, 106.345, and 5.14 g/100 g, respectively. G0 value of control on dynamic rheological properties was the highest among chicken ball samples with addition of carrageenan and gelatin. The higher the mixture concentrations of carrageenan, gelatin and meat, the higher G0 value of chicken ball

Optimization of egg tofu formulations containing carrageenan, gum arabic and corn starch by descriptive sensory analysis

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American Journal of Applied Sciences, Vol 12(1), 2015, 47-57

The objectives of this study was to determine the effects of carrageenan, gum Arabic and corn starch on the sensory characteristics of egg tofu and to optimize egg tofu formulations using Response Surface Methodology (RSM). A Central Composite Design (CCD) with three factors was used to study the effects of carrageenan (0.1-0.2%), gum Arabic (0.1-1.0%) and corn starch (1.5-2.5%) on the sensory characteristics of egg tofu. Eight trained panelists performed quantitative descriptive analysis. Analysis of Variance (ANOVA) showed that several of the response variables (egg aroma, starchiness, cohesiveness, astringency and aftertaste) were significantly different ($p<0.05$) and that the coefficients of determination (R^2) were in the range of 0.77-0.96. Based on the superimposed plot to determine the overlay region for sensory attributes, the formulation of egg tofu with desired sensory quality was obtained by incorporating 0.12% carrageenan, 0.61% gum Arabic and 2.00% corn starch. The best sensory performances were set as a goal for each response and the results showed that the optimum predicted response values obtained for egg aroma, starchiness, cohesiveness, astringency and aftertaste were 62, 88, 37, 34 and 60 mm respectively.

Optimization of extraction parameters on the antioxidant properties of banana waste

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Acta Scientiarum Polonorum Technologia Alimentaria, Vol 15(1), 2016, 65-78

Background: Banana is grown worldwide and consumed as ripe fruit or used for culinary purposes. Peels form about 18–33% of the whole fruit and are discarded as a waste product. With a view to exploiting banana peel as a source of valuable compounds, this study was undertaken to evaluate the effect of different extraction parameters on the antioxidant activities of the industrial by-product of banana waste (peel). **Materials and methods**: Influence of different extraction parameters such as types of solvent, percentages of solvent, and extraction times on total phenolic content (TPC) and antioxidant activity of mature and green peels of *Pisang Abu* (PA), *Pisang Berangan* (PB), and *Pisang Mas* (PM) were investigated. The best extraction parameters were initially selected based on different percentages of ethanol (0–100% v/v), extraction time (1–5 hr), and extraction temperature (25–60°C) for extraction of antioxidants in the banana peels. Total phenolic content (TPC) was evaluated using Folin-Ciocalteu reagent assay while antioxidant activities (AA) of banana peel were accessed by DPPH, ABTS, and -carotene bleaching (BCB) assays at optimum extraction conditions. **Results**: Based on different extraction solvents and percentages of solvents used, 70% and 90% of acetone had yielded the highest TPC for the mature and green PA peels, respectively; 90% of ethanol and methanol has yielded the highest TPC for the mature and green PB peels, respectively; while 90% ethanol for the mature and green PM peels. Similar extraction conditions were found for the antioxidant activities for

the banana peel assessed using DPPH assay except for green PB peel, which 70% methanol had contributed to the highest AA. Highest TPC and AA were obtained by applying 4, 1, and 2 hrs extraction for the peels of PA, PB and PM, respectively. The best extraction conditions were also used for determination of AAs using ABTS and -carotene bleaching assays. Therefore, the best extraction conditions used have given the highest TPC and AAs. **Conclusions**: By-products of banana (peel) can be considered as a potential source of antioxidants in food and pharmaceutical industry.

Optimization of neutralization parameters in chemical refining of kenaf seed oil by response surface methodology

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Industrial Crops and Products, Vol. 95, 2017, 742-750

Kenaf seed oil has been suggested to be used as edible oil due to its high nutritional value. Optimal parameters in the refining process for kenaf seed oil are still limited in order to produce edible kenaf seed oil with high quality attributes. Response surface methodology with central composite design was used to study the effect of the parameters in the neutralization stage of chemical refining process, namely the excess level of sodiumhydroxide (0–5%),temperature (25–85 °C) and time (10–50 min). The experimental data obtained from the twenty experimental runs were fitted to a second-order polynomial equation using multiple regression analysis. Well-fitting models were successfully generated for the responses of free fatty acids (R^2=0.9954) and peroxide value (R^2=0.9365) with the probability value less than 0.0001, which demonstrated a high significance for the regression models. The optimum parameters were recommended at an excess level of sodium hydroxide of 3.75%, temperature of 40 °C and time of 20 min to provide the neutralized kenaf seed oil with minimizing free fatty acids and peroxide value. Under these parameters, free fatty acids of 0.12% and peroxide value of 1.57 meq/kg were obtained in the neutralized kenaf seed oil.

Optimization of processing conditions for aqueous pigmented rice extracts as bases for antioxidant drinks

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Journal of Rice Research, Vol 3(2), 2015, 1000135

Pigmented rice can be categorized as a functional food due to its various health benefits, mainly from its polar antioxidant content which consists of anthocyanins in black rice and proanthocyanidins in red rice. This rice is usually cooked in excess water and removal of the water will be a waste as it can be further utilized as a base for antioxidant drink. Therefore, the objective of this study was to determine the optimum processing conditions (extraction temperature, time, and water/rice (W/R) ratio) for minimum 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity IC_{50}, maximum total flavonoid (TFC), and Maximum Total Phenolic Content (TPC) in the pigmented rice extracts using response surface methodology (RSM). The optimum hot water extraction conditions for black rice were W/R ratio of 20 ml/g at 95.6°C for 40 minutes, while that for red rice are W/R ratio of 20 ml/g at 97°C for 30 minutes. It can be concluded that RSM is a useful method in optimizing the processing conditions for production of antioxidant drink from pigmented rice and hot water extraction showed great potential in extracting antioxidants from pigmented rice.

Optimization of seaweed and water content for the production of seaweed paste using response surface methodology

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International Journal of ChemTech Research, Vol. 9 (06), 2016, 530-537.

The effects of seaweed concentration on the quality characteristics of seaweed paste [seaweed 30-70% (w/v), water 30-70% (w/v)] of *Kappaphycus alverazii* species were evaluated by response surface methodology (RSM) to determine the optimum amount of ingredients. The interactive effect of fresh seaweed and water percentage on the hardness and gel strength (g) of the paste was determined. Results showed that the experimental data could be adequately fitted into a second-order polynomial model with multiple regression coefficients (R^2) of 0.9805 and 0.7931 for the hardness and gel strength respectively. The hardness and gel strength of seaweed paste were dependent on the ratio of fresh seaweed mixing with water. The proposed optimum amount of ingredients for the production of seaweed paste is at percentage of 44.97 % fresh seaweed and 55.02 % water content. Based on the result obtained, the RSM demonstrated a suitable approach for the adding ingredients optimization of *Kappaphycus alverazii* paste.

Optimization of spray drying process of *Sargassum muticum* colour extract

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Drying Technology, Vol 34(14), 2016, 1735-1744

Sargassum muticum is categorized as a brown seaweed species which has been used as a dye fabric colourant in certain region of Asia. The brown colour extracts of *Sargassum muticum* also has an antioxidant properties which could enhance colour and nutrients in food products. However, the colour extract is unstable, and yet making the application limited. This study was carried out to encapsulate the colour extract with maltodextrin and stabilize the colour extract by spray drying technique using combinations of various levels of inlet temperature and feed flow rate. Initially, *Sargassum muticum* powder was analysed for moisture content, water activity, solubility and colour properties for optimization purposes. This study showed that, the optimum inlet temperature and feed flow rate of the spray drying process to produce good quality, stable and acceptable powder properties were at 140 °C and 3 rpm, respectively, with 4 % of maltodextrin. Then, the powder was analysed for density, compressibility index, hygroscopicity, particle size and antioxidant properties. This study represents an interesting food additive to be incorporated in functional food due to the attractive brown colourant and the presence of antioxidants.

Optimization of vanillin production using isoeugenol as substrate by *Aspergillus niger* I-1472

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International Food Research Journal, Vol 22(4), 2015, 1651-1656

Response Surface Methodology (RSM) was used in the study to optimize the production of vanillin from isoeugenol through fermentation by *Aspergillus niger* I-1472. Three factors were studied which include amount of isoeugenol, resin (Amberlite XAD-4) and Span 80. During fermentation, isoeugenol as substrate were vortexed with Span 80 and added into the culture on Day 4. Resin (Amberlite XAD-4) was added into the medium the following day. The predicted optimum medium combination consisted of 3.61 g/L of isoeugenol, 5.8% (g/ mL) of Amberlite XAD-4 resin and 0.37% of Span 80 with an expected vanillin production of 0.137 g/L. Verification test showed that the model produced similar predicted and experimental values.

Optimization studies on microwave assisted extraction of dragon fruit (*Hylocereus polyrhizus*) peel pectin using response surface methodology

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Optimization of microwave assisted extraction of dragon fruit peel pectin was conducted using respond surface methodology. Effect of extraction conditions, i.e. pH value (X_1), extraction time (X_2) and solid-liquid ratio (X_3) on the extraction yield was investigated using a central composite experimental design. Optimization of microwave assisted extraction was performed and three-dimensional (3D) response surface plots were derived from the mathematical models. Analysis of variance (ANOVA) was conducted and indicated a significant interaction between extraction conditions (pH value and extraction time) and extraction yield. The optimum conditions of microwave assisted extraction were as follows: X_1 = 2.07; X_2 = 65 s and X_3 = 66.57. The verification test on pectin extraction was performed and revealed a perfect agreement between experimental and predicted values. The maximum predicted yield of pectin extraction was 18.53%. Overall, application of microwave assisted extraction can give rise to high quality dragon fruit peel pectin.

Oxidative stability of microencapsulated kenaf seed oil using co extrusion technology

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Journal of the American Oil Chemists' Society, Vol. 93(4), 2016, 607–615

This study investigates the effect of microencapsulation (via co-extrusion technology using high methoxyl pectin-enhanced alginate as a shell formulation) on the storage stability and antioxidant properties of kenaf seed oil. Microencapsulated kenaf seed oil (MKSO) and unencapsulated oil were stored at 25 °C for 28 days and at 65 °C for 24 days. The oils were then subjected to stability and quality evaluation based on peroxide, p-anisidine, and total oxidation values, conjugated diene and triene levels, thiobarbituric acid reactive substances, free fatty acids, total phenolic content, and the radical scavenging activity assays of 2,2-diphenyl-1-picrylhydrazyl and 2,2 -azino-bis(3-ethylbenzothiazoline-6-sulphonic acid). The results showed that there was a significant increase ($p<0.05$) in oxidation and a significant decrease ($p<0.05$) of antioxidant activity in the unencapsulated oil while oxidation changes generally occurred more slowly in MKSO. It was demonstrated that the current microencapsulation method is a feasible approach to enhance oxidative stability of kenaf seed oil.

Physical properties and microstructure of butter cake added with *Persea americana* puree

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Sains Malaysiana, Vol. 45(7), 2016, 1105–1111

The effect of addition of avocado (*Persea americana*) puree on the physical and microstructure of butter cake was studied. Butter cakes were made by replacing butter with 10, 30 and 50% of avocado puree. Physical properties including batter specific gravity, volume, colour and image analysis of cellular structure of the crumb were analyzed. Texture profile analysis was determined using texture analyzer. The results showed that with the increased amount of avocado puree, the batter specific gravity increased while volume of the cakes reduced. The texture profile analysis showed that the cakes became harder as the amount of avocado puree increased, while cohesiveness was not affected. The cellular structure of the crumb exhibited a decrease in the number of air cells while the average cell size increased with addition of avocado puree. The colour analysis showed that the cake crumb became darker as the avocado puree was increased.

Physicochemical analysis of cholesterol-reduced egg yolk powder and its application in mayonnaise

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International Food Research Journal, Vol 23(2), 2016, 575-582

The aim of this study were to find out the physicochemical characteristics of cholesterolreduced egg yolk powder and its application in the production of mayonnaises. Cholesterolreduced egg yolk powder (CREYP) were prepared from removal of cholesterol by formation of cholesterol: β-cyclodextrin inclusion complex. The physicochemical characteristics of CREYP and NEYP were foaming capacity (FC):1.96%, 4%; foaming stability (FS):96.48%,94.55%; emulsion capacity (EC):59.82%,58.43% and emulsion stability (ES):43.94%,41.48% respectively. Whereas the viscosity of CREY, NEY and commercial mayonnaises were 8000, 4768 and 6747 cP respectively. The lightness (L*), redness (a*), yellowness (b*), saturation (C*) and hue angle (h°) values for CREYP and NEYP results showed significantly different ($p>0.05$) for all chroma values with CREYP showed higher L* and h° values but

lower in a*, b* and C* values showing that the yellow colour of NEYP lessened. Commercial mayonnaise appeared to be lighter and less yellowish than CREY mayonnaises with L* and b* values of commercial to CREY mayonnaises were L*:78.34; 63.78% and b*:8.29;14.98% respectively. It can be concluded that CREYP can be used as replace to the NEYP and whole liquid egg yolk with enhance nutritional values. The results obtained from this study will be very useful for producing CREYP.

Physicochemical and thermal properties of gamma-irradiated sago (*Metroxylon sagu*) starch

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Radiation Physics and Chemistry, Vol. 109, 2015, 48-53

Sago (*Metroxylon sagu*) starch was exposed to gamma-irradiation in air at doses 6, 10 and 25 kGy. Subsequent changes in the physicochemical and thermal properties were measured. The apparent amylose content and swelling power of irradiated sago starch was significantly reduced while reducing sugars and starch solubility were significantly increased due to degradation. X-ray diffraction studies showed that radiation did not affect the crystalline type but induced a decrease in the degree of crystallinity, indicating the destruction of the ordered distribution of neighboring polysaccharide chains in the starch granules, in particular of the amylopectin component, which is responsible for starch crystallinity. Differential scanning calorimetry (DSC) of irradiated sago starch showed a small but significant increase in the onset and peak transition temperatures at 10 and 25 kGy dose; the conclusion temperature and gelatinization enthalpy was not affected. SEM and particle size analysis produced no evidence of physical damage to sago starch up to 25 kGy dose radiation treatment since the granular appearance and size distribution was retained.

Physico-chemical characteristics of VitAto™ flour from different drying processes

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The physico-chemical characteristics (minerals and vitamins, colour, total sugar, reducing sugar, total starch, solubility, swelling power) and size of flour granules from different drying types (hot-air dried and drum dried) on selected sweet potato variety (VitAto™) were investigated. VitAto™ was collected locally in Malaysia. Calcium, magnesium, phosphorus, potassium, sodium, sulphur, zinc and vitamin C contents in VitAto™ flour using drum dried technique were significant higher ($p<0.05$) than hot-air dried flour. Drum drier technique showed a higher content of total starch (36.55 ± 0.89) and swelling power and solubility as the temperature increased. Total sugar (76.57 ± 0.67) and reducing sugar (25.02 ± 0.09) contents of VitAto™ flour by drum dried process was also higher than hot-air flour. The colour parameters showed that the L* value that measured brightness (76.57 ± 0.67) and b* values (52.93 ± 5.17) for drum dried flour were significantly higher ($p<0.05$) than hot-air flour. Scanning electron microscopy (SEM) analysis showed that the granular of flour from drum drier technique had irregular shapes with an average size ranging from 50 – 200 µm. This gives an idea about higher solubility value of drum dried flour than hot-air flour. This study showed that drum dried flour can be promoted as a potential drying technique in the food industry.

Physicochemical characterization of biofluid metabolites from liquid residual of tuna fish (*Euthynnus affinis*) throughout refrigerated storage condition

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The cold storage condition and use of chemical treatment to preserve the fish appearance sometimes cause difficulties to the consumers to estimate the freshness of fish in the market. However, during fish deterioration, some compound is released or formed due to microbial and biochemical process. Identification of released compound during fish spoilage is a crucial step in understanding the degree of spoilage. This study characterizes the physicochemical changes of metabolites biofluids from liquid residual of tuna fish (*Euthynnus affinis*) during refrigerated storage condition. Tuna fish were kept in ice at 0 °C and stored in cold room (4 °C) for seven days in order to study the changes in fish freshness and loss of quality through the storage period. Liquid residual of fish was collected at 0, 1, 2, 3, 4, 5, 6, and 7 days of storage. LC-MS/MS analysis was carried out to determine the possible dominant compound which was later identified as creatine and phenylalanine. Quantification of creatine and phenylalanine using HPLC with UV detector found that creatine and phenylalanine increased significantly up to day 4 and day 5 upon storage time for creatine and phenylalanine, respectively (< 0.05). The liquid residual pH increased from 6.5 on day 0 to 7.5 on day 7 (< 0.05). Changes in chemical compounds were supported with physical analysis on gills colour of spoilage fish. and values decreased with storage time from 41.08 to 24.76 and 18.34 to 10.40, respectively, while value increased from –3.80 to –0.46 (< 0.05). The finding of biofluid derived compounds was found as useful and alternative indicators of fish freshness in later study on the development of optical biosensor.

Physicochemical properties and morphological characteristics of composite flour added with cornlettes (*Zea mays*) for functional food ingredient

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Australian Journal of Basic and Applied Sciences, Vol. 10(11) 2016, 300-306

Background: Cornlettes (young corn) is rarely used in maximizing its usage as well as to accommodate the demands in functional food development. **Objective**: This study aimed to investigate physicochemical properties and morphological characteristics of composite flour containing cornlettes powder (CP) which partially replacing wheat flour. Composite flour was prepared by using CP mixed with wheat flour (WF) with the proportion of 10:90, 20:80, 30:70 and 100:0 (CP:WF). **Results**: Amylose contents significantly increased when the percentage of cornlettes powder in composite flours is increased. The highest amylose content was found in 100% CP sample (4.40g/20g) while the lowest amylose content was found in control sample (0.072 g/ 20 g). The percentage of swelling power in composite flour added with CP was significantly higher than control and there is significant difference in the setback viscosity of the composite flour starch samples. Composite flour

shows uniformed wheat starch granules which clustered with irregular shape of cornlettes starch granule. **Conclusion**: Addition of CP to partially replace wheat flour to form composite flour has resulted in improvement of swelling power and amylose composition while slightly altering the starches morphological structures. Composite flour with higher proportions of CP (30:70) can be used to partially replace wheat flour in order to meet the demands of food production.

Physicochemical properties of starch from *Dioscorea pyrifolia* tubers

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Starch from *Dioscorea pyrifolia* tubers was characterized for its proximate composition, physicochemical properties and toxicity. This starch contains 44.47 ± 1.86% amylose, 4.84 ± 0.29% moisture, 0.88 ± 0.21% ash, 1.34 ± 0.11% proteins and 92.73 ± 0.48% carbohydrates. X-ray diffraction (XRD) analysis showed a type-C starch with a relative crystallinity of 23.31 ± 2.41%. The starch granules are polyhedral, with a diameter of 2.8 to 5.6 lm and average size of 3.93 ± 1.47 lm. Initial, peak and finishing gelatinization temperatures for the starch were 71.51 ± 0.07, 75.05 ± 0.15, and 78.25 ± 0.18 °C, respectively; the gelatinization enthalpy was 3.86 ± 0.02 J/g, and the peak height index was 1.09 ± 0.05. Thermogravimetric analysis showed a weight loss of 85.81 ± 0.52% and a decomposition temperature of 320.16 ± 0.35 °C, which indicated that there was good thermal stability of the starch. Fish embryo toxicity (FET) showed that the starch was not toxic and that it was suitable for food and non-food industries.

Production of endopolysaccharides from Malaysia's local mushrooms in Air-lift Bioreactor

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Four local mushroom species, viz. *Auricularis polytricha*, *Lentinus edodes*, *Agrocybe sp* and *Pleurotus flabellatus* were grown under submerged culture and screened for endopolysaccharides. The fermentation was done in 250 ml working volume Erlenmeyer flask and the fermentation curves for all species were established. *Pleurotus flabellatus* has the highest rate of biomass production at the rate of 0.180 g/L/day, at 10 days hence chosen for further investigation. Two additional media, viz. Mushroom Complete Media (MCM) and Yeast Malt (YM) were selected to be compared with potato extract (PE) media used initially. MCM media produced the highest biomass productivity at the rate of 0.311 g/L/day. *Pleurotus flabellatus* biomass was extracted using modified Mizuno method and the endopolysaccharide obtained was tested for β-glucan. The yield of β-glucan was 7.70 ± 1.11 g/100g. The polysaccharides were purified using column chromatography to yield four fractions. The fourth fraction F_4, gave the highest molecular weight at 3.058 × 106 Dalton (11.8%) and 1.282 ×

10^4 Dalton (88.2%). The mushroom, *P. flabbelatus* was cultured using air-lift bioreactor, and the highest productivity was obtained at air-flowrate 2 L/min, yielding 2.25 g/L/day. The yield of biomass against substrate used (glucose consumption) $Y_{b/s}$ was 0.78 g/g.

Recovery of mangostins from *Garcinia mangostana* peels with an aqueous micellar biphasic system

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The α- and γ-mangostins from *Garcinia mangostana* pericarps (GMP) exhibit antioxidant, anti-bacterial, anti-inflammatory and anti-tumor properties. The extraction yields α- and γ-mangostins are often limited by the presence of the GMP cell walls. Therefore, the extraction and recovery of mangostins from GMP with an *Aspergillus niger* cellulaseassisted aqueous micellar biphasic system (CA-AMBS) was developed for enhanced yield of mangostins. Effects of the concentration of cellulase, the incubation time and the temperature of the system on the recovery of mangostins were investigated. The optimum condition for the recovery of α- and γ-mangostins was obtained with the addition of 0.5% (w/w) cellulase incubated at 40 °C for 2 h. High log partition coefficients of γ-mangostins (log Ka 4.79 ± 0.02) and -mangostins (log Kg 4.02 ± 0.02) were achieved. High yields of α-mangostins (73.4%) and α-mangostins (14.0%) were obtained from the micelle-rich bottom phase with final concentrations of 3.67 mg/mL and 0.70 mg/mL, respectively. The backextraction of mangostins was performed with the addition of 30% (w/w) of isopropanol and 0.05 M of KCl at pH 9 to the bottom phase of the CA-AMBS. The yields of the α- and γ-mangostins from GMP were considerably enhanced with the CA-AMBS and the direct recovery of mangostins was demonstrated without additional downstream processing steps

Retention of ascorbic acid and major mineral contents in water spinach and Chinese kale after three different cooking methods

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Introduction: The water spinach (*Ipomoea aquatica*) and Chinese kale (*Brassica oleracea* L. var. alboglabra) are popular in Malaysia, relatively cheap and rich sources of vitamins, dietary fibre and minerals. A study was conducted to determine the retention of ascorbic acid (vitamin C) and major minerals (zinc, iron and copper) in water spinach and Chinese kale after boiling, stir-frying and steaming. **Methods**: Ascorbic acid was determined using potassium iodate titration method. Major mineral contents were determined using atomic absorption spectroscopy. **Results**: The results showed that stir-frying retained the highest ascorbic acid level in both water spinach (64.4%) and Chinese kale (85.9 %). Zinc showed maximum retention in boiled water spinach (103.6%) while stir-fried Chinese

kale retained the highest content of zinc (88.8 %). The retention of iron level in water spinach ranged from 49.1 to 101.3% while that in Chinese kale was from 42.5 to 117.5%. The highest retention of copper was obtained in steamed water spinach (93.6%) and boiled Chinese kale (106.3%). **Conclusion**: Stir-frying is the best cooking method to retain ascorbic acid in water spinach and Chinese kale while zinc, iron, and copper retention in both vegetables varied depending on the type of cooking. These findings could be part of consumer education on methods of food preparation for optimum nutrient retention.

Seaweed tea: Fucoidan-rich functional food product development from Malaysian brown seaweed, *Sargassum binderi*

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Our previous studies on fucoidan from Malaysian brown seaweed, Sargassum binderi, found that it exhibited significant secondary anti-oxidative activity and showed non-toxicity. In order to exploit its health benefits, fucoidan-rich seaweed tea was developed in this study. A total of 4 different brewing time treatments were performed on Sargassum binderi at 5, 10, 15 and 20 mins (F_{t05}, F_{t10}, F_{t15} and F_{t20}, respectively). It was found that F_{t20} showed significantly ($p<0.05$) highest fucoidan content (27.22 ± 0.07 mg/200 mL), superoxide anion scavenging activity (16.46 ± 2.83%) and hydroxyl radical scavenging activity (89.83 ± 4.11%) compared to that of F_{t05}, F_{t10} and F_{t15}. Both the secondary antioxidant activities were significantly positive correlated to the fucoidan content tests (superoxide anion scavenging activity at r=0.97, p=0.0052; and hydroxyl radical scavenging activity at r=0.99, p=0.0011). Masking of the seaweed odour was performed using lemon essence and discriminative test found that masking was most effective using lemon essence at a concentration of 0.3% (v/v). Therefore, there is potential for this seaweed tea to be commercialised, thus, consumers may acquire the health benefit of fucoidan.

Single step purification of bromelain from *Ananas comosus* pulp using a polymer/salt aqueous biphasic system

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Bromelain is an important industrial proteolytic enzyme due to the wide application in food, cosmetic and therapeutic industries. There is a great demand in developing a cost-efficient method to recover bromelain from plant sources. Low interfacial tension and biocompatible aqueous biphasic system (ABS) is widely applied in various separation processes of bioproducts. Thus, recovery of bromelain from *Ananas comosus* (pineapple) pulp using polymer/salt ABS was attempted in this study. The ABS operating factors including polyethylene glycol (PEG) molecular weight, phase composition, pH, centrifugal force and additional of neutral salt were studied. The optimal condition for ABS recovery of bromelain from crude extract was achieved with ABS consisting of 17% (w/w) PEG 4000 and 14% (w/w) phosphate salt; centrifugal force of 6000 × g; pH of 8.0 and at 25 °C. Bromelain exhibited a high specific activity (SA) of 2.7 U and purification factor (P_F) of 16.3 in the top phase of PEG

4000/phosphate ABS with a yield (Y_T) of 55.6%. The findings demonstrated that ABS is a potential one-step operation in replacement to the existing methods in recovery of bromelain from plant sources

Synthesis of palm oil high in diacylglycerol through direct esterification

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Malaysian Journal of Analytical Sciences, Vol 19(1), 2015, 222-229

Palm oil (PO) mainly constitutes of 90-98% of triacylglycerol, 2-6% of diacylglycerol (DAG) and 2-5% of monoacylglycerol. This study was carried out to produce PO that is high in DAG through direct esterification using 1,3 positional specific lipase from *Rhizomucor miehei* (RM IM) and *Thermomyces lanuginose* (TL IM) as catalysts. Palm olein oil has been hydrolysed by water and 4% enzyme in a controlled water bath at 300 rpm for 48 hours at a temperature of 60±2oC while the esterification process was carried out in a same condition except it was run for 24 hours only. Samples DAG A1 and DAG B1 were synthesized products of the first replication using 10% enzyme TL IM and 10% enzyme RM IM respectively while samples DAG A2 and DAG B2 were synthesized products of second replication. DAG spots found on the thin layer chromatography (TLC) plates of samples DAG A1, A2, B1 and B2 bigger than the spot of the control sample. Based on high performance liquid chromatography chromatogram peak area, the total DAG accumulation showed significant differences ($p<0.05$) between the usage of enzymes TL IM and RM IM which were 34.28% and 45.67% respectively. The esterification method has clearly increased the DAG content of the control sample which was only 3.17%. Significant differences ($p<0.05$) also existed in the iodine value (IV), melting and crystallization temperature of all the samples. IV of control sample, DAG A and B were respectively 56.00, 35.00 and 30.50. Differential scanning calorimetry curves showed the melting and crystallization temperature were respectively -3.73°C and -5.72°C for samples using TL IM while -4.92 and -6.56 respectively for RM IM. The results concluded that the usage of enzyme RM IM is more effective in the production of PO high in DAG and efficiency of direct esterification process has been proved.

The ability of oyster mushroom in improving nutritional composition, -glucan and textural properties of chicken frankfurter

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This study was focused on the effect of incorporation of oyster mushroom, *Pleurotus sajorcaju* (PSC) powder to partially replace chicken meat in frankfurters on nutritional composition, -glucan content and textural properties. The frankfurters were formulated with either 0 (control), 2, 4 or 6% of PSC powder. The results show control chicken frankfurter had the highest fat content (11.60%) while 6% PSC frankfurter had the lowest value (10.74%). In other nutrient, ash, moisture and carbohydrate content in all samples ranged from 1.55 to 1.92%, 59.36 to 61.98% and 8.84 to 13.09%, respectively. Apparently, total dietary fiber of chicken frankfurter was increased in line with the levels of PSC powder (0.08 - 6.20%). All samples recorded -glucan in the range from 0.16 to 1.43%, except for control sample. The texture profile showed that both adhesiveness and cohesiveness attributes were not significantly different among all mushroom-based frankfurters. However, frankfurter added

with 6% mushroom was more cohesive and springier than the control formulation. In summary, partial replacement of chicken meat with PSC powder resulted in enhancement of dietary fibres up to 6.20% and -glucan up to 14.30% significantly, lowering fat content but unchanged adhesiveness and cohesiveness attributes. Therefore, PSC powder can be considered to be used as an alternative functional ingredient to improve nutritional values of processed food products.

The effect of avocado puree as fat replacer on the physical quality of muffin

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Malaysian Applied Biology Journal, Vol. 45(2), 2016, 11–16

Avocado (*Persea americana*) is a medium energy dense fruit with buttery puree texture. Avocado is high in monounsaturated fatty acids (MUFAs), which can promote healthy blood lipid profiles and regulates blood glucose levels. This study was performed to study the effect of avocado puree as a fat replacer on the physical quality of fat-reduced muffins. During the muffin-making, butter was replaced with avocado puree at a level of 25% (M1), 50% (M2), 75% (M3) and 100% (M4) whilst muffins with 0% addition of avocado puree were used as a control (M0). The effect of butter replacement on the muffin volume, moisture content, muffin texture profile analysis (TPA) and crumb colour were measured. The results showed that addition of the avocado puree has no significant difference ($p > 0.05$) on the weight and height of the M1, M2, M3 and M4 compared to M0. 100% avocado-replacement produced significantly ($p < 0.05$) springy muffin while the hardness, cohesiveness and chewiness of M1, M2, M3 and M4 showed no significant difference ($p > 0.05$) compared to M0. Muffinadded avocado (M1, M2, M3 and M4) also showed to have darker colour of muffin crumb compared to the control muffins. In conclusion, utilization of avocado puree as a fat replacer in reduced-fat muffins production had not significantly ($p > 0.05$) affected the physical properties of muffin. Therefore, avocado can be a natural ingredient for butter replacer in bakery products.

The effect of chronic gamma irradiation on Malaysia upland rice (*Oryza Sativa*) Kuku Belang

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Australian Journal of Basic and Applied Sciences, Vol. 9(31), 2015, 1-6

Nuclear technology approach has been widely implemented in agriculture as a complementary method to conventional breeding by crossing and hybridization. The Gamma Green House (GGH) located at Malaysia Nuclear Agency provides chronic radiation services to Plant Breeders locally and regionally. The GGH facility produces a low dose rate of gamma ray and living plants can be exposed in longer period of time. The biological effects produced by the radiation depend upon the total amount of radiation energy absorbed or delivered to an organism. A study on the effect of chronic radiation towards Malaysian local rice variety was carried out using the GGH facility. The traditional upland rice (*Oryza sativa*) variety Kuku Belang was exposed to chronic radiation to investigate the responds of the plants towards gamma irradiation. Seedlings in pots at age of 14 days were exposed

to gamma ray in GGH at different dose rate from 0.02 Gy/hour to 0.66 Gy/hour for 60 days. Data of survival rate and growth performance such as plant height and tiller number were recorded every 7 days. Effect of radiation, were observed in the growth rate, plant height, number of tiller and number of filled grain produced. At 160 Gy, the rice seedling showed the highest survival rate, with maximum plant height and highest number of filled grain. This could be due to radiation hormesis that are stimulating to the growth and development of the plants. This study has contributed to the information of low dose response on local rice varieties through chronic radiation of Gamma Green House facility in Malaysia.

The effect of various pretreatment methods on empty fruit bunch for glucose production

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In this study, a pretreatment of empty fruit bunch (EFB) using supercritical carbon dioxide (SC-CO_2), acid and alkaline were investigated for glucose yield from enzymatic hydrolysis. The chemical composition, X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM) analysis of EFB before and after pretreatment were determined. From this study, the chemical composition of EFB (% g/g dry biomass) before pretreatment for cellulose, hemicellulose and Klason lignin were recorded as 36.7%, 22.8%, and 24.2%, respectively. After pretreatment, the highest cellulose composition was obtained from EFB treated with alkaline followed by acid and SC-CO_2 which gave the results of 48.5%, 47.7% and 38% respectively. The glucose yield after enzymatic hydrolysis for untreated EFB was 17% (w/w). After pretreatment, the glucose yield increased to 84.4%, 34% and 24% for alkaline, acid and SC-CO_2 of the treated EFB, respectively. Other than that, XRD analysis showed increase in the crystallinity index after each pretreatment. Morphology analysis showed the surface of the treated EFB looked swollen and ruptured as compared with the surface of the untreated EFB. Between the three pretreatments, alkaline pretreatment gives the highest cellulose composition and glucose yield. Thus, it shows that alkaline pretreatment was the best pretreatment method on EFB compared to acid and SC-CO_2 pretreatments.

The interaction effect of mixing starter cultures on homemade natural yogurt's pH and viscosity

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Dairy yogurts are common food products consumed by people all over the world. Due to the simple process, many people have made their own natural yogurt at home. The fermentation due to the starter culture causes the textural properties of dairy yogurt. However, the literature is surprisingly scarce on the topic of starter culture interactions in the development of textural properties of dairy yogurt. This study investigated the interaction effect of three common starter cultures, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus* and *Streptococcus thermophiles*, on the viscosity of homemade

yogurt. Using Design Expert software, a 10-run mixture model experiment was designed to examine the textural properties developed by single or multiple inoculation of these starter cultures. All yogurt formulations reached the isoelectric point of milk and had pHs in the range 3.97 to 4.32. Yogurt formulations with *L. acidophilus* and *S. thermophilus* resulted in viscosities which were similar to commercial yogurt viscosity (1.77 Pa·s), while *L. bulgaricus* resulted in yogurt with a lower viscosity. Based on the mixture model, *L. acidophilus* had most influence on the yogurt viscosity, followed by *S. thermophiles* and *L. bulgaricus*. In conclusion, *L. acidophilus* can be used as a single starter culture or combined with other starter cultures to develop high viscosity homemade yogurt. A Combination of *S. thermophiles* and *L. acidphilus* can also be used to develop high viscosity yogurts. However, *L. bulgaricus* should not be inoculated alone or become a dominant ratio in multiple starter culture inoculation as it will decrease the overall homemade yogurt viscosity.

The potential of yeast isolated from polished and brown rice as bread leavening agent

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Sains Malaysiana, Vol. 44(3), 2015, 399–403

This study was conducted to determine the effects of yeast from fermented polished and brown rice on physical characteristics of bread. Yeast from four fermentation treatments which were raw polish rice (BP), cooked polish rice (BPM), raw brown rice (BB) and cooked brown rice (NBB), were used for the production of bread. The quality of bread was evaluated base on the specific volume, texture, size, number of pores, moisture content and colour. The results showed BBM yeast gives the highest specific volume and softness in texture. Moisture content of crust and crumb of bread that was fermented by yeast BBM was the highest. The abundant numbers and the smaller size of pore in yeast bread BBM has produced the most delicate texture and highest in the brightness (L *). Overall, BBM yeast shows the potential as leavening agents in bakery industry.

Thermal properties of batter and crumb structure of muffin incorporated with *Persea Americana* puree

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The feasibility of *Persea americana* (avocado) puree as fat replacer was studied by manipulating the levels of avocado puree incorporation (0%, 25%, 50%, 75%, and 100%) in muffins. Avocado incorporation elevated the endothermic peaks and melting enthalpy of muffin batter. However, no significant different ($p > 0.05$) was observed on crumb texture between control and samples incorporated with avocado puree. Further scanning onto the muffin crumb showed that poor protein matrix formed due to higher avocado incorporation. Full avocado substitution (100%) in crumb muffin significantly ($p < 0.05$) reduced the firmness by 28.57% and increased the springiness by 21.12% in muffin samples.

Utilization of Microvisco-amylograph to study flour, dough, and bread qualities of hydrocolloid/ flour blends

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Changes in functionality of wheat flour blended with hydrocolloids (alginate, locust bean gum, guar gum, and xanthan) were investigated. Microvisco-amylograph and flour quality analyses were conducted and showed significant ($p < 0.05$) differences among samples. Correlation of microvisco-amylograph values with other parameters showed that microvisco-amylograph parameters (final viscosity, setback, breakdown, etc.) showed significant ($p < 0.05$) correlation with other parameters. Microvisco-amylograph breakdown was significantly ($p < 0.05$) and positively correlated with dough strength and loaf volume. Microvisco-amylograph end of cooling, final viscosity, setback, and breakdown were identified as valuable for determination of flour, dough, and bread qualities as impacted by addition of hydrocolloids.

Scope 9 | D

Food Science and Technology

Food Antioxidant

Antioxidant activity and phenolic profile of various morphology parts of underutillised *Baccaurea angulata* fruit

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Baccaurea angulata is an underutilized tropical fruit of Borneo Island of Malaysia. The effect of solvents was examined on yield, total phenolic (TPC), total flavonoids (TFC), total carotene content (TCC), free radical scavenging activities and lipid peroxidation inhibition activities. The results indicated that the pulp (edible portion) had the highest yield, while methanol extracts were significantly ($p<0.01$) found to contain higher TPC, TFC and TCC than phosphate buffered saline (PBS) extracts for all the fruits parts. The methanol extracts also showed remarkable antiradical activity and significant lipid peroxidation inhibition activities, with their IC_{50} results highly comparable to that of commercial blueberry. The variations in the results among the extracts suggest different interactions, such as negative or antagonistic (interference), additive and synergistic effect interactions. The study indicated that *B. angulata* like other underutilized tropical fruits contained remarkable primary antioxidants. Thus, the fruit has the potential to be sources of antioxidant components.

Antioxidant activity of red algae *Kappaphycus alvarezii* and *Kappaphycus striatum*

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Antioxidants in seaweeds have attracted increasing interest for its role in protecting human health. Therefore, the aim of this study was to assess the Total phenolic content (TPC) values and antioxidant activities in red seaweeds *Kappaphycus alvarezii* and *Kappaphycus striatum* of different solvent extracts. Total phenolic content (TPC) and antioxidant activities (DPPH scavenging assay and Trolox equivalent antioxidant capacity assay, TEAC) for both *K. alvarezii* and *K. striatum* extracts were determined using different solvents at different concentrations (ethanol: 50%, 70%, 100%; acetone: 50%, 70%, 100%; methanol: 50%, 70%, 100%). The TPC value was measured using the Folin-Ciocalteu's method. The antioxidant activities were measured by 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay and Trolox Equivalent Antioxidant Capacity (TEAC) assay. The highest TPC value of *K. alvarezii* antioxidant extract was obtained by 50% ethanol extracts while for *K. striatum* obtained by 50% methanol extract. The highest percentage of DPPH free radical inhibition for *K. alvarezii* was shown by 50% acetone extract while *K. striatum* was shown using 50% methanol extract. The highest TEAC value for *K. alvarezii* was shown by 50% acetone while *K. striatum* extract

was shown by 50% ethanol extract. The TPC values and antioxidant activities of all solvent extracts of *K. striatum* were significantly higher ($p<0.05$) than K. alvarezii antioxidant extracts. The TPC values showed strong correlation ($r = 0.797$) with TEAC values for *K. alvarezii* antioxidant extract ($p<0.01$). The TEAC values also showed strong correlation ($r = 0.735$) with percentage of DPPH free radical inhibition for *K. alvarezii* ($p<0.01$). The TPC value, DPPH free radical scavenging assay and TEAC assay for *K. striatum* extracts showed strong correlation ($r > 0.8$) with each other ($p<0.01$). In summary, *K. striatum* showed better antioxidant activity and higher TPC value than K. alvarezii.

Antioxidant capacity and consumer acceptability of herbal egg tofu

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A mixture design was used to optimize the herbal egg tofu formulation containing *Polygonum minus, Curcuma longa* and *Zingiber officinale*. The effects of the herbs on the total phenolic content (TPC), ferric reducing antioxidant power (FRAP) assay and scavenging activity 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2 -azino-bis 3-ethylbenzothiazoline-6-sulfonic acid (ABTS), texture profile (hardness, springiness, cohesiveness, gumminess and chewiness) and consumer preference on sensory characteristics (appearance, color, aroma, taste, texture and overall acceptability) of the herbal egg tofu were investigated. An increase in *C. longa* content produced egg tofu with significantly higher ($p < 0.05$) TPC and antioxidant activity (FRAP, ABTS and DPPH assay), but a significantly lower score for overall acceptability. An increase in the *P. minus* content significantly ($p < 0.05$) increased the springiness of the egg tofu. The optimum formulation of the egg tofu was determined by overlapping the contour plot related to sensory characteristics (color, taste and overall acceptability) and springiness that formed the region with optimum value. The results showed that the optimum predicted response value for color, taste, overall acceptability and springiness were 4.9, 4.6, 4.8 and 0.96 mm, respectively, which were obtained from a combination of 0.7% *P. minus*, 0.5% *C. longa* and 0.8% *Z. officinale*.

Antioxidant content and activity in different parts of pomelo [*Citrus grandis* (L.) Osbeck] by-products

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This study aimed to investigate the total antioxidant content and activity in different parts of pomelo by-products, namely flavedo, albedo and segment membrane. Total phenolic content (TPC) was determined using Folin-Ciocalteu method while total flavonoid content (TFC) was determined using aluminium chloride colorimetric method. The total antioxidant activity was determined by performing DPPH free radical scavenging assay and ferric ion reducing antioxidant power (FRAP) assay. Albedo possessed the highest TPC and TFC while flavedo demonstrated the highest antioxidant activity in both assays as compared to other tissues. Pearson correlation tests revealed that there were no correlations between TPC and EC_{50} as well as FRAP value. There was also a lack of relationship between TFC and antioxidant activity as determined in DPPH and FRAP assays. The pomelo by-products of 'Ledang' possessed higher antioxidant properties than previous studies and therefore can be considered as a new source of natural antioxidants.

Antioxidant efficacy of mangosteen (*Garcinia mangostana* Linn.) peel extracts in sunflower oil during accelerated storage

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This study evaluated the efficacy of mangosteen peel extracts (100 and 200 ppm) in stabilizing sunflower oil tested under accelerated storage (65 °C) for a period of 24 days. BHA and -tocopherol were used as comparative standards besides the control. Established parameters such as peroxide value (PV), iodine value (IV), *p*-anisidine value (*p*-AnV), total oxidation value (TOTOX), thiobarbituric acid reactive substances (TBARS) and free fatty acid (FFA) content were used to assess the extent of oil deterioration. After 24 days storage at 65 °C, sunflower oil containing 200 ppm extract of mangosteen peel showed significant lower PV and TOTOX compared to BHA and -tocopherol. TBARS, *p*-AnV and FFA values of sunflower oil containing 200 ppm of mangosteen peel extract exhibited comparable inhibitory effects with BHA. Mangosteen peel extract at 200 ppm exhibited inhibitory effect against both primary and secondary oxidation up to 24 days under accelerated storage conditions. Thus, it is suggested that mangosteen peel extract may be used as a potential source of natural antioxidants in the application of food industry to suppress lipid oxidation.

Antioxidant efficacy of unripe banana (*Musa acuminata* colla) peel extracts in sunflower oil during accelerated storage

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Background: Sunflower oil is prone to oxidation during storage time, leading to production of toxic compounds that might affect human health. Synthetic antioxidants are used to prevent lipid oxidation. Spreading interest in the replacement of synthetic food antioxidants by natural ones has fostered research on fruit and vegetables for new antioxidants. **Material and methods**: In this study, the efficacy of unripe banana peel extracts (100, 200 and 300 ppm) in stabilizing sunflower oil was tested under accelerated storage (65°C) for a period of 24 days. BHA and -tocopherol served as comparative standards besides the control. Established parameters such as peroxide value (PV), iodine value (IV), *p*-anisidine value (*p*-AnV), total oxidation value (TOTOX), thiobarbituric acid reactive substances (TBARS) and free fatty acid (FFA) content were used to assess the extent of oil deterioration. **Results**: After 24 days storage at 65°C, sunflower oil containing 200 and 300 ppm extract of unripe banana peel showed significantly lower PV and TOTOX compared to BHA and -tocopherol. TBARS, *p*-AnV and FFA values of sunflower oil containing 200 and 300 ppm of unripe banana peel extract exhibited comparable inhibitory effects with BHA. Unripe banana peel extract at 200 and 300 ppm demonstrated inhibitory effect against both primary and secondary oxidation up to 24 days under accelerated storage conditions. **Conclusions**: Unripe banana peel extract may be used as a potential source of natural antioxidants in the application of food industry to suppress lipid oxidation.

Antioxidant peptides purified and identified from the oil palm (*Elaeis guineensis* Jacq.) kernel protein hydrolysate

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Protein extracted from oil palm kernel was hydrolyzed using pepsin-pancreatin (OPKH) and subsequently used to identify the potential antioxidative peptides. Then, the OPKH was purified sequentially by ultrafiltration, reversed-phase and semi-preparative HPLC. Antioxidant capacities (ACs) of the purified peptides from OPKH were evaluated using ferric reducing antioxidant power (FRAP), -carotene-linoleate bleaching (BCB) assay and 2,2 -azino-bis(3- ethylbenzthiazoline-6-sulphonic acid) (ABTS) radical scavenging activity assay. Amino acid compositions of the purified peptide fractions were also determined. The amino acid sequence of the antioxidative peptide was identified by liquid chromatography-electrospray ionization/multi-stage mass spectrometry (LC-ESI-Q-TOF-MS/MS) using de novo sequencing. There were nine fractions purified and collected where F6 demonstrated the highest AC. Three antioxidative peptides, Val-Val-Gly-Gly-Asp-Gly-Asp-Val (VVGGDGDV), Val-ProVal-Thr-Ser-Thr (VPVTST) and Leu-Thr-Thr-Leu-Asp-Ser-Glu (LTTLDSE) were identified in fraction F6.These peptides did not show any similarity with other antioxidant peptides listed in BLAST database of NCBI. These peptides may be useful ingredients in food and pharmaceutical applications.

Antioxidant properties of selected varieties of lettuce (*Lactuca sativa* L.) commercially available in Malaysia

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This study aimed to determine total antioxidant and antioxidant activity of selected local varieties of lettuce (*Lactuca sativa* L.). Five varieties (iceberg, butterhead, romaine, green coral and red coral) were subjected to DPPH radical scavenging activity and ferric reducing antioxidant power assay (FRAP) assays for determination of antioxidant activity. Total phenolic content and total flavonoid content were determined as total antioxidant. The EC_{50} values obtained from the DPPH radical scavenging assay ranged from 303.56 to 4485.41 µg/ml. The red coral lettuce had the lowest EC_{50} value indicating it possesses the highest antioxidant activity among the varieties. This variety also showed the highest FRAP value compared with the other varieties, where the values ranged from 48.05 to 2135.82 mM Fe^{2+}/100 g fresh weight. Total phenolic content of samples ranged from 4.85 to 76.05 mg gallic acid equivalent/100 g fresh weight, with the red coral lettuce had the highest value. Total flavonoid content of the lettuce samples ranged from 2.28 to 21.96 mg quercetin equivalent/100 g

fresh weight, and were significantly different ($p<0.05$) among the samples. The EC_{50} values of DPPH radical scavenging activity and FRAP values among samples were highly correlated with total phenolic content and total flavonoid content. Among the different varieties of lettuce, red coral lettuce showed the highest total antioxidants and antioxidant activity. Therefore, consumers are encouraged to consume this lettuce more on a regular basis for gaining a better health.

Antioxidative activities and polyphenolic content of different varieties of Malaysia young corn ear and cornsilk

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Sains Malaysiana, Vol 45(2), 2016, 195–200

This study aimed to determine the antioxidant capacity, total polyphenolic and total flavonoid content of Malaysian young corn ear (YCE) and its cornsilk (CS) of different varieties. Three different varieties of YCE and its CS locally grown in Malaysia were chosen namely Big Fruit, Thai Supersweet and Bi-color. CS Bi-color displayed the highest total phenolic content (143.58 mg GAE/g extract) while CS Thai Supersweet exhibited the highest total flavonoid content (26.63 mg CAE/g extract). Meanwhile, YCE of Bi-color variety demonstrated the highest total polyphenolic and flavonoid content (92.64 and 18.14 mg CAE/g extract, respectively) compared to other YCE varieties. At 800 g/mL, CS of Bi-color (93.82%) recorded the strongest electron donor due to higher DPPH scavenging activity, followed by CS Thai Supersweet (92.87%), YCE Bi-color (41.94%), YCE Thai Supersweet (28.87%), CS Big Fruit (28.87%) and YCE Big Fruit (21.38%). For FRAP, CS of Bi-color showed the highest reducing power activity (65.46%) among all the crude extracts. There is a significant correlation between total polyphenolic content, DPPH free radical scavenging activity and FRAP of YCE and CS of different varieties. In summary, CS extracts are the potential ingredient to be applied in food industries and at the same time reducing agriculture wastage.

Ascorbic acid quantification in *Benincasa hispida* fruit extracted using different solvents

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Ascorbic acid or vitamin C is mostly found in natural products such as fruits and vegetables. High performance liquid chromatography (HPLC) method has been developed and validated to compare the ascorbic acid content in *Benincasa hispida* (Bh) fruit extract with three different extraction solvents; i) 3% metaphosphoric acid, ii) 3% citric acid and iii) distilled water. The compound has been detected and quantified by the use of HPLC coupled with UV-Vis detector. The amount of ascorbic acid detected in Bh fruit extract prepared with different extraction solvents; 3% metaphosphoric acid, 3% citric acid and distilled water were 13.18, 7.91 and 9.42 mg/100g respectively. Total run time was 6 min and the retention time was 2.60 min. Calibration curve was linear with the concentration range 1.00 – 16.00 µg/ml. Limits of detection was 0.24 µg/ml, limit of quantification was 0.81 µg/ml and recovery was 93.52%. The result showed ascorbic acid content is higher in Bh fruit extract with 3%

metaphosphoric acid, followed by extract with distilled water and 3% citric acid. Thus, Bh is another novel fruit/ vegetable potentially used as food ingredient as it contains a good source of ascorbic acid that can be good for one's health.

Comparison of phenolic content and antioxidant activity of fresh and fried local fruits

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International Food Research Journal, Vol 23(4), 2016, 1717-1724

Fried fruits are popularly consumed by many people over the world. Some of the famous local fried fruits are fried cempedak, jackfruit and breadfruit. These fruits are rich in antioxidant, but the antioxidant content after frying is unknown as frying may alter the antioxidant content. This study aimed to compare total phenolic content and antioxidant activity of fresh and fried local fruits. Freeze-dried samples were extracted using 80% methanol and Folin-Ciocalteu assay was used to determine the total phenolic content (TPC) of the samples while FRAP and Beta-carotene assays were used to evaluate their antioxidant activity. Fried jackfruit (76.836 + 0.619 mg GAE/100g) had the highest TPC, followed by fresh jackfruit, fried cempedak, fresh cempedak, fried breadfruit and the lowest TPC was in fresh breadfruit (54.042 + 0.596 mg GAE/100g). Sample with the highest antioxidant activity as measured by FRAP assay was fresh cempedak (3.881 + 0.301 mM Fe^{2+}/g), followed by fresh breadfruit, fresh jackfruit, fried jackfruit, fried breadfruit and the least antioxidant activity was in fried cempedak (0.794 + 0.106 mM Fe^{2+}/g). Using Beta-carotene assay, fried cempedak had the highest percentage of antioxidant activity (98.936 + 0.182) followed by fresh jackfruit, fresh cempedak, fried jackfruit, fresh breadfruit and the lowest was observed in fried breadfruit (-76.449 + 8.139). There was no correlation found between TPC and antioxidant activity as measured using both FRAP and beta-carotene assays. In conclusion, frying of fruits resulted in increment of TPC but mixed changes in antioxidant activity of the final product thus suggesting the importance of controlling the frying process in getting the benefits of fruit antioxidants.

Comparison of Total Phenolic Contents (TPC) and antioxidant activities of fresh fruit juices, commercial 100% fruit juices and fruit drinks

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Sains Malaysiana, Vol 45(9), 2016, 1319–1327

There is an increasing trend of fruit juice consumption due to increasing reported health benefits of antioxidant content present in fruit juices. The aim of this study was to compare the total phenolic contents (TPC) and antioxidant activities of fresh fruit juices, commercial 100% fruit juices and fruit drinks. Seven types of freshly blended fruit juices and their commercial counterparts were selected. Folin-Ciocalteu method was used to determine the total phenolic content, whilst ferric reducing antioxidant power (FRAP) and 2,2-diphenyl-1-picrylhydrazyl (DPPH) assays were performed to evaluate the antioxidant activities of fruit juices. The TPC contents of fresh fruit juices, commercial 100% fruit juices and fruit drinks were at the ranges of 13.38-80.40, 21.65-130.39 and 3.32-45.10 mg GAE/100 mL, respectively. Both fresh guava juice and commercial guava drinks have exhibited the highest

antioxidant activities in DPPH assay (205.71-770.12 µmol TE/100 mL) and FRAP assay (320.80-843.13 µmol TE/100 mL). Pomegranate juices demonstrated the highest antioxidant activities among commercial 100% fruit juices with DPPH and FRAP values of 2705.01 and 2953.85 µmol TE/100 mL, respectively. Fruits drinks group had the lowest TPC and antioxidant activities for all types of fruits. TPC was significantly correlated ($p<0.05$) to FRAP ($r=0.954$) and DPPH ($r=0.908$) assays. In conclusion, the TPC and antioxidant activities of commercial 100% fruit juices and fresh juices were comparable as no significantly difference ($p>0.05$) was found between these two groups. Commercial fruit drinks in this study were not good source of antioxidants. These findings provide some useful information especially for ageing population in choosing healthy fruit juice or drinks for their health maintenance purposes.

Evaluation of antioxidant potential of *Artocarpus heterophyllus* L. J33 variety fruit waste from different extraction methods and identification of phenolic constituents by LCMS

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Food Chemistry, Vol 232, 2017, 621-632

Artocarpus heterophyllus J33 (AhJ33) fruit is a popular and valuable jackfruit variety in Malaysia. For export, the pulp has to be separated from the skin which is usually discarded. Hence, the conversion of the fruit waste to food products with economic value needs to be explored utilizing the waste to wealth concept. This paper reports the evaluation of antioxidant potential of AhJ33 fruit waste (rind and rachis) extracts from three different extraction methods (maceration, percolation and Soxhlet). The antioxidant potential was assessed by DPPH radical scavenging, FRAP and β-carotene bleaching assays. The total phenolic and total flavonoid contents were estimated by TPC and the TFC assays. For both rind and rachis, the maceration technique yielded extracts with the strongest antioxidant activities which correlated with the highest TPC and TFC values. TOF LCMS analysis identified two phenolic acids as the major constituents responsible for the antioxidant activity of the active extracts

Flavonoid profile and antioxidant activity of pink guava

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ScienceAsia, Vol 41, 2015, 149–154

This article determines ascorbic acid, total phenolic content and the antioxidant capacity of whole fruit, flesh, and skin fractions of two varieties of pink guava widely produced in Malaysia (semenyih and sungkai). They were analysed and specific flavonoid compounds (apigenin, isorhamentin, kaempferol, luteolin, myricetin, and quercetin) were determined. Ascorbic acid, total phenolic content and antioxidant capacity was found to be higher in semenyih than in sungkai, mainly in the skin fraction. The predominant flavonoid in all pink guava fractions was kaempferol, with sungkai flesh having the highest kaempferol content. The pink guava represents an important source of antioxidant flavonoid compounds that may have health benefits.

Identification of two novel antioxidant peptides from edible bird's nest (*Aerodramus fuciphagus*) protein hydrolysates

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Edible bird's nest (EBN) is widely consumed as a delicacy and traditional medicine amongst the Chinese. In the present study, for the first time, the antioxidant properties of an EBN pepsin–trypsin hydrolysate of the swiftlet species *Aerodramus fuciphagus* and its ultrafiltration fractions were investigated. Thirteen peptides with molecular weights between 514.29 and 954.52 Da were identified in the EBN fraction with the use of mass spectrometry. Two novel pentapeptides Pro-Phe-His-Pro-Tyr and Leu-Leu-Gly-Asp-Pro, corresponding to f134–138 and f164–168 of cytochrome b of *A. fuciphagus*, indicated the highest ORAC values of 14.95 and 14.32 μM of TE μM^{-1} peptide, respectively. Both purified peptides showed resistance against simulated gastrointestinal proteases. In addition, both peptides had no in vitro cytotoxicity on human lung MRC-5 cells and prevented human liver carcinoma HepG2 cellular damage caused by hydroxyl radicals. Therefore, it is suggested that EBN protein hydrolysates are a good source of natural antioxidants and could be applied as nutraceutical compounds.

Impact of optimised cooking on the antioxidant activity in edible mushrooms

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This study aimed to investigate the effect of four cooking methods with different durations on the in vitro antioxidant activities of five edible mushrooms, namely *Agaricus bisporus*, *Flammulina velutipes*, *Lentinula edodes*, *Pleurotus ostreatus* and *Pleurotus eryngii*. Among the raw samples, *A. bisporus* showed the highest total antioxidant activity (reducing power and radical scavenging), total flavonoid, ascorbic acid and water soluble phenolic contents. Short-duration steam cooking (3 min) increased the total flavonoid and ascorbic acid while prolonged pressure cooking (15 min) reduced the water soluble phenolic content in the mushrooms. The retention of antioxidant value in the mushrooms varied with the variety of mushroom after the cooking process. The cooking duration significantly affected the ascorbic acid in the mushrooms regardless of cooking method. To achieve the best antioxidant values, steam cooking was preferred for *F. velutipes* (1.5 min), *P. ostreatus* (4.5 min) and *L. edodes* (4.5 min) while microwave cooking for 1.5 min was a better choice for *A. bisporus*. Pressure cooked *P. eryngii* showed the best overall antioxidant value among the cooked samples. Optimised cooking method including pressure cooking could increase the antioxidant values in the edible mushrooms.

In vitro release study of freeze-dried and oven-dried microencapsulated kenaf seed oil

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Introduction: The high amounts of polyunsaturated fatty acid (PUFA) in kenaf seed oil (KSO) is susceptible to oxidation. However, KSO is rapidly oxidised due to its high PUFA content. **Methods**: In order to prevent oxidation, kenaf seed oil was encapsulated using a co-extrusion technique to produce microencapsulated kenaf seed oil (MKSO). The shell materials used were formulated from alginate with high methoxy pectin and chitosan. MKSO was freeze-dried and *in vitro* behaviour of MKSO was investigated and compared with oven-dried MKSO. After *in vitro* digestion, the antioxidant and bioactive compounds in freeze-dried MKSO were investigated. **Results**: Freeze-dried MKSO released more oil (95.35%) compared to oven-dried MKSO (83.88%) after *in vitro* digestion. Total phenolic content (TPC) and 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activities showed decreases, compared to before *in vitro* digestion while 2,2'-azino-bis(3- ethylbenzothiazoline-6-sulphonic acid) (ABTS) radical-scavenging assay and tocopherol content showed increases in released oil from MKSO after *in vitro* digestion compared to before *in vitro* digestion. For phytosterol composition, the decreases in released oil were not significant. **Conclusion**: The studies showed that microencapsulation allowed for site-controlled oil delivery and protected the bioactive compounds.

Influence of extraction solvents on *Cosmos caudatus* leaf antioxidant properties

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Cosmos caudatus is commonly used as a medicinal plant in tropical countries. *C. caudatus* leaf extracts were obtained using five different extraction solvents, namely 100 % methanol, 100 % ethanol, 95 % ethanol, 50 % ethanol, and 100 % water. Mechanically liberated *C. caudatus* leaf juice was also used for comparison. The total carotenoid content, total phenolic content, total flavonoid content, DPPH, ABTS, FRAP and -carotene bleaching assays of the extracts were determined spectrophotometrically, while ascorbic acid content was quantified using HPLC. Among all the CC leaf extracts, water extracts exhibited the highest total phenolic content (10,513 mg GAE/100 g fresh sample), total flavonoid content (1654.7 mg/100 g fresh sample), and ascorbic acid content (153.7 mg/100 g fresh sample). While the 100 % methanol and 50 % ethanol extracts of *C. caudatus* leaves demonstrated the highest antioxidant activities as assessed using DPPH, ABTS and FRAP. The highest total carotenoid content was observed in the methanol extract of *C. caudatus* leaves. *C. caudatus* leaf juice contained the lowest ascorbic acid, TPC, TFC and antioxidant activities. Overall, using different types of extraction solvents had significant effects on the antioxidant properties of the extracts. 50 % ethanol was subsequently recommended as the most efficient solvent to extract antioxidant compounds from *C. caudatus* leaf.

In-vitro gastrointestinal digestion of kenaf seed oil-in-water nanoemulsions

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The high nutrition value of kenaf seed oil has good potential to be used as functional foods or nutraceu-tical products. Kenaf seed oil-in-water nanoemulsions stabilised by ternary emulsifier mixtures, namelysodium caseinate, gum Arabic and Tween 20 were produced by using high pressure homogeniser. Atwo-stage in-vitro model was employed to investigate the bioaccessibility of bioactive compounds that isnaturally present in the kenaf seed oil-in-water nanoemulsions. The changes in the antioxidants proper-ties before and after in-vitro digestion and the structural changes during digestion were also evaluated. Bycomparing the digested and undigested nanoemulsions, the digested nanoemulsions had increased thetotal phenolic content by 71% and tocopherol content by 230%. However, 2,2-diphenyl-1-picrylhydrazyl(DPPH•) radical scavenging activity was decreased by 34% and phytosterols content was decreased by39%. The amount of free fatty acids (FFA) released from gastric digested nanoemulsions during 120 min ofintestinal digestion was 247.7 μmol/mL. This high release of FFA indicates good lipid digestion, which isthe preliminary step for releasing and absorption of lipophilic bioactive in the small intestine. This study provides useful insights into the changes of kenaf seed oil-in-water nanoemulsions during gastrointesti-nal digestion.

Kinetics extraction modelling and antiproliferative activity of *Clinacanthus nutans* water extract

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Clinacanthus nutans is widely grown in tropical Asia and locally known *"belalai gajah"* or Sabah snake grass. It has been used as a natural product to treat skin rashes, snake bites, lesion caused by herpes, diabetes, fever, and cancer. Therefore, the objectives of this research are to determine the maximum yield and time of exhaustive flavonoids extraction using Peleg's model and to evaluate potential of antiproliferative activity on human lung cancer cell (A549). The extraction process was carried out on fresh and dried leaves at 28 to 30 °C with liquid-to-solid ratio of 10 mL/g for 72 hrs. The extracts were collected intermittently analysed using mathematical Peleg's model and RP-HPLC. The highest amount of flavonoids was used to evaluate the inhibitory concentration (IC_{50}) via 2D cell culture of A549. Based on the results obtained, the predicted maximum extract density was observed at 29.20 ± 14.54 hrs of extraction ($_{exhaustive}$). However, the exhaustive time of extraction to acquire maximum flavonoids content exhibited approximately 10 hrs earlier. Therefore, 18 hrs of extraction time was chosen to acquire high content of flavonoids. The best antiproliferative effect (IC_{50}) on A549 cell line was observed at 138.82 ± 0.60 μg/mL. In conclusion, the flavonoids content in *Clinacanthus nutans* water extract possesses potential antiproliferative properties against A549, suggesting an alternative approach for cancer treatment.

Nutritional, phytochemical and pharmacological properties of *Mikania micrantha* Kunth

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Pertanika Journal of Scholarly Research Reviews, 2(3), 2016, 123-132

Mikania micrantha Kunth (Asteraceae) is a perennial creeping vine that can be found in South and North America, Africa, Pacific Islands and Southeast Asia, including Southern China and Malaysia. Previous studies have reported that this plant possessesseveral pharmacological properties which can be used to prevent and cure several diseases. Phytochemicals foundfrom various parts of M. micranthahave been linked to beneficial medicinal properties such as antioxidant, antimicrobial, antitumour, anti-inflammatory, anti-stress, and also anti-diabetic activities. The primary aim of this paper is to review available scientific informationon the nutritional, phytochemical and pharmacological properties of *M. micranthato* provide baseline information for future studies.

Physical properties, antioxidant content and anti-oxidative activities of Malaysian stingless *kelulut* (*Trigona* spp.) honey

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Honey produced by stingless bee of *Trigona* spp. is popularly known as *Kelulut* honey (KH) in Malaysia. Even though KH has been increasingly accepted by Malaysians, information relating to its physical and antioxidant properties is still limited. This study aimed to determine the physical properties, antioxidant content and anti-oxidative properties of KH collected from different regions in Peninsular Malaysia. Physical properties of KH including total soluble solids, pH, moisture, ash content, and colour were determined. Antioxidant content namely total phenolics, flavonoids, carotenoids, ascorbic acid equivalent antioxidant content (AEAC) and quercetin equivalent antioxidant content (QEAC) were also quantified. Anti-oxidative potential of KH was assayed using DPPH radical scavenging and FRAP assays. KH has pH of 3.29-3.71, total soluble solids (66.23-73.70 °Brix), 21.40-31.59% moisture and 0.22-0.41% ash content. Colour measurement showed KH from the northern region was lightest (L=39.32) while KH from east coast (b=-5.06) and central (a=5.65) regions were more pronounce in blue and red colours. KH from east coast region showed highest values for phenolics (1169.36 ± 51.11 mg GAE/kg), flavonoids (79.13 ± 0.49 mg QE/kg), carotenoids (4.61 ± 0.38 mg/kg), AEAC (146.20 ± 5.56 mg/kg) and QEAC (177.08 ± 5.54 mg/kg). In line with the antioxidant content, honey from the east coast region also had strongest anti-oxidative activities indicated in its lowest IC_{50} value of DPPH radicals (15.07 ± 1.05 mg/mL) and highest FRAP value (7477.03±48.80 μMFe(II)/kg). The KH collected from different regions showed varied physical and antioxidant attributes which may due to variety source of floral origin.

Physicochemical properties and antioxidant activity of milk samples collected from five goat breeds in Malaysia

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Five different goat breeds (Saanen, Kacang, Jamnapari, Boer and a crossbred of Jamnapari and Saanen) were obtained from one farm in Bandar Baru Bangi. The aim of this study was to determine the physicochemical properties and antioxidant capacity based on TPC, FRAP and DPPH. Goat milk samples were collected during the same lactation period (middle lactation) and were subsequently compared with cow milk. The results of the study showed that goat milk exhibited a significantly higher ($p<0.05$) antioxidant capacity than cow milk. Jamnapari milk exhibited the highest antioxidant capacity in Total Phenol Content (TPC), Ferric Reducing Antioxidant Power (FRAP) and 2,2-diphenyl-1-picrylhydrazyl (DPPH) assays with values of 544.08 mg GA/100 g FW, 481.69 mg TE/100 g FW and 67.44%, respectively. By contrast, the milk samples obtained from the Boer exhibited the lowest corresponding values of 460.00 mg GA/100 g FW, 386.06 mg TE/100 g FW and 59.68%, respectively. Results showed that physicochemical properties were significantly different ($p<0.05$) among the milk samples, with some samples more superior compared with others in one or more aspects. Jamnapari milk was superior in terms of ash, total soluble solid and protein with values of 0.96%, 13.02 Brix and 5.11%, respectively and this milk also showed the lowest moisture (81.28%) among all milk samples. Cow milk exhibited the highest fat (4.43%) and Kacang milk had the lowest titratable acidity (0.06%) than the other milk samples. Thus, goat milk can be considered as an excellence source of antioxidants.

Physicochemical properties, total phenolic and antioxidant activity of mixed tropical fruit juice, TP 3 in 1™

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This study was carried out on the TP 3 in 1™ juice formulation, which consisted of pomegranate concentrate with guava and roselle extract. This study aimed to determine its physicochemical properties, proximate content, total phenolic content, antioxidant activity, total sugar, vitamin C and several targeted polyphenol compounds. Total phenol content was determined using Folin-Ciocalteu method while antioxidant activity was determined using DPPH and ABTS methods. The results showed pH and total soluble solid values of the juice were 3.69 and 8.1 °Brix, respectively. The juice has brightness colour of L = 33.25, a = 3.16 and b = -4.63. Every 100 ml juice contained 10.92 g total sugar, 4 mg vitamin C and 0.44% titratable citric acid. Proximate analyses showed TP 3 in 1TM juice contained 89.38% moisture, 0.15% total ash, 0.16% protein, 0% fat and 10.31% total carbohydrates. The juice was low in calories (42 kcal/100 ml) and contained total phenolic (609 mg GAE/100 ml) and total monomeric anthocyanin (12.94 mg C3G/100 ml). Antioxidant value obtained through DPPH and ABTS test methods were 88.90% and 472.44 µM TE/ml, respectively. Eight selected

individual polyphenol compounds ranged from 0.13-633.73 mg/100 ml have been identified. TP 3 in 1™ juice consisting three different tropical fruits can be considered of having high phenolic content and antioxidant activity. Consumption of mixed tropical juices with various polyphenol compositions will protect human body from several diseases attributed to the reactions of free radicals.

Physicochemical properties, total phenolic content, and antioxidant capacity of homemade and commercial date (*Phoenix dactylifera* L.) vinegar

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Previous studies proved the antioxidant properties of dates. However, studies on date by products especially date vinegar are still lacking. Hence, it is the aim of the present study to compare the physicochemical properties, total phenolic content, and antioxidant capacity between homemade and commercial date vinegar. Physicochemical properties such as total sugar content, pH, and total titratable acidity of homemade and commercial date vinegar were studied. Both homemade and commercial date vinegar showed significant difference in physicochemical properties including pH, sugar content and total titratable acidity ($p<0.05$). Total phenolic content ranged from 281.17 mg GAE/L to 641.17 mg GAE/L with significant differences ($p<0.05$) noted between homemade and commercial date vinegar. Homemade semisoft date vinegar possessed significantly higher ($p<0.05$) hydrogen peroxide inhibition capacity (310.20 µg AAeq/mL) as compared to soft date vinegar (200.06 µg AAeq/mL) and commercial date vinegar (190.81 µg AAeq/mL). Pearson's correlation statistical test showed no significant correlation ($p>0.05$) between hydrogen peroxide scavenging activity and total phenolic content of date vinegar. Only the homemade date vinegar showed metal chelating property with values of 0.34 ± 0.10 and 2.90 ± 0.03 for semisoft and soft date cultivars respectively. Pearson's correlation statistical test showed significant correlation between metal chelating rate and total phenolic content ($r=0.50$; $p<0.01$) of the two samples. Homemade date vinegar showed generally higher antioxidant activity than commercial date vinegar and both samples were significantly different in terms of their physicochemical properties.

Physicochemical, oxidative and anti-oxidant stabilities of kenaf seed oil-in-water nanoemulsions under different storage temperatures

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Kenaf seed oil-in-water nanoemulsions stabilised by sodium caseinate, Tween 20 and –cyclodextrin complexes were produced using high pressure homogeniser. This formulation has been shown to possess good lipid digestion and increased bioaccessibility of tocopherols and total phenolic contents. However, its physicochemical and oxidative stability during storage was unknown. Therefore, the main objectives of this study were to evaluate the effects of three storage temperatures (4 °C ± 2 °C, 25 °C ± 2 °C and 40 °C ± 2 °C) on the physicochemical, oxidative and antioxidant stability of formulated kenaf seed oil-in-water nanoemulsions. The results showed that nanoemulsions stored at 4 C had maintained the highest stability with the highest zeta-potential value (–36.6 mV), lowest

changes of PDI and pH over 12 weeks of storage. It also presented the lowest reduction of polyunsaturated fatty acids (PUFA) over the course of storage period. In contrast, nanoemulsions that stored at 40 C exhibited lowest stability with the lowest zeta-potential (–27.3 mV). Sediment was observed in 8 weeks of storage and it had the highest reduction of PUFA. Total phenolic contents in nanoemulsions that stored at 4 °C and 25 °C showed decreasing trend during the storage period, except for nanoemulsions that stored at 40 °C showed a significant increase ($p < 0.05$) in the first week of storage, but subsequently also displayed decreasing trend. The overall results showed that nanoemulsions that stored at 4 °C and 25 °C were stable for up to 8 weeks of storage. Nanoemulsions that stored under accelerated storage temperature of 40 °C were stable for 1 week, which is equivalent to 28 days at room temperature (RT) based on Arrhenius equation. The results of this study could provide better understanding of the storage stability of kenaf seed oil-in-water nanoemulsions under different storage temperatures. It could be served as a predictive model to estimate its shelf-life.

Phytochemicals and antioxidant capacities from *Dacryodes rostrata* fruits

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Nowadays, people are gaining interest on natural products due to the health conscious and awareness of the side effect caused by synthetic products. Malaysia is one of the top biodiversity, which host rich diversity of indigenous fruit, which could be a potential source of nutraceutical, antioxidant and pharmaceuticals. *Dacryodes rostrata* is an indigenous fruit found in Sarawak, Malaysia and is reported to be rich in oil, protein, minerals and could be a potential source of natural antioxidants. Thus, in this work, antioxidant components and antioxidant capacities of the extracts of peel, pulp and seeds of *D. rostrata* were evaluated. Total phenolic (1008 ± 24 mg/g GAE DW) and flavonoid contents (2551 ± 37 mg/g QE DW) of the seed extracts were higher when compared to peel and the pulp extracts. In addition, 1,1-diphenyl-2-picryl hydrazyl (DPPH) free radical scavenging activity of the seed extracts were higher (63%), compared to peel (25%) and pulp (18%). Ferric reducing antioxidant power (FRAP) values of the seeds (1.25mM $FeSO_4$ equivalent) exhibited highest activity when, compared with peel (0.29 mM $FeSO_4$ equivalent) and pulp (0.90mM $FeSO_4$ equivalent). Seed extract also showed highest total antioxidant capacity determined by phosphomolybdenum method. Liquid chromatography-mass spectra (LC-MS) of the seed extracts from *D. rostrata* revealed the presence of phytochemicals in the form of gallic acid, ellagic acid, catechin, epicatechin and apigenin. Thus, *D.rostrata* seed extracts is having potent antioxidant capacity and could be used as a natural source of antioxidants.

Sauropus androgynus leaves for health benefits: Hype and the science

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Sauropus androgynus (SA) is a medicinal plant with high antioxidant potential. The leaves of this plant have been traditionally used to treat certain diseases, for weight loss, and as vegetable dishes. SA leaves contain an adequate amount of macronutrients and having most of the micronutrients. The micronutrients are phenolic compounds, carotenoids, antioxidant vitamins, and minerals. SA leaves also contain most of the essential minerals, including sodium, potassium, calcium, phosphorus, iron, magnesium, copper, zinc, manganese, and cobalt. Fresh leaves of SA typically consist of 70%-90% moisture, 3%-8% protein, 1%-4% fat, 1%-2% fiber, and about 2% ash. The other percentage of the leaves is carbohydrate. In this review, the types and amounts of phenolic compounds, carotenoids, antioxidant vitamins, and minerals are presented. Antinutrients and heavy metals detected in SA leaves are also revealed. These compounds could have adverse health effects, such as heavy metal toxicity and induce lung injury. Bronchiolitis obliterans and obstructive ventilator impairment of the patients are known to be caused by ingestion of uncooked or fresh SA leaves. SA leaves are the staple food in some of the developing nations that provide essential nutrients to the poor people. It also helps to maintain good health of these people. However, fresh consumption and over-consumption of SA leaves are not advisable. It may cause toxicity or lung injury. The antioxidative components of SA leaves have scientifically shown a vast health benefit to the human being, from test tubes to *in vivo* studies. However, extra precaution should be taken for minimizing the adverse health effect of intake of fresh SA leaves.

Study of antioxidant activity and physicochemical properties of coconut milk (Pati santan) in Malaysia

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Coconut milk is the word used to describe the liquid obtained from the mechanical or manually press of the coconut meat usually with or without added water. In Malay word the coconut milk is known as 'Pati Santan' which usually sold as a fresh liquid form in the local market. The composition of coconut milk depends on the amount of water used for the extraction, affecting significantly moisture and fat content. The aim of this study was to determine the physicochemical properties and antioxidant activity based on TPC, FRAP, ORAC and DPPH of Malaysian coconut milk. Results of the study showed that coconut milk samples exhibited a significantly different ($P<0.05$) antioxidant activity in comparison of goat and cow's milk for all the assays except DPPH. Coconut's milk exhibited the highest AA in TPC, FRAP, DPPH and ORAC assays with mean value of 575.15 mg GA/100 g FW, 471.55 mg TE/100 g FW, 68.39 % and 784.47 umol TE/100g F.W, respectively. In contrast, the cow's milk exhibited the lowest mean value of 477.68 mg GA/100 g FW, 398.88 mg TE/100 g FW, 60.81 % and 361.96 umol TE/100g F.W, respectively).Results showed that physicochemical properties of

Malaysian coconut milk were significantly different (P<0.05) among the comparative coconut milk samples of other tropical countries, with some samples more superior compared with others in one or more aspects. This result showed that Malaysian coconut milk possess high proteins content (3.40 ± 0.59) with lower amount of fats (15.44 ± 1.53).Thus, Pati Santan can be considered as an excellence source of antioxidants with health and medicinal applications of low content of fat.

Tocopherol and tocotrienol contents of chicken nuggets blended with red plam oils before and after frying

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Tocopherols and tocotrienols content before and after frying in chicken nuggets blended with red palm oils NVRO, NVRO-100 and NVRO-50 was compared against the chicken fat treatment used as control. The lowest total tocopherols and tocotrienols content after frying was observed in control samples and the highest was in NVRO-100. Control samples showed significant increase of total tocopherols and tocotrienols from 34.32 ug g^{1} before frying to 429.29 ug g^{-1} after frying due to oil uptake during frying where the cooking oil used was palm oil with inherent vitamin E precursors. The NVRO-50 showed significant decrease from 795.72 µg g^{-1} before frying to 690.87 µg g^{-1} after frying. Chicken nuggets blended with NVRO-100 were more heat stable followed by chicken nuggets blended with NVRO and NVRO-50. There was a significant loss of γ-T and δ-T in all samples after frying. This study showed the potential of utilising natural vitamin rich red palm oils as animal fat analogues in improving the nutritional quality of meat products.

Total phenolic content and antioxidant capacity of selected canned fruits

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Fruits are high in polyphenols which are compounds associated with the protection against diseases such as diabetes and cancer. However, food processing including canning can leads to the loss of polyphenol in the fruits. Thus, the aim of this study was to evaluate the total phenolic content (TPC) and antioxidant capacity of canned fruits commercially available in the local supermarkets in Malaysia. The TPC was determined by using Folin-Ciocalteu method while the antioxidant capacity was evaluated by using 2,2-diphenyl-1-picrylhydrazyl radical (DPPH assay) and Ferric Reducing Antioxidant Power (FRAP assay). Five types of different canned fruits with the total of 21 samples including longan, lychee, rambutan, pineapple and orange were selected for the analysis. The samples were analyzed in two forms which were, the homogenized (fruits and syrup) and syrup samples. Canned pineapples have the highest TPC for both homogenized (95.16±30.16 mg GAE/100 g) and syrup sample (108.62±33.88 mg GAE/100 g). For antioxidant capacity, canned pineapple also had the highest value for the homogenized sample (41.79±4.20 mol TE/100 g) while lychee was the highest (46.84±12.81 µmol TE/100 g) for syrup sample assessed by DPPH assay. For FRAP assay, lychee was highest in antioxidant capacity for both homogenized sample (40.61±10.55 µmol TE/100 g) and syrup sample

(33.58±7.56 mol TE/100 g). A positive and significant (P < 0.001) correlation was found between TPC and antioxidant capacity (DPPH and FRAP). In conclusion, canned pineapple and lychee were the highest sources of polyphenol as compared to other types of canned fruits. Further investigation is warranted to determine the specific polyphenol present in the canned fruits.

Total phenolic content and antioxidant capacities of instant mix spices cooking pastes

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Available studies to determine the total phenolic content and antioxidant capacities of cooking pastes available in Malaysia were currently limited. This study aimed to evaluate the total phenolic content (TPC) and antioxidant capacity of seven types of mix spices cooking paste in raw and cooked condition (N=33). Samples were selected based on market availability. TPC was determined by Folin-Ciocalteu method and the antioxidant capacities were evaluated by DPPH free radical scavenging assay, ferric reducing antioxidant power (FRAP) assay and ABTS free radical scavenging assay. Results were presented in dry weight (DW). TPC in the paste samples ranged from 246.25 to 370.57 mg GAE/100 g whereas antioxidant capacities ranged from 728.54 to 1267.66 mol TE/100 g for DPPH assay, 1247.15 to 1886.89 μmol TE/100 g for FRAP assay and 833.19 to 1589.40 μmol TE/100 g for ABTS assay. Chicken, fish and vegetarian curries were top three samples with the highest TPC and antioxidant capacities values. Cooking process had caused increment in TPC and antioxidant capacities of all paste samples, with Rendang paste showed the greatest increase in TPC (21.48%) and antioxidant capacities (24.26%-49.66%) after cooking. Linear relationships were observed between TPC and DPPH antioxidant capacity (r=0.545), FRAP antioxidant capacity (r=0.840) and ABTS antioxidant capacity (r=0.623). A positive relationship between TPC and antioxidant capacities indicated that polyphenol is one of the sources of antioxidants in mix spices cooking paste. Further investigations on the active compounds in the cooking pastes are needed to determine the bioavailability and effect of these compounds in human.

Total phenolic content and antioxidant capacity of beans: organic vs inorganic

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International Food Research Journal, Vol 24(2), 2017, 510-517

The purpose of this study was to evaluate and compare the effect of different cooking procedures on the total phenolic content and antioxidant capacity of organic and inorganic beans based on the increasing demand of organic food products. The total phenolic content and antioxidant capacities of eight types of beans matched to the organic and inorganic samples was analyzed based on three different conditions namely raw (R), cooked without soaking (CWS) and cooked after soaking (CAS). Changes in these variables before and after processing were compared between organic and inorganic beans. CAS caused significant (p<0.05) losses of total phenolic content and antioxidant capacity than CWS. Although cooking caused reduction in total phenolic content and antioxidant capacity, no prevalence losses from either type of organic or inorganic bean was found. In general, black bean, red

bean, green bean, red kidney bean and soybean from both organic and inorganic types of beans possessed higher total phenolic content and antioxidant capacity, whereas red dhal, yellow dhal and chickpea possessed lower levels of both parameter assessed. All antioxidant capacity assays showed positive and significant correlation ($p<0.001$) with total phenolic content. This paper provides new information on effect of cooking procedures on the health relevant functionality of organic beans. Knowing that the price of organic beans can be doubled of inorganic beans, this study provides an insight on the importance to balance out the cost and benefits of organic beans

Total phenolic content, antioxidative and antidiabetic properties of coconut (*Cocos nucifera L.*) Testa and selected bean seed coats

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Natural alternatives for the treatment of diabetes mellitus have been the interest of many researchers. In this study, the brown testas of mature coconuts were compared to beansseed coats of four varieties in terms of antioxidative and anti-hyperglycaemic properties. The total phenolic and flavonoid contents, the antioxidant potentials and the α-amylase and α-glucosidase inhibitory activities of the crude extracts were studied in vitro. The results showed that extracts of coconut testa and red kidney bean seed coat displayed higher α-glucosidase inhibition (IC_{50} = 19.90 ± 5.67 and 4.84 ± 1.43 μg/mL) and α-amylase inhibition (IC_{50} = 120.5 ± 15.4 and 532.8 ± 68.0 μg/mL) than the other extracts. These two extracts showed higher antioxidant capacities owing to their high phenolic and flavonoid contents. These results suggest that red kidney bean seedcoat and tender coconut testa would have higher potential as nutraceuticals and could serve as natural alternative sources of anti-diabetic remedy.

Total phenolics and antioxidant properties of red hot chilli peppers of different varieties in Malaysia as potent nutraceuticals

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Thai Journal of Pharmaceutical Sciences, Vol 41 (5th IPNaCS Conference Issue), 2017, 45-48

Red hot chilli pepper or "Nahuatl" is an exotic fruit commonly consumed by people in the Southeast Asian region. It is an important spice for cooking, seasoning, and also known as one of the functional foods. This study aimed to determine the potential antioxidant properties of different varieties of red hot chilli peppers (*Capsicum annuum* L.) commonly consumed by Malaysians. These chilli peppers were part of *Bara*, *Centil*, *Kulai* 151, *Kulai* 568, and *Pelita* varieties. The total phenolics and antioxidant activities of the chilli pepper samples (pulp, seed, and whole fruit) were determined based on *in vitro* antioxidant assays. Total phenolic content (TPC) and total flavonoid content (TFC) were determined

using the Folin-Ciocalteu reagent and aluminium chloride assays, respectively. The antioxidant activities of the pepper samples were assessed using the ABTS [2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid)] and ferric reducing antioxidant power (FRAP) assays. Extracted using the 70% ethanolic solvent, the red hot chilli of *Centil* (4-11%) and *Kulai* (3-10%) varieties had a higher extraction yield than the other varieties. The results showed that the seeds of chilli pepper samples (18-60 mg gallic acid equivalent/kg) had significantly lower TPC than the chilli pulps (93-95 mg GAE/kg). Both pulp and whole fruit extracts of all samples had similar TPC values. TFC in the seed samples (42-433 mg quercetin/kg) was the lowest compared with the chilli pepper pulps, which were comparable with TPC. Additionally, the chilli pepper of *Kulai* varieties had the lowest TFC (42-185 quercetin/kg). The antioxidant activities of *Bara* chilli pepper samples were the highest compared with the other varieties of chilli peppers. The ABTS value of *Kulai* 568 whole fruit extract was the highest, followed by the extracts of *Bara* and *Pelita* pulps. The seed extract from each of the variety (45-81%) had lower ABTS value than its pulp (59-94%) and whole fruit (83-94%). The *Centil* pulp extract had the highest FRAP value, followed by *Bara* and *Pelita* pulp extracts, whereas the *Centil* seed extract had the lowest ABTS value. Overall, compared with the larger sized chillies (i.e. *Kulai* 151 and *Kulai* 568), the smaller chillies (i.e. *Centil*, *Bara* and *Pelita*) have higher antioxidant properties and can potentially be used for various therapeutic effects.

Vitamin E contents and oxidative stability of red palm oils blended chicken nuggets during frozen storage

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Malaysian Journal of Analytical Sciences, Vol 19(1), 2015, 202 - 212

Red Palm Oil (RPO) has a high oxidative stability and contains high levels of natural antioxidants, such as vitamin E and carotenoids. In this study, Vitamin E contents and lipid oxidation of chicken nuggets blended with red palm oil consist of NVRO, NVRO-100 and NVRO-50 were compared against the control chicken fat treatment, each containing 10% fat. Vitamin E contents, thiobarbituric acid (TBA) values and peroxide values (PV) for all samples were measured throughout 4 months of storage at -18°C. All the vitamin E homologues were decreased. -tocopherol and -tocotrienol decreased faster meanwhile -tocopherol decreased slower than other homologues. Besides that, Vitamin E content in NVRO and NVRO-100 was significantly decreased ($p<0.05$) from 767.15 to 482.14 µg/g and 842.73 to 672.36 µg/g respectively. TBA and PV values for all samples chicken nuggets increased throughout 3 months of frozen storage but started to decrease thereafter. However, chicken nuggets formulated with NVRO, NVRO-100 and NVRO-50 significantly reduced ($p<0.05$) TBA and PV values compared with chicken fat treatments. This study showed that frozen storage influence vitamin E stability and the potential of utilization of red palm oils in improving nutritional quality and reducing lipid oxidation of chicken nugget.

Scope 9 | E

Food Science and Technology

Food Microbiology

Analysis of biofilms formation by *Cronobacter* sp. during growth in infant formula milk

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Pacifier nipples are in permanent contact with saliva and with the oral microflora therefore, act as a favoured site for the growth of biofilms. This research was conducted to identify the bacterial biofilms that has been found on the pacifiers that collected from local child nursery and to analyse the formation of biofilms by *Cronobacter* sp. during growth in infant formula milk. Pacifiers collected were analysed to obtain colony forming unit (CFU) and isolated bacteria were identified using several biochemical tests according to Bergey's Manual. Biofilm assay of three *Cronobacter* sp. were conducted using 24 wells microtiter plate and stained with 1% of crystal violet solution at different time interval: 6, 12, 18 and 24h. The hydrophobicity of the bacterial cell suspension was evaluated using bacterial adhesion to hydrocarbons (BATH) method. Extracellular polymeric substances (EPS) analysis was done to identify percentage of carbohydrate and protein content by using phenol sulphuric acid method and Bradford method, respectively. The results obtained showed that the normal microflora bacteria were the most abundant microorganisms that were found on the pacifier with the main genus isolated was *Staphylococcus* sp., *Enterobacteriaceae* sp. and *Clostridium* sp. Based on biofilm and EPS analysis, *Cronobacter sakazakii* formed a strong biofilms after 18 h, with carbohydrate was identified as main component of EPS.

Antifungal activity of *Eurycoma Longifolla* jack (tongkat ali) root extract

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Journal of International Dental and Medical Research, Vol 9(1), 2016, 70-74

Eurycoma longifolia jack (Tongkat Ali) has been known to possess many important biological properties and its uses are gradually expanding. To test the presence of antifungal activity of the ethanolic *Eurycoma longifolia* Jack (E.L) root extract. E.L. roots were extracted using ethanol. Two types of fungal strains were used; *Candida albicans* and *Aspergillus fumigatus*. Disc diffusion assay and Minimum inhibitory concentration (MIC) tests were used to determine the antifungal activity. The extract was prepared into three concentrations of 50, 100 and 150 mg/ml, Nystatin was used as positive control. The ethanolic extract of *E. longifolia* Jack root showed positive antifungal activity against *C.albicans* and *A.fumigatus*. The antifungal activity, measured through the zone of growth inhibition on the agar disc diffusion assay, against *A.fumigatus* was recorded to be 3.78±0.63, 6.11±1.45, 9.89±0.74mm, while for *C.albicans* was 4.44±0.5, 6.56±0.50, 8.44±0.90 mm for the extract concentrations of 50, 100 and 150 mg/ml respectively. The results of MIC showed the inhibition of visible growth of *A.fumigatus* and *C.albicans* at the minimum concentration of 12.5 and 25 mg/ml respectively. E.L root extract possesses potent antifungal properties and has the potential to be used as a medicinal product.

Antimicrobial properties of kacangma (*Leonurus Sibiricus*): The effect of extraction and heat treatment

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Kacangma (*Leonurus sibiricus*) is a popular traditional herb that has been consumed for decades by the people of Sarawak as a herbal medicine and culinary ingredient. Several studies conducted worldwide have found that *Leonurus* species has high antimicrobial activities. Evaluation of antimicrobial effectiveness of kacangma extract was carried out using disc diffusion test and direct inhibition test. Results showed that both the water and ethanolic extracts reacted differently in inhibiting microorganisms growth. Ethanolic extracts at concentrations of 50 and 100 mg/ml inhibited *Staphylococcus aureus*. Water extracts at concentrations of 10, 25, 50 and 100 mg/ml inhibited *Aspergillus niger*, while concentrations of 25, 50 and 100 mg/ml inhibited *Saccharomyces cerevisae* and a concentration of 100 mg/ml inhibited S. aureus. Effect of temperature treatments on antimicrobial activity of kacangma extract was studied using direct inhibition test by exposing the extracts to temperatures of 50, 100 and 121 °C. When the temperature of the heat treatments increased, the extract inhibitory effect on microorganisms growth also increased. Heat treatment at a high temperature of 121 °C did not reduce the inhibitory effect but instead increased it.

Assessment of potential probiotic properties lactic acid bacteria from shrimp paste or belacan

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Lactic acid bacteria or LAB in fermented foods is commonly associated with probiotic properties. Thus, this studywas conducted to evaluate the probiotic properties of LAB isolated from Malaysian fermented shrimp paste or belacan. A total of 219 bacterial isolates were successfully isolated from twenty-seven different samples of belacan on MRS agar supplemented with 0.5% calcium carbonate. Only 166 bacteral isolates or 75.8% were identified as catalase-negative, rodshaped, and Gram-positive. However, only thirteen isolates (7.8%) of LAB (I3, I8, N1, O1, O2, O3, R2, S1, T3, V3, X4, Y1, and Z1) could survive in both acidic (pH2, pH3, and pH4), and bile conditions (1%, 3%, and 5% ox bile). Hydrophobicity test was also done to identify the extent of the thirteen LAB survivals under anaerobic condition. Results found that all LAB isolates showed percentage hydrophobicity >50% and higher ($P< 0.05$) than commercial probiotic *Lactobacillus casei* CRL 431®. The percentage hydrophobicity ranged between 51.4 and 61.5%. Thus, this findings showed that the LAB isolated from belacan have a potential probiotic properties but further study need to be evaluated for the probiotic purposes in food products.

Characterisation of lactic acid bacteria and aromatic compounds in fermented fish pekasam

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Sains Malaysiana, Vol 46(3), 2017, 439–448

In this research, lactic acid bacteria (LAB) and aromatic compounds on different species of pekasam were determined. The sampling of pekasam which were tilapia, loma, lampam, sepat and gelama were performed at Kiah Pekasam Enterprise at Kuala Kangsar, Perak. Several procedures were performed to determine the LAB, namely, serial dilution, pour plating, enumeration of LAB, catalase test, Gram-staining and determination of LAB morphology. Confirmation of LAB was carried out which were deoxyribonucleic acid (DNA) extraction, amplification of polymerization chain reaction (PCR), gel electrophoresis and DNA sequencing. The DNA sequence for each strain was matched to the available sequence from GenBank database via BLAST at NCBI. *Lactobacillus brevis* KB290 DNA and *Lactobacillus casei* W56 were found on pekasam tilapia, *Lactobacillus plantarum* 16 was on pekasam lampam, *Lactobacillus casei* BD-II chromosome and *Lactobacillus plantarum* WCFS1 were on pekasam sepat, *Corynebacterium vitaeruminis* DSM 20294 and *Streptococcus anginosus* C1051 were found on pekasam gelama. *Staphylococcus carnosus* subsp. carnosus TM300 chromosome was the dominant LAB on pekasam loma. Liquid extraction was carried out to determine the aromatic compounds in pekasam, followed by profiling using gas chromatography-mass spectrometer (GC-MS). Comparison of aromatic compounds between methanol and hexane extracts from five different species of pekasam was performed. Our findings indicated that the methanol extraction was more efficient compared to that of hexane, as the quantity of aromatic compounds in methanol extract was higher to those using hexane. The highest amount of aromatic compounds produced was from pekasam loma. Carboxylic acids were the most dominant compounds found on pekasam and it gave rancid and 'goaty' off-flavour.

Defatted coconut residue crude polysaccharides as potential prebiotics: Study of their effects on proliferation and acidifying activity of probiotics *in vitro*

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This paper reports on the extraction, partial characterization and the potential application of crude polysaccharides from defatted coconut residue as a prebiotic. The coconut residue was defatted and extracted to obtain the crude polysaccharides and its physicochemical properties were determined. The

crude polysaccharides were assessed for monosaccharide composition, total carbohydrate content, reducing sugar concentration and protein content determination. The functional group and structural elucidation of crude polysaccharides was also done using Fourier transform infrared spectra analysis. The product was then subjected to artificial human gastric juice treatment to determine digestibility. Finally, an in vitro proliferation and acid production by two probiotic bacteria namely *Lactobacillus casei* Shirota and *Lactobacillus bulgaricus* were included in this study. It was found that the defatted coconut residue contained ash (0.54%), moisture (55.42%), protein (1.69%), crude fat (17.26%) and carbohydrate (25.73%). The percentage of crude polysaccharides extracted was 0.73 ± 0.04. The two fractions of monosaccharides obtained were glucose and fructose. Total carbohydrate content of DCR was 13.35% (w/v). The quantitative value of the reducing sugars obtained was 20.71%. Protein content in the crude polysaccharides was 0.009% and the peaks which indicated the presence of protein were observed at around 1640 cm^{-1} (amide I) and 1530 cm^{-1} (amide II). DCR crude polysaccharides were highly resistant (88%) to hydrolysis when subjected to artificial human gastric juice. The product was found to markedly stimulate two tested probiotics to proliferate and produce organic acids. All the above findings are supportive of the fact that polysaccharides extracted from DCR, an industrial waste, have a vast potential to be exploited as novel prebiotics.

Environment contaminant of *Bacillus cereus* isolated from ready to eat meat curry collected at various locations in Malaysia

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The aim of the study was to isolate and identify *Bacillus cereus* from meat curry and to subtype the isolated *B. cereus* using RAPD-PCR and antibiotic resistance pattern. Ready to eat (RTE) meat curry samples purchased from 12 different restaurants at Kajang, Serdang and KL Sentral regions located in Selangor and Kuala Lumpur, Malaysia. Twenty-four isolates biochemically identified as *B. cereus*. Antimicrobial resistance analysis demonstrated that *B. cereus* isolates were highly resistance to ceftriaxone (100%), vancomycin (87.5%), clindamycin (91.6%) and nalidixic acid (100%). None of the *B. cereus* isolates were resistance towards ciprofloxacin (100%), streptomycin (91.6%) and chloramphenicol (83.4%). The *B. cereus* isolates were examined for randomly amplified polymorphic DNA-polymerase chain reaction (RAPDPCR) using primer S30 (5'-GTGATCGCAG-3') and discriminated into nine profiles. The antimicrobial analysis showed seven patterns and phenotypically less heterogeneous when compared to RAPD-PCR. A total number of nineteen types of *B. cereus* have produced by a combination of phenotype and genotype methods. These results demonstrated that both typing method provides evidence of the presence of similarity and diversity of the *B. cereus* strains from RTE meat curry.

Identification of *Bacillus cereus* isolates from cooked rice by biochemical test and 16s rDNA sequences

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International Journal of ChemTech Research, Vol. 9(3), 2016, 469-475

Bacillus cereus isolates are considered to be toxigenic and can lead to food poisoning. Cooked rice is a potentially risky food, particularly while grown in tropical countries. The present study aims to explore the prevalence of *B.cereus* in cooked rice from several restaurant and stalls in the area (Bangi, Kajang and UKM) in Selangor Malaysia. The isolation was conducted using the standard procedure for detection of *B.cereus*. Of seventy (n=70) cooked rice samples examined, 42.8% were positive for B. cereus indicated bright pink colonies when it grown onto mannitol egg yolk polmyxin medium. The thirty five (35) colonies were selected and identified as *B.cereus* by biochemical test and 16s rDNA sequences. The results in the presence study, showed the cooked rice samples were potentially can cause food poisoning to the public consumers.

Logistic-like growth model of *Lactobacillus acidophilus*, *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus* in palm oil santan

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Palm oil santan is a healthier coconut milk replacement made from Palm oil. It was developed by the Malaysian Palm Oil Board (MPOB) in order to cater and to increase healthy food demand in Malaysia. In this study, we examined the growth and behavior of three yogurt starter cultures; *Lactobacillus acidophilus*, *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophiles* when they were inoculated into palm oil santan. All three starter cultures grew to 8–9 log (cfu/ml) in palm oil santan and fitted with a logistic-like growth model. Interestingly, L. acidophilus shows diauxic growth behaviour; an uncommon growth pattern usually found in substrates rich with sugar carbohydrates whereas palm oil in santan is a lipid substrate

Molecular characterization and phylogeny of Shiga toxin-producing *E. coli* (STEC) from imported beef meat in Malaysia

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Environmental Science and Pollution Research, Vol. 23(17), 2016, 17553-17562

This study aimed at determining the presence and characterization of *Escherichia coli* and Shiga toxin producing *E. coli* (STEC) from imported frozen beef meats. Seventy-four (74) frozen imported beef meat samples from two countries, India (42 samples) and Australia (32 samples), were collected and tested for *E. coli*. These samples were purchased from the frozen meat sections of five different supermarkets in different locations in Selangor, Malaysia, from April 2012 to October 2014. A total of 222 *E. coli* strains were isolated from the meat samples; 126 strains were isolated from country A (India), and 96 *E. coli* strains were from country of origin B (Australia), respectively. A total of 70 *E.*

coli strains were identified and characterized. All *E. coli* strains were isolated into Fluorocult medium and identified using API 20E kit. All selected *E. coli* strains were characterized for Shiga toxin genes (stx1 and stx2). All biochemically identified *E. coli* in this study were further subjected to molecular detection through polymerase chain reaction (PCR) amplification and characterization using 16S ribosomal RNA (rRNA) gene of Shiga toxin-producing *E. coli*. Of the 70 *E. coli* strains, 11 strains were positive for both Shiga toxin genes (stx1 and stx2) and 11 (11/70) strains were positive for stx1 gene, while 25 (25/70) strains were positive for stx2 gene. The analysis of 16S rRNA gene of all the *E. coli* isolates in this study was successfully sequenced and analyzed, and based on sequence data obtained, a phylogenetic tree of the 16S rRNA gene was performed using Clustal W programme in MEGA 6.06 software. Phylogenetic tree showed that the *E. coli* isolates in our study cluster with the strain of *E. coli* isolated in other countries, which further confirm that the isolates of *E. coli* in this study are similar to those obtained in other studies. As a result, all the strains obtained in this study proved to be a strain of pathogenic *E. coli*, which may cause a serious outbreak of food-borne disease. The isolation of pathogenic *E. coli* strains from the imported meat samples calls for prudent management of imported meats by the relevant authorities.

Occurrence and prevalence of *Cronobacter* spp. in plant and animal derived food sources: a systematic review and meta-analysis

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Cronobacter species are motile, non-spore forming, Gram negative emerging opportunistic pathogens mostly associated with bacteremia, meningitis, septicemia, brain abscesses and necrotizing enterocolitis in infected neonates, infants and immunocompromised adults. Members of the genus *Cronobacter* are previously associated with powdered infant formula although the main reservoir and routes of contamination are yet to be ascertained. This study therefore aim to summarize occurrence and prevalence of *Cronobacter* spp. from different food related sources. A retrospective systematic review and meta-analysis of peer reviewed primary studies reported between 2008 and 2014 for the occurrence and prevalence of *Cronobacter* spp. in animal and plant related sources was conducted using "*Cronobacter* isolation", "*Cronobacter* detection" and "*Cronobacter* enumeration" as search terms in the following databases: Web of Science (Science Direct) and ProQuest. Data extracted from the primary studies were then analyzed with meta-analysis techniques for effect rate and fixed effects was used to explore heterogeneity between the sources. Publication bias was evaluated using funnel plot. A total of 916 articles were retrieved from the data bases of which 28 articles met inclusion criteria. *Cronobacter* spp. could only be isolated from 103 (5.7 %) samples of animal related food while 123 (19 %) samples of plant related food samples harbors the bacteria. The result of this study shows that occurrence of *Cronobacter* was more prevalent in plant related sources with overall prevalence rate of 20.1 % (95 % CI 0.168–0.238) than animal originated sources with overall prevalence rate of 8 % (95 % CI 0.066–0.096). High heterogeneity (I^2=84) was observed mostly in plant related sources such as herbs, spices and vegetables compared to animal related sources (I^2=82). It could be observed from this study that plant related sources serve as reservoir and contamination routes of *Cronobacter* spp.

Scope 10 | A

Experimental Nutrition

Antioxidants

A new formulation of gamma delta tocotrienol has superior bioavailibility compared to existing tocotrienol-rich fraction in healthy human subjects

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Gamma and delta tocotrienols are isomers of Vitamin E with established potency in pre-clinical anti-cancer research. This single-dose, randomized, crossover study aimed to compare the safety and bioavailability of a new formulation of Gamma Delta Tocotrienol (GDT) in comparison with the existing Tocotrienol-rich Fraction (TRF) in terms of gamma and delta isomers in healthy volunteers. Subjects were given either two 300mg GDT (450 mg γ-T3 &150 mg γ-T3) capsules or four 200mg TRF (451.2 mg γ-T3 & 102.72 mg δ-T3) capsules and blood samples were taken at several time points over 24hours. Plasma tocotrienol concentrations were determined using HPLC method. The 90% CI for gamma and delta tocotrienols for the ratio of log-transformation of GDT/TRF for C_{max} and $AUC_{0-\infty}$ (values were anti-logged and expressed as a percentage) were beyond the bioequivalence limits (106.21–195.46, 154.11–195.93 and 52.35–99.66, 74.82–89.44 respectively). The Wilcoxon Signed Rank Test for T_{max} did not show any significant difference between GDT and TRF for both isomers ($p>0.05$). No adverse events were reported during the entire period of study. GDT was found not bioequivalent to TRF, in terms of AUC and C_{max}. Gamma tocotrienol in GDT showed superior bioavailability whilst delta tocotrienol showed less bioavailability compared to TRF.

Antioxidant, antidiabetic and antiglycation properties of methanolic extracts of local and imported *Punica granatum*

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Punica granatum, commonly known as pomegranate, has been proven to exhibit many pharmacological activities, and among them are antioxidant and antidiabetic activities. *P. granatum* that is available in Malaysia is mostly imported, but it is grown locally too. Many studies had been done on imported *P. granatum*, but limited research performed on local *P. granatum*. In this study, *in vitro* antioxidant and antidiabetic activities of methanolic extracts of pulp and peel of both local and imported *P. granatum* were evaluated. The antioxidant study was done by evaluating the total phenolic content (TPC), total flavonoid content (TFC), and reducing power ability. The TPC and TFC were done using the Folin–Ciocalteu assay and aluminum chloride colorimetric assay, respectively. The antidiabetic study was done using alpha glucosidase inhibition assay and antiglycation assay. The results showed that the peel extracts have higher phenolic and flavonoid content than the pulp extracts. In the antidiabetic study, the peel extracts also showed higher alpha glucosidase inhibition and antiglycation activity. In general, local *P. granatum* showed to have better antioxidant, and antidiabetic activities compared to the imported *P. granatum*.

Comparison of the effects of three different *Baccaurea angulata* whole fruit juice doses on plasma, aorta and liver MDA levels, antioxidant enzymes and total antioxidant capacity.

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Purpose: *Baccaurea angulata* (common names: belimbing dayak or belimbing hutan) is a Malaysian underutilized fruit. The preliminary work on *B. angulata* fruit juice showed that it possesses antioxidant properties. Therefore, further work is needed to confirm the efficacy and proper dosage of *B. angulata* as a potential natural antioxidant. The present study was thus carried out to compare the effects of three different *B. angulata* whole fruit (WF) juice doses administered at nutritional doses of 0.50, 1.00 and 1.50 ml/kg/day on plasma, aorta and liver malondialdehyde (MDA) levels, antioxidant enzymes (superoxide dismutase, glutathione peroxidase and catalase) as well as total antioxidant capacity in rabbits fed high-cholesterol diet. **Methods**: Thirty-five male rabbits of New Zealand strain were randomly assigned to seven groups. For 12 weeks, group CH was fed 1% cholesterol diet only; group C1 was fed 1% cholesterol diet and 0.50 ml/kg/day *B. angulata* WF juice; group C2 was fed 1% cholesterol diet and 1.00 ml/kg/day *B. angulata* WF juice; group C3 was fed 1% cholesterol diet and 1.50 ml/kg/day *B. angulata* WF juice; group N was fed standard pellet only; group N1 was fed standard pellet and 0.50 ml/kg/day *B. angulata* WF juice; and group N2 was fed standard pellet and 1.00 ml/kg/day *B. angulata* WF juice. **Results**: The three doses reduced the formation of MDA and enhanced the expression of endogenous antioxidant enzymes. The highest dose used (1.50 ml/kg/day) was, however, seen as the most potent. **Conclusion**: Higher doses of *B. angulata* juice exerted better antioxidant activity.

Effect of oil palm tocotrienol rich fraction on the viability and morphology of astrocytes injured with glutamate

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Tocotrienol-rich fraction (TRF) is an extract of palm oil that consists of 25% α-tocopherol and 75% tocotrienols. TRF was shown to possess antioxidant, anti-inflammatory, anticancer, neuroprotective and cholesterol-lowering activities. Glutamate is the major mediator of excitatory signals in the mammalian central nervous system. Extreme amounts of glutamate in the extracellular spaces can lead to numerous neurodegenerative diseases. Hence, the efficacy of oil palm TRF and α-tocopherol in protecting astrocytes against glutamate-induced cell death was studied. Specifically, the effectiveness of pre- or post-treatment of TRF and α-tocopherol upon glutamate excitotoxicity was determined by evaluating cell viability and morphology of astrocytes. Cell viability was measured using MTT assay while cell morphology was monitored under fluorescent microscope using the acridine orange/propidium iodide (AO/PI) assay. Exposure to 230 mM glutamate significantly reduced cell viability to 50% in both the pre- and post-treatment studies; however, pre- and post-treatment with TRF and αtocopherol attenuated the cytotoxic effect of glutamate. Compared to glutamate-injured astrocytes, pre-treatment with 100, 200 and 300 ng/ml TRF significantly improved cell viability following glutamate injury to 86.6%, 86.7% and 93.9%, respectively ($p < 0.05$). On the contrary, high concentrations of α-tocopherol promote cell death. This study shows that TRF not only provide a better protection against glutamate toxicity (pretreatment), but was also able to reverse the lipid peroxidation resulting from glutamate insults (post-treatment). The present results demonstrate that TRF, but not α-tocopherol, protected the astrocytes against glutamateinduced cell death, indicating its neuro-protective potential.

Insights into putative health implications of gelam (*Melaleuca cajuputi*) honey: Evidence from *in-vivo* and *in-vitro* studies

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Medical Sciences, Vol. 4(1), 2016, 3-16

Honey has been used as a therapeutic agent since ancient times for health maintenance and the treatment of various ailments. In modern days, researchers reappraised the therapeutic values of honey, such as anti-oxidative, anti-inflammatory, antimicrobial, anti-diabetic, anti-tumor, and wound healing properties. These findings supported its applications in the modern healthcare system as complementary medicine. Gelam honey (GH) is a monofloral Malaysian honey which has been proven to have considerable health benefits. This paper presents a state of the art review on the therapeutic values of GH. A descriptive elucidation is performed to elaborate a wide spectrum of biological activities of GH using evidence from a considerable body of literature. The compositional and physiochemical characteristics of GH have contributed substantially to its putative biological properties. A brief explanation will be presented on GH attributes to familiarize readers with this novel natural health product.

Isolation, purification and identification of three novel antioxidative peptides from patin (*Pangasius sutchi*) myofibrillar protein hydrolysates

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Myofibrillar protein from patin was hydrolysed using papain, alcalase and flavourzyme with differing degrees of hydrolysis (DH) to obtain antioxidative peptides. The protein solubility and peptide content of the myofibrillar protein hydrolysates (MPHs) were observed. The antioxidant activity of the hydrolysates was evaluated. The results showed that the highest DH (89.17%) of MPH was produced by the 120-min papain treatment. When the DH of MPHs increased, protein solubility and peptide content increased. Papain-MPHs exhibited the highest antioxidant activity. The papain hydrolysate was purified using ion exchange chromatography, gel filtration chromatography and RP-HPLC. The potent fraction (MI 4) obtained from RP-HPLC had DPPH radical scavenging activity that was 2.97 times higher than MPH. Three antioxidative peptide sequences were identified as VPKNYFHDIV, LVMFLDNQHRVIRH, and FVNQPYLLYSVHMK according to HPLC and connected to the electrospray ionization-time-of-flight mass spectrometer (ESI-TOF MS/MS). The FVNQPYLLYSVHMK peptide exhibited the highest antioxidant activity. The presence of hydrophobic amino acids (Leu, Val and Phe), hydrophilic and basic amino acids, (His, Pro and Lys), and aromatic amino acids (Phe and Tyr) in the peptide sequences is believed to contribute to the high antioxidant activity of MPHs. These results suggest that MPHs from patin have potential as a natural antioxidants ingredient in foods.

Liver heme oxygenase 1 expression is positively induced by palm oil-derived tocotrinol-rich fraction (TRF) supplementation in mice

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Current Topics in Pharmacology, Vol. 21, 2017, 55-62

The antioxidant activities of tocotrienols are more robust than that of tocopherols. Palm oil is a rich natural source of tocotrienols. Heme oxygenase-1 (HO-1) is an enzyme that has antioxidant, anti-inflammatory and cytoprotective functions. The objective of this study is to determine the effects of different doses of TRF oral supplementation on HO-1 gene and protein expression in mice livers. Thirty male ICR white mice (25-30 g) were divided into five groups; three groups were administered TRF orally for 14 days at doses of 200, 500 and 1000 mg/kg respectively (n= 6 per group), a positive control group was administered 100 mg/kg butylated hydroxyanisole (BHA) orally for 14 days (n= 6), and a control group (n = 6) was only administered the vehicle (corn oil). At day 15, the mice were sacrificed and their livers isolated. Total RNA was extracted from the livers and quantitative real-time polymerase chain reaction (qPCR) assays were performed to analyse HO-1 gene expression. The livers were then homogenized and HO-1 protein expression was analysed by Western blotting. It was observed that TRF oral supplementation at concentrations of 200, 500 and 1000 mg/kg for 14 days resulted in significant concentration-dependent increase in HO-1 gene and protein expression in mice livers, compared to controls. In conclusion, TRF supplementation induced HO-1 gene and protein expression in mice livers dose-dependently, with the highest expression seen in mice receiving 1000 mg/kg TRF.

Male infertility: The effect of natural antioxidants and phytocompounds on seminal oxidative stress

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Diseases, Vol. 5(1), 2017, 9-35

Defective sperm function has been identified as the most common cause of infertility. The objective of this study was to review recent findings on the effects of various antioxidants on male fertility. High amounts of poly unsaturated fatty acid are found in the mammalian spermatozoa membranes, thereby making them susceptible to lipid peroxidation. Although, free radicals and reactive oxygen species (ROS) play major roles in reproduction, they are strongly associated with oxidative stress. Furthermore, factors such as obesity, inflammation, pollutants and cigarette smoking are negatively correlated with spermatogenesis. Endogenous antioxidants system exists to mediate these damages. In a normal physiological state, the seminal plasma contains antioxidant enzyme mechanism that is capable of quenching these ROS as well as protecting the spermatozoa against any likely damage. However, high level of ROS triggered by inflammatory cells and oxidation of fatty acid in obese subjects may down play antioxidant mechanism resulting in oxidative stress. Evaluation of such oxidative stress is the first step in the treatment of male infertility through administration of suitable antioxidant. Notably, antioxidant such as vitamin E and C, carotenoids and carnitine have been found beneficial in restoring a balance between ROS generation and scavenging activities. There are emerging evidences that herbal products can also boost male reproductive functions. Nonetheless, a good lifestyle, regular exercise, avoidance of stress and observing safety rules at work are habits that can reverse male infertility.

Oral administration of tocotrienol ameliorates lead-induced toxicity in the rat brain

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The occurrence of severe lead (Pb) poisoning has risen in certain countries. There is increasing evidence that chronic lead exposure disturbs the prooxidant: antioxidant balance in the brain tissue and alters brain histology. The present study observed the antioxidant effect of tocotrienol-rich fraction (TRF) on brain tissues of the experimental rats following lead poisoning. Eighteen (n= 18) male *Sprague-Dawley* rats, 6-weeks old, were randomly divided into control (CTRL) group and experimental groups; fed with 0.2% w/v lead acetate, as PB2 group; and fed with 0.2% w/v lead acetate and daily TRF supplementation (200 mg/kg body weight) as PB2T group. The experiment was conducted for 30 days. At the end of the study, the brain tissues were harvested and histopathological changes of the hippocampal region were observed. Biochemical findings such as brain lead, TRF and malondialdehyde (MDA) levels, and erythrocyte superoxide dismutase (SOD) activity were determined. It was observed that atypical apoptotic-like and disorganized neurons were present in the hippocampal region of the untreated PB2 group compared to PB2T group. Biochemical parameters showed a significant decrease ($p< 0.05$) in brain lead level in PB2T compared to PB. Even though no significant difference ($p> 0.05$) was obtained for MDA level, there was a significant increase ($p< 0.05$) in the erythrocyte SOD activity in PB2T compared to PB2 and CTRL. Supplementation with TRF improved histopathological changes in the brain tissues caused by lead exposure in drinking water by reducing lead accumulation in the brain of experimental rats.

Palm oil-derived phytosterol: Glutathione antioxidant status in rats exposed to carbon tetrachloride

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The aim of this study was to assess the antioxidant effect of phytosterol from palm oil by studying its ability to improve antioxidant status of rats induced with oxidative stress by carbon tetrachloride (CCl_4). The rats were divided into four groups of normal control (NC), carbon tetrachloride (CCl_4), phytosterol (P) and phytosterol plus carbon tetrachloride (P+CCl_4). The P and P+CCl4 groups received weekly phytosterol pre-treatment via subcutaneous injections at 140 mg/kg rat weight for 5 weeks while the NC and CCl_4 groups only received olive oil (vehicle). Carbon tetrachloride at the dose determined by a preliminary study was given as single oral dose to induce lipid peroxidation in the CCl_4 and P+CCl_4 groups. After 24 hours, the rats were sacrificed and the heart, liver, kidney and lung were isolated for the determination of reduced glutathione (GSH) and oxidized glutathione (GSSG) levels. Carbon tetrachloride caused significant reduction in the GSH: GSSH ratio in all major organs. Phytosterol pre-treatment as in the P+CCl_4 group significantly increased the GSH: GSSG ratio in major organs. The present findings indicate that phytosterols keep tissue glutathione concentration in normal levels which may indicate improving antioxidant status in major organs of the rats treated with carbon tetrachloride.

Palm tocotrienol-rich fraction inhibits methionine-induced cystathionine β-synthase in rat liver

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Oxidative stress plays an important role in cardiovascular diseases. The study investigated the effects of dietary palm tocotrienol-rich fraction on homocysteine metabolism in rats fed a high-methionine diet. Forty-two male Wistar rats were randomly assigned to six groups. Five groups were fed with high-methionine diet (1 %) for 10 weeks. Groups 2 to 5 were also given dietary folate (8 mg/kg) and three doses of palm tocotrienol-rich fraction (30, 60 and 150 mg/kg) from week 6 to week 10. The last group was only given basal rat chow. High-methionine diet increased plasma homocysteine after 10 weeks, which was prevented by the supplementations of folate and high-dose palm tocotrienol-rich fraction. Hepatic S-adenosyl methionine (SAM) content was unaffected in all groups but S-adenosyl homocysteine (SAH) content was reduced in the folate group. Folate supplementation increased the SAM/SAH ratio, while in the palm tocotrienol-rich fraction groups, the ratio was lower compared with the folate. Augmented activity of hepatic cystathionine β-synthase and lipid peroxidation content by highmethionine diet was inhibited by palm tocotrienolrich fraction supplementations (moderate and high doses), but not by folate. The supplemented groups had lower hepatic lipid peroxidation than the highmethionine diet. In conclusion, palm tocotrienolrich fraction reduced high-methionine-induced hyperhomocysteinaemia possibly by reducing hepatic oxidative stress in high-methionine-fed rats. It may also exert a direct inhibitory effect on hepatic cystathionine β-synthase.

Plantago major treatment enhanced innate antioxidant activity in experimental acetaminophen toxicity

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Asian Pacific Journal of Tropical Biomedicine, Vol. 5(9), 2015, 728–732

Objective: To determine the effect of *Plantago major* (*P. major*) extract on the liver injury following acetaminophen (APAP) toxicity. **Methods**: The male Sprague Dawley rats (n= 38) were randomly divided into normal control (n= 6) and experiment (n= 32) groups. The latter was subdivided into four groups and induced with APAP (1 000 mg/kg) per oral, followed by *P. major* extract and N-acetylcysteine orally to the respective groups for six days. **Results**: On the seventh day, the serum bilirubin, liver enzymes and tissue malondialdehyde were increased in APAP groups whereas the total protein in serum, tissue superoxide dismutase and glutathione levels were reduced. The plant extract treatment reduced the histological deteriorations such as aggregation of hepatocellular cords, formation of binucleated cells and vacuolisation of the cells with scanty cytoplasm. It also revealed significant reduction of malondialdehyde and increased level of superoxide dismutase and glutathione. The findings in the extract treated groups were comparable to the group treated with N-acetylcysteine. **Conclusions**: In conclusion, *P. major* can enhance innate antioxidant activity and ameliorate the APAP-induced liver injury.

Potential benefits of annatto tocotrienol in glucocorticoid induced osteoporosis: An animal study

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Long-term glucocorticoid treatment induces oxidative stress that cause osteoporosis is an antioxidant and has protective effects against free radical associated diseases. Annatto tocotrienol is a tocopherol free tocotrienol mixture. The purpose of this study was to determine the effects of annatto tocotrienol against glucocorticoid-induced osteoporosis. 32 adult male Sprague-Dawley rats were used in this study. 16 rats were adrenalectomized and divided into two groups; Adrx+Dexa and Adrx+Dexa+ATT and were administered with intramuscular injection of dexamethasone 120 µg/kg/ day. Eight rats underwent sham procedure and the other 8 serves as baseline group. The Adrx+Dexa group was given vehicle palm olein 0.1 ml/kg/day orally while Adrx+Dexa+ATT group was supplemented with annatto tocotrienol 60 mg/ kg/day. The sham operated rats were given vehicle palm olein 0.05 ml/kg/day by intramuscular injection and 0.1 ml/kg/day orally. The treatments were given for two months before the rats were euthanized. The femurs were tested for biomechanical strength and analyzed for bone histomorphometry. The results showed that long-term glucocorticoid treatment increased, bone resorption marker (CTX), lipid peroxidation; and decreased superoxide dismutase (SOD) activity with no significant changes to serum osteocalcin. Bone biomechanical strength was compromised with reduction in structural, static and dynamic parameters of bone histomorphometry. Annatto tocotrienol supplementation had maintained lipid peroxidation, CTX level, SOD activity and protected bone histomorphometric parameters and biomechanical strength. The results of this study suggested that annatto tocotrienol may have protective effects against osteoporosis induced by glucocorticoids and may be used as prophylaxis for patients on long term glucocorticoid therapy.

Preventive effects of tocotrienol on stress-induced gastric mucosal lesions and its relation to oxidative and inflammatory biomarkers

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This study aimed to investigate the possible gastroprotective effect of tocotrienol against water-immersion restraint stress (WIRS) induced gastric ulcers in rats by measuring its effect on gastric mucosal nitric oxide (NO), oxidative stress, and inflammatory biomarkers. Twenty-eight male Wistar rats were randomly assigned to four groups of seven rats. The two control groups were administered vitamin-free palm oil (vehicle) and the two treatment groups were given omeprazole (20 mg/kg) or tocotrienol (60 mg/kg) orally. After 28 days, rats from one control group and both treated groups were subjected to WIRS for 3.5 hours once. Malondialdehyde (MDA), NO content, and superoxide dismutase (SOD) activity were assayed in gastric tissue homogenates. Gastric tissue SOD, iNOS, TNF-α and IL1-β expression were measured. WIRS increased the gastric MDA, NO, and pro-inflammatory cytokines levels significantly when compared to the non-stressed control group. Administration of tocotrienol and omeprazole displayed significant protection against gastric ulcers induced by exposure to WIRS by correction of both ulcer score and MDA content. Tissue content of TNF-α and SOD activity

were markedly reduced by the treatment with tocotrienol but not omeprazole. Tocotrienol significantly corrected nitrite to near normal levels and attenuated iNOS gene expression, which was upregulated in this ulcer model. In conclusion, oral supplementation with tocotrienol provides a gastroprotective effect in WIRS-induced ulcers. Gastroprotection is mediated through 1) free radical scavenging activity, 2) the increase in gastric mucosal antioxidant enzyme activity, 3) normalisation of gastric mucosal NO through reduction of iNOS expression, and 4) attenuation of inflammatory cytokines. In comparison to omeprazole, it exerts similar effectiveness but has a more diverse mechanism of protection, particularly through its effect on NO, SOD activity, and TNF-α

The effect of administration of an equal dose of different classes of dietary chemicals on NQO1 expressional level in mice liver

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Pharmacophore, Vol. 8(5), 2017, 1-9

Objective: NAD(P)H: quinone oxidoreductase 1 (NQO1) is important in xenobiotic and carcinogenic detoxifications. NQO1-mediated detoxification of quinones is thought to be an important strategy for cancer chemoprevention. The objective of this study was to determine the expressional levels of liver NQO1 that could be observed by administration of an equal dose (50 mg/kg) of five different dietary chemicals (sulforaphane, quercetin, curcumin, butylated hydroxyanisole, indole-3-carbinol) to mice. **Methods**: Adult male ICR white mice were divided into 8 groups (n= 6 per group) i.e. normal control, sulforaphane, quercetin, curcumin, butylated hydroxyanisole, indole-3-carbinol, vehicle 1 control and vehicle 2 control groups. The chemicals were administered intraperitoneally for 14 days at a dose of 50 mg/kg body weight. At day 15, mice were sacrificed and their livers harvested. Total RNA was extracted, reverse transcribed and subjected to quantitative real-time PCR to detect NQO1 gene expression. Agarose gel electrophoresis was performed to verify the specificity of amplification. Western blots were performed to detect NQO1 protein expression. **Results**: There was 3.1-, 1.5-, 2.2-, 2.5- and 2.5-fold increase in mice liver NQO1 gene expression after treatment with 50 mg/kg sulforaphane, curcumin, quercetin, indole 3 carbinol and butylated hydroxyanisole respectively ($P< 0.05$). The results also showed that NQO1 protein expression in the livers of mice treated with 50 mg/kg sulforaphane, curcumin, quercetin, indole-3-carbinol and butylated hydroxyanisole was increased by 2.3-, 1.7-, 1.8-, 1.9- and 1.9-fold respectively ($P< 0.05$). **Conclusions**: At the dose of 50 mg/kg, sulforaphane exhibited the highest level of liver NQO1 expression, followed by indole-3-carbinol and butylated hydroxyanisole (equivalent expression levels), quercetin and curcumin.

Tocotrienol modulates the expression of proteins in oxidative stress-induced *Caenorhabditis elegans*

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Objective: Oxidative stress that damages proteins result in aging and age related diseases. The aim of this study is to determine the effect of tocotrienol rich fraction (TRF) on the expression of proteins in oxidative stress-induced *Caenohabditis elegans* (*C.elegans*) which has homologous genes to humans. **Methods**: The worms were treated with TRF prior to, after and continuously in separate groups upon induction of oxidative stress with hydrogen peroxide. The expression of proteins were analyzed with 2D-gel electrophoresis and identified with mass spectrophotometry. **Results** showed that induction of oxidative stress and TRF treatment separately modulated the expression of 11 proteins. Pre-treatment of TRF altered the expression of 5 proteins while posttreatment and a continuous treatment of TRF in oxidative stress-induced worms affected the expression of 9 and 10 proteins respectively. Results: From these differentially expressed proteins, a total of 12 were successfully identified. TRF was found to increase the expression of glutathione-S transferase but decreased the expression of mRNA cap guanine-N7 methyltransferase, inorganic pyro-phosphatase, enoyle-CoA hydratase, vitellogenin 6 precursor, cathepsin B-like cysteine proteinase 4 precursor, triosephosphatase isomerase, tubulin-specific chaperon B and putative D-amino acid oxidase. **Conclusion**: In conclusion, TRF modulated the expression of proteins involved in energy metabolism, oxidative stress, proteolysis and biosynthesis of mRNA in *C.elegans*.

Tocotrienol rich fraction supplementation increased the antioxidant enzymes activities in skeletal and heart muscle of aging mice

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Aging is initiated from free radical reactions which interrupted the antioxidant/prooxidant balance and consequently causing aging-related disease. Tocotrienol Rich Fraction (TRF) has been reported as a potent antioxidant against oxidative damage by increasing antioxidant enzymes levels in many organs such as brain, bones and blood but not in muscle. This study was carried out to evaluate the effect of long term TRF supplementation on antioxidant status in skeletal and heart muscle of aging mice. Mice were divided into 3 groups, control without treatment (CWT), refined, bleach and deodorization (RBD) oil control and TRF supplementation groups. 13.5 months supplementation was done on 5 months-old rats (young mice) until they reach 18.5 months old (old mice). The activity of antioxidant enzymes, i.e. superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and glutathione reductase (GRx) in skeletal and heart muscles were measured. TRF supplementation increased SOD, CAT and GPx activities significantly in skeletal and heart muscles compared to both control groups. TRF supplementation increased the GRx activity significantly in skeletal and heart muscles compared to CWT but not RBD oil control group. In conclusion, long term TRF supplementation significantly increased the antioxidant enzymes activities in skeletal and heart muscles in aging mice.

Tocotrienol rich fraction supplementation modulates antioxidant enzymes activity and reduces DNA damage in APPswe/PS1dE9 alzheimer`s disease mouse model

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Sains Malaysiana, Vol. 45(9), 2016, 1363-1370

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by deterioration of the brain functions that result in impairment of memory, cognition and behavioural functions. Oxidative stress is well known to be one of the causative factors for AD. Thus this disease is potentially modulated by natural antioxidants such as vitamin E. The aim of this study was to evaluate the effect of tocotrienol-rich fraction (*TRF*) supplementation on antioxidant enzymes and DNA damage using APPswe/PS1dE9 transgenic mouse model of AD. Animals were supplemented with TRF (200 mg/kg) or alpha-tocopherol (αT) (200 mg/kg) for six months starting from nine months old. We found that superoxide dismutase (SOD) activity in AD mouse was decreased by supplementation of TRF and αT as compared with AD control mouse with no significant differences in glutathione peroxidise (GPx) activity in all groups. TRF supplementation significantly increased catalase (*CAT*) activity. The level of DNA damage of AD mouse shows significant decrease with supplementation of TRF and αT. In conclusion, TRF was able to modulate antioxidant enzymes activity and decreased the level of DNA damage of AD transgenic mouse model.

Tocotrienol-rich fraction ameliorates antioxidant defense mechanisms and improves replicative senescence-associated oxidative stress in human myoblasts

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During aging, oxidative stress affects the normal function of satellite cells, with consequent regeneration defects that lead to sarcopenia. This study aimed to evaluate tocotrienol-rich fraction (TRF) modulation in reestablishing the oxidative status of myoblasts during replicative senescence and to compare the effects of TRF with other antioxidants (-tocopherol (ATF) and Nacetyl-cysteine (NAC)). Primary human myoblasts were cultured to young, presenescent, and senescent phases. The cells were treated with antioxidants for 24 h, followed by the assessment of free radical generation, lipid peroxidation, antioxidant enzyme mRNA expression and activities, and the ratio of reduced to oxidized glutathione. Our data showed that replicative senescence increased reactive oxygen species (ROS) generation and lipid peroxidation in myoblasts. Treatment with TRF significantly diminished ROS production and decreased lipid peroxidation in senescent myoblasts. Moreover, the gene expression of superoxide dismutase (*SOD2*), catalase (*CAT*), and glutathione peroxidase (*GPX1*) was modulated by TRF treatment, with increased activity of superoxide dismutase and catalase and reduced

glutathione peroxidase in senescent myoblasts. In comparison to ATF and NAC, TRF was more efficient in heightening the antioxidant capacity and reducing free radical insults. These results suggested that TRF is able to ameliorate antioxidant defense mechanisms and improves replicative senescence-associated oxidative stress in myoblasts.

Tocotrienol-rich palm oil extract induces NAD(P)H:quinone Oxidoreductase 1 (NQO1) expression in mice liver

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A diet rich in tocotrienols has been shown to be beneficial for health. However, its detailed mechanism of action is still not fully understood. NAD (P)H:quinone oxidoreductase 1 (NQO1) is important in cellular defence due to its ability to detoxify reactive quinones and quinoneimines to their less toxic hydroquinones forms. The objective of this study is to investigate the effects of different doses of palm oil-derived tocotrienol rich fraction (palm TRF) supplementation on NQO1 gene and protein expression in mice livers. Western blot and qPCR assays were used to detect NQO1 expression levels. It was found that palm TRF significantly induced NQO1 expression at all doses given. In conclusion, palm TRF treatment increased NQO1 gene and protein expression in mice liver dose dependently, with the highest expression seen in mice treated with 1000 mg/kg palm TRF, followed by 500 and 200 mg/kg respectively.

Vitamin E, γ-tocotrienol, protects against buthionine sulfoximine-induced cell death by scavenging free radicals in SH-SY5Y neuroblastoma cells

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The induction of reactive oxygen species (ROS) to selectively kill cancer cells is an important feature of radiotherapy and various chemotherapies. Depletion of glutathione can induce apoptosis in cancer cells or sensitize them to anticancer treatments intended to modulate ROS levels. In contrast, antioxidants protect cancer cells from oxidative stress-induced cell death by scavenging ROS. The role of exogenous antioxidants in cancer cells under oxidative insults remains controversial and unclear. This study aimed to identify protective pathways modulated byg-tocotrienol (gT3), an isomer of vitamin E, in human neuroblastoma SH-SY5Y cells under oxidative stress. Using buthionine sulfoximine (BSO) as an inhibitor of glutathione synthesis, we found that BSO treatment reduced the viability of SH-SY5Y cells. BSO induced cell death by increasing apoptosis, decreased the level of reduced glutathione (GSH), and increased ROS levels in SH-SY5Y cells. Addition ofgT3 increased the viability of BSO-treated cells, suppressed apoptosis, and decreased the ROS level induced by BSO, while the GSH level was unaffected. These results suggest that decreasing GSH levels by BSO increased ROS levels, leading to apoptosis in SH-SY5Y cells. gT3 attenuated the BSOinduced cell death by scavenging free radicals

Scope 10 | B

Experimental Nutrition

Herbs and spices

Allicin alleviates dextran sodium sulfate- (DSS-) induced ulcerative colitis in BALB/c mice

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The objective of this study is to evaluate the effect of allicin (10 mg/kg body weight, orally) in an experimental murine model of UC by administering 2.5% dextran sodium sulfate (DSS) in drinking water to BALB/c mice. DSS-induced mice presented reduced body weight, which was improved by allicin administration. We noted increases in CD68 expression, myeloperoxidase (MPO) activities, and Malonaldehyde (MDA) and mRNA levels of proinflammatory cytokines, such as *tumor necrosis factor-(TNF-)* α *, interleukin- (IL-) 1*β *, IL-6*, and *IL-17*, and decrease in the activities of enzymic antioxidants such as superoxide dismutase (SOD), Catalase (CAT), Glutathione reductase (GR), and Glutathione peroxidase (GPx) in DSS-induced mice. However, allicin treatment significantly decreased CD68, MPO, MDA, and proinflammatory cytokines and increased the enzymic antioxidants significantly (< 0.05). In addition, allicin was capable of reducing the activation and nuclear accumulation of signal transducer and activator of transcription 3 (STAT3), thereby preventing degradation of the inhibitory protein IκB and inducing inhibition of the nuclear translocation of nuclear factor (NF)-κ B-p65 in the colonic mucosa. These findings suggest that allicin exerts clinically useful anti-inflammatory effects mediated through the suppression of the NF- B and IL-6/p-STAT3^{Y705} pathways.

Aloe Emodin enhances tamoxifen cytotoxiciteffect on ERα-positive breast cancer cells, MCF-7, through down regulation of MEK1 and MEK2

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The positive response to tamoxifen in ERα-positive breast cancer patients is usually of a short duration as many of the patients eventually develop resistance. Our preliminary results show that aloe emodin extracted from the leaves of the Aloebarbadensis Miller demonstrated a cytotoxicity that is selective to ERα-positive breast cancer cells (MCF-7), but not to ERα-negative breast cancer cells (MDA-MB-231) and to the control cells (MCF-10A). The objective of this study was to test the hypothesis that aloe emodin may enhance the response of MCF-7 cells to treatment with tamoxifen. MCF-7 cells were treated with aloe emodin alone, tamoxifen alone or a combination of emodin and tamoxifen, at their respective IC_{50} concentrations and at different time points of 24 hours, 48 hours and 72 hours. The respective IC_{50}s were the concentrations of aloe emodin and tamoxifen required to achieve 50% inhibition of the cells in the study. Cell viability and apoptosis were determined using trypan blue exclusion and DNA fragmentation assays, respectively. The involvement of RAS/MEKs/ERKs genes of

MAPK signalling pathways with aloe emodin was determined using QuantiGene 2.0 Plex assay. Data was evaluated using the one-way ANOVA test. Our findings showed that aloe emodin enhanced the cytotoxicity of tamoxifen on MCF-7 cells through apoptosis by downregulation of MEK1/2 genes. Our research may provide a rational basis for further in vivo studies to verify the efficacy of a combination of aloe emodin and tamoxifen on the viability of ERα-positive-breast cancer cells.

Aloe Emodin induces apoptosis in ER+-breast Cancer Cells; MCF-7 through IGF-1R signalling pathway

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Two-third of breast cancer patients expressed estrogen receptors (ER)s and received endocrine treatment with established anti-estrogens such as tamoxifen. But the action and acquired resistance during treatment are largely unknown. In contrary, phytochemicals are more selective and less cytotoxic to normal cells. Accordingly, we found aloe emodin, an anthraquinone to inhibit the proliferation of ER+-breast cancer cells, MCF-7 with IC50 of 80 μM, but not affecting control breast cells, MCF-10A. Tamoxifen was non-selective to both cells with IC50 of 27 and 38 μM, respectively. Thus, we aimed to investigate the anti-proliferative mechanism of aloe emodin on MCF-7 and its underlying signalling compared to tamoxifen. Cells were treated separately with aloe emodin and tamoxifen at respective IC50 for 72 h. Apoptosis was determined using Annexin V-FITC/PI staining. The expression of insulin-like growth factor-1 receptor (IGF-1R), insulinlike growth factor binding protein (IGFBP)-2 and B-raf gene was investigated using QuantiGene 2.0 Plex assay. Pairedstudent t-test and ANOVA test were used to compare between untreated and treated cells on the measured parameters. Each treatment was conducted in triplicate and repeated three times. Significance was set at $p<0.05$. The presences of early and late apoptosis in MCF-7 were seen in both treatments. All target genes were down regulated. The anti-proliferation effect of aloe emodin on MCF-7 is similar with tamoxifen which mediates inhibition of IGF-1R signalling pathway. This suggests aloe emodin as a potential anti-cancer agent to be used in combined anti-estrogen therapy to enhance its efficacy in ER+-breast cancer treatment.

Anti-cancer activity of three terminalia species and preliminary phytochemical screening

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This study evaluated anticancer potential of three *Terminalia species*, *Terminalia muelleri*, *Terminalia bellerica*, and *Terminalia laxiflora* and also their phytochemical content were determined. Anticancer potential of the plant extracts was measured according to MTT assay. The results showed that *T. muelleri* methanolic extract was active against breast cancer cell line with IC_{50} 40 µg/mL. *T. bellerica* methanolic extract exerted cytotoxic effects only against colon cancer and liver cancer cell lines with IC_{50} of 50 and 15µg/mL, respectively. While *T. laxiflora* methanolic extract did not inhibit the proliferation of all cancer cell lines tested. Phytochemical investigation of the three plant species proved the presence of carbohydrates, flavonoids, tannins, and triterpenes. The methanolic extracts of *T. muelleri* and *T. bellerica* had a significant anticancer activity and so further phytochemical study to isolate and identify the bioactive molecules responsible for the observed anticancer activity is necessary.

Anticancer properties of Malaysian herbs: A review

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Discovery of drugs from medicinal plants continues to provide major leads against various pharmacological targets, particularly in cancer diseases. Hence, there are increasing demands to discover more therapeutic agents from various species of medicinal plants. Chemical compounds in plants are important for human beings due to their therapeutic properties. *Goniothalamus umbrosus*, *Typhonium flagelliforme*, *Myrmecodia pendens*, *Strobilanthes crispus* and *Clinacanthus nutans*, are among the herbal species, which are consumed by cancer patients in order to combat against the growth of cancer cells. The present review aims to highlight on the anti-cancer properties of the listed Malaysian herbs.

Anti-inflammatory potential of ethyl acetate fraction of *Moringa oleifera* in downregulating the NF-κB signaling pathway in lipopolysaccharide-stimulated macrophages

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In the present investigation, we prepared four different solvent fractions (chloroform, hexane, butanol, and ethyl acetate) of *Moringa oleifera* extract to evaluate its anti-inflammatory potential and cellular mechanism of action in lipopolysaccharide (LPS)-induced RAW264.7 cells. Cell cytotoxicity assay suggested that the solvent fractions were not cytotoxic to macrophages at concentrations up to 200 μg/mL. The ethyl acetate fraction suppressed LPS-induced production of nitric oxide and proinflammatory cytokines in macrophages in a concentration-dependent manner and was more effective than the other fractions. Immunoblot observations revealed that the ethyl acetate fraction effectively inhibited the expression of inflammatory mediators including cyclooxygenase-2, inducible nitric oxide synthase, and nuclear factor (NF)-κB p65 through suppression of the NF-κB signaling pathway. Furthermore, it upregulated the expression of the inhibitor of κB (IκBα) and blocked the nuclear translocation of NF-κB. These findings indicated that the ethyl acetate fraction of *M. oleifera* exhibited potent anti-inflammatory activity in LPS-stimulated macrophages via suppression of the NF-B signaling pathway.

Anti-inflammatory property of *Plantago major* leaf extract reduces the inflammatory reaction in experimental acetaminophen-induced liver injury

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Hepatic injury induces inflammatory process and cell necrosis. *Plantago major* is traditionally used for various diseases. This study aimed to determine the anti-inflammatory property of *P. major* leaf extracts on inflammatory reaction following acetaminophen (APAP) hepatotoxicity. Thirty male Sprague-Dawley rats were divided into 5 groups, namely, normal control (C), APAP, aqueous (APAP + AQ), methanol (APAP + MT), and ethanol (APAP + ET) extract treated groups. All APAP groups received oral APAP (2 g/kg) at day 0. Then, 1000 mg/kg dose of *P. major* extracts was given for six days. The levels of liver transaminases were measured at day 1 and day 7 after APAP induction. At day 7, the blood and liver tissue were collected to determine plasma cytokines and tissue 11β -HSD type 1 enzyme. The in vitro anti-inflammatory activities of methanol, ethanol, and aqueous extracts were 26.74 ± 1.6%, 21.69 ± 2.81%, and 12.23 ± 3.15%, respectively. The ALT and AST levels were significantly higher in the APAP groups at day 1 whereas the enzyme levels of all groups showed no significant difference at day 7. The extracts treatment significantly reduced the proinflammatory cytokine levels and significantly increased the 11β -HSD type 1 enzyme activity ($\rho < 0.05$). In conclusion, the P. major extracts attenuate the inflammatory reaction following APAP-induced liver injury.

Boldine suppresses dextran sulfate sodium-induced mouse experimental colitis: NF-jB and IL-6/STAT3 as potential targets

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Ulcerative colitis (UC) is a nonspecific inflammatory disorder characterized by oxidative and nitrosative stress, leucocyte infiltration, and upregulation of inflammatory mediators. Boldine is an alkaloid compound found in Boldo tree, with multiple pharmacological actions, mainly anti-inflammatory, antioxidant, antitumor, and immunomodulatory activities. Hence, the effect of boldine for its anti-inflammatory properties against dextran sulfate sodium (DSS)-induced UC in BALB/c mice was studied. Administration of boldine to DSSinduced mice protects colon damage by reduced disease activity index, spleen weight, and increased colon length. Also administration of boldine showed a reduction in the activity of myeloperoxidase (MPO) and CD 681 expression. Boldine reduced the colon damage, with significant reductions in both the extent and the severity of the inflammation as well as in crypt damage and leukocyte infiltration in the mucosa. Analysis *in vivo* showed clear decrease in the production of *tumor necrosis factor (TNF)-α, Interleukin (IL)26, IL-17*, and signal transducer and activator of transcription-(p-STAT3)^{Y705} with nuclear factor (p65-NF-jB) production being reduced significantly. Moreover, p65-NF-κB activation was reduced in mouse macrophage RAW 264.7 cells *in vitro*. The data demonstrated that boldine may be beneficial in colitis through selective immunomodulatory effects, which may be mediated, at least in part, by inhibition of p65-NF-κB and STAT3 signaling pathways.

Changes in leptin in relation to increased testosterone levels associated with *Eurycoma Longifolia* Jack (Tongkat Ali)

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Objectives: *Eurycoma Longifolia* jack root extract has been known for its aphrodisiac and anabolic properties. Our study aimed at investigating the effects of this extract on the serum leptin in relation to the well-known effects on testosterone levels of male rats. **Methodology**: Twenty-four mature male Albino Wistar rats were used in this study. The rats were divided into 3 groups; control, group A and group B. Body weight was recorded for the rats in all groups. Group A received 5 mg/kg twice daily of pure *Eurycoma Longifolia* root extract. Group B received 10 mg/kg twice daily of the same extract. The duration of treatment was 6 weeks at the end of which, serum leptin and testosterone levels were analyzed in all groups and body weight recorded. **Results**: The mean serum leptin and testosterone levels for the control were 1.13 ± 0.13 ng/ml and 0.79 ± 0.07 ng/ml respectively. While for group A were 1.09 ± 0.19 ng/ml, 0.89 ± 0.16 ng/ml and for Group B were 0.89 ± 0.16 ng/ml,1.75 ± 0.1 ng/ml respectively. The rats in the treated groups showed decrease in body weight in comparison to the control which was not significant in group A (p= 0.867) and significant in group B (p= 0.042). Statistical analysis showed that the serum leptin level of group B was significantly lower than that of control group (p= 0.001) and group A (p= 0.03). On the other hand, no significant difference in serum leptin levels was observed between the control group and group A. The serum testosterone level was significantly higher in group B than control and group A while group A did not show a statistically significant difference than control. **Conclusion**: *Eurycoma Longifolia* root extract can significantly decrease serum leptin levels in relation to the rise in serum testosterone levels. *Eurycoma Longifolia* consumption also causes a significant decrease in total body weight pointing to the possibility of decreased body fat content.

Citrus leaf extract reduces blood pressure and vascular damage in repeatedly heated palm oil diet-induced hypertensive rats

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Prolonged consumption of repeatedly heated vegetable oil increases blood pressure. This study aimed to determine the effects of Citrus leaf extract, (CLE) on blood pressure, blood pressure-regulating enzymes and mediators, as well as aortic histomorphometry in heated palm oil induced-hypertension. Male *Sprague Dawley* rats (n= 56) were divided into seven groups; control group was given normal diet and the other groups were fed with palm oil-enriched diet (15% w/w) either fresh (FPO), five-time-heated (5HPO) or ten-time-heated (10HPO) with or without CLE (0.15%, w/w) supplementation. CLE supplementation reduced the heated oil-raising effect of blood pressure, plasma TBARS, thromboxane and angiotensin-1 converting enzyme in 5HPO but not in 10HPO group. CLE increased serum heme oxygenase-1 in both 5HPO and 10HPO groups. CLE supplementation reduced the increase in aortic intima-media thickness, intima-media area and circumferential wall tension in 5HPO group but not in 10HPO group. These findings suggested that CLE supplementation reduces the blood pressure-raising effects of 5HPO and vascular damage, possibly through its antioxidant effect by modulating vasoactive mediators and blood pressure-regulating enzymes.

Combined ginger extract & gelam honey modulate Ras/ERK and PI3K/AKT pathway genes in colon cancer HT29 cells

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Background: The interconnected Ras/ERK and PI3K/AKT pathways play a central role in colorectal tumorigenesis, and they are targets for elucidating mechanisms involved in attempts to induce colon cancer cell death. Both ginger (*Zingiber officinale*) and honey have been shown to exhibit anti-tumor and anti-inflammation properties against many types of cancer, including colorectal cancer. However, there are currently no reports showing the combined effect of these two dietary compounds in cancer growth inhibition. The aim of this study was to evaluate the synergistic effect of crude ginger extract and Gelam honey in combination as potential cancer chemopreventive agents against the colorectal cancer cell line HT29. **Methods**: The cells were divided into 4 groups: the first group represents HT29 cells without treatment, the second and third groups were cells treated singly with either ginger or Gelam honey, respectively, and the last group represents cells treated with ginger and Gelam honey combined. **Results**: The results of MTS assay showed that the IC_{50} of ginger and Gelam honey alone were 5.2 mg/ml and 80 mg/ml, respectively, whereas the IC_{50} of the combination treatment was 3 mg/ml ofginger plus 27 mg/ml of Gelam honey with a combination index of < 1, suggesting synergism. Cell death in response to the combined ginger and Gelam honey treatment was associated

with the stimulation of early apoptosis (upregulation of *caspase 9* and I Bgenes) accompanied by downregulation of the *KRAS, ERK, AKT, Bcl-xL, NFkB*(*p65*) genes in a synergistic manner. **Conclusions**: In conclusion, the combination of ginger and Gelam honey may be an effective chemopreventive and therapeutic strategy for inducingthe death of colon cancer cells.

Comparison of cytotoxicity measurements of *Centella Asiatica* (L.) on human wharton`s jelly-derived mesenchymal stem cells in vitro via MTT and Prestoblue Assay

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Articular cartilage tissue injury can cause permanent defect due to its incapability to selfregenerate since there is limited in vascularisation. Nowadays, stem cells are used in Autologous Chondrocyte Implantation (ACI) due to their advantages in promoting recovery and regeneration of local tissue. The ability of adipose-derived stem cells (ASC) as multipotential precursor cells and its capability of self-regenerating in large numbers are very promising. Co-culturing chondrocytes and stem cells have been found to encourage chondrogenesis, suppress hypertrophic cell development and reduce osteogenic potential. The use of biomaterial such as fibrin is suitable for its natural role in recovery and regeneration of injured tissues. Therefore, in this study we co-cultured articular rabbit chondrocytes with ASC in 3-dimensional fibrin gel to study its effect on ASC chondrogenic differentiation. Human ASC and rabbit chondrocytes were isolated and cultured until passage P3 and P2 respectively. Both cells were then trypsinized and co-cultured (1:1) in fibrin gel. Fibrin gels containing cells were harvested on Day 0 and Day 7 then, digested to retrieve cells prior to Real Time-Polymerase Chain Reaction (RT-PCR) for detection of chondrogenic gene expression Collagen Type I (Col I), Collagen Type II (Col II), Aggrecan Core Protein (ACP) and human SOX9. Haematoxylin & Eosin and immunohistochemistry staining was done to observe cells morphology and the presence of Collagen Type II proteins. The chondrogenic gene expression for both groups showed an increase as compared to Day 0 with significance level ($P< 0.05$) suggesting that chondrogenesis has occurred. Collagen Type II stain coincides with its gene expression. The results suggested that by co-culturing these two types of cells, chondrocytes does have positive effect on the chondrogenic differentiation of ASC. We propose the use of ASC to replace some of the chondrocytes used in articular cartilage tissue regenerative therapy.

Cytotoxic activity of *Luvunga scandens* against human cancer cell lines

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Luvunga scandens belongs to the family of Rutaceae which usually inhabit tropical and moist environment. This plant is known as 'Mengkurat Jakun' among locals and used traditionally to treat

fever and fatigue via decoction. The aim of this study was to investigate the cytotoxic activity of the leaves and stems extracts of *L. scandens* extract. Extracts of the leaves and stems were obtained from sequential extraction procedures by various organic solvents. All extracts were subjected to cytotoxic study by 3-(4, 5-dimethylthaizol-2-yl)-2, 5-diphenyltetrazolium bromide (MTT) assay. In in vitro cytotoxicity assay, all *L. scandens* extracts exhibited cytotoxicity against human breast adenocarcinoma (MCF-7) and human lung adenocarcinoma (A549) cell lines. The IC_{50} values of dichloromethane and methanol extracts from the leaves of *L. scandens* against MCF-7 cell line were 62.5 µg/mL and 88.0 µg/mL, respectively, whereas IC_{50} of methanol extract from stem was 81.0 µg/mL. All extracts were less active against A549 cell line where IC_{50} value were not be determined. The present findings revealed the potential of *L. scandens* as a cytotoxic agent against MCF-7 cell line. However, further studies should be planned to evaluate role of the plant in cytotoxic activity.

Cytotoxicity and proapoptotic effects of *Allium atroviolaceum* flower extract by modulating cell cycle arrest and caspase-dependent and *p*53-independent pathway in breast cancer cell lines

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Breast cancer is the second leading cause of cancer death among women and despite significant advances in therapy, it remains a critical health problem worldwide. *Allium atroviolaceum* is an herbaceous plant, with limited information about the therapeutic capability. We aimed to study the anticancer effect of flower extract and the mechanisms of action in MCF-7 and MDA-MB-231. The extract inhibits the proliferation of the cells in a time- and dose-dependent manner. The underlying mechanism involved the stimulation of S and G2/M phase arrest in MCF-7 and S phase arrest in MDA-MB-231 associated with decreased level of *Cdk1*, in a *p53*-independent pathway. Furthermore, the extract induces apoptosis in both cell lines, as indicated by the percentage of sub-G0 population, the morphological changes observed by phase contrast and fluorescent microscopy, and increase in AnnexinV-positive cells. The apoptosis induction was related to downregulation of *Bcl*-2 and also likely to be caspase-dependent. Moreover, the combination of the extract and tamoxifen exhibits synergistic effect, suggesting that it can complement current chemotherapy. LC-MS analysis displayed 17 major compounds in the extract which might be responsible for the observed effects. Overall, this study demonstrates the potential applications of *Allium atroviolaceum* extract as an anticancer drug for breast cancer treatment.

Effect of extraction conditions on yield, total phenolic contents and antibacterial activity of methanolic *Cinnamomum zeylanicum* blume leaves extract

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Increase of foodborne diseases has promulgated the development of new natural food additive with high extraction yield to eliminate food pathogenic organisms. One such possibility is the use of plant product as antibacterial agents with non-conventional method to enhance the yield. In this study, cinnamon leaves (*Cinnamomum zeylanicum* Blume) were subjected to ultrasonic assisted extraction (UAE) using response surface methodology (RSM) to optimise extraction yield and total phenolic contents. The effect of two independent factors, extraction temperature (x1: 25-40°C) and extraction time (x2: 15-45 minutes) were investigated. Optimum extraction yield and total phenolic contents of cinnamon leaves were 27.49 ± 1.59% and 3987 ± 79.10 mg GAE/g which were closely as predicted using RSM (28.34%, 4048 mg GAE/g), respectively. The optimum condition of extraction yield (40°C and 45 minutes) showed the maximum zone of inhibition against all tested foodborne pathogens (7.33 ± 0.50 to 13.22 ± 0.44 mm), whereas optimum condition of total phenolic contents (33°C and 31 minutes) showed the lowest zone inhibition (6.78 ± 0.67 mm to 11.67 ± 1.41 mm). The minimal inhibitory concentration (MIC) values range from 97.65 to 6250.00 μg/mL and minimal bactericidal concentration (MBC) values from 6.25 to 50.00 mg/mL. These results indicated that UAE method is excellent in producing significantly the highest of extraction yield, total phenolic contents and act as a potential natural antibacterial agent even using low extraction temperature and short time.

Effect of *Nigella Sativa* supplementation on human lipids: Systematic review

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Nigella sativa (NS) is widely used in traditional medicine and several studies have been conducted to reveal NS effects on different medical disorders including hyperlipidemia. Since hyperlipidemia is a common risk factor for the development of cardiovascular illness. We evaluated the effects of NS supplementation on lipid profile in clinical trial performed among humans. A search on published studies was done by using databases including Scopus, PubMed, Google Scholar, Thomas Reuters Web of Science, and CINAHIL. Terms searched included "*Nigella sativa*, Black seed, Black cumin, Triglycerides, Cholesterol, Lipoproteins". Initially 432 articles were extracted. However, four hundred eighteen papers were unrelated, reviews, animal studies, combined and duplicated studies were excluded, and finally only fourteen articles were eligible for this review. After analysing 14 articles including 738 participants from different countries and nations. Results of these clinical trials revealed

that Nigella sativa is effective to change the lipid profile significantly in different conditions. This systematic review revealed that *Nigella sativa* supplementation might be effective in hyperlipidemic control in humans and seems potential target of future drug for hyperlipidemic conditions.

Effects of phenolic-rich extracts of *Clinacanthus nutans* on high fat and high cholesterol diet-induced insulin resistance

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Background: *Clinacanthus nutans* is used traditionally in many parts of Asia to improve well-being, but there are limited studies on its efficacy. We explored the potential use of *C. nutans* for prevention of high fat and high cholesterol diet-(HFHC-) induced insulin resistance in rats. **Methods**: The leaf of *C. nutans* was extracted using water (AL extract) and methanol (AML extract), and the extracts were fed to rats alongside the HFHC diet for 7 weeks, and compared with simvastatin. Oral glucose tolerance test, and serum insulin, retinol binding protein 4 (RBP4), adiponectin and leptin were measured. Homeostatic model assessment of insulin resistance (HOMA-IR) was computed, while transcriptional regulation of hepatic insulin signaling genes was also assessed. **Results**: Glycemic response was higher in the HFHC group compared with the AL and AML groups, which also had lower serum RBP4, fasting glucose, insulin and HOMA-IR. Serum adiponectin levels were higher, while leptin levels were lower in the AML and AL groups compared to the HFHC group. There was upregulation of the Insulin receptor substrate, phosphotidyl inositol-3-phosphate, adiponectin receptor and leptin receptor genes, in comparison with the HFHC group. **Conclusions**: Overall, the results showed that the HFHC diet worsened metabolic indices and induced insulin resistance partly through transcriptional regulation of the insulin signaling genes. *C.nutans*, on the other hand, attenuated the metabolic effects and transcriptional changes induced by the HFHC diet. The results suggested that *C.nutans* may be a good source of functional ingredient for the prevention of insulin resistance.

Effects of selected herbs and vegetables on the nutritional quality of beef burger and rat bioassay

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Rat bioassay was used to evaluate the nutritional quality of beef burger as influenced by the addition of selected herbs and vegetables. The selected herbs and vegetables used were pucuk ubi (*Mannihot esculenta*), pucuk gajus (*Anacardium occidentale*), pegaga (*Centella asiatica*) and jantung pisang (*Musa paradisiaca*) as treatment group with casein and skimmed milk as reference. The rats were fed with herbs and vegetables at the rate of 0.5 (low dose) and 25 (high dose) g/kg body weight. The samples were analyzed for proximate analysis, protein quality and protein digestibility. The rats fed with pucuk ubi (high dose) (364.30 ± 25.34 g) indicated the highest mean of increased body weight

(121.05 ± 14.65 g) while rats fed with skimmed milk (310.98 ± 18.92 g) showed the lowest mean increase in body weight (88.33 ± 14.25 g). As for the Protein Efficiency Ratio (PER) value, all the rats fed with herbs diet showed PER values that were significantly lower ($p< 0.05$) compared to the casein. As for the in vivo apparent protein digestibility test, casein showed the highest digestibility value (86.33 ± 4.20) while pucuk gajus (high dose) (59.59 ± 5.41) showed the lowest. As for the in vitro digestibility analyses, casein indicated the highest value for in vitro digestibility (93.84 ± 0.33). Administration of herbs and vegetables at low and high doses show significant effects ($p<0.05$) on nutritional quality of beef burger. In conclusion, it was found that antinutritional factors in selected herbs and vegetables might affect the nutritional quality of beef burger.

Eurycoma longifolia, a Malaysian medicinal herb, significantly upregulates proliferation and differentiation in pre-osteoblasts (MC3T3-E1): An *in vitro* model

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Objective: *Eurycoma longifolia* (*EL*), a well-recognized Malaysian medicinal herb, has gained widespread popularity due to its ability to protect against bone calcium loss in androgen-deficient osteoporosis. Nevertheless numerous animal studies have proved the bone protective effect of *EL*; however, the exact mechanism is not well-explained yet. Thus, the present study was aimed to explore the in vitro basis of bone protective effects of *EL* by using mouse pre-osteoblast cell line (MC3T3-E1). **Methods**: The cytotoxicity and proliferative potential of *EL* were evaluated by lactate dehydrogenase (LDH) and cell counting methods. Despite cell growth, the ability of *EL* to promote osteogenic differentiation of bone-forming cells was assessed by quantifying collagen (early differentiation marker) and calcium (late differentiation marker) in *EL*-treated bone forming cells. **Results**: Resulting data obtained from dose optimization study revealed that *EL* at 5 to 50 µg/ml concentration showed marked effects in significantly promoting cell growth in MC3T3-E1 cells. As such, resulting data also demonstrated the superior potential of *EL* in up regulating collagen synthesis and mineralization (calcium deposition) in MC3T3-E1 cells at 25 µg/ml, in comparison to untreated (negative control) and dihydrotestosterone (5α-DHT)-treated cells (positive control). **Conclusion**: These pronounced effects of EL on osteoblasts provide an in vitro basis for the bone protective potential of EL and thus can be considered as an alternative regimen for the treatment of androgen-deficient male osteoporosis.

Evaluation of antidiabetic effects of the traditional medicinal plant *Gynostemma Pentaphyllum* and the possible mechanisms of insulin release

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Aims: To evaluate the antidiabetic effects of *Gynostemma pentaphyllum* (*GP*) in Goto-Kakizaki (GK) rat, an animal model of type 2 diabetes, and to investigate the mechanisms of insulin release. **Methods**: Oral glucose tolerance test was performed and plasma insulin levels were measured. **Results**: An oral treatment with *GP* (0.3 g/kg of body weight daily) for two weeks in GK rats improved glucose tolerance versus placebo group (< 0.01). Plasma insulin levels were significantly increased in the *GP*-treated group. The insulin release from GP-treated GK rats was 1.9-fold higher as compared to the control group (< 0.001). GP stimulated insulin release in isolated GK rat islets at high glucose. Opening of ATP-sensitive potassium (K-ATP) channels by diazoxide and inhibition of calcium channels by nifedipine significantly decreased insulin response to *GP*. Furthermore, the protein kinase A (PKA) inhibitor H89 decreased the insulin response to *GP* (< 0.05). In addition, *GP*-induced insulin secretion was decreased after preincubation of GK islets with pertussis toxin to inhibit exocytotic Ge proteins (< 0.05). **Conclusion**: The antidiabetic effect of *GP* is associated with the stimulation of insulin release from the islets. *GP*-induced insulin release is partly mediated via K-ATP and L-type Ca^{2+} channels, the PKA system and also dependent on pertussis toxin sensitive G_e-protein.

Extract of *Woodfordia fruticosa* flowers ameliorates hyperglycemia, oxidative stress and improves β-cell function in streptozotocin–nicotinamide induced diabetic rats

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Aims of study: The study aimed to ascertain the antidiabetic potential of *W. fruticosa* flower methanolic extract (WF) on Streptozotocin (STZ)–nicotinamide-induced diabetic rat model. **Materials and methods**: Diabetes was induced in Sprague Dawley (SD) rats by STZ–nicotinamide and thereafter diabetic rats were treated with three different doses of WF (100, 200 and 400 mg/kg body weight) respectively and glibenclamide as a positive control. Biochemical parameters such as blood glucose, serum insulin and C-peptide levels were measured with oxidative stress markers. Furthermore, histology of liver and pancreas was carried out to evaluate glycogen content and β-cell structures. Moreover, immunohistochemistry and western blot analysis were performed on kidney and pancreas tissues to determine renal Bcl-2, pancreatic insulin and glucose transporter (GLUT-2, 4) protein expression in all the experimental groups. **Results**: The acute toxicity study showed non-toxic nature of all the three doses of WF. Further, studies on diabetic rats exhibited anti-hyperglycemic effects by upregulating serum insulin and C-peptide levels. Similarly, WF shown to ameliorate oxidative stress by downregulating LPO levels and augmenting the antioxidant enzyme (ABTS). Furthermore, histopathological analysis demonstrate recovery in the structural degeneration of β-cells mass of pancreas tissue with increase in the liver glycogen content of the diabetic rats. Interestingly, protective nature of the extract was further revealed by the immunohistochemical study result which displayed upregulation in the insulin and renal Bcl-2 expression, the anti apoptosis protein. Moreover, western blot result have shown slight alteration in the GLUT-2 and GLUT-4 protein expression with the highest dose of WFc treatment, that might have stimulated glucose uptake in the pancreas and played an important role in attenuating the blood glucose levels. **Conclusion**: The overall study result have demonstrated the potential of WF in the management of diabetes and its related complications, thus warrants further investigation on its major compounds with in depth mechanistic studies at molecular level.

Gallic acid attenuates dextran sulfate sodium induced experimental colitis in BalB/c mice

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Gallic acid (GA) is a polyhydroxy phenolic compound that has been detected in various natural products, such as green tea, strawberries, grapes, bananas, and many other fruits. In inflammatory bowel disease, inflammation is promoted by oxidative stress. GA is a strong antioxidant; thus, we evaluated the cytoprotective and anti-inflammatory role of GA in a dextran sulfate sodium (DSS)-induced mouse colitis model. Experimental acute colitis was induced in male BALB/c mice by administering 2.5% DSS in the drinking water for 7 days. The disease activity index; colon weight/length ratio; histopathological analysis; mRNA expressions of IL-21 and IL-23; and protein expression of nuclear erythroid 2-related factor 2 (Nrf2) were compared between the control and experimental mice. The colonic content of malondialdehyde and the activities of superoxide dismutase, catalase, glutathione peroxidase, and glutathione reductase activity were examined as parameters of the redox state. We determined that GA significantly attenuated the disease activity index and colon shortening, and reduced the histopathological evidence of injury. GA also significantly ($P< 0.05$) reduced the expressions of *IL-21* and *IL-23*. Furthermore, GA activates/upregulates the expression of Nrf2 and its downstream targets, including *UDP-GT* and *NQO1*, in DSS-induced mice. The findings of this study demonstrate the protective effect of GA on experimental colitis, which is probably due to an antioxidant nature of GA.

Gallic acid suppresses inflammation in dextran sodium sulfate-induced colitis in mice: Possible mechanisms

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Inflammatory bowel diseases (IBD) encompass at least two forms of intestinal inflammation: Crohn's disease and ulcerative colitis (UC). Both conditions are chronic and inflammatory disorders in the gastrointestinal tract, with an increasing prevalence being associated with the industrialization of nations and in developing countries. Patients with these disorders are 10 to 20 times more likely to develop cancer of the colon. The aim of this study was to characterize the effects of a naturally occurring polyphenol, gallic acid (GA), in an experimental murine model of UC. A significant blunting of weight loss and clinical symptoms was observed in dextran sodium sulfate (DSS)-exposed, GA-treated mice compared with control mice. This effect was associated with a remarkable amelioration of the disruption of the colonic architecture, a significant reduction in colonic myeloperoxidase (MPO) activity, and a decrease in the expression of inflammatory mediators, such as inducible nitric oxide synthase (iNOS), cyclooxygenase (COX)-2, and pro-inflammatory cytokines. In addition, GA reduced the activation and nuclear accumulation of p-STAT3^{Y705}, preventing the degradation of the inhibitory

protein I B and inhibiting of the nuclear translocation of p65-NF-κB in colonic mucosa. These findings suggest that GA exerts potentially clinically useful anti-inflammatory effects mediated through the suppression of p65-NF-κB and IL-6/p-STAT3^{Y705} activation.

Gynostemma pentaphyllum exhibits anti-inflammatory properties and modulates antimicrobial peptide expression in the urinary bladder

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Gynostemma pentaphyllum (GP) is a traditional Chinese medicine but is also consumed as tea by healthy people for its many beneficial effects. The herb is known for its anti-diabetic effect and immuno-modulatory properties. In patients with diabetes, the incidence of infections, including urinary tract infections, is increased and a common cause for antibiotic treatment. We hypothesized that GP could exhibit a beneficial impact on innate immunity in the urinary tract, thereby fighting such bacterial infections. Our aim was therefore to investigate whether orally taken GP would act on the urinary tract and modulate immune reactions in bladder epithelial cells. The extract was analyzed by NMR and was found to consist almost exclusively of a mixture of several saponins present in different concentrations. *Ex vivo* infection experiments demonstrated that the pro-inflammatory response to *Escherichia coli* was attenuated in bladder tissue from diabetic rats receiving GP compared to diabetic animals without treatment. *In vitro* assays using uroepithelial cells challenged with *E. coli* corroborated these results. Moreover, GP treatment modulated the expression of antimicrobial peptides. With these properties, GP might be a beneficial supplement for diabetic patients with history of urinary tract infections.

Haematological and histopathological evaluation of dried kacangma (*Leonurus sibiricus*) in New Zealand White rabbits

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Kacangma (*Leonurus sibiricus* L.) is a popular traditional herb that has been consumed for decades by the people of Sarawak as herbal medicine and culinary ingredient. This study was conducted to evaluate the toxicity of kacangma herb on New Zealand White male and female rabbits through subchronic studies. Effects of kacangma herb intake at the level of 0.5, 5.0 and 25.0 g/kg body weight was evaluated for 90 days with focus on hematological and histopathological studies. The haematological study revealed no significant changes in all parameters studied i.e. heamoglobin, red

blood cell value, white blood cell value, packed cell volume, mean cell volume, mean cell haemoglobin and mean cell haemoglobin concentration. Vice versa, in the histophatological study, administration of dried kacangma herb at medium and high dose was found to cause adverse effects on histopathological structure in liver and kidney of both male and female rabbits. However, since low dose group showed no significant differences to the control group, therefore it is considered safe and less chance of developing toxicity if the herb is consumed at the low dose of 0.5 g/kg body weight as observed throughout the 90 days period of subchronic study.

Herbal extracts exhibit anti-diabetic activities in 3T3 adipocytes model

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The prevalence and suffering of diabetes and obesity has been increasing among the various communities of the world including Malaysia. The cost of treatment is also rising. Therefore, it is important to explore non pharmacological regimens that are non-invasive and with less health risks and cost burden to the patients, healthcare professionals and nations. The objective of this study was to evaluate efficacy of the traditionally used antidiabetic herbs. **Methods**: Water extracts of *Andrographis paniculata*, *Lagerstroemia speciose* and *Orthosiphon stamineus* (Cat whisker) were prepared and evaluated for their effects on cell proliferation, adipogenesis, glucose uptake, quantification of mRNAs for Ppary, Glut4, adiponectin and leptin using RealTime Polymerase Chain Reaction (qRT-PCR) in 3T3-L1 preadipocytes. **Result and Discussion**: There were significant ($P<0.01$, $P<0.05$) increase in adipogenesis activity for cells treated with insulin, *A. paniculata* and *O. stamineus* compared to control. There was significant ($P< 0.01$, $P< 0.05$) increase in glucose uptakes in the cells treated with Sodium Orthovanadate, *L. speciosa*, *A. paniculata* and *O. stamineus* compared to control. Ppar transcriptional levels in cells treated with *A. paniculata* extract was similar to control. However, *L. speciose* extract ($P< 0.01$) showed significantly lower levels of Ppar mRNA expression compared to control. Gene expression analysis demonstrated that *A. paniculata* and *L. speciosa* extracts significantly ($P< 0.01$, $P< 0.05$) induced Glut4 mRNA transcription compared to control in 3T3-L1 adipocytes. **Conclusions**: The present study suggests that the extracts of *A. paniculata* and *O. stamineus* possess insulin-mimicking effects.

Herbal supplements and hepatotoxicity: A short review

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Herbal products have gained popularity over the past few decades. The reasons attributed to the rise in popularity are cheaper costs, easy availability, patient compliance and fewer side effects. However, liver toxicity following consumption of herbal remedies is on the increase. Thus, there is an urgent need to understand the mechanism of action of the herbal supplements on the liver. Occasionally, herbal supplements may also interact with conventional drugs. The present review focusses on a few herbs such as *Aloe barbadensis*, *Atractylis gummifera*, *Centella asiatica*, *Mitragyna speciosa*, *Morinda citrifolia*, *Larea tridentata*, *Symphytum officinale*, *Teucrium chamaedrys* and *Xanthium strumarium*, which are reported to cause hepatotoxicity in humans and animals. Prior knowledge on hepatotoxicity caused by herbs may be beneficial for clinicians and medical practitioners.

In vitro and *in vivo* wound healing studies of methanolic fraction of *Centella asiatica* extract

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Ethnopharmacological relevance: Asiaticoside is claimed as a bioactive compound capable of wound healing. In order to ensure that the pharmacological activity of the extract is traceable and measurable, the present study attempted to evaluate the bioactivity of rich fractionated extract of asiaticoside. **Aim of the study**: The current study evaluates the wound healing efficacy via *in vitro* scratch assay and *in vivo* circular wound excision model. **Materials and methods**: The ethanol extract was fractionated into seven fractions via vacuum liquid chromatography. The compound of interest in the fractions was qualitatively identified using thin layer chromatography and the positive fraction containing asiaticoside was further quantified using reverse-phase HPLC. The asiaticoside-rich fraction was subjected to (i) colorimetric MTT (methylthiazoltetrazolium) cytotoxicity assay following incubation with human dermal fibroblast (HDF) and human dermal keratinocyte (HaCaT); (ii) *in vitro* 12-well plate scratch assay (using HDF and HaCaT cells) and (iii) topically apply (40%, 10% and 2.5%, w/w) on *in vivo* circular wound excision of rabbits. Data on wound contraction, epithelisation period, hydroxyproline content and histophatological analysis was collected from *in vivo* study. **Results**: The results showed that the methanol fraction of the extract contained about 2.4% asiaticoside. Based on the results of colorimetric MTT (methylthiazoltetrazolium) cytotoxicity assay, both HDF and HaCaT showed significant stimulation upon application of the methanolic fraction of extract at concentrations of 100 µg/mL and 0.19 µg/mL. The methanol fraction showed almost no toxicity effect at the concentrations tested since their IC_{50} could not be determined in concentrations ranging from 100 g/mL to 0.19 µg/mL. Since all the concentrations tested allowed for more than 90% cell viability, the concentrations chosen for the scratch assay were randomly chosen and designated as highest (100 g/mL), medium (6 g/mL) and lowest (0.2 µg/mL) concentrations. In the scratch assay, methanol fraction of extract with concentration of 0.2 µg/mL and 100 g/mL showed significant effect on HDF and HaCaT compared to the positive control ($p < 0.05$). *In vivo*, it was shown that the methanol fraction of the extract induced collagen synthesis. Histopathology data also concluded that dose-dependent effect of the tested extract as a wound healer was present. **Conclusions**: Taken together, recent findings suggest that methanol fraction of *C. asiatica* demonstrated remarkable polyvalent activity, and thus has potential as an effective wound healer. In conclusion, the claim of the presence of wound healing properties in *C. asiatica* had been well supported based on the results obtained in this study.

In vitro anti-bacterial activity of *Eurycoma jack* (tongkat ali) root extract

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Introduction: Currently, researchers are aiming to explore herbal plants to replace synthetic drugs because herbal plants contain high active compounds and fewer side effects. Our study was done to determine the antibacterial activity of *Eurycoma longifolia Jack* (*E. longifolia*) root using ethanol based extract. **Methods**: Five types of pathogenic bacterial strains were used; Gram-positive (*Staphylococcus aureus* and *Bacillus cereus*) and Gram-negative (*Escherichia coli*, *Salmonella typhi* and *Pseudomonas aeruginosa*). Disc diffusion assay and Minimum Inhibitory Concentration (MIC) tests were used to determine the inhibition zone and turbidity of suspension which reflects the antibacterial activity of the extract. **Results**: The ethanolic extract of *E. longifolia Jack* root extract showed positive results against Gram-positive bacteria (*S. aureus* and *B. cereus*) and Gram-negative (*S. typhi*). *B.cereus* and *S.typhi* showed inhibition zone values of 11.76mm and 14.33mm at the extract concentration of 150mg/ml that were higher than the positive control values (9.00, 12.67mm) respectively. However, *E. coli* and *P. aeruginosa* did not show any inhibition by the ethanol-based extract. Conclusion: From the results we can conclude that *E. Longifolia* root extract possesses antibacterial activity that can be further explored to produce new medicinal products.

In vitro anticancer activity of Au, Ag nanoparticles synthesized using *Commelina nudiflora* L. aqueous extract against HCT-116 colon cancer cells

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Recently, metal nanoparticles have been getting great medical and social interests due to their potential physico-chemical properties such as higher affinity, low molecular weight, and larger surface area. The biosynthesized gold and silver nanoparticles are spherical, triangular in shape with an average size of 24–150 nm as reported in our earlier studies. The biological properties of synthesized gold and silver nanoparticles are demonstrated in this paper. The different *in vitro* assays such as MTT, flow cytometry, and reverse transcription polymerase chain reaction (RTqPCR) techniques were used to evaluate the in vitro anticancer properties of synthesized metal nanoparticles. The biosynthesized gold and silver nanoparticles have shown reduced cell viability and increased cytotoxicity in HCT116 colon cancer cells with IC_{50} concentration of 200 and 100 μg/ml, respectively. The flow cytometry experiments revealed that the IC_{50} concentrations of gold and silver nanoparticle-treated cells that

have significant changes were observed in the sub-G1 cell cycle phase compared with the positive control. Additionally, the relative messenger RNA (mRNA) gene expressions of HCT-116 cells were studied by RT-qPCR techniques. The pro-apoptotic genes such as PUMA (++), Caspase-3 (+), Caspase-8 (++), and Caspase9 (++) were upregulated in the treated HCT-116 cells compared with cisplatin. Overall, these findings have proved that the synthesized gold and silver nanoparticles could be potent anti-colon cancer drugs.

In vitro antiproliferative and apoptosis inducing effect of *Allium atroviolaceum* bulb extract on breast, cervical, and liver cancer cells

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Natural products are considered potent sources for novel drug discovery and development. The multiple therapeutic effects of natural compounds in traditional medicine motivate us to evaluate the cytotoxic activity of bulb of *Allium atroviolaceum* in MCF7 and MDA-MB-231, HeLa and HepG2 cell lines. The bulb methanol extract of *A. atroviolaceum* was found to be an active cell proliferation inhibitor at the time and dose dependent manner. Determination of DNA content by flow cytometry demonstrated S and G2/M phase arrest of MCF-7 cell, correlated to Cdk1 downregulation, S phase arrest in MDA-MB-231 which is p53 and Cdk1-dependent, sub-G0 cell cycle arrest in HeLa aligned with *Cdk1* downregulation, G0/G1, S, G2/M phase arrest in HepG2 which is p53-dependent. Apoptosis as the mechanism of cell death was confirmed by morphology study, caspases activity assay, as well as apoptosis related gene expression, Bcl-2. Caspase-8, -9, and -3 activity with downregulation of Bcl-2 illustrated occurrence of both intrinsic and extrinsic pathways in MCF7, while caspase-3 and -8 activity revealed extrinsic pathway of apoptosis, although Bcl-2 downregulated. In HeLa cells, the activity of caspase-9 and -3 and downregulation of Bcl-2 shows intrinsic pathway or mitochondrial pathway, whereas HepG2 shows caspase independent apoptosis. Further, the combination of the extract with tamoxifen against MCF7 and MDA-MB-231 and combination with doxorubicin against HeLa and HeG2 demonstrated synergistic effect in most concentrations, suggests that the bulb of A. atroviolaceum may be useful for the treatment of cancer lonely or in combination with other drugs.

Investigation of tiger milk mushroom medicinal mushroom, *Lignosus rhinocerotis* (*Agaricomycetes*) as an anti-ulcer agent

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The aim of this study was to determine the antiulcer activity of *Lignosus rhinocerotis* in rats. A total of 48 Sprague-Dawley rats were used in ethanol-induced, aspirin-induced, and water immersion-restraint stress-induced ulcer models. Rats were equally divided into 4 groups for each model and

orally administered 5 mL/kg distilled water, 20 mg/kg omeprazole, as well as 250 and 500 mg/kg of *L. rhinocerotis* powder. *L. rhinocerotis* powder at both 250 and 500 mg/kg doses demonstrated significant ($P < 0.05$) protection against gastric ulceration in all the induced ulcer models. Histological studies revealed severe damage and hemorrhage of gastric mucosa in the negative control group for all ulcer-induced models. The study suggests that *L. rhinocerotis* powder possesses dose-dependent antiulcer activity in the gastric mucosa, as ascertained grossly and histologically, compared with the negative control groups.

Lipid lowering effects of *Piper sarmentosum* extract in ovariectomy-induced obese rats

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This study was conducted to evaluate the effects of *Piper sarmentosum* (PS) water extract on plasma lipid profile in ovariectomizedinduced obese rats. Forty-two female Sprague-Dawley rats were divided into six groups; four treatments (sham, control, PS and glycyrrhizic acid (GCA)) and two basal (control and sham). All groups underwent ovariectomy excluding sham groups which underwent sham operationand left for 1 month. Basal groups were sacrificed on day 0, while ovariectomized groups were given PS extract (0.125g/kg), GCA (0.120g/kg) and water respectively, while sham received only water. Lipid profile was measured at 0, 3 and 5 months of treatment. Liver tissues were taken for bioactivity of HMG-CoA reductase enzyme analysis. Our results showed that all the ovariectomized groups had a significant improvement ($p<0.05$) in the lipid profile compared to the sham group after 3 and 5 months of treatment respectively. However, in the GCA treated group the HDL-c increment and LDL-c reduction was lesser ($p<0.05$) compared to the PS treated group. The HMG-CoA reductase enzyme activityin both PS and GCA treated groups showed a significant reduction ($p<0.05$). In conclusion, *Piper sarmentosum* water extract is suggested as a possible alternative therapy for hyperlipidemia based on the positive effects on lipid profile. Industrial relevance. *Piper sarmentosum* is used as herbal medicine for several illnesses in Malay traditional society. The current study have shown its potential properties in lowering plasma lipid profileusing in vivo approaches and may considered for human use after further studies.

Low dose *Marantodes pumilum* leaf and roots extracts preserved bone structure in ovariectomized rats

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Background: *Marantodes pumilum* var. alata, a phytoestrogen-rich herb, has been reported to exert protection on bone of estrogen-deficient animals against osteoporosis. However, comparative osteo-protective activity of its leaf and root extracts has not been fully elucidated. **Objective**: The aim of this study was to investigate and compare the osteo-protective effects of aqueous leaf and root extracts of *Marantodes pumilum* var alata in ovariectomized rat model. **Methodology**: Twenty-seven female rats were divided into nine groups: sham-operated (Sham); ovariectomized control (OVXC);

64.5 µg kgG^{-1} $dayG^{-1}$ estrogen treatment (ERT); 20 mg kgG^{-1} $dayG^{-1}$ (MPv20), 50 mg kgG^{-1} $dayG^{-1}$ (MPv50) and 100 mg kgG^{-1} $dayG^{-1}$ (MPv100) doses leaf extract treatments and; 20 mg kgG^{-1} $dayG^{-1}$ (MPr20), 50 mg kgG^{-1} $dayG^{-1}$ (MPr50) and 100 mg kgG^{-1} $dayG^{-1}$ (MPr100) doses root extract treatment groups. After 8 weeks treatment period, the left femora were excised and investigated using Micro-computed tomography (µ-CT). Results were analysed using one-way ANOVA and Tukey's post hoc test. **Results**: The MPv20, MPv50 and MPr20 groups showed significantly higher ($p< 0.05$) bone mineral density on the trabecular bone while all treatment groups recorded significantly higher ($p< 0.05$) tissue mineral density on the cortical bone when compared with OVXC group. Trabecular bone number and separation were significantly higher and lower ($p< 0.05$), respectively, in both MPv20 and MPr20 groups. Significantly higher ($p< 0.05$) cortical bone area fraction and thickness in MPv20 group and medullary area in MPr20 group were observed. **Conclusion**: Lower dose (20 mg kgG^{-1} $dayG^{-1}$) of both leaf and root extracts of *Marantodes pumilum* var alata preserved bone mineral density and micro-architecture of estrogen-deficient rats better than higher doses.

Low level of cyclooxygenase-2 transcript in the spleen of lymphoma rats supplemented with garlic powder

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Objective: In this study, we evaluate the transcription levels of COX-2 in the spleen of lymphoma rats supplemented with garlic powder. **Methods**: Three groups of rats were equally divided into control (n= 3), lymphoma (n= 3), and lymphoma supplemented with garlic powder (n= 3) groups. Lymphoma was induced via administration of *N*-methyl-*N*-nitrosourea (MNU) intraperitoneally 4 times in 2 week periods. Garlic powder mixed with ground commercial rat diet was given daily at 5% of feed intake, starting at day 1 of MNU exposure. All rats were kept for 24 weeks before spleen samples were collected and extracted for total RNA. The transcription levels of COX-2 transcript in the total RNA were determined using quantitative real-time reverse transcriptase polymerase chain reaction assay. The total RNA was converted into cDNA followed by amplification of COX-2 and beta-actin genes. **Results**: Results of the amplification of COX-2 transcripts were normalized with the housekeeping gene, beta-actin. The relative transcription level of COX-2 transcript in the spleen of lymphoma rats was 1.941 ± 0.131 fold higher ($p< 0.05$) than control rats (1.00 ± 0.001 fold), while the transcription levels in the spleen of lymphoma rats supplemented with garlic was significantly lower (0.423 ± 0.239 SE fold) than the lymphoma rats that received no supplementation of garlic powder. **Conclusion**: The findings suggest that garlic powder reduces the transcription of COX-2 transcript in the spleen of lymphoma rats

Nanoencapsulation, an Efficient and Promising Approach to Maximize Wound Healing Efficacy of Curcumin: a Review of New Trends and State-of-the-Art

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Wound healing is a multifarious and vibrant process of replacing devitalized and damaged cellular structures, leading to restoration of the skin's barrier function, re-establishment of tissue integrity, and maintenance of the internal homeostasis. Curcumin (CUR) and its analogs have gained widespread recognition due to their remarkable anti-inflammatory, anti-infective, anticancer, immunomodulatory, antioxidant, and wound healing activities. However, their pharmaceutical significance is limited due to inherent hydrophobic nature, poor water solubility, low bioavailability, chemical instability, rapid metabolism and short half-life. Owing to their pharmaceutical limitations, newer strategies have been attempted in recent years aiming to mitigate problems related to the effective delivery of curcumanoids and to improve their wound healing potential. These advanced strategies include nanovesicles, polymeric micelles, conventional liposomes and hyalurosomes, nanocomposite hydrogels, electrospun nanofibers, nanohybrid scaffolds, nanoconjugates, nanostructured lipid carriers (NLCs), nanoemulsion, nanodispersion, and polymeric nanoparticles (NPs). The superior wound healing activities achieved after nanoencapsulation of the CUR are attributed to its target-specific delivery, longer retention at the target site, avoiding premature degradation of the encapsulated cargo and the therapeutic superiority of the advanced delivery systems over the conventional delivery. We have critically reviewed the literature and summarize the convincing evidence which explore the pharmaceutical significance and therapeutic feasibility of the advanced delivery systems in improving wound healing activities of the CUR and its analogs.

Natural luteolin from methanolic extract of Malaysian *Brucea javanica* leaves induces apoptosis in HeLa cell lines

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There are a growing number of deaths of cancer patients due to toxicity of conventional chemotherapy. Therefore, continuous discovery of natural anticancer compounds with cytoselective actions would be an ideal strategy to overcome the problem. Thus, natural products from plant are still the alternative source in the search for anticancer drugs that can have a direct effect on both cancer cell removal and also minimize the side effects to the patients. Based on the traditional usage and pharmaceutical potential of *Brucea javanica* reported before, a study on the leaves of this plant

was carried out. The aims of the study were to isolate the bioactive compound from *B. javanica* Leaves (BJL) extracts *via* bioassayguided fractionation using several selected cancer cell lines, to determine the mode of cancer cell death induced by BJL's active compound and the molecular mechanism of apoptosis implicated in cancer cell lines by measuring the level of apoptotic protein expression such as bax, bcl-XL, caspase-3 and tumour suppressor p53. Among three crude extracts of BJL, methanol was the most potent against selected cancer cell lines which consist of cervical, breast, bone, ovarian and liver cancer cells. Cisplatin was used as positive control for the antiproliferative assay. Using a bioassay-guided fractionation, chromatography, NMR and mass spectrometry analysis we have isolated luteolin. It is a known compound from the flavonoid group which was found to be cytoselective. The IC_{50} value for HeLa is 8.02 µg/ml while for Vero is > 99 µg/ml. Hoechst 33258 staining and flow cytometric analysis of Annexin V-FITC staining revealed that luteolin induces apoptotic cell death in cervical cancer cell HeLa. Flow cytometric analysis also showed that luteolin induces apoptosis by increasing the p53, bax and caspase-3 protein expression.

Phenolic rich extract from *Clinacanthus nutans* attenuates hyperlipidemia-associated oxidative stress in rats

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Clinacanthus nutans is used as traditional medicine in Asia but there are limited scientific studies to support its use. In this study, the stem and leaf of *C. nutans* were extracted using solvents of differing polarities, and their antioxidant capacities were determined using multiple antioxidant assays. The water and aqueous methanolic leaf extracts were further fractionated and their antioxidant capacities and phenolic compositions were tested. Furthermore, the efficacies of the water and aqueous methanolic leaf extracts were tested against hyperlipidemia-induced oxidative stress in rats. Serum and hepatic antioxidant and oxidative stress markers were tested after feeding the rats with high fat diet together with the extracts or simvastatin for 7 weeks. The results indicated that both leaf extracts attenuated oxidative stress through increasing serum antioxidant enzymes activity and upregulating the expression of hepatic antioxidant genes. Multiple phenolic compounds were detected in the extracts and fractions of *C. nutans*, although protocatechuic acid was one of the most abundant and may have contributed significantly towards the bioactivities of the extracts. However, synergistic effects of different phenolics may have contributed to the overall bioactivities. *C. nutans* can be a good source of functional ingredients for the management of oxidative stress-related diseases.

Piper betle induced cytoprotective genes and proteins via the NRF2/are pathway in aging mice

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Background/Aims: The objective of this study was to elucidate the underlying antioxidant mechanism of aqueous extract of *Piper betle* (PB) in aging rats. The nuclear factor erythroid 2-related factor 2 (Nrf2)/ARE pathway involving phase II detoxifying and antioxidant enzymes plays an important role in the antioxidant system by reducing electrophiles and reactive oxygen species through induction of phase II enzymes and proteins. **Methods**: Genes and proteins of phase II detoxifying antioxidant enzymes were analyzed by QuantiGenePlex 2.0 Assay and Western blot analysis. **Results**: PB significantly induced genes and proteins of phase II and antioxidant enzymes, NAD(P)H quinone oxidoreductase 1, and catalase in aging mice ($p < 0.05$). The expression of these enzymes were stimulated via translocation of Nrf2 into the nucleus, indicating the involvement of ARE, a cis-acting motif located in the promoter region of nearly all phase II genes. **Conclusions**: PB was testified for the first time to induce cytoprotective genes through the Nrf2/ARE signaling pathway, thus unraveling the antioxidant mechanism of PB during the aging process.

Piper betle L. modulates senescence-associated genes expression in replicative senescent human diploid fibroblasts

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Piper betle (PB) is a traditional medicine that is widely used to treat different diseases around Asian region. The leaf extracts contain various bioactive compounds, which were reported to have antidiabetic, antibacterial, anti-inflammatory, antioxidant, and anticancer effects. In this study, the effect of PB aqueous extracts on replicative senescent human diploid fibroblasts (HDFs) was investigated by determining the expressions of senescence-associated genes using quantitative PCR. Our results showed that PB extracts at 0.4 mg/ml can improve cell proliferation of young (143%), presenescent (127.3%), and senescent (157.3%) HDFs. Increased expressions of *PRDX6, TP53, CDKN2A, PAK2*, and *MAPK14* were observed in senescent HDFs compared to young and/or presenescent HDFs. Treatment with PB extracts modulates the transcriptional profile changes in senescent HDFs. By contrast, expressions of *SOD1* increased, whereas *GPX1, PRDX6, TP53, CDKN2A, PAK2*, and *MAPK14* were decreased in PB-treated senescent HDFs compared to untreated senescent HDFs. In conclusion, this study indicates the modulation of PB extracts on senescenceassociated genes expression of replicative senescent HDFs. Further studies warrant determining the mechanism of PB in modulating replicative senescence of HDFs through these signaling pathways.

Piper Sarmentosum effects on 11 β-hydroxysteroid dehydrogenase type 1 enzyme in serum and bone in rat model of glucocorticoid-induced osteoporosis

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Glucocorticoid-induced osteoporosis is one of the common causes of secondary osteoporosis. *Piper sarmentosum* (Ps) extract possesses antioxidant and anti-inflammatory activities. In this study, we determined the correlation between the effects of Ps leaf water extract with the regulation of 11β -hydroxysteroid dehydrogenase (HSD) type 1 enzyme activity in serum and bone of glucocorticoid-induced osteoporotic rats. Twenty-four Sprague-Dawley rats were grouped into following: G1: sham-operated group administered with intramuscular vehicle olive oil and vehicle normal saline orally; G2: adrenalectomized (adrx) control group given intramuscular dexamethasone (120 µg/kg/day) and vehicle normal saline orally; G3: adrx group given intramuscular dexamethasone (120 µg/kg/day) and water extract of *Piper sarmentosum* (125 mg/kg/day) orally. After two months, the femur and serum were taken for ELISA analysis. Results showed that Ps leaf water extract significantly reduced the femur corticosterone concentration ($p < 0.05$). This suggests that Ps leaf water extract was able to prevent bone loss due to long-term glucocorticoid therapy by acting locally on the bone cells by increasing the dehydrogenase action of 11β -HSD type 1. Thus, Ps may have the potential to be used as an alternative medicine against osteoporosis and osteoporotic fracture in patients on long-term glucocorticoid treatment.

Promotion of HepG2 cell apoptosis by flower of *Allium atroviolaceum* and the mechanism of action

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Background: Liver cancer is a high incidence and fatal disease, the fifth most frequent cancer worldwide that is usually diagnosed at an advanced stage. The number of deaths from liver cancer has not declined even following various therapies. Plant secondary metabolites and their semi-synthetic derivatives play a principal role in anticancer drug therapy, since they are effective in the treatment of specific characteristics while also reducing side effects. *Allium atroviolaceum*, a plant of the genus Allium has been used in folk medicine to protect against several diseases. However, cytotoxicity and the anti-proliferative effect of *Allium atroviolaceum* remain unclear. This work aims to investigate the anticancer properties of *Allium atroviolaceum* and the mechanism of action. **Methods**: To evaluate the *in vitro* cytotoxicity of flower *of Allium atroviolaceum*, methanol extract at a dose range from 100 to 3.12 g/ml was assessed against the HepG2 hepatocarcinoma cell line, and also on normal 3T3 cells, by monitoring proliferation using the MTT assay method. A microscopy study was undertaken to observe morphological changes of HepG2 cells after treatment and cell cycle arrest and apoptosis were studied using flow cytometry. The apoptosis mechanism of action was assessed by the level of caspase-3 activity and expression of apoptosis related genes, *Bcl-2, Cdk1* and *p53*. The combination effect of the methanolic extract with doxorubicin was also investigated by determination of a combination index. **Results**: The results demonstrated growth inhibition of cells in both dose- and time-dependent manners, while no cytotoxic effect on normal cell 3T3 was found. The results revealed the occurrence of apoptosis, illustrated by sub-G0 cell cycle arrest, the change in morphological feature and annexin-V and propidium iodide staining, which is correlated with *Bcl-2* downregulation and caspase-3 activity, but *p53*-independent. In addition, a combination of *Allium*

atroviolaceum and doxorubicin led to a significant synergistic effect. **Conclusion**: These findings suggest that *Allium atroviolaceum* flower extract has potential as a potent cytotoxic agent against HepG2 cell lines, as it has commendable anti-proliferative activities against human hepatocarcinoma and it can be considered as an effective adjuvant therapeutic agent after the clinical trials.

Protective effects of saffron extract and crocin supplementation on fatty liver tissue of high-fat diet-induced obese rats

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Background: Saffron is the dried stigma of *Crocus sativus* L. flower which commonly used as a natural remedy to enhance health and even fights disease in the Middle-East and Southeast Asian countries. **Methods**: This study was aimed to investigate protective effect of saffron extract and crocin in fatty liver tissue of high-fat diet induced obese rats. A total of 36 healthy male Sprague Dawley rats were divided into six groups. Two groups served as controls, a normal diet (ND) and a high-fat diet (HFD). The other four groups were each supplemented with saffron extract and crocin at concentrations of 40 and 80 mg/kg body weight/day for 8 weeks. All groups except ND were fed with HFD until end of the study. At baseline, blood sample was collected for determination of levels of hepatic marker enzymes, including aspartate aminotransferase, alanine aminotransferase, alkaline phosphatise and albumin. Liver sample was collected, weighed and stained with haematoxylin and eosin for further histopathological examination. **Results**: Saffron extract and crocin at concentrations of 40 and 80 mg/kg had dose-dependently alleviated levels of liver enzymes and histopathological changes in diet-induced obese rat model compared to control (HFD group). **Conclusion**: This study suggested that saffron extract and crocin supplements have hepatoprotective effect against non-alcoholic fatty liver disease and HFD-induced liver damage.

Quantitative analysis of minerals in the selected formulations of spices and herbs using ICP-MS

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The purpose of this study was to assess minerals contents of three different formulations of spices and herbs, that is mixed herbs (F1), mixed spices (F2) and mixed spices & herbs (F3) predominantly formulated for general health and wellbeing. Minerals namely K, Ca, Mg, Cr, Mn, Zn, Cu and Fe, which are considered vital for good health were studied. The samples were processed, digested and the aforementioned minerals were quantitatively analyzed in the said formulations of spices and herbs by using ICP-MS. The analysis was performed in triplicates and the post-hoc (tukey) test was applied to determine the mean difference amongst the mineral contents of the three formulations with $p< 0.05$ was considered significant. The formulation F1 (mixed herbs) showed significantly ($p< 0.05$) higher contents of Mg, K, Ca, Fe, Cu and Zn, whereas the F2 (mixed spices) and F3 (mixed spices and herbs) showed significantly ($p< 0.05$) higher contents of Mn and Cr respectively. The high mineral contents in the three formulations particularly the F1 makes them nutritionally effective to control various diseases occurring due to mineral deficiencies.

Recent updates in neuroprotective and neuroregenerative potential of *Centella asiatica*

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Centella asiatica, locally well known in Malaysia as pegaga, is a traditional herb that has been used widely in Ayurvedic medicine, traditional Chinese medicine, and in the traditional medicine of other Southeast Asian countries including Malaysia. Although consumption of the plant is indicated for various illnesses, its potential neuroprotective properties have been well studied and documented. In addition to past studies, recent studies also discovered and/or reconfirmed that *C. asiatica* acts as an antioxidant, reducing the effect of oxidative stress *in vitro* and *in vivo*. At the *in vitro* level, *C. asiatica* promotes dendrite arborisation and elongation, and also protects the neurons from apoptosis. *In vivo* studies have shown that the whole extract and also individual compounds of *C. asiatica* have a protective effect against various neurological diseases. Most of the *in vivo* studies on neuroprotective effects have focused on Alzheimer's disease, Parkinson's disease, learning and memory enhancement, neurotoxicity and other mental illnesses such as depression and anxiety, and epilepsy. Recent studies have embarked on finding the molecular mechanism of neuroprotection by *C. asiatica* extract. However, the capability of *C. asiatica* in enhancing neuroregeneration has not been studied much and is limited to the regeneration of crushed sciatic nerves and protection from neuronal injury in hypoxia conditions. More studies are still needed to identify the compounds and the mechanism of action of *C. asiatica* that are particularly involved in neuroprotection and neuroregeneration. Furthermore, the extraction method, biochemical profile and dosage information of the *C. asiatica* extract need to be standardised to enhance the economic value of this traditional herb and to accelerate the entry of *C. asiatica* extracts into modern medicine.

Saffron extract and crocin reduced biomarkers associated with obesity in rats fed a high-fat diet

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Introduction: This study aimed to investigate the effect of saffron extract and crocin on blood biomarkers associated with obesity using the rat model. **Methods**: Obesity was induced by feeding a high-fat diet to 42 male Sprague-Dawley rats for 12 weeks, after which they were equally distributed into seven groups. Three groups served as controls namely, normal diet (ND), high-fat diet (HFD), and high-fat diet plus orlistat (HFD + ORL), while the remaining four treatment groups consisted of HFD added low or high dose (40 and 80 mg/kg/day) of either saffron extract or crocin in the food. At the end of 8 weeks, blood samples were collected by cardiac puncture for biochemical analysis. **Results**: Obese rats treated with a high dose of saffron extract and crocin showed significantly lower plasma glucose levels (5.26 and 5.67 mmol/L respectively) than the HFD rats (6.92 mmol/L). Saffron extract and crocin at a high dose showed significantly lower levels of plasma insulin (3.97 and 3.88 ng/mL respctively) compared to HFD control (5.41 ng/mL). Adiponectin levels significantly increased in obese rats fed saffron extract and crocin at high doses (7.44 and 7.92 µg/mL respectively) compared to HFD control (5.34 µg/mL). Ghrelin level significantly increased from 419.10 to 284.10 pg/mL, while leptin level significantly decreased from 8.08 to 5.68 ng/mL for the high dose crocin groups compared to HFD control. No significant differences in plasma serotonin levels were found among the groups. **Conclusion**: Saffron extract and crocin show potential in reducing blood biomarkers associated with obesity as well as anti-inflammatory and regulatory potential of adipocytokines in an animal model.

Tetrapleura tetraptera spice attenuates high-carbohydrate, high-fat diet-induced obese and type 2 diabetic rats with metabolic syndrome features

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Background: Tetrapleura tetraptera, a seasoning and nutritive spice is also used in western African folk medicine in the management of wide variety of diseases including diabetes, inflammation and hypertension. Flavonoids and saponins are some abundant secondary metabolic constituents in the fruits of this plant. This study aimed at evaluating the potential therapeutic action of the polyphenol-rich hydroethanolic extract (HET) of this fruit in experimentally induced obese and type 2 diabetic rats (T2DM) with characteristic metabolic syndrome (MetS). **Methods**: MetS was induced in rats by high-carbohydrate, high-fat diet and administration of low-dose streptozotocin. Then different oral doses

of HET (200 and 400 mg/kg) were administered to T2DM rats for 28 days. A standard antidiabetic drug, metformin (300 mg/kg), was used for comparison. The body weight, systolic blood pressure, oxidative stress and metabolic parameters were then assessed to evaluate the effect of HET on MetS. **Results**: HET reduced weight gain, fasting blood glucose and plasma insulin levels as well as homeostasis model assessment of insulin resistance (HOMA-IR) and alleviated obesity and T2DM associated oxidative stress and hypertension in rats. Moreover, a significantly hypolipidemic property and an attenuation of liver injury and tissue steatosis was observed after HET administration. HET further demonstrated its anti-inflammation effect via down regulation of tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), C-reactive protein (CRP), leptin and an increase in adiponectin. The HET exhibited dose-dependent effects which were comparable to that of metformin. **Conclusions**: The present study thereby demonstrates the anti-insulin resistance, antilipidemic, anti-obesity, hypotensive and anti-inflammatory properties of HET; hence it has the potential to be further developed for the management of MetS such as obesity, T2DM and hypertension.

The effects of *Cosmos caudatus* (ulam raja) on detoxifying enzymes in extrahepatic organs in mice

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Ulam Raja' or *Cosmos caudatus* is a common appetizer (ulam) consumed by the Malay community in Malaysia. However, in vivo studies pertaining to its antioxidant and chemoprotective properties are lacking. This study was done to determine the effects of *Cosmos caudatus* on detoxifying enzymes in extrahepatic organs (lungs, kidneys and stomach) in mice. Thirty adult male white mice were treated orally for 21 days with different doses of 'Ulam Raja' aqueous extract (UR) (100, 500, 1000 mg/kg). The control group was given normal saline by oral gavage. Mice fed with diet containing 0.5% butylated hydroxyanisole (BHA) were used as positive control. After 21 days, the mice were sacrificed and extrahepatic organs were harvested. The activities of several detoxifying enzymes [catalase (CAT), superoxide dismutase (SOD), glutathione S-transferase (GST), DT-diaphorase (DTD)] were measured. Lipid peroxidation level was determined by measuring malondialdehyde (MDA) concentration. In lungs, 100, 500 & 1000 mg/kg UR oral supplementation resulted in significant increases in CAT, SOD and GST activities. DTD activity in lungs was significantly increased in mice treated with 1000 mg/kg UR. MDA levels in lungs were significantly decreased in mice treated with 100 mg/kg & 500 mg/kg UR but was significantly increased in mice treated with 1000 mg/kg UR. In kidneys, DTD activity was significantly increased in mice treated with 1000 mg/kg UR. In stomach, CAT activity was significantly increased in mice treated with 1000 mg/kg UR. The results showed that *Cosmos caudatus* supplementation in mice could protect extrahepatic organs from xenobiotic and oxidative injury. This indicates that consumption of 'Ulam Raja' might be a useful chemoprotective measure.

The effects of *Cosmos caudatus* (ulam raja) on the levels of expression of Nrf2 target genes in mice liver

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Journal of Pharmacy and Nutrition Sciences, Vol. 7, 2017, 147-157

Background: *Cosmos caudatus* (Ulam Raja) is an appetizer (ulam) eaten with rice in Malaysia. Previous studies showed that *Cosmos caudatus* possess high antioxidant content. Nrf2 is a transcription factor which regulates the expression of phase II enzymes and antioxidant proteins. The aim of this study is to investigate the effects of *Cosmos caudatus* aqueous extract (UR) on the expression of Nrf2 target genes in mice liver. **Methods**: ICR white mice were treated for 21 days with different doses of UR (100, 500, 1000 mg/kg) through oral gavage. Control mice were only given distilled water. After 21 days, the mice were sacrificed and their livers harvested. Total RNA was extracted, reverse transcribed and subjected to qPCR to detect Nrf2 target genes expression. **Results**: Administration of 100 mg/kg UR significantly increased NQO1 expression in mice liver. Administration of 500 mg/kg UR significantly increased HO-1 liver expression. Administration of 100 and 500 mg/kg UR significantly increased GSTA1 liver expression. Administration of 500 and 1000 mg/kg UR significantly increased GSTM3 liver expression, whereas GSTP and GSTM1 liver expression was significantly decreased at similar doses. Administration of all doses of UR significantly decreased the expression of GSTA3, SOD3 and GCLC in mice liver. **Conclusion**: UR administration mostly resulted in downregulation of Nrf2 target genes. However, conclusive evidence can only be made through the use of Nrf2 knockout mice or by performing Nrf2 nuclear translocation studies.

The effects of *Cosmos caudatus* (ulam raja) supplementation on serum and bone minerals levels in ovariectomized rats

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Cosmos caudatus (ulam raja) contains high mineral content and possesses high antioxidant activity which may be beneficial in bone disorder such as postmenopausal osteoporosis. The effects of *C. caudatus* on bone metabolism biomarkers in ovariectomized rats were studied. 48 Sprague-Dawley rats aged three months were divided into 6 groups. One group of rats was sham-operated while the remaining rats were ovariectomized. The ovariectomized rats were further divided into 5 groups: the control, three groups force-fed with *C. caudatus* at the doses of 100 mg/kg, 200 mg/kg or 300 mg/kg and another group supplemented with calcium 1% *ad libitum*. Treatments were given 6 days per week for a period of eight weeks. Blood samples were collected twice; before and after treatment. Parameters measured were bone resorbing cytokine; interleukin-1 and the bone biomarkers; osteocalcin and pyridinoline. Serum IL-1 and pyridinoline levels were significantly increased in ovariectomized rats. Supplementation of *C. caudatus* was able to prevent the increase of IL-1 and pyridinoline in ovariectomized rats. Besides that, *C. caudatus* showed the same effect as calcium 1% on biochemical parameters of bone metabolism in ovariectomized rats. In conclusion, *Cosmos caudatus* was as effective as calcium in preventing the increase in bone resorption in ovariectomized rats.

The spice for joint inflammation: anti-inflammatory role of curcumin in treating osteoarthritis

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Osteoarthritis is a degenerative disease of the joint affecting aging populations worldwide. It has an underlying inflammatory cause, which contributes to the loss of chondrocytes, leading to diminished cartilage layer at the affected joints. Compounds with antiinflammatory properties are potential treatment agents for osteoarthritis. Curcumin derived from Curcumaspecies is an anti-inflammatory compound as such. This review aims to summarize the antiosteoarthritic effects of curcumin derived from clinical and preclinical studies. Many clinical trials have been conducted to determine the effectiveness of curcumin in osteoarthritic patients. Extracts of Curcumaspecies, curcuminoids and enhanced curcumin, were used in these studies. Patients with osteoarthritis showed improvement in pain, physical function, and quality of life after taking curcumin. They also reported reduced concomitant usage of analgesics and side effects during treatment. In vitro studies demonstrated that curcumin could prevent the apoptosis of chondrocytes, suppress the release of proteoglycans and metal metalloproteases and expression of cyclooxygenase, prostaglandin E-2, and inflammatory cytokines in chondrocytes. These were achieved by blocking the activation of nuclear factor kappa-light-chain-enhancer of activated B cells (NF- κB) system in the chondrocytes, by preventing the activation of nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor, alpha, phosphorylation, and translocation of the p65 subunit of NF- κB complexes into the nucleus. In conclusion, curcumin is a potential candidate for the treatment of osteoarthritis. More well-planned randomized control trials and enhanced curcumin formulation are required to justify the use of curcumin in treating osteoarthritis.

The underlying mechanism of action for various medicinal properties of *Piper betle*

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Piper betle (betel) plant belongs to the Piperaceae family. Piper betle is widely known for its potent medicinal properties. Various active compounds are present in Piper. betle such as allylpyrocatechol, hydroxychavicol, piperbetol, ethylpiperbetol, piperol A, piperol B, chavibetol, and alkaloids which account for these beneficial medicinal properties. In the present narrative review, we looked into the various active compounds present in the Piper betle and attempted to understand their underlying mechanism of action. Proper understanding of the molecular biology involving the mechanism of action may help in better drug formulation and provide better therapeutic actions in the field of alternative and complementary medicine.

The use of *Piper sarmentosum* leaves aqueous extract (Kadukmy™) as antihypertensive agent in spontaneous hypertensive rats

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BMC Complementary and Alternative Medicine, Vol. 15(1), 2015, 54-63

Background: The National Health and Morbidity Survey in 2011 estimated that 35.1% (5.7 million) of Malaysian adults aged 18 and older suffer from hypertension. Hypertension is still treated by conventional medicine despite its exact aetiology being unknown. Studies showed that oxidative stress and low availability of nitric oxide (NO) causes an increase in vascular wall tension and increase blood pressure. *Piper sarmentosum* (PS) a traditional Malay herbal plant is well known for its high antioxidant content. Antioxidant is useful in improving cardiovascular diseases particularly hypertension. Thus, it is beneficial to determine the effect of PS leaves aqueous extract (Kadukmy™) on the blood pressure, NO level, oxidative stress markers and serum cholesterol level of the Spontaneous Hypertensive Rats (SHR). **Methods**: Rats were devided into five groups consisting of three treatment groups and two control groups. Baseline blood investigations were done before and following commencement of treatment. Spontaneous hypertensive rats were treated for 28 consecutive days and the blood pressure was measured weekly. **Results**: Kadukmy™ administration showed a significant reduction in systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) ($P< 0.05$), increased serum NO level ($P< 0.05$), reduced serum malondialdehyde (MDA) level ($P< 0.05$) and reduction of serum total cholesterol level in groups treated with Kadukmy-1™. **Conclusions**: The result of the present study revealed that Kadukmy™ exerts its antioxidant activity to reduce oxidative stress damage, increase NO production and able to reduce blood pressure and cholesterol level.

Time and dose-dependent effects of *Labisia Pumila* on the bone strength of postmenopausal osteoporosis rat model

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Background: Post-menopausal osteoporosis has long been treated and prevented by estrogen replacement therapy (ERT). Despite its effectiveness, ERT is associated with serious adverse effects. *Labisia pumila var. alata* (LP) is a herb with potential as an alternative agent to ERT due to its phytoestrogenic, antioxidative and anti-inflammatory effects on bone. This study aimed to determine the effects of LP supplementation on bone biomechanical strength of postmenopausal osteoporosis rat model. **Methods**: Ninety-six female Sprague–Dawley rats aged 4 to 5 months old were randomly divided into six groups; six rats in the baseline group (BL) and eighteen rats in each group of; Sham-operated (Sham), ovariectomised control (OVXC) and ovariectomised with daily oral gavages of Premarin at 64.5 g/kg (ERT), LP at 20 mg/kg (LP20) and LP at 100 mg/kg (LP100) respectively. These groups were subdivided into three, six and nine weeks of treatment periods. Rats in BL group were euthanized before the start of the study, while other rats were euthanized after completion of their

treatments. Femora were dissected out for biomechanical strength analysis using Instron Universal Model 5848 Micro Tester. **Results**: OVXC group showed deterioration in the bone biomechanical strength with time. Both ERT and LP supplemented rats showed improvements in bone strength parameters such as maximum load, displacement, stiffness, stress, and Young Modulus. The most improved bone strength was seen in rats given LP at the dose of 100 mg/kg for nine weeks. **Conclusion**: LP supplementation at 100 mg/kg was more effective than ERT in reversing ovariectomy-induced bone biomechanical changes.

Use of Chinese herbal medicine and health-related quality of life among cancer patients in Johor, Malaysia

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Malaysian Journal of Nutrition, Vol. 23(2), 2017, 227-238

Introduction: Chinese Herbal Medicine (CHM) is becoming increasingly popular among cancer patients worldwide. While health-related quality of life (HRQoL) in relation to cancer outcomes has attracted global attention, there are few studies on CHM use and HRQoL among cancer patients in Malaysia. This study attempted to determine the association between use of CHM, including the types, reasons, and beliefs, and HRQoL among Malaysian cancer patients. **Methods**: A cross-sectional study was conducted among 120 cancer patients (60 male and 60 female) recruited from government oncology clinics in Johor state. A purposive non-probability sampling was applied to recruit respondents. **Results**: Use of CHM was reported by about half of the patients (49.2%). Common types of CHM used included Chinese herbal extracts (27.5%), Sabah snake grass (12.2%), and ginger (11.5%). The median score for overall belief in CHM significantly differed between CHM users (71.7%) and non-users (65.0%) ($p<0.001$). The HRQoL was generally reported as 'good' with high scores for overall functioning scales and low scores for symptom scales. However, no significant difference in HRQoL between CHM users and non-users was noted. 'Social Functioning' scores between both groups showed a significant difference ($p< 0.001$) with respect to sex, with females scoring higher than males. No significant association was noted between CHM use and socio-demographic characteristics except for sex. **Conclusion**: There is a high prevalence of self-prescription of CHM among the cancer patients studied. Nonetheless use of CHM did not show any significant difference in terms of quality of life among CHM users.

Zerumbone-loaded nanostructured lipid carrier induces apoptosis in human colorectal adenocarcinoma (caco-2) cell line

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Nanoscience and Nanotechnology Letters, Vol. 8(4), 2016, 294-302

The incorporation of zerumbone (Zer) into nanostructured lipid carrier (NLC) is hypothesized to increase the efficacy of the drug. Nanostructured lipid carrier has sustained-drug release characteristics and is able to improve the solubility and bioavailability of the lipophilic drug. In this study, the anti-cancer effect of Zer was tested on human colorectal adenocarcinoma (Caco-2) cell line. The effect of

Zer, zerumbone-loaded nanostructured lipid carrier (Zer-NLC) and NLC on the Caco-2 cell viability were determined using the MTT assay. The treatment concentration ranges from 0 to 120 μM at four different time intervals (i.e., 0 h, 24 hrs, 48 hrs and 72 hrs) were evaluated. At 24 hrs, the half-growth inhibitory concentration (GI50) of Zer-NLC (i.e., 4.25 μM) is lower than that of Zer (i.e., 23.75 μM). However, Zer outperformed the Zer-NLC at the subsequent time points. Similar trend was observed in other parameters including the cytostatic concentration (CC) and half-lethal concentration 50 (LC50). Phase contrast imaging and AO/PI fluorescence staining were performed at the CC and LC50 values. The morphological changes and the apoptosis features could be seen in cells treated with Zer and Zer-NLC while cells treated with NLC showed minor morphological changes. The cells treated with Zer-NLC demonstrated a slightly slower progression of apoptosis, which could be due to the controlled release of Zer from the NLC matrix. It was concluded that the incorporation of Zer into NLC did not compromise the potency and efficacy of the drug.

Scope 10 | C

Experimental Nutrition

Oils and fats

Apoptosis gene network regulated by delta-tocotrienol in K562 chronic myeloid leukaemia cells

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Palm oil is rich in various health-beneficial phytonutrients. The vitamin E and the carotenoids make up a large portion of these phytonutrients. The tocotrienols are a relatively newer class of vitamin E isoforms that are actively being researched for its various health promoting properties. In this study, the anti-cancer properties of the delta-tocotrienol (δ-T3) isoform were investigated on a leukemic cell line. A preliminary cytotoxicity assay was carried out to identify δ-T3's potency in inducing cell death. Following this a real time-based gene array experiment was carried out to distinguish the apoptosis genes regulated by δ-T3 in the K562 leukemic cell line. Results show that treatment with δ-T3 significant regulated the expression of several genes that promote apoptosis such as *TP53, TP73, HRK, MCL1, CASP7, CASP8, DAPK1, PYCARD, FASLG* and *TNFRSF9*. These findings suggest that palm δ-T3 can exert anti-cancer activities in chronic myeloid leukemic cells.

Cardioprotective effect of virgin coconut oil in heated palm oil diet-induced hypertensive rats

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Context: Virgin coconut oil (VCO) contains high antioxidant activity which may have protective effects on the heart in hypertensive rats. **Objectives**: The study investigated the effects of VCO on blood pressure and cardiac tissue by measuring angiotensin-converting enzyme (ACE) activity and its histomorphometry in rats fed with a heated palm oil (HPO) diet. **Materials and methods**: Thirty-two male Sprague–Dawley rats were randomly divided into four groups: (i) control, (ii) orally given VCO (1.42 ml/kg), (iii) fed with a HPO (15%) diet, and (iv) fed with a HPO diet and supplemented with VCO (1.42 ml/kg, po) (HPO+VCO) for 16 weeks. Blood pressure was measured monthly. After 16 weeks, rat hearts were dissected for lipid peroxidation (TBARS) and ACE activity measurement and histomorphometric study. **Results**: Systolic blood pressure was significantly increased in the HPO group compared with the control starting at week eight (112.91 ± 1.32 versus 98.08 ± 3.61 mmHg, $p< 0.05$) which was prevented by VCO supplementation (91.73 ± 3.42 mmHg). The consumption of HPO increased TBARS and ACE activity in heart, which were inhibited by VCO supplementation. The increases in the myofiber width and area as well as nuclear size reduction in the HPO group were significantly prevented by VCO supplementation. **Conclusion**: These results suggested that VCO supplementation possesses a cardioprotective effect by preventing the increase in blood pressure via an antioxidant mechanism and remodeling in rats fed repeatedly with a HPO diet.

Changes in blood pressure, vascular reactivity and inflammatory biomarkers following consumption of heated corn oil

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Consumption of corn oil for cooking purpose is gaining popularity. The present study examined the effect of heated corn oil on blood pressure and its possible mechanism in experimental rats. Thirty male Sprague-Dawley rats were randomly divided into 5 groups and were fed with the following diets, Group I was fed with basal diet only; whereas group II, III, IV and V were fed with basal diet fortified with 15% (w/w) either fresh, once-heated, five-timesheated or ten-times-heated corn oil, respectively for 16 weeks. Body weight, blood pressure were measured at baseline and weekly interval for 16 weeks. Inflammatory biomarkers which included soluble intracellular adhesion molecules (sICAM), soluble vascular adhesion molecules (sVCAM) and C reactive protein (CRP), were measured at baseline and the end of 16 weeks. The rats were sacrificed and thoracic aorta was taken for measurement of vascular reactivity. There was significant increase in the blood pressure in the groups fed with heated once, five-times (5HCO) and ten-timesheated corn oil (10-HCO) compared to the control. The increase in the blood pressure was associated with an increase in CRP, sICAM and sVCAM, reduction in vasodilatation response to acetylcholine and greater vasoconstriction response to phenylephrine. The results suggest that repeatedly heated corn oil causes elevation in blood pressure, vascular inflammation which impairs vascular reactivity thereby predisposing to hypertension. There is a need to educate people not to consume corn oil in a heated state.

Comparison between tocotrienol and omeprazole on gastric growth factors in stress-exposed rats

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World Journal of Gastroenterology, Vol. 23(32), 2017, 5887-5894

Aim: To investigate and compare the effects of tocotrienol and omeprazole on gastric growth factors in rats exposed to water-immersion restraint stress (WIRS). **Methods**: Twenty-eight male Wistar rats were randomly assigned to four groups of seven rats. The two control groups were administered vitamin-free palm oil (vehicle) and the two treatment groups were given omeprazole (20 mg/kg) or tocotrienol (60 mg/kg) by oral gavage. After 28 d of treatment, rats from one control group and both treated groups were subjected to WIRS one time for 3.5 h. Gastric lesions were measured and gastric tissues were obtained to measure vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), basic fibroblast growth factor (bFGF), and transforming growth factor-alpha (TGF-α) mRNA expression. **Results**: Rats exposed to WIRS for 3.5 h demonstrated the presence of considerable ulcers in the form of gastric erosion. The lesion index in the stressed control (S) group was increased ($P< 0.001$) compared to the tocotrienol treated and omeprazole treated groups. Stress led to a decrease in gastric VEGF ($P< 0.001$), bFGF ($P< 0.001$) and TGF-α ($P< 0.001$) mRNA levels and caused an increase

in EGF mRNA (P< 0.001) that was statistically significant compared to the nonstressed control group. Although both treatment agents exerted similar ulcer reducing ability, only treatment with tocotrienol led to increased expression of VEGF (P= 0.008), bFGF (P= 0.001) and TGF-α (P= 0.002) mRNA. **Conclusion**: Tocotrienol provides gastroprotective effects in WIRS-induced ulcers. Compared to omeprazole, tocotrienol exerts a similar protective effect, albeit through multiple mechanisms of protection, particularly through up-regulation of growth factors that assist in repair of gastric tissue injuries.

Consumption of ADD-X and repeatedly heated palm oil on the blood pressure and oxidative stress markers in ovariectomized rats

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Background and Objective: Oxidative stress is connected with the pathogenesis of cardiovascular diseases. A series of deep-fat frying in dietary cooking oil produce more amount of reactive oxygen species. In this study, repeatedly heated palm oil and ADD-X were studied for its effect on the Blood Pressure (BP), lipid peroxidation and antioxidant parameters. **Methodology**: Thirty female Sprague-Dawley rats were divided into 5 groups with 6 rats each. All groups of the animals were ovariectomized after anesthetized. Group 1 was fed 2% cholesterol chow (Chol-C), groups 2 and 4, respectively fed 2% cholesterol chow along with 5 and 10 times heated palm oil (5 HPO and 10 HPO). Groups 3 and 5 were respectively given 2% cholesterol chow with 5 HPO and 10 HPO along with ADD-X. Duration of the feeding was 6 months. Systolic, diastolic and mean BP were monitored 4 weeks intervals using a non-invasive method. At the end of the study, blood was collected for oxidative stress and antioxidant parameters. **Results**: The BP was elevated significantly ($p<0.05$) in 10 HPO and 5 HPO groups, respectively, where the 10 HPO group viewing higher values. The Increased in BP was significantly lower in ADD-X treated groups. The level of thiobarbituric acid reactive substances (TBARS) was significantly increased in 5 HPO and 10 HPO treated animals and decrease antioxidant parameters compared to Chol-C animals. Consumption of ADD-X reduces TBARS and increase antioxidant enzymes. **Conclusion**: Repeatedly heated palm oil increases BP, lipid peroxidation and decrease antioxidant enzymes. Supplementation of ADD-X reversed the BP and reduce oxidative stress biomarkers in the post menopausal rat models.

Consumption of heated palm oil and its effect on kidney in rats

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This research studied the effects of heated palm oil on serum creatinine and kidney histological changes in rats. Forty female Sprague-Dawley rats were divided into four groups (I to IV). Group I was fed with normal rats chaw (control). The groups II, III and IV were fed with rat chaw fortified with 15% weight/weight (w/w) fresh palm oil (FPO), heated five times palm oil (5HPO) and heated ten times palm oil (10HPO), respectively for a period of 16 weeks. Blood for serum creatinine was taken and determined at baseline and at the end of the study period using commercial kit and Cobas integra

analyzer. The rats were sacrificed and the kidneys were weighed and examined histologically. The tissues were stained with haematoxylin and eosin. There was a significant reduction in the kidney's weight in 5HPO and 10HPO group compared to fresh and control group. At the end of 16 weeks there was a significant increase in serum creatinine in all study groups compared to the respective baseline. However, there was no significant difference in serum creatinine in the palm oil fed groups compared with control. Histologically, localized congestion was noted in the tubular region of the kidney in the group fed with FPO, while diffuse congestion was observed in the glomerulus and tubular region of the group fed with 5HPO and 10HPO. There was also evidence of chronic inflammation with lymphocytes infiltration located in the tubular region of the groups fed with 5HPO and 10HPO. The inflammatory changes were more severe in 10HPO compared to 5HPO group. In conclusion; heated palm oil diet reduced kidney's weight, causes tubular congestion and inflammation which were more severe in 10HPO compared to 5HPO. The histological changes were not accompanied by an increase in serum creatinine level.

Effect of consumption of fresh and heated virgin coconut oil on the blood pressure and inflammatory biomarkers: An experimental study in Sprague Dawley rats

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Alexandria Journal of Medicine, Vol. 51(1), 2015, 53-63

Background: It is a common practice to heat cooking oil and reuse it in order to cut expenses. The use of repeatedly heated cooking oil predisposes to various cardiovascular diseases. Virgin coconut oil (VCO) is reported to possess antioxidant action. **Aim**: The study aimed to determine the effect of heating of VCO on the blood pressure (BP) and inflammatory bio-markers. **Methods**: Thirty male Sprague-Dawley rats were divided into five groups and were fed with the following diet for 24 weeks: normal rat chow (control); chow + fresh VCO (FVCO); chow + VCO heated once (1HVCO); chow + VCO heated five times (5HVCO) and chow + VCO heated ten times (10HVCO). BP was measured at baseline and four weekly for 24 weeks. Blood was collected at baseline and at the end of study to measure plasma TXB_2, PGI_2, VCAM-1, ICAM-1 and LDH enzyme activity. **Results**: BP increased significantly in the 5HVCO and 10HVCO groups compared to the control and FVCO groups. The 5HVCO and 10HVCO diet caused a significant increase in the plasma TXB_2 and a significant decrease in the plasma PGI_2 level. The plasma levels of VCAM-1, ICAM-1 and CRP were significantly increased in the 10HVCO group. **Conclusion**: Repeatedly heated VCO caused an elevation in the BP. The BP elevation was associated with a significant increase in the inflammatory bio-markers (VCAM-1, ICAM-1 and CRP), TXB_2 and a significant reduction in the plasma PGI_2 level

Effect of palm oil (*Elaeis guineensis*) tocotrienols on mesenteric adipose tissue deposition and the expression of 11β-hydroxysteroid dehydrogenase type 1 enzyme (11β-HSD1) in adrenalectomized rats treated with dexamethasone

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Objectives: A study was done to investigate the effect of palm oil (*Elaeis guineensis*) tocotrienols on (1) rats mesenteric adipose tissue deposition (2) and 11 -HSD1 enzyme expression in mesenteric adipocyte. There is a necessity to find an inhibitor for the 11 -HSD1 enzyme which enhances the proliferation of mesenteric adipocyte tissue therefore curbing the onset of metabolic syndrome. **Material and Methods**: A total of 35 male Spraque Dawley rats were divided into 5 different groups, i.e., a baseline control group (n= 7), a sham operated group (n= 7) and three experimental adrenalectomised groups (ADR) (n= 21). Each of the experimental ADR group was given intramuscular dexamethasone (Dexa) with a dose of 120 g/kg after 2 weeks post adrenalectomy and were divided into adrenalectomised control (n= 7), Glycyrrhizic acid (GCA) treated (dose= 120 mg/kg/day; n= 7) and Palm Tocotrienol treated (dose= 60 mg/kg/day; n= 7) groups. These various treatments were given 6 days a week for 8 weeks via gastric gavage (following 2 weeks of adrenalectomy). Data is expressed as mean ± standard error mean (SEM), compared to each other using one-way analysis-of-variance (ANOVA) followed by Tukey's post hoc test and then a t-test. **Results**: The results show that palm tocotrienol tend to slightly increase mesenteric adipose tissue deposition in rats. However, palm tocotrienol was also found to have potential in inhibiting the expression of 11β-HSD1 enzyme in mesenteric adipocytes. **Conclusions**: This study suggests palm tocotrienol inhibits 11β-HSD1 enzyme expression and activity.

Effect of tocotrienol rich fraction (TRF) on synaptogenic molecules in aging *Caenorhabdis elegans*

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International Journal of Biomedical and Advance Research, Vol 6(01), 2015, 36-42

Objective: This study was performed to determine the effect of tocotrienol rich fraction (TRF) on the expression of synaptogenic genes and proteins in aging *C. elegans*. **Method**: Age synchronized DP132 strain worms were divided into two groups; control and treatment where worms were grown in nematode growth medium enriched with 50 g/ml TRF. The RNA and proteins expressions of SYD-2, SAD-1 and AEX-3 were determined at day 2, 8 and 13 by q-RTPCR and western blot respectively. **Results**: The RNA and proteins expressions of SYD-2, SAD-1 and AEX-3 decreased significantly with age in *C.elegans*. Interestingly, TRF treatment successfully increased the expression of these molecules from day 2 to day 8 which is known to be the reproductive phase of *C.elegans* but showed limited effect on the expression of these proteins at day 13. **Conclusion**: TRF enhances the expression of molecules involved in synaptic function of young *C.elegans*.

Effects of aging and tocotrienol-rich fraction supplementation on brain arginine metabolism in rats

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Accumulating evidence suggests that altered arginine metabolism is involved in the aging and neurodegenerative processes. This study sought to determine the effects of age and vitamin E supplementation in the form of tocotrienol-rich fraction (TRF) on brain arginine metabolism. Male Wistar rats at ages of 3 and 21 months were supplemented with TRF orally for 3 months prior to the dissection of tissue from five brain regions. The tissue concentrations of L-arginine and its nine downstream metabolites were quantified using high-performance liquid chromatography and liquid chromatography tandem mass spectrometry. We found age-related alterations in L-arginine metabolites in the chemical- and region-specific manners. Moreover, TRF supplementation reversed age-associated changes in arginine metabolites in the entorhinal cortex and cerebellum. Multiple regression analysis revealed a number of significant neurochemical-behavioral correlations, indicating the beneficial effects of TRF supplementation on memory and motor function.

Effects of palm tocotrienols on the expression and activity of 11β-hydroxysteroid dehydrogenase 1 enzyme and fat deposition in the liver of adrenalectomized rats treated with long term glucocorticoid

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International Medical Journal, Vol. 22(6), 2015, 453-458

Background and Aims: Long term glucocorticoid treatment stimulates the differentiation of preadipocytes to adipocytes, regulated by 11ß-hydroxysteroid dehydrogenase type 1 (11ß-HSD1) enzyme. 11ß-HSD1 catalyzes the activation of cortisol from its inactive form and amplifies glucocorticoid-mediated adipocyte differentiation, thus, leads to obesity. Palm tocotrienol extract (gamma tocotrienol) was shown to decrease the body fat mass of adrenalectomized rats treated with dexamethasone. This study was conducted to evaluate effects of palm tocotrienol on expression and activity of 11ß-HSD1 enzyme and fat deposition in the liver of adrenalectomized rats receiving long term glucocorticoid treatment. **Methods**: Thirty eight male Sprague-Dawley rats were randomly divided into five groups: Baseline group, B (n= 6), Sham group, SS (n= 8) and three adrenalectomized groups (n= 24). Baseline group rats were sacrificed after two weeks of acclimatization. Adrenalectomized groups were given intramuscular Dexamethasone and subdivided into study control group, SC (n= 8), Glycyrrhizic acid treated group, SG (n= 8) and Palm tocotrienol treated group, SP (n= 8). Sham group rats were given intramuscular and oral gavage palm olein as vehicle. **Results**: Following eight weeks of treatment, the rats supplemented with Palm tocotrienol showed significant reduction in the expression of 11ß-HSD1 enzyme in the livers. The activities of 11ß-HSD1 enzyme in this group were reduced with no significant difference. There was no fat deposition seen in the liver

architecture. **Conclusion**: Palm tocotrienol has the potential to inhibit 11ß-HSD1 enzyme and subsequently prevents the glucocorticoid excess, therefore lowering the risk of obesity in patient receiving long term glucocorticoid treatment.

Effects of tocotrienols on insulin secretion-associated genes expression of rat pancreatic islets in a dynamic culture

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Frontiers in Pharmacology, Vol. 7, 2016, 291-308

Tocotrienols (T3) are well-known for their antioxidant properties besides showing therapeutic potential in clinical complications such as hyperlipidemia induced by diabetes. The aim of this study was to determine the effects of δ-T3, γ-T3, and α-T3 on insulin secretion-associated genes expression of rat pancreatic islets in a dynamic culture. Pancreatic islets freshly isolated from male Wistar rats were treated with T3 for 1 h at 37 °C in a microfluidic system with continuous operation. The cells were collected for total RNA extraction and reverse-transcribed, followed by measurement of insulin secretion-associated genes expression using quantitative real-time polymerase chain reaction. Molecular docking experiments were performed to gain insights on how the T3 bind to the receptors. Short-term exposure of δ- and γ-T3 to pancreatic β cells in a stimulant glucose condition (16.7 mM) significantly regulated preproinsulin mRNA levels and insulin gene transcription. In contrast, α-T3 possessed less ability in the activation of insulin synthesis level. Essentially, potassium chloride (KCl), a β cell membrane depolarising agent added into the treatment further enhanced the insulin production.δ - and γ -T3 revealed significantly higher quantitative expression in most of the insulin secretion-associated genes groups containing 16.7 mM glucose alone and 16.7 mM glucose with 30 mM KCl ranging from 600 to 1200 μM ($p< 0.05$). The findings suggest the potential of δ-T3 in regulating insulin synthesis and glucosestimulated insulin secretion through triggering pathway especially in the presence of KCl.

Effects of virgin coconut oil as adjunct therapy in the treatment of allergic rhinitis

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Journal of Clinical and Health Sciences, Vol. 1(1), 2016, 22-28

Introduction: The role of virgin coconut oil in the treatment of allergic rhinitis is controversial. Thus, the aim of the present study is to determine the effects of virgin coconut oil ingestion, in addition to standard medications, on allergic rhinitis. We also studied the side effects of consumption of virgin coconut oil. **Methods**: Fifty two subjects were equally divided into test and control groups. All subjects received a daily dose of 10mg of loratadine for 28 days. The test group was given 10ml of virgin coconut oil three times a day in addition to loratadine. The symptoms of allergic rhinitis were scored at the beginning and end of the study. **Results**: the symptom score were divided into nasal and non-nasal symptom scores. Sneezing score showed a significant difference, however the score was more in control group than test group, indicating that improvement in symptom was more in control group.

The rest of the nasal symptom and non-nasal symptom score showed no significant difference between test and control groups. Approximately 58% of the test subjects developed side effects from consumption of virgin coconut oil, mainly gastrointestinal side effects. **Conclusion**: In the present study, ingestion of virgin coconut oil does not improve the overall and individual symptoms of allergic rhinitis, furthermore it has side effects.

Effects of virgin coconut oil on the histomorphometric parameters in the aortae and hearts of rats fed with repeatedly heated palm oil

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International Journal of Bioscience, Biochemistry and Bioinformatics, Vol. 5(2), 2015, 120-131

The study was carried out to investigate the effects of virgin coconut oil (VCO) on histomorphometric changes in the aorta and heart of thermoxidized palm oil-fed rats. Thirty two male Sprague-Dawley rats were divided into four groups: control group fed with normal diet; 5 times heated palm oil-fed group (5HPO) fortified with 15% of 5HPO; VCO group supplemented with 1.43ml/kg of VCO; and 5HPO + VCO group. The treatment lasted for four months. Upon sacrifice, aortic and heart tissues were processed for light microscopic studies. Light microscopic studies showed thickened intima and media of the aorta in two out of eight rats in the 5HPO group only, while the rest of the rats did not show any thickening of either the intima or media of the aorta. Intima media area (IMA) in the VCO, 5HPO and 5HPO+VCO was significantly increased compared to the control group. Circumferential wall tension (CWT) and tensile stress (TS) in the aorta of 5HPO showed a significant increase compared to the other groups. Cardiomyofibre width in 5HPO group showed a significant increase in size compared to the control, VCO and 5HPO+VCO groups. Cardiomyofibre nuclear size in the 5HPO group decreased in size significantly compared to the control, VCO and 5HPO+VCO groups. VCO supplementation at a dose of 1.43ml/kg showed protective effects on the aorta and heart of thermoxidized palm oil fed rats.

Food consumption and body weight in mice treated with palm oil derived tocotrienol rich fraction (TRF)

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The effect of palm oil-derived tocotrienol rich fraction (TRF) treatment on body weight and food consumption in male ICR white mice was investigated in this study. Mice were randomly divided into 4 groups (n= 10 for each group). The first group is designated as control group. The other three groups were given TRF by oral gavage at concentrations of 200, 500, and 1000 mg/kg respectively for 14 days. Mice were weighed twice weekly at the same hour, and food intake was recorded daily. The results showed that administration of TRF at different doses did not significantly affect body weight and food intake in mice.

Gamma-tocotrienol acts as a BH3 mimetic to induce apoptosis in neuroblastoma SH-SY5Y cells

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Bcl-2 family proteins are crucial regulators of apoptosis. Both pro- and antiapoptotic members exist, and overexpression of the latter facilitates evasion of apoptosis in many cancer types. Bcl-2 homology domain 3 (BH3) mimetics are small molecule inhibitors of antiapoptotic Bcl-2 family members, and these inhibitors are promising anticancer agents. In this study, we report that gamma-tocotrienol (γT3), an isomer of vitamin E, can inhibit Bcl-2 to induce apoptosis. We demonstrate that γT3 induces cell death in human neuroblastoma SH-SY5Y cells by depolarising the mitochondrial membrane potential, enabling release of cytochrome c to the cytosol and increasing the activities of caspases-9 and -3. Treatment of cells with inhibitors of Bax or caspase-9 attenuated the cell death induced by γT3. Simulated docking analysis suggested that γT3 binds at the hydrophobic groove of Bcl-2, while a binding assay showed that γT3 competed with a fluorescent probe to bind at the hydrophobic groove. Our data suggest that γT3 mimics the action of BH3-only protein by binding to the hydrophobic groove of Bcl-2 and inducing apoptosis via the intrinsic pathway in a Bax- and caspase-9-dependent manner.

Gamma-tocotrienol treatment increased peroxiredoxin-4 expression in hepg^2 liver cancer cell line

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BMC Complementary and Alternative Medicine, Vol. 15(1), 2015, 64-70

Background: To determine the antiproliferative effect of gamma-tocotrienol (GTT) treatment on differential protein expression in HepG2 cells. **Methods**: HepG2 cells were treated with 70 μM GTT for 48 hours and differentially expressed protein spots were determined by two-dimensional electrophoresis (2DE), identified by MALDI-TOF mass spectrometer (MS) and validated by quantitative real-time polymerase chain reaction (qRT-PCR). **Results**: GTT treatment on HepG2 cells showed a total of five differentially expressed proteins when compared to their respective untreated cells where three proteins were down-regulated and two proteins were up-regulated. One of these upregulated proteins was identified as peroxiredoxin-4 (Prx4). Validation by qRT-PCR however showed decreased expression of Prx4 mRNA in HepG2 cells following GTT treatment. **Conclusions**: GTT might directly influence the expression dynamics of peroxiredoxin-4 to control proliferation in liver cancer.

Heated cooking oils and its effect on blood pressure and possible mechanism: A review

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Studies have shown that oxidative stress and endothelial dysfunction involved in the development of hypertension. Repeated heating of cooking oils caused thermal oxidation which produces harmful products including free radicals. Hence, repeatedly heated cooking oils may be responsible for an increase in blood pressure or hypertension. The present review compared the effect of few heated vegetable oils on blood pressure and possible mechanisms of the blood pressure raising effect were discussed. Studies have reported that heated oils cause oxidative stress, vascular inflammation leading to endothelial dysfunction. The impaired endothelial function then may interfere with the homeostasis of endothelial derived relaxing and constricting factors. This subsequently leads to an increase in vascular reactivity and blood pressure.

High fat diet alters the expression of M cells and claudin 4 in the Peyer'S Patches of rats

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Prevalence of obesity is increasing worldwide. One of the major risk factors for obesity is consumption of high fat diet (HFD). Gastrointestinal tract (GIT) is the first organ where HFD comes in contact with the body. But, the effect of HFD on the GIT especially the GIT barrier is not investigated properly. M cells are present in the Follicle associated epithelium (FAE) of Peyer's patches (PP) of GIT and are important component of intestinal barrier. Healthy and adequate number of M cells is important for an effective intestinal barrier. Intestinal tight junction protein Claudin 4, situated in between the enterocytes of Peyer's patches (PP), regulates the permeability through the intestinal mucosa. Reduced Claudin 4 is responsible for increased paracellular transport of antigenic materials. Calprotectin is an inflammatory marker secreted by neutrophils during inflammation. Its level is considered specific for intestinal inflammation. The objectives of this study were to investigate the expressions of M cells and Claudin 4 in the PP and to determine the fecal calprotectin level (FCP) of male Wistar rats fed HFD. Four weeks old, twenty male Wistar rats were divided into chow (n= 10) and HFD (n= 10) groups. After 6 weeks of consuming the respective diets, stool and GIT segments containing PP were collected. After tissue processing, tissues were sectioned into 3 micrometer thickness and were taken on poly-L-lysine coated glass slides. Immunohistochemical staining was done by rat M cell specific CK-8 antibody and anti-Claudin 4 antibody. Scoring was done to calculate the average number of M cells and Claudin 4 in the PP of both groups under light microscope. FCP were measured using a commercial enzyme linked immunoassay (ELISA) kit. Statistical analysis was done by chi-square test and independent T-test. Data are presented as mean ± SD. A p value <0.05 was considered as significant. The number of M cells in the PP was significantly higher in HFD group as compared to the control (p= 0.004). The expression of Claudin 4 in the PP was significantly decreased in HFD group as compared to the control (p= 0.018). The fecal calprotectin level in HFD group was significantly higher compared to the control (p= 0.016). HFD consumption for 6 weeks leads to a higher number of M cell and reduced the expression of Claudin 4 in the intestinal Peyer's patches of male Wistar rats which might be due to GI inflammation.

Kenaf seed oil: A potential new source of edible oil

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Background: Kenaf is gaining more attention in recent years due to its high fiber content and medicinal usage. It is now cultivated in many countries and its commercial value is being explored. Kenaf seeds, which are usually discarded as waste product have high oil content and can be a new source of edible oil. **Scope and approach**: In this review, kenaf seed oil (KSO) will be described in details. Kenaf seed oil can be extracted from kenaf seeds by Soxhlet extraction or supercritical fluid extraction (SFE). In order to prolong the shelf life of kenaf seed oil, microencapsulation is carried out and the storage stability is studied. The health benefits and uses of kenaf seed oil are also studied to explore its commercial value and applications. **Key findings and conclusions**: Kenaf seed oil is composed mostly of unsaturated fatty acid with palmitic, oleic and linoleic being the major one. It also contains various bioactive components such as phenols, saponins, tannins and alkaloids. It is reported that Soxhlet extraction gives higher yield than SFE but the latter method is preferred due to safety issue. Spray drying is used to encapsulate the KSO and the microencapsulated KSO has enhanced oxidative stability. KSO possesses various biological activities such as anti-hypercholesterolemic, anti-oxidation, anti-cancer, anti-inflammatory and others due to the presence of phytochemicals. Besides using as edible oil, KSO finds applications in various fields, such as cosmetics, chemicals and fuel.

Maternal intake of dietary virgin coconut oil modifies essential fatty acids and causes low body weight and spiky fur in mice

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BMC Complementary and Alternative Medicine, Vol. 17(1), 2017, 79-87

Background: Coconut oil is commonly used as herbal medicine worldwide. There is limited information regarding its effects on the developing embryo and infant growth. **Methods**: We investigated the effect of virgin coconut oil post-natally and until 6 weeks old in mice (age of maturity). Females were fed with either standard, virgin olive oil or virgin coconut oil diets 1 month prior to copulation, during gestation and continued until weaning of pups. Subsequently, groups of pups borne of the respective diets were continuously fed the same diet as its mother from weaning until 6 weeks old. Profiles of the standard and coconut oil diets were analysed by gas chromatography flame ionization detector (GCFID). **Results**: Analysis of the mean of the total weight gained/ loss over 6 weeks revealed that in the first 3 weeks, pups whose mothers were fed virgin coconut oil and virgin olive oil have a significantly lower body weight than that of standard diet pups. At 6 weeks of age, only virgin coconut oil fed pups exhibited significantly lower body weight. We report that virgin coconut oil modifies the fatty acid profiles of the standard diet by inducing high levels of medium chain fatty acids with low levels of essential fatty acids. Furthermore, pups borne by females fed with virgin coconut oil developed spiky fur. **Conclusion**: Our study has demonstrated that virgin coconut oil could affect infant growth and appearance via maternal intake; we suggest the use of virgin coconut oil as herbal medicine to be treated with caution.

Mechanisms of the antihypertensive effects of Nigella sativa oil in L-Name-induced hypertensive rats

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Clinics, Vol. 70(11), 2015, 751-757

Objectives: This study was conducted to determine whether the blood pressure-lowering effect of *Nigella sativa* might be mediated by its effects on nitric oxide, angiotensin-converting enzyme, heme oxygenase and oxidative stress markers. **Methods**: Twenty-four adult male Sprague-Dawley rats were divided equally into 4 groups. One group served as the control (group 1), whereas the other three groups (groups 2-4) were administered L-NAME (25 mg/kg, intraperitoneally). Groups 3 and 4 were given oral nicardipine daily at a dose of 3 mg/kg and *Nigella sativa* oil at a dose of 2.5 mg/kg for 8 weeks, respectively, concomitantly with L-NAME administration. **Results**: *Nigella sativa* oil prevented the increase in systolic blood pressure in the L-NAME-treated rats. The blood pressure reduction was associated with a reduction in cardiac lipid peroxidation product, NADPH oxidase, angiotensin-converting enzyme activity and plasma nitric oxide, as well as with an increase in heme oxygenase-1 activity in the heart. The effects of *Nigella sativa* on blood pressure, lipid peroxidation product, nicotinamide adenine dinucleotide phosphate oxidase and angiotensin-converting enzyme were similar to those of nicardipine. In contrast, L-NAME had opposite effects on lipid peroxidation, angiotensin-converting enzyme and NO. **Conclusion**: The antihypertensive effect of *Nigella sativa* oil appears to be mediated by a reduction in cardiac oxidative stress and angiotensin-converting enzyme activity, an increase in cardiac heme oxygenase-1 activity and a prevention of plasma nitric oxide loss. Thus, *Nigella sativa* oil might be beneficial for controlling hypertension.

Palm oil fat diet consumption and its effects on serum liver enzymes and microscopic changes in experimental rats

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Pakistan Journal of Nutrition, Vol. 14(9), 2015, 575-580

The present study aimed to observe the effect of consumption of heated palm oil especially with regard to liver histology and enzymes such as alanine transaminase (ALT) and alkaline phosphatase (ALP). We divided forty female Spraque-Dawley rats into four groups (I to IV). The group I was administered with 2% cholesterol diet. The groups II, III and IV were administered with 2% cholesterol diet fortified with 15% weight/weight (w/w) fresh palm oil (FPO), heated once palm oil (1HPO) and heated five times palm oil (5HPO), respectively for a period of 16 weeks. Blood for liver enzymes were drawn and analyzed prior to and at the end of the study. At the end of the study the animals were sacrificed and the liver tissue was examined histologically. The histological specimens were stained with haematoxylin and eosin. Fresh, heated once and heated five times palm oil diet caused significant increase in serum ALT compared to their respective baseline values. No significant difference in the ALT levels among groups fed with oil was observed. The increase in serum ALP was only observed with heated once and five times palm oil. Histologically, palm oil rich diet causes liver inflammation and microsteatosis but not necrosis. The hepatic histological changes were not affected by heating. High fat diet cause inflammation, microsteatosis and altered serum ALT and ALP in the liver. The histological changes and altered liver enzymes were not affected by heating except for serum ALP.

Protective effects of pulp and kernel oils from *Canarium odontophyllum* fruit in normal and hypercholesterolemic rabbits

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International Food Research Journal, Vol. 22(4), 2015, 1318-1326

This study aimed to determine the protective effects of CO pulp and kernel oils supplementation to normocholesterolemic and hypercholesterolemic rabbits. Rabbits from the treatment groups were supplemented with CO pulp and kernel oils for four weeks. Bloods were drawn from all experimental groups at baseline and fourth week to determine protective effects of CO oils supplementation on plasma total antioxidant status (TAS) and catalase (CAT) activity. Liver function tests (ALT, AST, and GGT activities) were also determined for all the groups. The results showed that CO oil supplementation increased plasma TAS in both normal and hypercholesterolemic groups. Plasma CAT activities in the hypercholesterolemic groups supplemented with CO oils were significantly reduced but not for the normocholesterolemic groups. Significant reduction of plasma AST was observed for the hypercholesterolemic rabbits given CO pulp and kernel oils compared with the hypercholesterolemic control rabbits, but not for plasma ALT and GGT. In the normocholesterolemic rabbits, CO pulp oil had caused a significant elevation of plasma ALT, AST, and GGT levels as compared to the negative control rabbits. Therefore, CO pulp and kernel oils are somehow not hepatotoxic, and the oils are potent functional foods.

Renoprotective effect of virgin coconut oil in heated palm oil diet-induced hypertensive rats

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Applied Physiology, Nutrition, and Metabolism, Vol. 41(10), 2016, 1033-1038

Virgin coconut oil, rich in antioxidants was shown to attenuate hypertension. This study aimed to investigate the effects of virgin coconut oil on blood pressure and related parameters in kidneys in rats fed with five-time-heated palm oil. Thirty-two male Sprague Dawley rats were divided into four groups. Two groups were fed with five-time-heated palm oil (5HPO) (15%) diet and the second group was also given virgin coconut oil (1.42 ml/kg, oral) daily for 16 weeks. The other two groups were given basal diet without (control) and with virgin coconut oil. Systolic blood pressure was measured pre- and post-treatment. After 16 weeks, the rats were sacrificed and kidneys were harvested. Dietary 5HPO increased blood pressure, renal thiobarbituric acid reactive subtances (TBARS) and nitric oxide (NO) contents, but decreased heme oxygenase (HO) activity. Virgin coconut oil prevented the increases in 5HPO-induced blood pressure and renal NO content as well as the decrease in renal HO activity. The virgin coconut oil also reduced the elevation of renal TBARS induced by the heated oil. However, neither dietary 5HPO nor virgin coconut oil affected renal histomorphometry. In conclusion, virgin coconut oil has a potential to reduce the development of hypertension and renal injury induced by dietary heated oil, possibly via its antioxidant protective effects on the kidneys.

Targeting genes in insulin-associated signalling pathway, DNA damage, cell proliferation and cell differentiation pathways by tocotrienol-rich fraction in preventing cellular senescence of human diploid fibroblasts

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Clinical Therapeutics, Vol. 166, 2015, e365-e373

Background and Objective: Tocotrienols have been known for their antioxidant properties besides their roles in cellular signalling, gene expression, immune response and apoptosis. This study aimed to determine the molecular mechanism of tocotrienol-rich fraction (TRF) in preventing cellular senescence of human diploid fibroblasts (HDFs) by targeting the genes in senescence-associated signalling pathways. **Materials and Methods**: Real time quantitative PCR (qRT-PCR) was utilized to evaluate the expression of genes involved in these pathways. **Results**: Our findings showed that *SOD1* and *CCS-1* were significantly down-regulated in pre-senescent cells while *CCS-1* and *PRDX6* were up-regulated in senescent cells ($p< 0.05$). Treatment with TRF significantly down-regulated *SOD1* in pre-senescent and senescent HDFs, up-regulated *SOD2* in senescent cells, *CAT* in young HDFs, *GPX1* in young and pre-senescent HDFs, and *CCS-1* in young, pre-senescent and senescent HDFs ($p< 0.05$). TRF treatment also caused up-regulation of *FOXO3A* in all age groups of cells ($p< 0.05$). The expression of *TP53*, *PAK2* and *CDKN2A* was significantly increased in senescent HDFs and treatment with TRF significantly down-regulated *TP53* in senescent cells ($p< 0.05$). *MAPK14* was significantly upregulated ($p< 0.05$) in senescent HDFs while no changes was observed on the expression of *JUN*. TRF treatment, however, down-regulated *MAPK14*in young and senescent cells and up-regulated *JUN* in young and pre-senescent HDFs ($p< 0.05$). **Conclusion**: TRF modulated the expression of genes involved in senescence-associated signalling pathways during replicative senescence of HDFs.

The biological effects of tocotrienol on bone: A review on evidence from rodent models

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Dove Press Journal (Drug Design, Development and Therapy), Vol. 9, 2015, 2049-2061

Osteoporosis causes significant health care and economic burden to society, leading to a relentless search for effective preventive agents. Tocotrienol, a member of the vitamin E family, has demonstrated promising potential as an osteoporosis-preventing agent. This review summarizes evidence on the effects of tocotrienol on bone in animal models. Techniques used to examine the effects of tocotrienol on bone in animals included bone histomorphometry, X-ray microtomography, dual-energy X-ray absorptiometry, bone turnover markers, bone calcium content, and biomechanical strength. Tocotrienol was shown to improve osteoblast number, bone formation, mineral deposition, and bone microarchitecture in osteopenic rats. It also decreased osteoclast number and bone erosion in the rats. Tocotrienol supplementation resulted in an improvement in bone mineral density, although biomechanical strength was not significantly altered in the rats. The beneficial effects of tocotrienol on bone can be attributed to its role as an antioxidant, anti-inflammatory agent, suppressor of the mevalonate pathway, and modulator of genes favorable to bone formation.

The effects of annatto tocotrienol on bone biomechanical strength and bone calcium content in an animal model of osteoporosis due to testosterone deficiency

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Osteoporosis reduces the skeletal strength and increases the risk for fracture. It is an underdiagnosed disease in men. Annatto tocotrienol has been shown to improve bone structural indices and increase expression of bone formation genes in orchidectomized rats. This study aimed to evaluate the effects of annatto tocotrienol on biomechanical strength and calcium content of the bone in orchidectomized rats. Thirty three-month-old male Sprague-Dawley rats were randomly assigned to five groups. The baseline control (BC) group was sacrificed at the onset of the study. The sham-operated group (SHAM) received olive oil (the vehicle of tocotrienol) orally daily and peanut oil (the vehicle of testosterone) intramuscularly weekly. The remaining rats were orchidectomized and treated with three different regimens, i.e., (1) daily oral olive oil plus weekly intramuscular peanut oil injection; (2) daily oral annatto tocotrienol at 60 mg/kg plus weekly intramuscular peanut oil injection; (3) daily oral olive oil plus weekly intramuscular testosterone enanthate injection at 7 mg/kg. Blood, femur and tibia of the rats were harvested at the end of the two-month treatment period for the evaluation of serum total calcium and inorganic phosphate levels, bone biomechanical strength test and bone calcium content. Annatto-tocotrienol treatment improved serum calcium level and tibial calcium content ($p< 0.05$) but it did not affect femoral biomechanical strength ($p> 0.05$). In conclusion, annatto-tocotrienol at 60 mg/kg augments bone calcium level by preventing calcium mobilization into the circulation. A longer treatment period is needed for annatto tocotrienol to exert its effects on bone strength.

The effects of targeted deliveries of lovastatin and tocotrienol on ossification-related gene expressions in fracture healing in an osteoporosis rat model

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International Journal of Environment and Research Public Health, Vol. 12, 2015, 12958-12976

Osteoporotic drugs are used to prevent fragility fractures, but their role in fracture healing still remains unknown. Thus, alternative agents with suitable mode of delivery are needed to promote fracture healing. This study was performed to investigate the effects of direct deliveries of lovastatin and tocotrienolto fracture sites on ossification-related gene expression in fracture healing in a postmenopausal osteoporosis model. Forty-eight Sprague Dawley female rats were divided into six groups. Group I comprised the sham-operated rats, while Groups II–VI were ovariectomized rats. After 8 weeks, the right tibiae of all rats were fractured and stabilized. Group I and Group II were given two single injections of lovastatin and tocotrienol carriers. Group III was given an estrogen preparation at 64.5 µg/kg daily via oral gavages. Group IV was injected with lovastatin particles (750 µg/kg), while Group V was injected with tocotrienol particles (60 mg/kg). Group VI received two single injections of 750 µg/kg lovastatin particles and 60 mg/kg tocotrienol particles. After 4 weeks, the gene expressions were measured. Group VI showed significantly higher gene expressions of osteocalcin, BMP-2, VEGF-α, and RUNX-2 compared to Group II. In conclusion, combined treatment of lovastatin and tocotrienol upregulated the expression of genes related to fracture healing.

The effects of tocotrienol and lovastatin co-supplementation on bone dynamic histomorphometry and bone morphogenetic protein-2 expression in rats with estrogen deficiency

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Nutrients, Vol. 9, 2017, 143-154

Both tocotrienol and statins are suppressors of the mevalonate pathway. Supplementation of tocotrienol among statin users could potentially protect them against osteoporosis. This study aimed to compare the effects of tocotrienol and lovastatin co-supplementation with individual treatments on bone dynamic histomorphometric indices and bone morphogenetic protein-2 (BMP-2) gene expression in ovariectomized rats. Forty-eight female Sprague-Dawley rats were randomized equally into six groups. The baseline was sacrificed upon receipt. All other groups were ovariectomized, except for the sham group. The ovariectomized groups were administered orally daily with (1) lovastatin 11 mg/kg/day alone; (2) tocotrienol derived from annatto bean (annatto tocotrienol) 60 mg/kg/day alone; (3) lovastatin 11 mg/kg/day, and annatto tocotrienol 60 mg/kg/day. The sham and ovariectomized control groups were treated with equal volume of vehicle. After eight weeks of treatment, the rats were sacrificed. Their bones were harvested for bone dynamic histomorphometry and BMP-2 gene expression. Rats supplemented with annatto tocotrienol and lovastatin concurrently demonstrated significantly lower single-labeled surface, but increased double-labeled surface, mineralizing surface, mineral apposition rate and bone formation rate compared to individual treatments ($p < 0.05$). There was a parallel increase in BMP-2 gene expression in the rats receiving combined treatment ($p < 0.05$). The combination of annatto tocotrienol and lovastatin exerted either additively or synergistically on selected bone parameters. In conclusion, tocotrienol can augment the bone formation and mineralization in rats receiving low-dose statins. Supplementation of tocotrienol in statin users can potentially protect them from osteoporosis.

The role of antioxidants in attenuating heated oil-induced cardiovascular effects: A review

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Repeatedly heated cooking oil was reported to have potential detrimental effect on health. Studies have shown that repeatedly heated cooking oil undergoes thermal oxidation which generates reactive oxygen species that contributes to the occurrence of vascular inflammation and dysfunction. These vascular changes lead to multiple health problems such as hypertension, dyslipidemia, atherosclerosis, osteoporosis, as well as kidneys and liver abnormality. Apart from the reactive oxygen species, such abnormality might be due to the reduction of natural antioxidants in the oil with repeated heating. Therefore, there is an inherent need to further explore the individual antioxidants which exert cardiovascular protective effects, particularly via its effects on blood pressure, blood lipid profiles as well as cardiovascular structures. Therefore, this review was undertaken to ascertain if the detrimental effects of heated oil can be reduced by the administration of antioxidants, particularly polyphenols - which are the main focus of this article.

The tocotrienol-rich fraction is superior to tocopherol in promoting myogenic differentiation in the prevention of replicative senescence of myoblasts

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Aging results in a loss of muscle mass and strength. Myoblasts play an important role in maintaining muscle mass through regenerative processes, which are impaired during aging. Vitamin E potentially ameliorates age-related phenotypes. Hence, this study aimed to determine the effects of the tocotrienol-rich fraction (TRF) and α-tocopherol (ATF) in protecting myoblasts from replicative senescence and promoting myogenic differentiation. Primary human myoblasts were cultured into young and senescent stages and were then treated with TRF or ATF for 24 h, followed by an analysis of cell proliferation, senescence biomarkers, cellular morphology and differentiation. Our data showed that replicative senescence impaired the normal regenerative processes of myoblasts, resulting in changes in cellular morphology, cell proliferation, senescence-associated β-galactosidase (SA-β-gal) expression, myogenic differentiation and myogenic regulatory factors (MRFs) expression. Treatment with both TRF and ATF was beneficial to senescent myoblasts in reclaiming the morphology of young cells, improved cell viability and decreased SA-β-gal expression. However, only TRF treatment increased BrdU incorporation in senescent myoblasts, as well as promoted myogenic differentiation through the modulation of MRFs at the mRNA and protein levels. *MYOD1* and *MYOG* gene expression and myogenin protein expression were modulated in the early phases of myogenic differentiation. In conclusion, the tocotrienol-rich fraction is superior to α-tocopherol in ameliorating replicative senescence-related aberration and promoting differentiation via modulation of MRFs expression, indicating vitamin E potential in modulating replicative senescence of myoblasts.

The use of delta-tocotrienol and lovastatin for anti-osteoporotic therapy

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Aims: Statins are competitive inhibitors of HMGCoA reductase and are commonly used as antihypercholesterolemic agents. Experimental studies clearly demonstrate the beneficial effects of statins on bone. Tocotrienols have also been shown to have anti-osteoporotic effects on the skeletal system. This study was conducted to observe the effect of a combination of delta-tocotrienol and lovastatin on structural bone histomorphometry and bone biomechanical strength in a postmenopausal rat model at clinically tolerable doses, and to compare it with the effect of delta-tocotrienol or lovastatin. **Main methods**: Forty-eight female Sprague Dawley rats wererandomly divided into six groups: baseline control; sham-operated control; ovariectomised control; ovariectomised + 11 mg/kg lovastatin; ovariectomised + 60 mg/kg delta-tocotrienol and ovariectomised + 60 mg/kg delta-tocotrienol + 11 mg/kg lovastatin. These treatments were given via oral gavage daily for eight weeks. After sacrificing the rats, the left and right femurs were dissected

and processed for bone histomorphometric analysis and a bone biomechanical test, respectively. **Key findings**: Delta-tocotrienol in combination with lovastatin significantly improved the trabecular volume, trabecular number, trabecular thickness and trabecular separation; and it significantly increased bone strength in oestrogen-deficient rats. Delta-tocotrienol alone enhanced bone formation and maintained bone strength in ovariectomised rats. Delta-tocotrienol plus lovastatin treatment promoted better trabecular volume and trabecular number and received higher load than delta-tocotrienol alone. Lovastatin alone was not effective. **Significance**: Thus, the combination of delta-tocotrienol and lovastatin has the potential to be used for antiosteoporotic therapy in postmenopausal women.

Tocotrienol rich fraction modulates the expression of synaptogenic RNAs in neurons of *Caenorhabditis elegans*

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Research Updates in Medical Sciences, Vol. 5(1), 2017, 4-11

Background: One of the main concerns of getting older is the experience of impairments in memory function. Synapses play an important role in learning and memory during aging and their deterioration is associated with reactive oxygen species. Among the many vitamin E analogues, tocotrienols are known to have neuroprotective effect as well as remarkable antioxidant activities. Recent in vitro studies have successfully extracted embryos from *C. Elegans* to develop neurons, muscles and epithelial cells. Thus, this study is aimed to identify the effect of tocotrienol rich fraction (TRF) towards the expression of synapse-associated genes in ageing neurons derived from the embryos of C.elegans. **Method:** Primary culture of *C. elegans* embryonic cultured cells was incubated with TRF. The expression level of syd-2, sad-1, and aex-3 were determined using the quantitative real-time polymerase chain reaction. Dosage of TRF treatment was predetermined by a colorimetric assay. **Results:** *C.elegans* was treated with an optimal dose of 10 g/ml TRF for 24 hours. Expression of syd-2 was found to be up-regulated with TRF treatment. However, insignificant changes were found in the expression of sad-1 and aex-3. Conclusion: TRF increases the expression of syd-2 which regulates the differentiation of presynaptic termini inneurons derived from the embryos of *C.elegans*.

Tocotrienol-rich fraction prevents cellular aging by modulating cell proliferation signaling pathways

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La Clinica Terapeutica, Vol. 166(2), 2015, e81-e90

Background and Objective: Vitamin E has been suggested as nutritional intervention for the prevention of degenerative and age-related diseases. In this study, we aimed to elucidate the underlying mechanism of tocotrienol-rich fraction (TRF) in delaying cellular aging by targeting the proliferation signaling pathways in human diploid fibroblasts (HDFs). **Materials and Methods**: Tocotrienol-rich fraction was used to treat different stages of cellular aging of primary human diploid fibroblasts viz. young (passage 6), pre-senescent (passage 15) and senescent (passage 30). Several selected targets involved in the downstream of PI3K/AKT and RAF/MEK/ERK pathways were compared in total RNA and protein. **Results**: Different transcriptional profiles were observed in young, pre-

senescent and senescent HDFs, in which cellular aging increased AKT, FOXO3, CDKN1A and RSK1 mRNA expression level, but decreased ELK1, FOS and SIRT1 mRNA expression level. With tocotrienol-rich fraction treatment, gene expression of AKT, FOXO3, ERK and RSK1 mRNA was decreased in senescent cells, but not in young cells. The three down-regulated mRNA in cellular aging, ELK1, FOS and SIRT1, were increased with tocotrienol-rich fraction treatment. Expression of FOXO3 and P21Cip1 proteins showed up-regulation in senescent cells but tocotrienol-rich fraction only decreased P21Cip1 protein expression in senescent cells. **Conclusions**: Tocotrienol-rich fraction exerts gene modulating properties that might be responsible in promoting cell cycle progression during cellular aging.

Tocotrienols stimulate insulin secretion of rat pancreatic isolated islets in a dynamic culture

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Background: Tocotrienols (T3) are the naturally occurring vitamin E derivatives that possess antioxidant properties and therapeutic potential in diabetic complications. The bioactivities of the derivatives are determined by the number and arrangement of methyl substitution on the structure. **Objective**: The objective of this study was to determine the effects of T3 derivatives, δ-T3, γ-T3 and α-T3 on insulin secretion of rat pancreatic islets in a dynamic culture. Method: Pancreatic islets isolated from male Wistar rats were treated with T3 for 1 h at 37°C in a microfluidic system with continuous operation that provided a stable cell culture environment. Glucose (2.8 mM and 16.7 mM, as basal and stimulant, respectively) and potassium chloride (KCl) (30 mM) were added to the treatment in calcium free medium. The supernatant was collected for insulin measurements. **Results**: Short-term exposure (1 h) of δ-T3 to β cells in the stimulant glucose condition significantly potentiated insulin secretion in a dose-dependent manner. γ-T3 and α-T3 also displayed dosedependent effect but were less effective in the activation of insulin secretion. Essentially, KCl, a pancreatic β cell membrane depolarizing agent, added into the treatment further enhanced the insulin secretion of δ-T3, γ-T3 and α-T3 with ED_{50} values of 504, 511 and 588 μM, respectively. **Conclusion**: The findings suggest the potential of δ-T3 in regulating glucose-stimulated insulin secretion (GSIS) in response to the intracellular calcium especially in the presence of KCl.

Vitamin E improved bone strength and bone minerals in male rats given alcohol

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Iranian Journal of Basic Medical Sciences, Vol. 20(12), 2017, 1360-1367

Objective(s): Alcohol consumption induces oxidative stress on bone, which in turn increases the risk of osteoporosis. This study determined the effects of vitamin E on bone strength and bone mineral content in alcohol-induced osteoporotic rats. **Materials and Methods**: Three months old Sprague Dawley male rats were randomly divided into 5 groups: (I) control group; (II) alcohol (3 g/kg) + normal saline; (III) alcohol (3 g/kg) + olive oil; (IV) alcohol (3 g/kg) + alpha-tocopherol (60 mg/kg) and (V)

alcohol (3 g/kg) + palm vitamin E (60 mg/kg). The treatment lasted for three months. Following sacrifice, the right tibia was subjected to bone biomechanical test while the lumbar (fourth and fifth lumbar) and left tibia bones were harvested for bone mineral measurement. **Results**: Alcohol caused reduction in bone biomechanical parameters (maximum force, ultimate stress, yield stress and Young's modulus) and bone minerals (bone calcium and magnesium) compared to control group (P< 0.05). Palm vitamin E was able to improve bone biomechanical parameters by increasing the maximum force, ultimate stress and Young's modulus (P< 0.05) while alpha-tocopherol was not able to. Both alpha-tocopherol and palm vitamin E were able to significantly increase tibia calcium and magnesium content while only alpha-tocopherol caused significant increase in lumbar calcium content (P< 0.05). **Conclusion**: Both palm vitamin E and alpha-tocopherol improved bone mineral content which was reduced by alcohol. However, only palm vitamin E was able to improve bone strength in alcohol treated rats.

γ-tocotrienols prevents cell cycle arrest in aged human fibroblast cell through p16^{INK4a} pathway

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Human diploid fibroblasts (HDFs) proliferation in culture has been used as a model of aging at the cellular level. Growth arrest is one of the most important mechanisms responsible for replicative senescence. Recent researches have been focusing on the function of vitamin E in modulating cellular signaling and gene expression. Therefore, the aim of this study was to elucidate the effect of palm γ-tocotrienol (vitamin E) in modulating cellular aging through p16 INK4a pathway in HDF cells. Primary culture of senescent HDFs was incubated with 70 M of palm γ-tocotrienol for 24 hours. Silencing of p16 INK4a was carried out by siRNA transfection. RNA was extracted from the different treatment groups and gene expression analysis was carried out by real-time reverse transcription polymerase chain reaction. Proteins that were regulated by p16 INK4a were determined by western blot technique. The finding of this study showed that p16 INK4a mRNA was overexpressed in senescent HDFs, and hypophosphorylatedpRb and cyclin D1 protein expressions were increased (p< 0.05). However, downregulation of p16 INK4a and hypophosphorylated-pRb and cyclin D1 protein expressions (p<0.05) by γ-tocotrienol led to modulation of the cell cycle regulation during cellular aging. In conclusion, senescent HDFs showed change in biological process specifically in cell cycle regulation with elevated expression of genes and proteins which may contribute to cell cycle arrest. Palm γ-tocotrienol may delay cellular senescence of HDFs by regulating cell cycle through downregulation of p16 INK4a and hypophosphorylatedpRb and cyclin D1 protein expressions.

γ-tocotrienol and 6-gingerol in combination synergistically induce cytotoxicity and apoptosis in HT-29 and SW837 human colorectal cancer cells

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Numerous bioactive compounds have cytotoxic properties towards cancer cells. However, most studies have used single compounds when bioactives may target different pathways and exert greater cytotoxic effects when used incombination. Therefore, the objective of this study was to determine the anti-proliferative effect of γ-tocotrienol (γ-T3) and 6-gingerol (6G) in combination by evaluating apoptosis and active caspase-3 in HT-29 and SW837 colorectal cancer cells. MTS assays were performed to determine the anti-proliferative and cytotoxicity effect of γ-T3 (0–150 μg/mL) and 6G (0–300 μg/mL) on the cells. The half maximal inhibitory concentration (IC50) value of 6G+ γ-T3 for HT-29 was 105 + 67 μg/mL and for SW837 it was 70 + 20 μg/mL. Apoptosis, active caspase-3 and annexin V FITC assays were performed after 24 h of treatment using flow cytometry. These bioactives in combination showed synergistic effect on HT-29 (CI: 0.89 ± 0.02,) and SW837 (CI: 0.79 ± 0.10) apoptosis was increased by 21.2% in HT-29 and 55.4% in SW837 ($p < 0.05$) after 24 h treatment, while normal hepatic WRL-68 cells were unaffected. Increased apoptosis by the combined treatments was also observed morphologically, with effects like cell shrinkage and pyknosis. In conclusion, although further studies need to be done, γ-T3 and 6G when used in combination act synergistically increasing cytotoxicity and apoptosis in cancer cells.

Scope 10 | D

Experimental Nutrition

Plant based (fruits, vegetables, legumes, cereal, flower extract, seaweed, plant by product and honey)

Acacia honey accelerates *in vitro* corneal ulcer wound healing model

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Background: The study aimed to evaluate the effects of Acacia honey (AH) on the migration, differentiation and healing properties of the cultured rabbit corneal fibroblasts. **Methods**: Stromal derived corneal fibroblasts from New Zealand White rabbit (n= 6) were isolated and cultured until passage 1. *In vitro* corneal ulcer was created using a 4 mm corneal trephine onto confluent cultures and treated with basal medium (FD), medium containing serum (FDS), with and without 0.025 % AH. Wound areas were recorded at day 0, 3 and 6 post wound creation. Genes and proteins associated with wound healing and differentiation such as aldehyde dehydrogenase (ALDH), vimentin, alpha-smooth muscle actin (α-SMA), collagen type I, lumican and matrix metalloproteinase 12 (MMP12) were evaluated using qRT-PCR and immunocytochemistry respectively. **Results**: Cells cultured with AH-enriched FDS media achieved complete wound closure at day 6 post wound creation. The cells cultured in AH-enriched FDS media increased the expression of vimentin, collagen type I and lumican genes and decreased the ALDH, α-SMA and MMP12 gene expressions. Protein expression of ALDH, vimentin and α-SMA were in accordance with the gene expression analyses. **Conclusion**: These results demonstrated AH accelerate corneal fibroblasts migration and differentiation of the in vitro corneal ulcer model while increasing the genes and proteins associated with stromal wound healing.

Alpha-amylase, antioxidant, and anti-inflammatory activities of *Eucheuma denticulatum* (N.L. Burman) F.S. Collins and Hervey

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Journal of Applied Phycology, Vol. 28(3), 2016, 1965-1974

Eucheuma denticulatum is a red edible seaweed that grows in the East Malaysia coastal region. The objective of this study was to investigate the α-amylase, antioxidant and anti-inflammatory activities of *E. denticulatum* ethanol extract and its three fractions (n-hexane, ethyl acetate and acetone). α-Amylase activity was assessed by dinitrosalicylic acid (DNS) assay, while the antioxidant property was determined by oxygen radical absorbance capacity (ORAC) analysis. The anti-inflammatory effects of the seaweed samples were evaluated by nitric oxide (NO), interleukin-6 (IL-6), interleukin-1 (IL-1), tumor necrosis factor-alpha (TNF-α), and monocyte chemoattractant protein-1 (MCP-1) activities on the interferon-gamma/lipopolysaccharide (IFN-γ/LPS)-stimulated murine macrophage cell line (RAW 264.7) using Griess reaction and immunoassays, respectively. At 10 mgmL^{-1}, *E. denticulatum* ethanol extract and three fractions inhibited α-amylase activities at variable levels. The highest (67 %) inhibition of α-amylase enzyme was by the ethanol crude extract. The three fractions showed inhibition with a

mean of 42 %. Crude ethanol extracts also exhibited higher antioxidant capacity (36,400 ± 23.5 mol Trolox equivalent (TE) (100 g)$^{-1}$) when compared to the fractions. Crude extract and fractions (1–100 gmL^{-1}), also exhibited anti-inflammatory activity without showing any cytotoxic effect to RAW 264.7 cells. The present study suggests that *E. denticulatum* has the potential to be a promising source of effective functional metabolite. An extensive research on the edible varieties would contribute to a better understanding of their importance as functional food.

Anti-elastase, anti-collagenase and antimicrobial activities of the underutilized red pitaya peel: An *in vitro* study for anti-aging applications

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Objective: To investigate the in vitro anti-elastase, anti-collagenase, and antimicrobial activities of the red pitaya peel extract for cosmetic application focusing on skin aging. **Methods**: Extraction was performed by the reflux method for 103 minutes at 56°C with 82% aqueous ethanol solution and the red pitaya peel extract was evaporated using a rotary evaporator. Anti-elastase and anti-collagenase properties were evaluated using the drug discovery kits (neutrophil elastase colorimetric and matrix metalloproteinase-1 colorimetric, respectively). The antimicrobial potential was analyzed using agar well diffusion method against 10 selected microorganisms, and the presence or absence of the inhibition zones was identified. **Results**: The red pitaya peel extract exhibited remarkable inhibition percentage 87.62 ± 0.05% and 96.92 ± 0.02% for anti-elastase and anti-collagenase activities, respectively. Red pitaya peel extract showed significant inhibition against the Gram-positive *Bacillus subtilis* B29 with an inhibition zone diameter of 8.0 ± 0.3 mm. **Conclusion**: The excellent anti-aging properties displayed by the underutilized red pitaya peel extract highlighted its potential as a natural source of anti-aging agent for cosmetic formulations.

Anti-hypercholesterolemic effect of kenaf (*Hibiscus cannabinus* L.) seed on high-fat diet Sprague dawley rats

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Objective: To determine the antihypercholesterolemic effects of kenaf seed samples and compare with the commercial hypocholesterolemic drug on serum lipids profiles and malondialdehyde (MDA) level in the rat. **Methods**: Kenaf seed oil (KSO), microencapsulated kenaf seed oil (MKSO), kenaf seed extract (KSE) and defatted kenaf seed meal (DKSM) were prepared and phytochemicals screening on these samples were done prior *in vivo* study. Phenolic compounds in KSE were quantified using high performance liquid chromatography. There were 40 (divided in eight diet groups of 5) male Sprague dawley rats adapted to normal standard diet or hypercholesterolemic diet (HD) with or without the treatment of these kenaf samples for 32 days. **Results**: All the kenaf samples exhibited to contain most of the major phytochemicals. KSE possessed gallic acid, tannic acid, catechin, benzaldehyde,

benzoic acid, syringic acid, sinapic acid, ferulic acid, naringin acid, and protocatechuic acid. The significant higher (P< 0.05) serum total cholesterol, low density lipoprotein cholesterol and MDA levels in HD group without treatment than the normal control group suggested the hypercholesterolemia was induced by the incorporation of cholesterol into diet. KSE exhibited higher cholesterol-lowering properties due to the significant lower (P< 0.05) in serum triglycerides, total cholesterol and MDA levels. KSE showed the highest efficiency of cholesterol-lowering activity, followed by KSO, MKSO and DKSM. **Conclusions**: DKSM, MKSO, KSO and KSE appeared to have comparable anti-hypercholesterolemic effect with the commercial hypocholesterolemic drug. Hence, kenaf seed could be used as an alternative natural source to replace the synthetic hypocholesterolemic drugs.

Anti-ulcer activity of *Hibiscus cannabinus* and *Hibiscus sabdariffa* seeds in ulcer-induced rats

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The aim of this research is to determine the antiulcer properties and percentage protection of *Hibiscus cannabinus* and *Hibiscus sabdariffa* seed samples towards ulcer-induced Sprague dawley rats. Rats were divided into six groups each for each ulceration method and fed with distilled water, Omeprazole, *H. cannabinus* seed oil (HCSO), *H. cannabinus* seed extract (HCSE), *H. sabdariffa* seed oil (HSSO) and *H. sabdariffa* seed extract (HSSE), respectively via oral administration. Among the two plants tested, *H. cannabinus* showed the best protection percentage towards ethanol, non-steroidal anti-inflammatory drugs (NSAIDs) and cold restrain stress induced ulcers. *H. cannabinus* seed extract (HSSE) exhibited an exceptionally high ulcer protection of 74.98 ± 0.78% against NSAIDs induced ulcer. The gastric lesions were controlled primarily by both mucosal protection and acid inhibition. In conclusion, addition of these seeds to the daily diet may reduce free radical activity in the body and reduce the risk of developing peptic ulcer disease.

Aqueous extract of cornsilk confers mild diuretic activity in normal rats

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Cornsilk is traditionally used to treat illnesses related to kidney and as diuretic agent. The study was performed to evaluate the effectiveness of Malaysian cornsilk in elevating diuresis and their dose response relationship in normal Sprague-Dawley rat. The diuresis activity was determined by administered the rats with different dose treatments of 400, 500, 600, 700 and 800 mg/kg. Cumulative urine was significantly increased with the dosage levels (400-600 mg/ kg) ranging from 14.06 - 20.13 mL. Cumulative urine of aqueous extract of cornsilk (AEC) at 400 mg/kg (14.06 mL) and 500 mg/kg (15.21 mL) treatments found to be significantly lower than positive control (21.25 mL). In addition, Na+ content was significantly higher compared with negative control at dosages of 500, 600, 700 and 800 mg/kg. At any rate, K^+ and Cl^- content of all AEC treatments were not significantly different during 24 h monitoring. The pH values were increased paralleled with the increment of AEC dosages, though it was not significant. On the other result, the ED_{50} of AEC was observed at 454.10 mg/kg. Malaysian AEC had shown a mild diuretic activity in elevating urine and Na^+ content at dosages

from 500 to 800 mg/kg. Whilst, AEC also showed an effect of potassium sparing diuretics. Thus, it is suggested that Malaysian cornsilk can be used as an alternative natural diuretic agent.

Baccaurea angulata fruit inhibits lipid peroxidation and induces the increase in antioxidant enzymes activities

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Purpose: The consequence of the increased demand due to the population expansion has put tremendous pressure on the natural supply of fruits. Hence, there is an unprecedented growing interest in the exploration of the potentials of underutilized fruits as alternatives to the commercially available fruits. *Baccaurea angulata* is an underutilized fruit widely distributed in Borneo Island of Malaysia. The present study was conducted to investigate the effects of B. angulata whole fruit (WF), skin (SK) and pulp (PL) juices on malondialdehyde (MDA) levels and antioxidant enzymes in rabbits fed high-cholesterol diet. **Methods**: Thirty-six male rabbits of New Zealand strain were randomly assigned to six groups. Rabbits were fed either a standard pellet (group NC) or a high-cholesterol diet (groups HC, PC, WF, SK and PL). Groups WF, SK and PL were also given 1 ml/kg/day *B. angulata* WF, SK and PL juices, respectively. **Results**: *Baccaurea angulata* had high antioxidant activities. The administration of the various juices significantly reduced ($p < 0.05$) the concentration of induced plasma MDA. The decrease in the SOD, GPx, CAT and TAC levels caused by cholesterol feeding was also ameliorated with *B. angulata*. **Conclusion**: Our results show that *B. angulata* fruit is beneficial in positively influencing and managing oxidative damage.

Baccaurea angulata fruit juice ameliorates altered hematological and biochemical biomarkers in diet-induced hypercholesterolemic rabbits

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Hypercholesterolemia is an important risk factor linked to the alteration of blood hematology and clinical chemistry associated with the development and progression of atherosclerosis. Previous studies have demonstrated the safety and potential health benefits of *Baccaurea angulata* (BA) fruit. We hypothesized that the oral administration of BA fruit juice could ameliorate the alteration in the hematological and biochemical biomarkers of diet-induced hypercholesterolemic rabbits. The aim of this study was to investigate the effects of different doses of BA juice on the hematological and biochemical biomarkers in normo- and hypercholesterolemic rabbits. Thirtyfive healthy adult New Zealand White rabbits were assigned to seven different groups for 90 days of diet intervention. Four atherogenic groups were fed a 1% cholesterol diet and 0, 0.5, 1.0, and 1.5 mL of BA juice per kg of rabbit daily. The other three normal groups were fed a commercial rabbit pellet diet and 0, 0.5, and

1.0 mL of BA juice per kg of rabbit daily. Baseline and final blood samples after 90 days of repeated administration BA juice were analyzed for hematological parameters while serum, aortic and hepatic lysates were analyzed for lipid profiles and other biochemical biomarkers. The alteration of the hemopoietic system, physiological changes in serum and tissues lipid profiles and other biochemicals resulting from the consumption of a high-cholesterol diet were significantly ($p<.0.05$) ameliorated by the administration of BA juice. Improvement of the biomarkers in rabbits were dose-dependent, markedly enhanced at the highest dose of juice (1.5 mL/kg/day). The results suggest potential health benefits of the antioxidant-rich BA fruit juice against hypercholesterolemia-associated hematological and biochemical alterations in the rabbit.

Baccaurea angulata fruit juice reduces atherosclerotic lesions in diet-induced Hypercholesterolemic rabbits

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Background: Atherosclerosis is the most common disease of large and medium-sized arteries linked to oxidative stress, dyslipidemia as well as chronic inflammation. The aim of this study was to evaluate the potential health benefits of *Baccaurea angulata* (BA) fruit juice on the aorta of diet-induced hypercholesterolemic rabbits, to detect an accumulation of fatty streak and evaluate the percentage of atherosclerotic lesion accrued. **Methods**: Thirty-five healthy male adults New Zealand White rabbits were assigned to seven different groups. Four groups were fed 1% cholesterol diet and 0, 0.5, 1.0, and 1.5 mL of BA fruit juice per kg of rabbit daily (atherogenic groups), while the other three groups were fed commercial rabbit pellet and 0, 0.5, and 1.0 mL of juice per kg of rabbit daily (normocholesterolemic groups) for 90 days. The thoracic and abdominal aorta between the heart origin and bifurcation into iliac arteries of all the rabbits were carefully removed and analyzed accordingly. **Results**: The supplementation of the high-cholesterol diet of hypercholesterolemic rabbits with only 0.5 mL BA/kg rabbit per day significantly ($p< 0.001$) improved aortic lipid profile, attenuated aortic fatty streak development and reduced intima thickening. Higher BA doses used (1.0 and 1.5 mL/kg rabbit per day) also significantly ($p < 0.001$) decreased further the development of aortic fatty streaks, reduced the thickening of the tunica intima layer and preserved endothelial healing following arterial injury. **Conclusion**: Therefore, BA fruit is a potential novel functional food with effective anti-inflammatory, antiatherogenic and hypocholesterolemic activities.

Biological properties of cucumber (*Cucumis sativus* L.) extract

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Malaysian Journal of Analytical Sciences, Vol. 19(6), 2015, 1218-1222

Peel and pulp of *Cucumis sativus* L. fruit were extracted from aqueous (water) and phosphate buffered solution at incubated temperature of 37 °C similar to normal human physiological temperature to

investigate the potential of these extracts as antibacterial and cytotoxic agents using antibacterial susceptibility assay against six pathogenic bacteria of gram positive and negative and cytotoxic assay against human non-small cell lung carcinoma cell line (H1299) and human breast adenocarcinoma cell line (MCF-7). The phytochemical contents of all extracts were determined to correlate with their biological properties.

Brewers' rice attenuated aberrant crypt foci developing in colon of azoxymethane-treated rats

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Brewers' rice is one of abundant agricultural waste products in the rice industry. The present study is designed to investigate the potential of brewers' rice to inhibit the development of aberrant crypt foci (ACF) in colon of azoxymethane (AOM)-treated rats. The effects on the attenuation of hepatic toxicity and kidney function enzymes were also evaluated. Male Sprague-Dawley rats were randomly divided into five groups: (G1) normal; (G2) AOM alone; and (G3), (G4), and (G5), which were AOM fed with 10%, 20%, and 40% (w/w) of brewers' rice, respectively. The rats in group 2-5 were injected intraperitoneally with AOM (15 mg/kg body weight) once weekly for two weeks. After 8 weeks of treatment, the total number of ACF/colon and the number of ACF in the distal and middle colon were significantly reduced in all treatment groups compared to G2 ($p< 0.05$). Brewers' rice decreased the number of ACF with dysplastic morphology in a dose-dependent manner. Alkaline phosphatase (ALP) level in G5 was significantly lower compared to the G2 ($p< 0.05$). In conclusion, this study found the potential value of brewers' rice in reducing the risk of cancer susceptibility in colon.

Brewers' rice modulates oxidative stress in azoxymethane mediated colon carcinogenesis in rats

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Aim: To investigate the mechanistic action of brewers' rice in regulating the Wnt/nuclear factor-kappa B (NFκB)/Nrf2-signaling pathways during colon carcinogenesis in male Sprague-Dawley rats. **Methods**: Male Sprague-Dawley rats were randomly divided into the following five groups (six rats in each group): (G1) normal, (G2) azoxymethane (AOM) alone, (G3) AOM + 10% (weight (w)/weight (w)) brewers' rice, (G4) AOM + 20% (w/w) brewers' rice, and (G5) AOM + 40% (w/w) brewers' rice. They were intraperitoneally administered 15 mg/kg body weight of AOM in saline once weekly over a two

week period and treated with an American Institute of Nutrition (AIN)-93G diet containing 10%, 20%, and 40% (w/w) brewers' rice. The mRNA levels of glycogen synthase kinase 3β (*GSK*3β), β-catenin, key inflammation markers, nuclear factor E2-related factor 2 (*Nrf2*), and heme oxygenase-1 (*HO-1*)-dependent transcriptional activity were assessed by quantitative real-time polymerase chain reaction analyses. The colon superoxide dismutase, malondialdehyde, and nitric oxide levels were also analyzed to assess the antioxidant effect of these treatments. The results were analyzed using one-way analysis of variance (ANOVA), and a P value of < 0.05 was considered significant. **Results**: The overall analyses demonstrated that the dietary administration of brewers' rice in AOM-induced rat colon carcinogenesis resulted in the transcriptional upregulation of *GSK*3β, inducible nitric oxide synthase (*iNOS*), *Nrf2*, and *HO-1*. We discovered that the dietary administration of brewers' rice downregulated the β-catenin and NF-κB mRNA levels. A significant reduction in β-catenin expression was found in the groups administered with 20% (0.611 ± 0.034) and 40% (0.436 ± 0.045) (w/w) brewers' rice compared with that of the group treated with AOM alone (1.000 ± 0.064) (P< 0.05). The NF-κB expression was significantly lower between the AOM-alone group (1.000 ± 0.048) and those groups fed with diets containing 10% (w/w) brewers' rice (0.255 ± 0.022), 20% (w/w) brewers' rice (0.450 ± 0.045), or 40% (w/w) brewers' rice (0.541 ± 0.027) (P< 0.05). Brewers' rice improved the antioxidant levels, indicating that brewers' rice can enhance effective recovery from oxidative stress induced by AOM. **Conclusion**: Our results provide evidence that brewers' rice can suppress colon cancer *via* the regulation of Nrf2 expression and the inhibition of the Wnt/NF-κB signaling pathways.

Brewers' rice, a by-product from rice processing, has antiproliferative activity on human colorectal cancer (HT-29) cell line

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Colon carcinogenesis is a malignant tumor, and is well-known as the third leading cancer, which contributes to high mortality and morbidity worldwide. Brewers' rice, known locally as temukut, consists of a mixture of broken kernels with rice bran and rice germ which is a byproduct produced in the rice industry. Although extensive studies on the anti-cancer properties of rice bran, published data on the cytotoxicity of brewers' rice are very limited. The present study was conducted to evaluate the apoptosis induction capability of the water extract of brewers' rice (WBR) on human colorectal cancer (HT-29) cell line. The HT-29 cells were treated with various concentrations (16, 32, and 64 g/mL) of WBR for 24 and 48 hours. The morphological analysis of apoptotic cells was evaluated using inverted light microscope and fluorescence microscope. The apoptotic HT-29 cells was evaluated using Annexin V-FITC and propidium iodide (PI) staining apoptosis test and cell cycle analyses. The data obtained were evaluated using a one-way analysis of variance (ANOVA) and P < 0.05 was considered statistical significant. Overall analyses indicated that WBR induced typical characteristics of apoptosis in HT-29 cells, including nuclear fragmentation (NF), nuclear compaction (NC), apoptotic bodies (AB), cellular shrinkage (CS), and chromatin condensation (CC), as visualized under inverted light microscope and fluorescence microscope. Cell cycle analyses and Annexin V-FITC and propidium iodide (PI) staining apoptosis test using flow cytometry revealed that WBR induced apoptotic population in HT-29 cells. In this study, our findings provide clear evidence that WBR inhibits the growth of HT-29 cells via induction of apoptosis. Taken together, we suggest that WBR may be a potential candidate for the prevention and treatment of colorectal cancer.

Brewers' rice: A by-product from rice processing provides natural hepatorenal protection in azoxymethane-induced oxidative stress in rats

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Brewers' rice, which is known locally as *temukut*, is a mixture of broken rice, rice bran, and rice germ. Our present study was designed to identify the effect of brewers' rice on the attenuation of liver and kidney damage induced by azoxymethane (AOM). Alanine transaminase (ALT), alkaline phosphatase (ALP), aspartate transaminase (AST), creatinine, and urea were evaluated to understand potential hepatoprotective effects and the ability of brewers' rice to attenuate kidney pathology induced by AOM treatment. Liver and kidney tissues were evaluated by hematoxylin and eosin (H&E) staining. Overall analyses revealed that brewers' rice improved the levels of serum markers in a manner associated with better histopathological outcomes, which indicated that brewers' rice could enhance recovery from hepatocyte and kidney damage. Taken together, these results suggest that brewers' rice could be used in future applications to combat liver and kidney disease.

Characterisation of fucoidan extracted from Malaysian *Sargassum binderi*

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Fucoidan is a sulphated polysaccharide that consists mainly of fucose, normally found in brown seaweeds. In this study, fucoidan was extracted from *Sargassum binderi* (F_{sar}) from Malaysia and subsequently characterised. The chemical characteristics of F_{sar} were found to be different than those of commercial food grade fucoidan (F_{ysk}) and those of previously studied fucoidans. NMR analysis proposed that the main structure of F_{sar} is 3) fuc-2-OSO_3 (1 3) fuc (1 .The molecular weight (47.87 kDa) and degree of sulphation (0.20) of F_{sar} were higher than those of F_{ysk}, at 27.98 kDa and 0.15, respectively. However, F_{sar} s polydispersity index (1.12) and fucose content (34.50%) were lower than those of F_{ysk}, at 1.88 and 43.30%, respectively. Both F_{sar} and F_{ysk} showed similar thermogravimetric properties with four mass losses, amorphous in nature and negative optical rotations. Results show that F_{sar} has fundamental characteristics of fucoidan with different structural conformation i.e. variation in glycosidic linkages and sulphate group orientation.

Chemical properties and toxicology studies of fucoidan extracted from Malaysian *Sargassum binderi*

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Food Science and Biotechnology, Vol. 25(1), 2016, 23-29

Fucoidan is a sulfated polysaccharide that consists mainly of fucose and is found in brown seaweeds. In this study, fucoidan was extracted from *Sargassum binderi* (F_{sar}) from Malaysia and subsequently characterized in terms of composition, structure and toxicology. It was found that the molecular weight, polydispersity index, monosaccharide profile and degree of sulfation of F_{sar} differed from those of commercial food-grade fucoidan (F_{ysk}). NMR analysis suggested that the main structure of F_{sar} was →3)fuc-2-OSO3 –(1→3)fuc-2-OSO3–(1→. A cytotoxicity study employing up to 200 mg/mL *Sargassum binderi* extract showed that cell inhibition was less than 50% (IC_{50}), while acute toxicity results classified *S. binderi* as category 5 (unclassified) according to the OECD Guideline 423, as no mortality was observed at the highest dosage (2,000 mg/kg). Both toxicity results showed that this material is safe to be consumed. The chemical characteristics and non-toxicity of F_{sar} demonstrate its potential in biological and food product applications.

Cocoa polyphenols treatment ameliorates visceral obesity by reduction lipogenesis and promoting fatty acid oxidation genes in obese rats through interfering with AMPK pathway

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This study was conducted to investigate the pharmacological activity of cocoa polyphenols (CPs) on visceral obesity markers and the possible mechanisms. In this study, Sprague–Dawley (SD) rats were fed either a low fat diet (LFD) or a high fat diet (HFD). After 12 wk of diet intervention, only one group of HFD rats (n = 10/group) were treated at a dose of 600 mg/kg bw/day CPs (HFD + CPs) for 4 wk. The gene and protein expression levels of phosphorylation of AMPK activated protein kinase α/β (AMPK α/β) were measured using real time PCR and Western blotting. The mRNA expression of lipogenic key enzymes (Acaca, Fasn, Mcat, and Scd 1), and β–oxidation key enzymes (CPT1, Prkaa1, Acox1) were investigated. In addition, the upstream transcription factors (PPARα, PPARγ, C/EBPα, and SREBP-1c) were also examined. In accordance with these findings, CPs treatment improved visceral adiposity, adipocytes hypertrophy, and liver steatosis. AMP-activated protein kinase α/β (AMPK α/β) phosphorylation in liver and adipose tissue of HFD + CPs treated rats was activated compared with HFD fed rats. The expression of lipogensis related genes was decreased, while expression levels of β oxidation related genes were increased compared with HFD fed rats. Together, these data partially unravel the ameliorative effects of CPs treatment on visceral obesity markers by inhibiting lipogenesis and promoting β oxidation related genes through activation of the AMPK pathway.

Comparative evaluation of nutritional compositions, antioxidant capacities and phenolic compounds of red and green sessile joyweed (*Alternanthera sessilis*)

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The nutritional compositions, antioxidant capacities, and phenolic compounds of *Alternanthera sessilis* red (ASR) and green (ASG) in water and ethanolic extracts were compared. Nutritional compositions were determined according to an AOAC method. Total phenolic content was evaluated by a colorimetric reduction using the Folin–Ciocalteu method. High-performance liquid chromatography combined with diode array and electrospray ionization mass spectrometric detection was used to the study phenolic compounds. Antioxidant capacities were evaluated by five different methods. The results showed that ASR contained significantly ($p<0.05$) higher protein, fat, carbohydrate and mineral contents compared to ASG. The ethanolic extracts of both ASR and ASG presented significantly greater antioxidant capacity than the water extracts at $p<0.05$. The total phenolic content exhibited a positive correlation with the antioxidant capacities, which could be one of the critical contributors to the antioxidant activity of ASR and ASG.

Cytotoxic and anti-inflammatory activities of *Garcinia xanthochymus* extracts on cell

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Objective: *Garcinia xanthochymus* extract has been reported to have several pharmacological properties. This study was conducted to evaluate cytotoxic and anti-inflammatory activities of *G. xanthochymus* extracts on cell lines. **Methods**: The roots and stem barks of plant were extracted using maceration method with n-hexane, dichloromethane and methanol, successively. Cytotoxic activity of the extracts was tested against MCF-7 breast adenocarcinoma using MTT assay. Anti-inflammatory study was evaluated using RAW 264.7 mouse macrophage cells. The nitric oxide production in LPS-stimulated cells was measured using Griess reagent. **Results**: The results of cytotoxic and anti-inflammatory study showed that dichloromethane and *n*-hexane extracts of root and stem bark exhibited cytotoxic activity in dose-dependent manner. Meanwhile, for anti-inflammatory study, all root extracts together with stem bark dichloromethane and *n*-hexane extracts reduce NO production in LPS-stimulated cells in dose dependent manner. **Conclusions**: This finding indicated that *G. xanthochymus* extracts might become interesting candidate for treatment of cancer and inflammation.

Determination of element compositions and antioxidant activities of *Kappaphycus alvarezii* found in the waters of Langkawi and Sabah, Malaysia

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The element composition and antioxidant properties of the two red seaweeds *Kappaphycus alvarezii*, from Langkawi and Sabah in Malaysia were determined. The results indicate that the two red seaweeds contained high levels mineral such as *K. alvarezii*. There were no significant differences in TPC (26.81-28.04 umol /100g GAE), DPPH (18.75-22.76%), ORAC (235.12-530.24umol/100g TE) between the two seaweeds. This study suggested that *Kappaphycus alvarezii* from both habitats could be used as ingredients to improving nutritive value and functional properties in human diets.

Dietary cocoa inhibits colitis associated cancer: a crucial involvement of the IL-6/STAT3 pathway

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Patients with inflammatory bowel disease (IBD) are at increased risk for developing ulcerative colitis (UC)-associated colorectal cancer (CRC). The interleukin-6 (IL-6)/Signal Transducer and Activator of Transcription (STAT)-3 signaling regulate survival and proliferation of intestinal epithelial cells and play an important role in the pathogenesis of inflammatory bowel disease and colorectal cancer (CRC). Cocoa is enriched with polyphenols that known to possess antioxidant, anti-inflammatory, and antitumor activities. Here, we explored the antitumor effects and mechanisms of cocoa diet on colitis-associated cancer (CAC) using the azoxymethane/dextran sulfate sodium (AOM/DSS) model, with a particular focus on whether cocoa exerts its anticancer effect through the IL-6/STAT3 pathway. We found that cocoa significantly decreased the tumor incidence and size in CAC-induced mice. In addition to inhibiting proliferation of tumor epithelial cells, cocoa suppressed colonic IL-6 expression and subsequently activation of STAT3. Thus, our findings demonstrated that cocoa diet suppresses CAC tumorigenesis, and its antitumor effect is partly mediated by limiting IL-6/STAT3 activation. In addition cocoa induces apoptosis by increased the expressions of Bax, Caspase 3 and decreased Bcl-xl. Thus, we conclude that cocoa may be a potential agent in the prevention and treatment of CAC.

Dietary cocoa protects against colitis associated cancer by activating the Nrf2/Keap1 pathway

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International Union of Biochemistry and Molecular Biology, 41(1), 2015, 1-14, doi: 10.1002/biof.1195

Colorectal cancer (CRC) is the third most common malignancy in males and the second most common cancer worldwide. Chronic colonic inflammation is a known risk factor for CRC. Cocoa contains many polyphenolic compounds that have beneficial effects in humans. The objective of this study is to

explore the antioxidant properties of cocoa in the mouse model of azoxymethane (AOM)/dextran sulfate sodium (DSS)-induced colitis-associated cancer, focusing on the activation of Nrf2 signaling. Mice were treated with AOM/DSS and randomized to receive either a control diet or a 5 and 10% cocoa diet during the study period. On day 62 of the experiment, the entire colon was processed for biochemical and histopathological examination and further evaluations. Increased levels of malondialdehyde (MDA) were observed in AOM/DSS-induced mice; however, subsequent administration of cocoa decreased the MDA. Enzymatic and nonenzymatic antioxidants, such as superoxide dismutase, catalase, glutathione peroxidase and glutathione reductase, were decreased in the AOM/DSS mice. Cocoa treatment increases the activities/levels of enzymatic and nonenzymatic antioxidants. Inflammatory mediators, such as inducible nitric oxide synthase (iNOS) and cyclooxygenase (COX)-2, were elevated during AOM/DSS-induction, and treatment with 5 and 10% cocoa effectively decreases the expression of iNOS and COX-2. The NF-E2-related factor 2 and its downstream targets, such as NQO1 and UDP-GT, were increased by cocoa treatment. The results of our study suggest that cocoa may merit further clinical investigation as a chemopreventive agent that helps prevent CAC.

Edible films from seaweed (*Kappaphycus alvarezii*)

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A new patent pending process is proposed in this study to produce edible film directly from seaweed (*Kappaphycus alvarezii*). Seaweed together with other ingredients has been used to produce the film through casting technique. Physical and mechanical tests were performed on the edible films to examine the thickness, colour, transparency, solubility, tensile strength, elongation at break, water permeability rate, oxygen permeability rate and surface morphology. Produced film was transparent, stretchable, sealable and have basic properties as a film for food packaging. This study suggests that the edible film could be used as novel materials in food industry as sachet/pouch/bag for instant coffee, breakfast cereals drinks, seasoning powder, candies etc; as wrapper for seasoning cube and chocolate; as interleaf for frozen foods such as burger patties to avoid the patties from sticking together; and also as material for edible logo in bakeries products. Other than that, the edible film also could be used in pharmaceutical industry as functional strips such as oral freshener strips and drug strips. In cosmetic and toiletries industries, the edible film could be used to produce facial mask and bag for pre-portioned detergent. Compared with edible film developed earlier using alginate and carrageenan, film developed in this research used seaweed directly. The developed film reduced the need to extract the alginate and carrageenan, making material preparation easier and cheaper

Effect of germination on total dietary fibre and total sugar in selected legumes

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Legume is a plant in the family of Fabaceae (or Leguminosae) that is cultivated and consumed throughout the world. Legume's role in human health appears to be limited because of several limiting factors such as low protein and starch digestibility, poor mineral bioavailability and high antinutritional factors. Germination is defined as a process that occurs during seed growth that starts with uptake of water until the emergence of radicle through the surrounding structure. It has been suggested that germination is a cheaper and more effective technology that can improve the quality of legumes by increasing their nutritional value. This study was conducted to compare changes in dietary fibre and total sugar compositions after germination process in kidney, mung, soy beans and peanuts. Total dietary fibre was found to be significantly increased ($p<0.05$) in all germinated samples, with significant increased ($p<0.05$) of soluble and insoluble dietary fibres. For total sugar content, germination increased the level of total sugars. Glucose was the highest available sugar in samples that increased after germination while arabinose was second available sugar that increased in germinated legumes except kidney beans. Overall, germination has improved nutritional properties of legumes in terms of dietary fibre and total sugar content but the changes are influenced by the type of legumes.

Effect of additional *Hoodia gordonii* and seaweed powder on the sensory and physicochemical properties of brown rice bar

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Awareness of the nutritional content of food has increased with the emergence of various health products in the market. Cereal bar is one of the beneficial foods among consumer that concern on their healthy food. This study was conducted to develop a brown rice bar that contain active ingredients (*H. gordonii* and seaweed powder) and to determine the effect on sensory evaluation and physicochemical properties (colour, texture and proximate analysis) of this product. This study consisted of two phases in which the first phase consisted of development of ten formulations including control. All of the formulations were undergo analysis of colour, texture and sensory evaluation. Based on the sensory evaluation, Control (*H. gordonii*: 0%, seaweed: 0%) and two best formulations that consist of formulation 6 *(H. gordonii*: 1.6%; seaweed: 2.8%) and formulation 9 (*H. gordonii*: 2.4%, seaweed: 2.8%) were chosen to undergo the second phase which is proximate analysis. Base on the result, were significant different ($p<0.05$) on proximate analysis except for the protein and moisture content. Therefore, it can be concluded that *H. gordonii* is a good source of fiber when adding in a bar.

Effect of *Momordica charantia* fruit extract on vascular complication in type 1 diabetic rats

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EXCLI Journal, Vol. 14, 2015, 179-189

Diabetes mellitus is one of the risk factors in the development of vascular complications. Decreased nitric oxide (NO) production and increased lipid peroxidation in diabetes mellitus are the dominant exaggerating factors. *Mormodica charantia* (MC) was proven to be useful in improving diabetes mellitus and its complications. In the present study, a total of 40 male Sprague-Dawley rats were used. Diabetes was induced by a single dose (50 mg/kg) of streptozotocin (STZ), intramuscularly. Following

4 weeks of STZ induction, the animals were equally divided into five groups (n= 8); Control group (Ctrl), control group treated with MC (Ctrl-*MC*), diabetic untreated group (DM-Ctrl), diabetic group treated with *MC* (DM-*MC*) and diabetic group treated with metformin 150 g/kg (DM-Met). Oral administration of the *MC* fruit extract (1.5 g/kg) was continued for 28 days. DM-*MC* group showed a significant decrease (P< 0.05) in blood pressure, total cholesterol and triglyceride levels compared to the DM-Ctrl group. Aortic tissue NO level was significantly increased and malondialdehyde level was decreased in the DM-*MC* group. Immunohistochemical staining showed an increase in eNOS expression in the endothelial lining of the DM-*MC* group. Similarly, morphological deterioration of the aortic tissues was reverted to normal. In summary, treatment with the MC fruit extract exerted the significant vasculoprotective effect in the type 1 diabetic rat model.

Effect of seaweed *Kappaphycus alvarezii* in the synthesis of Cu@Cu2O core-shell nanoparticles prepared by chemical reduction method

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This study aims is to investigate the influence of different concentrations of *Kappaphycus alvarezii* (*K. alvarezii*) for the synthesis of Cu@Cu2O core–shell nanoparticles (NPs) in aqueous solution. The core–shell NPs were prepared by a chemical reduction method using *K. alvarezii*, CuSO45H2O, NaOH, ascorbic acid, hydrazinium hydroxide, as stabilizer, copper precursor, pH moderator, antioxidant and reducing agent under 120 °C temperature, respectively. Formation of Cu@Cu2O-NPs was determined by UV–Vis spectroscopy where surface plasmon absorption maxima can be observed at 390-590 nm. The synthesized core–shell NPs were also characterized by X-ray diffraction. Moreover, the morphology and structure of the *K. alvarezii*/Cu@Cu2O-NPs were investigated by TEM, FESEM and EDXRF. The Fourier transform infrared spectrum suggested the complexation present between *K. alvarezii* and Cu@Cu2O-NPs. The study clearly showed that using various amounts of *K. alvarezii* leads to produce different ratios and sizes of Cu@Cu2O NPs. The size of the Cu@Cu2O-NPs decreased as the amount of *K. alvarezii* was increased. The ratio of Cu@Cu2O increases with the increasing concentration of *K. alvarezii* until 0.2 wt%.

Effect of selected tropical fruits on health-promoting properties in rats

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Guava, papaya and soursop are among several tropical fruits that contain antioxidants. The study was conducted to investigate the health-promoting effect of these fruits on *Sprague-Dawley* rats. The parameters determined were total antioxidant status, alanin aminotransferase (ALT), aspartate aminotransferase (AST), total protein, albumin, globulin, urea, creatinine, total cholesterol, triglyceride, low density lipoprotein-cholesterol (LDL-C) and high density lipoprotein-cholesterol (HDL-C). TAS level in supplemented (guava, papaya and soursop) group were significantly higher (p< 0.05) compared to the control group. Supplementation of guava, papaya and soursop puree did not affect the ALT and AST levels. Significant difference (p< 0.05) was observed between control and supplemented groups for total protein, albumin and globulin levels. The total cholesterol level was significantly reduced (p<

0.05) in guava and soursop at medium and high dosage compared to control group. Rats supplemented with papaya puree at all dosage exhibited significantly higher (p< 0.05) level of HDL-C compared to control group. Supplementation with these fruits will increase the antioxidant and HDL-C level in blood serum of rats, which will improve health to a better status.

Effect of yeast and acetic fermentation on phytochemical and antioxidant properties of jackfruit pulp (*Artocarpus Heterophyllus* L.)

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Jackfruit (*Artocarpus heterophyllus* L.) is one of the important tropical fruits in Malaysia, mainly used for fresh consumption because of its good source of energy, deliciously sweet in taste, proteins, dietary fiber, minerals and vitamins. To date, there is lack of fermentation study reported on jackfruit. Hence, the aim of this work is to evaluate the phytochemical content and antioxidant properties of fermented jackfruit which was subjected to acetic acid bacteria and yeast fermentation individually for a duration of 7 days. The changes in the pH value, brix value, total reducing sugar content, total phenolic and total flavonoid content were examined for both yeast and acetic acid fermented jackfruit samples. Few antioxidant activities such as ferric reducing antioxidant power (FRAP) value and 2,2-diphenyl -1-picrylhydrazyl (DPPH) free radical scavenging activity were also analyzed to determine the differences in the respective properties of jackfruit pulp after being subjected to yeast or acetic acid fermentation. There is a slight change on brix value and DPPH free radical scavenging activity (31.05-33.17% radical scavenging activity) for both yeast and acetic acid fermented samples. However, acetic acid fermented jackfruit exhibited higher total reducing sugar content (23.24 mg glucose/mL) and total phenolics content when compared to yeast fermented jackfruit sample. Both yeast and acetic acid fermented jackfruit samples showed higher FRAP value (0.435 -0.48 mg ascorbic acid/mL) than unfermented jackfruit sample (0.372 mg ascorbic acid/mL) except for total flavonoid content which exhibited a decreasing trend after fermentation.

Effects of different cooking methods on isoflavone content in Malaysian soy-based dishes

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Soy-based products are one of famous raw ingredients used in the preparation of Asian cuisines. These soy-based products are good source of isoflavones. This study was carried out to observe the effects of different cooking methods on isoflavone content in soy-based products. A total of eight Malaysian dishes prepared using soy-based products with different cooking methods was selected as samples for this study. Daidzein and genestein contents in raw and cooked soy-based products were both quantified using high performance liquid chromatography (HPLC). The results showed that dishes containing tempe as ingredients had significantly higher (p≤0.05) in this study.

Effects of gelam honey on oxidative stress in lung cancer cells

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Gelam honey was reported to exhibit anti-oxidative, anti-tumour and anti-inflammatory properties against many types of cancer. The main aim of the present study was to evaluate the effect of Gelam honey on the oxidative stress level of human lung cancer cells. IC_{50} of Gelam honey was identified by treating A549 cells with different doses of honey (50-200 mg/ml). The cells were divided into four groups and induced with stress using hydrogen peroxide (H_2O_2) accordingly: control, H_2O_2, Gelam honey, H_2O_2 + Gelam honey. After 24 hrs of treatment, oxidative stress markers such as malondialdehyde (MDA) and protein carbonyl, were determined. Induction of oxidative stress significantly increased the levels of MDA ($p<0.05$) but had no effect on protein carbonyl levels. Treatment with Gelam honey was found to reduce MDA levels ($p<0.05$) in A549 cells exposed to H_2O_2 but had no effect on the level of protein carbonyl. Interestingly, Gelam honey treatment alone had no effects on the levels of MDA and protein carbonyl. In conclusion, Gelam honey reduces lipid peroxidation but not protein oxidation in human lung cancer cells subjected to oxidative stress.

Effects of oil palm (*Elais Guineensis*) fruit extracts on insulin secretion from BRIN BD11 cells

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Introduction: Diabetes is one of the top ten causes of mortality in Malaysia. Several antidiabetic studies using palm oil (*Elaeis guineensis*) have been explored in recent years. The oil palm fruit itself has not been investigated and hence this study was conducted to evaluate its effects in stimulating insulin secretion from pancreatic β-cell. **Methods**: The insulinotropic activity of oil palm fruit aqueous extract (OPF) on clonal pancreatic β-cell line was investigated using BRIN BD11 cell line. The cell lines were incubated with different concentrations of OPF to evaluate the stimulatory effect of OPF toward insulin secretion from BRIN BD11 cells using the Rat Insulin ELISA Assay Kits. **Results**: OPF concentrations (100-1000 µg/m1) were shown to significantly induce insulin secretion by a multiple of 1.97-2.58 in the BRIN BD11 cells. The highest insulin secretion increase (2.58-fold, $p< 0.001$) was induced by 500 µg/ml in the OPF treated group. Evaluation of the possible mechanisms involved suggested that the mechanisms of insulin secreting activity of the 500 µg/ml OPF extract may involve the K^+_{ATP} channel-dependent pathway which exerts an insulin secretion effect through depolarising the membrane of pancreatic β-cells. **Conclusion**: The present study has revealed the presence of insulinotropic activity in *Elaeis guineensis* fruit. Future work assessing its use as a source of active components is recommended.

Efficacy of cocoa pod extract as antiwrinkle gel on human skin surface

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Objective: Cocoa pods are abundant waste materials of cocoa plantation, which are usually discarded onto plantation floors. However, due to poor plantation management, the discarded cocoa pods can create suitable breeding ground for *Phytophthora palmivora*, which is regarded as the causal agent of the black pod disease. On the other hand, cocoa pods potentially contain antioxidant compounds. Antioxidant compounds are related to the protection of skin from wrinkles and can be used as functional cosmetic ingredients. Therefore, in this study, cocoa pods were extracted and to be used as active ingredients for antiwrinkles. **Methods**: The active compounds in cocoa pod extracts (CPE) were screened using liquid chromatography–mass spectrometry (LC-MS). Fibroblast cells were used to determine the effective concentration of CPE to maintain the viability for at least 50% of the cells (EC_{50}). The gel was tested by 12 panelists to determine the efficacy of CPE in gel form using Visioscan to reduce skin wrinkles and improve skin condition. **Results**: CPE was detected to contain malic acid, procyanidin B1, rosmarinic acid, procyanidin C1, apigenin, and ellagic acid, all of which may contribute to functional cosmetic properties of CPE. The EC_{50} value of cocoa pod extracts was used to calculate the amount of CPE to be incorporated into gel so that the formulated product could reach an effective concentration of extract while being nonintoxicant to the skin cell. The results showed that CPE is potential ingredient to reduce wrinkles. Skin wrinkles reduced at 6.38 ± 1.23% with the application of the CPE gel within 3 weeks and significantly improved further (12.39 ± 1.59%) after 5 weeks. The skin hydration increased (3.181 ± 1.06%) after 3 weeks of the CPE gel application. **Conclusion**: Flavonoid compounds in CPE contributed to the functional cosmetic properties of CPE. The CPE which is nontoxic to skin cells help to reduce wrinkles on skin after 3 weeks of application. CPE can be used as the active ingredients in antiwrinkle products, and prolonged application may result in significant visual changes to the naked eyes.

Efficacy study of broken rice maltodextrin in in vitro wound healing assay

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Maltodextrins that contain both simple sugars and polymers of saccharides have been widely used as ingredients in food products and pharmaceutical delivery systems. To date, no much work has been reported on the applications of maltodextrin from broken rice (RB) sources. Therefore, the objective of this work was to investigate the in vitro wound healing efficacy of RB maltodextrin at different conditions. Wounds treated with lower dextrose equivalent (DE) range (DE 10–14) of maltodextrins at a concentration of 10% obtained from RB were found to be able to heal the wounds significantly faster (< 0.01) than maltodextrin with higher DE ranges (DE 15–19 and DE 20–24) and concentrations of 5% and 20%. The findings from both BrdU and MTT assay further confirmed its

wound healing properties as the NIH 3T3 fibroblast wounded cells were able to proliferate without causing cytotoxic effect when wounded cell was treated with maltodextrin. All these findings indicated that the RB maltodextrin could perform better than the commercial maltodextrin at the same DE range. This study showed that RB maltodextrins had better functionality properties than other maltodextrin sources and played a beneficial role in wound healing application.

Enhancing effects of *Trichosanthes cucumerina* extracts on adipogenesis, adipolysis and glucose uptake in 3T3-L1 adipocytes

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Objectives/Research Problem: Alternative traditional medicines and herbal remedies are continuously being used in the prevention of various diseases due to their beneficial health implications and cost effectiveness. One of these diseases is a state of hyperglycemia which can be managed through the use of natural products originating from herbs, fruits or vegetables. One of the proclaimed and underutilized vegetables used in this study is a commonly consumed gourd belonging to the *Cucurbitaceae* family, named: *Trichosanthes Cucumerina* (known as Snake gourd or Labu Ular). **Materials and Method**: Water and ethanol extracts of the whole vegetable were assessed for cell viability which revealed that 3T3-L1 adipocytes maximum toleration concentration was 0.063 mg/ml. The extracts were further tested on adipocytes' differentiation and showed a stimulation of lipid droplets formation during adipogenesis. **Results and Discussion**: The extracts significantly ($p< 0.001$) increased glycerol concentrations during adipolysis with concentrations of 75.34 ± 3.69 and 43.50 ± 4.23 µg/ml for the ethanol extract (TCWe) and water extract (TCWw) of the whole vegetable, respectively. The extracts also significantly ($p< 0.001$) promoted the uptake of glucose into the cells with values of 71.24 and 44.47% for the ethanol extract (TCWe) and the water extract (TCWw) of the whole vegetable, respectively. **Conclusion**: The present study showed that there is a beneficial effect of the extracts of *Trichosanthes Cucumerina* on adipogenesis, adipolysis and glucose uptake on 3T3-L1 adipocytes which can be a key factor in the prevention and treatment of non-communicable diseases such as diabetes, obesity and metabolic syndrome.

Evaluation of banana (*Musa* sp.) flowers of selected varieties for their antioxidative and anti-hyperglycemic potentials

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Consumption of banana flower as a vegetable is popular among many countries in Southeast Asia. In this study, banana flowers of six different Malaysian cultivars namely, pisang Abu (*Musa balbisiana* cv P. Abu), pisang Berangan (*Musa acuminata* cv P. Berangan), pisang Nipah (*Musa balbisiana* cv P. Nipah), pisang Susu (*Musa acuminata* cv P. Susu), pisang Mas (*Musa acuminate* cv P. Mas) and pisang Rastali (*Musa paradisiaca* cv P. Rastali) were investigated for their antioxidant and anti-hyperglyemic properties. The total poly phenolic content and antioxidant activities, the -amylase and -glucosidase

inhibitory potentials of the banana flower extracts were studied in vitro using relevant assays. Among the six cultivars, cultivar Susu was found to have the highest phenolic content (80.13 ± 4.64 mg of GAE/g of extract) and displayed the highest ABTS+ and DPPH radical scavenging activities (24.73 ± 0.04 and 25.10 ± 0.15 µmole of Trolox equivalent/g of extract). The anti-amylase and antiglucosidase activity of the banana flowers extracts were in the range of 47.31 - 62.58% and 74.98 - 91.62%, respectively. All banana flower extracts inhibited the activity of -glucosidase better than -amylase at the concentration of 200 µg/ml. This study concluded that the extracts of Malaysian banana flowers were potent sources of natural antioxidants, which can be used as postprandial hyperglycemia regulators.

Evaluation of fruit leather made from two cultivars of papaya

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Two papaya cultivars were used to manufacture fruit leather. The objective of this study was to formulate papaya leather from locally grown papaya using natural ingredients like pectin, honey and citric acid. The fresh fruits were pureed and mix with natural ingredients, and dried in an oven at 60 °C for 12 hours. The physicochemical properties and antioxidant activity were determined. The results showed that fruit leather made from Hongkong cultivar is significantly ($P < 0.05$) higher in sensory parameters as well as physicochemical properties and antioxidant activity. The phenolics content and antioxidant activity increased by process of drying the fruit leather compared to fresh fruits in both papaya cultivars. Therefore, the consumer requirements for healthy and safe food products were respected.

Evaluation of *in vitro* wound healing efficacy of breadfruit derived starch hydrolysate

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To study the wound healing efficacy of breadfruit starch hydrolysate, an in vitro wound scratch assay was conducted, in which the migration rate of wounded NIH 3T3 fibroblasts was determined. Wounds treated with lower dextrose equivalent (DE), (DE 10-14) starch hydrolysate were found capable to improve the wound healing of NIH 3T3 fibroblast cell with the percentage of wound closure improvement of 77%, respectively when compared with higher DE range (DE 15-19 and DE 20-24). The findings obtained in the BrdU uptake and MTT viability assays confirmed the wound healing properties of breadfruit starch hydrolysate as the starch hydrolysate-treated wounded NIH 3T3 fibroblasts were able to proliferate well and no cytotoxicity was observed. Together, these findings indicated that the newly developed breadfruit starch hydrolysate performed better than commercial (COM) starch hydrolysate of the same DE ranges. In conclusion, breadfruit starch hydrolysate had better functional properties than did starch hydrolysates derived from other sources and that they could play a beneficial role in wound healing applications.

Evaluation of total phenolic content, antioxidant activities and sugar content of fresh mixed fruit and vegetables juices

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The notion of fruit and vegetables (FV) in preventing chronic diseases has long been discerned. To meet the recommended FV intake, FV juices have emerged as a convenient and healthy choice. Mixed fruit and vegetable juices (MFVJ) cater the blend of desirable flavor and taste of consumers. This study was carried out to determine the total phenolic content (TPC), antioxidant activities and sugar content of selected MFVJ. Folin-Ciocalteu assay was employed to quantify TPC, whereas DPPH and FRAP assays were used to evaluate the antioxidant activities of MFVJ. The sugar content was determined using phenol-sulfuric acid method. MFVJ extracted from bitter gourd, green apple and orange (BGO) had the highest TPC content (76.4 ± 4.2 mg GAE/100 ml). Celery and green apple (CG) juice showed the highest DPPH value (522.3 ± 7.6 mg TE/100ml) whereas carrot and starfruit (AS) juice have the highest FRAP value (419.6 ± 21.6 mg TE/100 ml). The sugar content of MFVJ was within the range of 5.7-13.3 g/100 ml. MFVJ can be considered as healthy beverages with considerable amounts of phenolic compounds and low sugar content. This study provides some useful reference for consumers who consume juices with combinations of FV. Future studies need to discover more combinations of FV juices, providing more data pertaining to MFVJ. Identification of individual phenolic compounds should also be part of future research using various instrumental analyses.

Flower extract of *Allium atroviolaceum* triggered apoptosis, activated caspase-3 and down-regulated antiapoptotic Bcl-2 gene in HeLa cancer cell line

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Cervical cancer accounts for the second most frequent cancer and also third leading cause of cancer mortality (15%) among women worldwide. The major problems of chemotherapeutic treatment in cervical cancer are non-specific cytotoxicity and drug resistance. Plant-derived products, known as natural therapies, have been used for thousands of years in cancer treatment with a very low number of side effects. *Allium atroviolaceum* is a species in the genus *Allium* and *Liliaceae* family, which could prove to have beneficial effects on cancer treatment, although there is a lack of corresponding attention. The methanolic extract from the *A.atroviolaceum* flower displayed marked anticancer activity on HeLa human cervix carcinoma cells with much lower cytotoxic effects on normal cells (3T3). The *A.atroviolaceum* extract induced apoptosis, confirmed by cell cycle arrest at the sub-G0 (apoptosis) phase, characteristic morphological changes, evident DNA fragmentation, observed by fluorescent microscope, and early and late apoptosis detection by Annexin V. Furthermore, down-regulation of *Bcl-2* and activation of caspase-9 and -3 strongly indicated that the mitochondrial pathway was involved in the apoptosis signal pathway. Moreover, combination of *A.atroviolaceum* extract with doxorubicin revealed a significant reduction of IC_{50} and led to a synergistic effect. In summary, *A.atroviolaceum* displayed a significant anti-tumour effect through apoptosis induction in HeLa cells, suggesting that the *A.atroviolaceum* flower might have therapeutic potential against cervix carcinoma.

Fructose-drinking water induced nonalcoholic fatty liver disease and ultrastructural alteration of hepatocyte mitochondria in male wistar rat

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Background: Nonalcoholic fatty liver disease (NAFLD) is one of the complications of the metabolic syndrome. It encompasses a wide range of disease spectrum from simple steatosis to liver cirrhosis. Structural alteration of hepatic mitochondria might be involved in the pathogenesis of NAFLD. **Aims**: In the present study, we used a newly established model of fructose-induced metabolic syndrome in male Wistar rats in order to investigate the ultrastructural changes in hepatic mitochondria that occur with fructose consumption and their association with NAFLD pathogenesis. **Methods**: The concentration of fructose-drinking water (FDW) used in this study was 20%. Six male Wistar rats were supplemented with FDW 20% for eight weeks. Body composition and metabolic parameters were measured before and after 8 weeks of FDW 20%. Histomorphology of the liver was evaluated and ultrastructural changes of mitochondria were assessed with transmission electron micrograph. **Results**: After 8 weeks of fructose consumption, the animals developed several features of the metabolic syndrome. Moreover, fructose consumption led to the development of macrovesicular hepatic steatosis and mitochondrial ultrastructural changes, such as increase in mitochondrial size, disruption of the cristae, and reduction of matrix density. **Conclusion**: We conclude that in male Wistar rat 8-week consumption of FDW 20% leads to NAFLD likely via mitochondrial structural alteration.

Functional properties of pectin from dragon fruit (*Hylocereus polyrhizus*) peel and its sensory attributes

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This study was aimed to add value to the disposed dragon fruit peel from the juice industry. Pectin was extracted from the fruit peel and functional properties of pectin and its application in jam processing were investigated. Hunter 'L*', 'a*', and 'b*' values of the dragon fruit peel pectin were 39.95, 34.87 and 20.18 respectively, which showed light red in colour compared to the commercial apple and citrus pectin. In terms of textural properties, the dragon fruit peel pectin showed several characteristics which were similar to apple and citrus pectin. Water holding capacity of the pectin was similar to apple pectin which was 5.50 and 5.45 g/g respectively. Its oil holding capacity and swelling capacity also showed no significant difference ($p > 0.05$) from that of citrus pectin. It was successfully applied in pineapple jam but at a high percentage of up to 2% to make it well set. For sensory attributes, no significant ($p < 0.05$) differences were observed between the mean scores of the jam produced using dragon fruit peel pectin and apple pectin except for the colour attribute. It is therefore recommended to use this pectin as a thickener in food products such as low viscous food and beverages.

Gelam honey increases antioxidant enzyme activity in young rat cardiac mitochondria

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Objective: The aim of this study is to determine the effect of gelam honey on antioxidant enzyme activity in cardiac mitochondria of young and aged rats. **Methods**: Twenty-four male Spraque-Dawley rats were divided into young (2 months) and aged (19 months) groups. Each group was further divided into control (fed with plain water) and supplemented with 2.5 g/kg body weight of gelam honey for 8 months. **Results**: Gelam honey increases cardiac manganese superoxide dismutase (MnSOD) and glutathione peroxidase (GPx) activities in young. Malondialdehyde (MDA) level was reduced in gelam honey supplemented young group. Gelam honey increases cytochrome oxidase activity in the young group compared to control. **Conclusions**: Gelam honey reduces the oxidative damage and increase mitochondrial function by increasing antioxidant enzymes and cytochrome oxidase activity in the young group.

Gelam honey potentiates ex vivo corneal keratocytes proliferation with desirable phenotype expression

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Background: This study aimed to evaluate the effects of Gelam honey on corneal keratocytes proliferative capacity and phenotypic characterization via MTT assay, gene expression and immunocytochemistry. **Methods**: Corneal keratocytes from New Zealand white rabbits were cultured in basal medium (BM) and serum enriched medium (BMS). Serial dilutions of Gelam honey (GH) were added to both media and cells were cultured until passage 1. MTT assay was performed on corneal keratocytes in both media to ascertain the optimal dose of GH that produced maximum proliferation. **Results**: Gelam honey at the concentration of 0.0015 % in both media showed the highest proliferative capacity with no morphological changes compared to their respective controls. The gene expression of aldehyde dehydrogenase (ALDH), a marker for quiescent keratocytes and vimentin, a marker for fibroblast, were higher in the GH enriched groups. The alpha smooth muscle actin (α-SMA) expression, marker for myofibroblast, was lower in GH treated groups compared to the controls. Immunocytochemistry results were in accordance to the gene expression analyses. **Conclusion**: Gelam honey at a concentration of 0.0015 % promotes ex vivo corneal keratocytes proliferation while retaining desirable phenotype expression. The results serve as a basis for the development of Gelam honey as a potential natural product in promoting corneal wound healing.

Hepatic genome-wide expression of lipid metabolism in diet-induced obesity rats treated with cocoa polyphenols

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Cocoa polyphenols (CPs) have been shown to exhibit hypolipidaemic actions, suggesting that CPs offer great potential for ameliorating lipid abnormalities. However, the conceivable molecular mechanisms underlying the pharmacological activity of CPs in obesity-induced liver steatosis have yet to be an investigated. This study analysed the hepatic genome-wide expression patterns in high-fat diet (HFD)-induced obese rats using DNA microarray. Rats were fed either a low fat (LFD) or high fat diet (HFD) for 12 weeks. After supplementation, HFD rats (n= 10/group) were treated with 600 mg/kg bw/day CPs (HFD + CPs) for 4 weeks. As a result, compared to the HFD group, CP treatment significantly lowered lipid in the liver and attenuated the increases in body weight as well as visceral fat accumulation in the CP group. DNA microarray analysis resulted in a differential expression of 862 genes of the 12,282 genes expressed in the liver. The differential expression patterns of selected genes were validated with real-time-PCR. Metabolic pathway analysis via bioinformatic tools showed that genes in lipid catabolism, primarily in fatty acid oxidation, were up-regulated in the CP group, whereas genes in lipid synthesis pathways were down-regulated. Together, these findings provide a novel insight into possible molecular mechanisms behind the pharmacological actions of CPs on the management of the obesity-induced steatosis markers in rats with diet-induced obesity.

Hypocholesterolemic and antiatherosclerotic potential of *Basella alba* leaf extract in hypercholesterolemia-induced rabbits

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Hypercholesterolemia is the major risk factor that leads to atherosclerosis. Nowadays, alternative treatment using medicinal plants gained much attention since the usage of statins leads to adverse health effects, especially liver and muscle toxicity. This study was designed to investigate the hypocholesterolemic and antiatherosclerotic effects of *Basella alba* (*B. alba*) using hypercholesterolemiainduced rabbits. Twenty New Zealand white rabbits were divided into 5 groups and fed with varying diets: normal diet, 2% high cholesterol diet (HCD), 2% HCD + 10 mg/kg simvastatin, 2% HCD + 100 mg/kg *B. alba* extract, and 2% HCD + 200 mg/kg *B. alba* extract, respectively. The treatment with *B. alba* extract significantly lowered the levels of total cholesterol, LDL, and triglycerides and increased HDL and antioxidant enzymes (SOD and GPx) levels. The elevated levels of liver enzymes (AST and ALT) and creatine kinase were noted in hypercholesterolemic and statin treated groups indicating liver and muscle injuries. Treatment with *B. alba* extract also significantly suppressed the aortic plaque formation and reduced the intima: media ratio as observed in simvastatin-treated group. This is the first in vivo study on *B. alba* that suggests its potential as an alternative therapeutic agent for hypercholesterolemia and atherosclerosis.

Hypoglycemic and antidiabetic effect of *Pleurotus sajor-caju* aqueous extract in normal and streptozotocin-induced diabetic rats

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Introduction: *Pleurotus sajor-caju* (PSC) is an edible oyster mushroom featuring high nutritional values and pharmacological properties. Objective. To investigate the hypoglycemic and antidiabetic effects of single and repeated oral administration of PSC aqueous extract in normal and diabetic rats. **Materials and Methods**: A single dose of 500, 750, or 1000 mg/kg of the PSC extract was given to experimental rats to determine the effects on blood glucose (BG) and oral glucose tolerance test (OGTT). The effective dose (750 mg/kg) of PSC extract was repeatedly administrated daily for 21 days in diabetic rats to examine its antidiabetic effects in terms of BG control, body weight, urine sugar, HbA1c, and several serum profiles. **Results**: The dose of 750 mg/kg showed the most significant BG reduction (23.5%) in normal rats 6 hours after administration in BG study ($\rho < 0.05$). In OGTT study, the same dose produced a maximum BG fall of 41.3% in normal rats and 36.5% in diabetic rats 3 hours after glucose administration. In 21-day study, treated diabetic rats showed significant improvement in terms of fasting BG, body weight, and urine sugar as compared to control diabetic rats. **Conclusion**: The study evidenced scientifically the beneficial use of PSC as an alternative medicine in diabetes management.

In utero exposure to germinated brown rice and its oryzanol-rich extract attenuated high fat diet-induced insulin resistance in F1 generation of rats

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Background: The development of insulin resistance is multifactorial, with maternal pre- and postnatal nutrition having significant influences. In this regard, high fat diet (HFD) feeding in pregnancy has been shown to increase risks of metabolic diseases. Thus, we investigated the effects of supplementation of HFD with germinated brown rice (GBR) and GBR-derived gamma oryzanol-rich extract (OE) on insulin resistance and its epigenetic implications in pregnant rats and their offsprings. **Methods**: Pregnant female Sprague dawley rats were fed with HFD alone, HFD + GBR or HFD + OE (100 or 200 mg/kg/day) throughout pregnancy and lactation. Their offsprings were weaned at 4 weeks post-delivery and were followed up until 8 weeks. Serum levels of adipokines were measured in dams and their offsprings, and global DNA methylation and histone acetylation patterns were estimated from the liver. **Results**: The dams and offsprings of the GBR and OE groups had lower weight gain, glycemic response, 8-Iso prostaglandin, retinol binding protein 4 and fasting insulin, and elevated adiponectin levels compared with the HFD group. Fasting leptin levels were lower only in the GBR groups. Hepatic global DNA methylation was lower in the GBR groups while hepatic H4 acetylation was lower in both GBR and OE dams. In the offsprings, DNA methylation and H4 acetylation were only lower in the OE group. However, dams and offsprings of the GBR and OE groups had higher hepatic H3 acetylation. **Conclusions**: GBR and OE can be used as functional ingredients for the amelioration of HFD-induced epigeneticallymediated insulin resistance.

In vitro antioxidant capacities and antidiabetics properties of phenolic extracts from selected citrus peels

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This study aims to determine the antioxidant capacities (AC) and antidiabetic properties of phenolic extracts (free and bound) from white Tambun pomelo peels, kaffir lime peels, lime peels and calamansi peels. AC, total phenolic content (TPC) and antidiabetic properties of selected citrus peels extracts were determined spectrophotometrically using 2,2-Diphenyl-1- picrylhydrazyl free radical (DPPH) scavenging, ferric-reducing antioxidant power (FRAP), Folin-Ciocalteu (FC) and α-amylase and α-glucosidase inhibition assay, respectively. This study found that the methanolic extract of kaffir lime showed the best AC with the lowest IC_{150} value of DPPH radical (7.51 ± 0.50 mg/ml) and highest FRAP value [369.48 ± 20.15 mM Fe (II) E/g DW]. TPC of free phenolic extracts of all citrus peels were significantly ($p<0.05$) higher compared to the bound phenolic extracts with extract of calamansi showed the highest TPC. Free- and bound phenolic extract of calamansi also had the highest α-amylase inhibition activity (61.79 ± 4.13%; 45.30 ± 5.35%) respectively. The highest inhibitory effect in α-glucosidase inhibition assay of free- and bound phenolic extracts were white Tambun pomelo (41.06 ± 10.94%) and calamansi (43.99 ± 22.03%) respectively. Hence, the citrus peels could be furthered study for their potential in management and/or prevention of diabetes.

In vitro inhibitory activity of selected legumes against pancreatic lipase

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This study was conducted to determine the inhibitory potential of seven selected legumes against pancreatic lipase, a key enzyme related to obesity. The samples investigated include chickpea (*Cicer arietinum*), dhal (*Lens culinaris*), mung bean (*Vigna radiata*), red bean (*Vigna angularis*), black-eyed pea (*Vigna unguiculata*), yellow soya bean and black soya bean (*Glycine max*). The results showed no significant differences between the median inhibition concentration (IC_{50}) values of red bean (5.90 ± 0.59 mg/mL), chickpea (6.30 ± 2.19 mg/mL), black soya bean (6.65 ± 0.62 mg/mL), black-eyed pea (6.73 ± 1.84 mg/mL) and yellow soya bean (6.97 ± 0.67 mg/mL). Dhal (IC_{50}: 7.94 ± 0.18 mg/mL) and mung bean (IC_{50}: 8.14 ± 0.41 mg/mL) exhibited the least pancreatic lipase inhibitory activity and their IC_{50} values were significantly lower than those of red bean and chickpea ($P< 0.05$). Red bean, chickpea, black soya bean and black-eyed pea extracts were tested again for pancreatic lipase inhibition under simulated gut conditions. The inhibitory activities of red bean, black soya bean and black-eyed pea were significantly lower than the activity without gut simulation.

Influence of different extraction conditions on antioxidant properties of soursop peel

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Background: Soursop is a healthy fruit. Peels form about 20% of the soursop fruit and are usually discarded as waste product. With a view to utilizing soursop peel as a source of valuable compounds, this study aimed to investigate the influence of different extraction conditions on total phenolic content (TPC) and antioxidant capacity (AC) of soursop (*Annona muricata* L.) peel. **Material and methods**: Different ethanol concentrations (20–100%, v/v), extraction temperatures (25–60 °C), and extraction time (1–5 h) were tested. Extracts were prepared on the basis of the best optimal extraction conditions (20% ethanol, 40 °C the extraction temperature, and 4 h of extraction time), an optimal TPC and AC was determined for the soursop peel using DPPH, ABTS, FRAP and β-carotene bleaching (BCB) assays. The different extraction conditions tested at best optimum conditions have significantly affected the TPC and AC of the soursop peel. **Results**: Soursop peel extract extracted in the best optimal extraction conditions had moderate levels of TPC (52.2 g GAE/ml), and FRAP value (58.9 g TE/ml extract). The extract demonstrated high BCB inhibitory activity (80.08%). The EC_{50} values of the extract were high, 1179.96 and 145.12 g/ml, as assessed using DPPH and ABTS assays, respectively. The TPC was positively and highly correlated with the AC of soursop peel assessed by ABTS, FRAP, and BCB assay, but it was moderately correlated with DPPH radical scavenging activity. A moderate correlation of TPC with DPPH suggested that polyphenols in the extracts were partially responsible for the AC. **Conclusions**: By-products of soursop such as its peel could be an inexpensive source of good natural antioxidants with nutraceutical potential in the functional food industry.

In-vivo toxicity studies of a mixture of *Hibiscus sabdariffa* L., *Clinacanthus nutans* L. and stevia leaves in *Sprague Dawley* rats

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Natural products from medicinal plants are widely used worldwide as they are claimed to generate new alternative medicines. Following its proven medicinal properties, a mixture of *Hibiscus sabdariffa* L., *Clinacanthus nutans* L., *Stevia rebaudiana* in the ratio of 1:1:0.5 (HS:CN:Stevia; w/w/w) was shown to be effective therapy as diuretic and in chemoprevention. However, no study has been conducted to assess the toxic effect or the LD_{50} of this mixture. Therefore, a standard in-vivo toxicological assessment was carried out in a 28-day oral administration study. The doses tested were 1,000 mg/kg, 2,000 mg/kg and 5,000 mg/kg of body weight in *Sprague Dawley* rats. No mortality, adverse clinical signs and abnormal changes in body weight. Toxicologically significant changes were only seen in relative liver weight, red blood cell count, haematocrit, haemoglobin and total protein. However, the difference was toxicologically insignificant since the values were within normal physiological ranges. These observations suggest that the mixture is practically nontoxic in *Sprague Dawley* rats and the no-observed-adverse-effect level (NOAEL) is greater than 5,000 mg/kg.

Inhibitory effect of *gelam* honey on bone loss in periodontitis rat *(Kesan perencatan madu gelam terhadap kehilangan tulang pada tikus periodontitis)*

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Periodontitis adalah penyakit kronik yang melibatkan kehilangan tulang dan inflamasi pada tisu periodontium. Interleukin-6 (IL-6) dan Tumor Necrosis Factor-α (TNF-α) merupakan penanda pro-inflamasi yang penting yang terlibat dalam periodontitis. Sebanyak 20 ekor tikus Sprague-Dawley dibahagikan kepada empat kumpulan iaitu: Kumpulan kawalan dengan salin normal (CS); kumpulan kawalan dengan madu Gelam 3 g/mL (CH); kumpulan ujian periodontitis dengan salin normal (TS); dan kumpulan ujian periodontitis dengan madu Gelam 3 g/mL (TH). Benang bersaiz 4/0 diikat pada molar pertama gigi tikus sebelah kiri bagi tujuan rangsangan penyakit periodontitis. Madu Gelam diberi secara paksa oral selama 15 hari. Selepas 15 hari, sampel plasma dan tisu dianalisis menggunakan kaedah Elisa dan pewarnaan histologi. Kehilangan tulang alveolar pada kumpulan TS adalah paling tinggi berbanding dengan kumpulan kawalan, CS dan CH namun, tiada perbezaan yang signifikan berbanding dengan kumpulan TH. Berdasarkan ujian imunohistokimia, ekspresi IL-6 dan TNF-α pada tisu periodontium adalah tinggi secara signifikan pada kumpulan TS berbanding dengan kumpulan lain. Namun, tiada perubahan aras IL-6 dan TNF-α yang signifikan pada plasma ke semua tikus kajian.

Malaysian brown seaweeds *Sargassum siliquosum* and *Sargassum polycystum*: Low Density Lipoprotein (LDL) oxidation, angiotensin converting enzyme (ACE), α-amylase, and α-glucosidase inhibition activities

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Two Malaysian brown seaweeds, *Sargassum siliquosum* and *Sargassum polycystum* were first extracted using methanol to get the crude extract (CE) and further fractionated to obtain fucoxanthin-rich fraction (FRF). Samples were evaluated for their phenolic, flavonoid, and fucoxanthin contents, as well as their inhibitory activities towards low density lipoprotein (LDL) oxidation, angiotensin converting enzyme (ACE), α-amylase, and α-glucosidase. In LDL oxidation assay, an increasing trend in antioxidant activity was observed as the concentration of FRF (0.04–0.2 mg/mL) and CE (0.2–1.0 mg/mL) increased, though not statistically significant. As for serum oxidation assay, significant decrease in antioxidant activity was observed as concentration of FRF increased, while CE showed no significant difference in inhibitory activity across the concentrations used. The IC_{50} values for ACE inhibitory activity of CE (0.03–0.42 mg/mL) were lower than that of FRF (0.94–1.53 mg/mL). When compared to reference drug Voglibose (IC_{50} value of 0.61 mg/mL) in the effectiveness in inhibiting α-amylase, CE (0.58 mg/mL) gave significantly lower IC_{50} values while FRF (0.68–0.71 mg/mL) had significantly higher IC_{50} values. The α-glucosidase inhibitory activity of CE (IC_{50} value of 0.57–0.69 mg/mL) and

FRF (IC_{50} value of 0.50–0.53 mg/mL) were comparable to that of reference drug (IC_{50} value of 0.54 mg/mL). Results had shown the potential of *S. siliquosum* and *S. polycystum* in reducing cardiovascular diseases related risk factors following their inhibitory activities on ACE, α-amylase and α-glucosidase. In addition, it is likelihood that FRF possessed antioxidant activity at low concentration level.

Mechanism of chemoprevention against colon cancer cells using combined gelam honey and ginger extract via mTOP and WNT/β-catenin pathways

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The PI3K-Akt-mTOR, Wnt/β-catenin and apoptosis signaling pathways have been shown to be involved in genesis of colorectal cancer (CRC). The aim of this study was to elucidate whether combination of Gelam honey and ginger might have chemopreventive properties in HT29 colon cancer cells by modulating the mTOR, Wnt/β-catenin and apoptosis signaling pathways. Treatment with Gelam honey and ginger reduced the viability of the HT29 cells dose dependently with IC50 values of 88 mg/ml and 2.15 mg/ml respectively, their while the combined treatment of 2 mg/ml of ginger with 31 mg/ml of Gelam honey inhibited growth of most HT29 cells. Gelam honey, ginger and combination induced apoptosis in a dose dependent manner with the combined treatment exhibiting the highest apoptosis rate. The combined treatment downregulated the gene expressions of Akt, mTOR, Raptor, Rictor, β-catenin, Gsk3β, Tcf4 and cyclin D1 while cytochrome C and caspase 3 genes were shown to be upregulated. In conclusion, the combination of Gelam honey and ginger may serve as a potential therapy in the treatment of colorectal cancer through inhibiton of mTOR, Wnt/ βcatenin signaling pathways and induction of apoptosis pathway.

Moringa oleifera seed extract: A review on its environmental applications

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This review focus on the use of *Moringa oleifera* seed extract and it application in the environment. It is usually referred to as the miracle tree because of its vast usefulness of its various parts. It is a source of protein, calcium, iron, carotenoids and phytochemicals utilized for several usage in developing countries. The plant parts have been used in various application such as medicine, cosmetics, food supplements and water purification. This review presents the various application of *Moringa oleifera* seed extract as an adsorbent, coagulant, dewatering agent and as a disinfectant. This review also highlight the various methods used in processing the seed extracts, different phytochemical and chemical constituents present in the seed extract. Other aspects that require further investigation were also highlighted in this review.

Parkia speciosa empty pod prevents hypertension and cardiac damage in rats given N(G)-Nitro-L-Arginine Methyl Ester

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Parkia speciosa Hassk is a plant found abundantly in Southeast Asia region. Its seeds with or without pods and roots have been used in traditional medicine in this region to treat hypertension. Therefore, we aimed to investigate the potential effect of the plant empty pod extract on hypertension development and changes in heart induced by *N(G)*-nitro-L-arginine methyl ester (L-NAME) administration in rats. Twenty-four male Sprague Dawley rats were divided into four groups. Groups 1 to 3 were given L-NAME (25 mg/kg, intraperitoneally) for 8 weeks. Groups 2 and 3 were also given *Parkia speciosa* empty pods methanolic extract (800 mg/kg, orally) and nicardipine (3 mg/kg, orally), concurrently with L-NAME. The last group served as the control. L-NAME reduced plasma nitric oxide level and therefore, increased systolic blood pressure, angiotensin-converting enzyme and NADPH oxidase activities as well as lipid peroxidation in the heart. *Parkia speciosa* extract and nicardipine treatments had significantly prevented the elevations of blood pressure, angiotensin-converting enzyme, NADPH oxidase activities and lipid peroxidation in the heart induced by the L-NAME. Parkia speciosa extract but not nicardipine prevented the reduction in plasma nitric oxide level caused by L-NAME. In conclusion, *Parkia speciose* empty pods methanolic extract has a potential to prevent the development of hypertension possibly by preventing the loss of plasma nitric oxide, as well as has cardioprotective effects by reducing angiotensin-converting enzyme activity and oxidative stress in the heart in rats administered L-NAME.

Perinatal exposure to germinated brown rice and its gamma amino-butyric acid-rich extract prevents high fat diet-induced insulin resistance in first generation rat offspring

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Background: Evidence suggests perinatal environments influence the risk of developing insulin resistance. **Objective**: The present study was aimed at determining the effects of intrauterine exposure to germinated brown rice (GBR) and GBR-derived gamma (g) aminobutyric acid (GABA) extract on epigenetically mediated high fat dietinduced insulin resistance. **Design**: Pregnant Sprague Dawley rats were fed high-fat diet (HFD), HFDGBR, or HFDGABA throughout pregnancy until 4 weeks postdelivery. The pups were weighed weekly and maintained on normal pellet until 8 weeks postdelivery. After sacrifice, biochemical markers of obesity and insulin resistance including oral glucose tolerance test, adiponectin, leptin, and retinol binding protein-4 (RBP4) were measured. Hepatic gene expression changes and the global methylation and histone acetylation levels were also evaluated. **Results**: Detailed analyses revealed that mothers given GBR and GABA extract, and their offspring had increased adiponectin levels and reduced insulin, homeostasis model assessment of insulin resistance, leptin, oxidative stress, and RBP4 levels, while their hepatic mRNA levels of *GLUT2* and *IPF1* were increased. Furthermore, GBR and GABA extract lowered global DNA methylation levels and modulated H3 and H4 acetylation levels. **Conclusions**: These results showed that intrauterine

exposure to GBR-influenced metabolic outcomes in offspring of rats with underlying epigenetic changes and transcriptional implications that led to improved glucose homeostasis.

Potential of fermented papaya beverage in the prevention of foodborne illness incidence

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Foodborne illness is recognized as an emerging infectious disease. The incidence of foodborne infections is common and the majority cases are undiagnosed or unreported. Apart from some diarrhea or minor gastrointestinal problem, some foodborne pathogenic microbes may cause death, particularly to those people with weakened immune system. In this study, we have developed a new fermented papaya beverage using symbiotic culture of yeast and acetic acid bacteria under controlled biofermentation process. An in-vitro assessment of fermented papaya beverage against few foodborne pathogenic microorganism was conducted to determine its minimum bactericidal concentration ($MBC_{>99}$). Three types of foodborne pathogen: *Escherichia coli* O157, *Salmonella enterica* serovar Typhimurium ATCC 53648, *Salmonella enterica* serovar Enteritidis (isolated from infectious chicken) were selected. From minimum bactericidal concentration ($MBC_{>99}$) assay, both fermented papaya pulp and leaves beverages have shown 100% killing rate against three selected foodborne pathogenic microbes. Inversely, non-fermented papaya pulp and leaves beverages indicated no inhibition at all. In fact, further dilution of fermented papaya pulp and leaves beverages demonstrated different degree of $MBC_{>99}$ and brix value, but the pH value remained less than 3.5. These findings indicated the combination of soluble solid compounds presents in both fermented papaya beverage and product acidity play an important role in the inhibition of pathogenic microorganisms. The preliminary promising results of this work have shown that the great potential of fermented papaya beverages as a preventive measure to reduce the incidence of foodborne illness.

Prebiotic evaluation of red seaweed (*Kappaphycus alvarezii*) using in vitro colon model

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Red seaweed (*Kappaphycus alvarezii*) cultivated from Sabah (RSS) and Langkawi (RSL) were digested using in vitro mouth, gastric and duodenal model. The digested seaweed then fermented in a pH-controlled batch culture system inoculated with human faeces to mimic the distal colon. Bacterial enumeration were monitored using fluorescent in situ hybridisation, and the fermentation end products, the short chain fatty acids (SCFA), were analysed using HPLC. Both RSS and RSL showed significant increase of *Bifidobacterium* sp.; from log10 7.96 at 0 h to log10 8.72 at 24 h, and from log10 7.96 at 0 h to log10 8.60 at 24 h, respectively, and shows no significant difference when compared to the *Bifidobacterium* sp. count at 24 h of inulin fermentation. Both seaweeds also showed significant increase in total SCFA production, particularly acetate and propionate. Overall, this data suggested that *K. alvarezii* might have the potential as a prebiotic ingredient.

Proliferative activity of saponin-reducing *Carica papaya* leaves extracts on human lung fibroblast cell (IMR90)

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Carica papaya belongs to *Carricaceae* family, which has been proven traditionally to treat dengue fever due to its pharmacological properties to increase platelet count. However, during the critical phase of dengue fever, the platelet count will decrease due to the blood vessel rupturing. Therefore, the main objectives of this study were to reduce the bitterness of *Carica papaya* extract by removing saponin and to study the effect of saponin-reducing extract on the proliferative activity of human lung fibroblast cell (IMR90). For preparative isolation of the saponin compound, peleg model was used to determine the maximum extract concentration, exhaustive time of extraction and total saponin content (TSC) using different weights of dry Amberlite® IRA-67 resin. The remaining saponins in the extract were quantified by mean of RP-HPLC prior to material balance. Then, approximately 1.0 x 10^4 cells of IMR90 were seeded onto 96-well plate and later treated with various concentrations of extracts for 3 days of incubation. The results showed that, the amount of saponin left in the extract was approximately the same as in the untreated extract ($p< 0.05$). A short adsorption incubation time (2 hrs) was believed to affect the saponin adsorption efficiency. In fact, other bio-active constituents (e.g. polyphenolic compounds) might have been adsorbed as there was a significant depreciation of antioxidant properties on the treated extract ($p< 0.05$). In conclusion, after three consecutively days of extractsIMR90 cell incubation, the best EC_{50} values of both untreated and saponin-reducing extracts were observed to be more than 24 hrs of exposure ranging from 104.08 ± 0.90 to 17040.47 ± 2.30 µg/ml. Meanwhile, saponin-reducing extract has been proven not to affect any normal cell growth but in fact it decreased 1.2-fold as compared to the extract containing saponin (control).

Protective effects of defatted dabai peel extracts in hypercholesterolemic rabbits based on histopathological methods

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Defatted dabai peel contains a high amount of anthocyanin. Anthocyanins are known to prevent several types of disease, including cardiovascular-related complications. This study aimed to describe the effects of different doses of defatted dabai peel extract by histopathological analyses on lesions in the liver, kidney, heart and aorta. Histopathology methods were applied to determine the protective effects of defatted dabai peel extracts against hypercholesterolemia-induced oxidative damages to animal organs. Haematoxylin and eosin staining was applied for histopathology examination for liver, kidney, heart and aorta. Data showed that a high dose of defatted dabai extract (3000 mg per day) applied to hypercholesterolemic rabbits for eight weeks had mild protective effect, especially reducing the severity of hepatic fibrosis and steatosis of the renal medulla. The high dose of extract supplementation also reduced inflammation of aorta and formation of atherosclerosis plaque in the cell wall of right ventricle of the heart. The high dose of defatted dabai peel extract could be a protective agent against oxidative stress.

Review of dried fruits: Phytochemicals, antioxidant efficacies, and health benefits

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Dried fruits, which serve as important healthful snacks worldwide, provide a concentrated form of fresh fruits. They are nutritionally equivalent to fresh fruits in smaller serving sizes, ranging from 30 to 43 g depending on the fruit, in current dietary recommendation in different countries. Daily consumption of dried fruits is recommended in order to gain full benefit of essential nutrients, health-promoting phytochemicals, and antioxidants that they contain, together with their desirable taste and aroma. Recently, much interest in the health benefits of dried fruits has led to many in vitro and in vivo (animal and human intervention) studies as well as the identification and quantification of various groups of phytochemicals. This review discusses phytochemical compositions, antioxidant efficacies, and potential health benefits of eight traditional dried fruits such as apples, apricots, dates, figs, peaches, pears, prunes, and raisins, together with dried cranberries. Novel product formulations and future perspectives of dried fruits are also discussed. Research findings from the existing literature published within the last 10 years have been compiled and summarised.

Roselle polyphenols exert potent negative inotropic effects via modulation of intracellular calcium regulatory channels in isolated rat heart

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Cardiovascular Toxicology, Vol. 17(3), 2017, 251-259

Roselle (*Hibiscus sabdariffa* Linn.) calyces have demonstrated propitious cardioprotective effects in animal and clinical studies; however, little is known about its action on cardiac mechanical function. This study was undertaken to investigate direct action of roselle polyphenols (RP) on cardiac function in Langendorff-perfused rat hearts. We utilized RP extract which consists of 12 flavonoids and seven phenolic acids (as shown by HPLC profiling) and has a safe concentration range between 125 and 500 g/ml in this study. Direct perfusion of RP in concentration-dependent manner lowered systolic function of the heart as shown by lowered LVDP and dP/dt_{max}, suggesting a negative inotropic effect. RP also reduced heart rate (negative chronotropic action) while simultaneously increasing maximal velocity of relaxation (positive lusitropic action). Conversely, RP perfusion increased coronary pressure, an indicator for improvement in coronary blood flow. Inotropic responses elicited by pharmacological agonists for L-type Ca^{2+} channel [(±)-Bay K 8644], ryanodine receptor (4-chloro-*m*-cresol), -adrenergic receptor (isoproterenol) and SERCA blocker (thapsigargin) were all abolished by RP. In conclusion, RP elicits negative inotropic, negative chronotropic and positive lusitropic responses by possibly modulating calcium entry, release and reuptake in the heart. Our findings have shown the potential use of RP as a therapeutic agent to treat conditions like arrhythmia.

Safety assessment of a new developed fruit juice product: Mixed Fruit Juice in experimental rats

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The interest in dietary antioxidants which are mainly found in fruits, has prompted research in the field of commercial high antioxidant juice for healthy purposes. Fruits also are rich with antioxidants that help in reducing of degenerative diseases such as cancer, arthritis, cardiovascular disease and inflammation. Based on the health claims from the natural antioxidants, a new healthy juice called Mixed Fruit Juice (MFJ) has been developed by using three combinations of local fruits (soursop, mango and kasturi lime). In order to promote the commercial use of this product, the safety evaluation is needed to be carried out. The 28-days repeated toxicity test has been conducted in female and male rats for pre-clinical safety assessment prior to human study. There was no mortality observed when varying doses of the MFJ (5, 10 and 20%) administered to all rats. Hematological analysis showed no significant differences in most parameters examined. There were no significant changes observed in the liver and kidney functions tests of all treated-rats as compared to control normal rats. Furthermore, lipid profiles and blood glucose level were also within the normal range as noted in control rats. The present data demonstrate that the supplementation of MFJ did not produce adverse effects on the body system of experimental rats. This is the first documented report on the safety assessment of MFJ in rats.

Scientific evidence of rice by-products for cancer prevention: Chemopreventive properties of waste products from rice milling on carcinogenesis *in vitro* and *in vivo*

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Cancer is a significant global health concern affecting men and women worldwide. Although current chemopreventive drugs could inhibit the growth of cancer cells, they exert many adverse side effects. Dietary factor plays a crucial role in the management of cancers and has drawn the attention of researchers to be used as an option to combat this disease. Bothin vitroandin vivostudies showed that rice and its by-products display encouraging results in the prevention of this disease. The mechanism of anticancer effect is suggested partly through potentiation of bioactive compounds like vitamin E, phytic acid, γ-aminobutyric acid (GABA), γ-oryzanol, and phenolics. Nevertheless, the bioactivity of rice and its by-products is still incompletely understood. In this review, we present the findings from a preclinical study both inin vitroand in animal experiments on the promising role of rice by-products with focus on cancer prevention.

Supplementation of *Psidium guajava* (guava) fruit polysaccharide attenuates paracetamol-induced liver injury by enhancing the endogenous antioxidant activity

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Sains Malaysiana, Vol. 44(8), 2015, 1129–1136

This study was aimed to determine the effect of polysaccharide from guava fruit on paracetamol (PCM)-induced liver injury. Aqueous extract of *Psidium guajava* fruit was treated with 95% ethanol to collect the water soluble polysaccharide precipitates. Thirty-eight male Sprague Dawley rats were divided into control (C), PPG400, PCM, PPG200+PCM and PPG400+PCM. The control and PCM groups received 0.9% normal saline orally while the rest were given 200 and 400 mg/kg of freeze-dried polysaccharide (PPG) per oral for fourteen days. At day 15, the animals were orally received PCM (2 g/kg) except the control and PPG400 groups which received 5% dimethyl sulfoxide. At day 16, the blood was collected to determine serum liver enzymes such as transaminases (AST and ALT). The liver tissue was harvested for determination of superoxide dismutase (SOD), glutathione (GSH), tumour necrosis factor-α (TNF-α), interleukin-6(IL6), microscopic changes and glycogen content. The PCM group showed significant higher level of AST, ALT, TNF-α and IL6 than those of group C. The PCM group showed glycogen depletion, vacuolisation, loss of cell membrane, inflammatory cells infiltration and distorted hepatocelluar cords and narrow sinusoidal spaces. However, those PCM-induced alterations were attenuated by the PPG supplementation. Therefore, the polysaccharide of *Psidium guajava* possesses hepatoprotective activity and can be used as a dietary supplementation for protection of liver.

Water extract of brewers' rice induces apoptosis in human colorectal cancer cells via activation of caspase-3 and caspase-8 and downregulates the Wnt/ β-catenin downstream signaling pathway in brewers ' rice-treated rats with azoxymethane-induced colon carcinogenesis

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Background: Brewers' rice, is locally known astemukut, is a mixture of broken rice, rice bran, and rice germ. The current study is an extension of our previous work, which demonstrated that water extract of brewers' rice (WBR) induced apoptosis in human colorectal cancer (HT-29) cells. We also identified that brewers' rice was effective in reducing the tumor incidence and multiplicity in azoxymethane (AOM)-injected colon cancer rats. Our present study was designed to identify whether WBR confers an inhibitory effect via the regulation of upstream components in the Wnt signaling pathway in HT-29 cells. To further determine whether thein vitro mechanisms of action observed in the HT-29 cells inhibit the downstream signaling target of the Wnt/β-catenin pathway, we evaluated the mechanistic action of brewers' rice in regulating the expressions and key protein markers during colon carcinogenesis in male Sprague–Dawley rats. **Methods**: The mRNA levels of several upstream-related genes in the Wnt signaling pathway in HT-29 cells treated with WBR were determined by quantitative real-time PCR analyses. Caspase-3 and–8 were evaluated using a colorimetric assay. Male Sprague–Dawley rats were administered two intraperitoneal injections of AOM in saline (15 mg/kg body weight) over a two-week period and received with 10, 20, and 40 % (w/w) brewers' rice. The expressions and protein levels of cyclin D1 and c-myc were evaluated by immunohistochemical staining and western blotting, respectively. **Results**: The overall analyses revealed that the treatment of HT-29 cells with WBR inhibited Wnt signaling activity through upregulation of the casein kinase 1 (CK1) and adenomatous polyposis coli (APC) mRNA levels. We discovered that the treatment of HT-29 cells with WBR resulted in the induction of apoptosis by the significant activation of caspase-3 and–8 activities compared with the control ($P<0.05$).In vivo analyses indicated that brewers' rice diminished the β-catenin, cyclin D1, and c-myc protein level **Conclusions**: We provide evidence that brewers' rice can induce apoptosis and inhibit the proliferation of HT-29 cells through regulation of caspase-dependent pathways and inhibit the Wnt/β-catenin downstream signaling pathwayin vivo. We suggest that brewers' rice may be a useful dietary agent for colorectal cancer.

Scope 10 | E

Experimental Nutrition

Non plant based (microbes, edible animal source)

Antimicrobial effect of Malaysian green tea leaves (*Camellia Sinensis*) on the skin microbiota

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Aims: *Camellia sinensis* (green tea) is known for its therapeutic properties (anti-inflammatory, anti-oxidative and antiageing). The aim of this study was to determine the in vitro inhibitory activity of green tea extract on some odorous skin commensal bacteria. **Methodology and results**: Tea leaves were collected from MARDI Agro Technology Park, Cameron Highlands. A standardised protocol was used to obtain green tea extract. Aqueous green tea extracts were tested for antibacterial activity by well diffusion method. Minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) assays were performed by broth microdilution assays using green tea extract concentrations from 16 to 0.0313 mg/mL. Green tea extract showed antibacterial activity against skin microbiota. The high antimicrobial effect was achieved against *Micrococcus luteus* with MIC and MBC of 0.125 and 0.25 mg/µL respectively, followed by *Staphylococcus epidermidis* with MIC and MBC of 0.25 and 0.25 mg/µL respectively, *Bacillus subtilis* with MIC and MBC of 0.5 and 0.5 mg/µL respectively and lastly, *Corynebacterium xerosis* with MIC and MBC of 0.5 and 1.0 mg/µL respectively. **Conclusion, significance and impact of study**: The results obtained from the study confirm the *in vitro* anti-microbial activity of green tea extracts against skin microbiota. The antibacterial effects of green tea against skin bacteria with its anti-oxidant and anti-aging properties will help in keeping skin healthy, fresh and reducing unpleasant odors.

Antimicrobial effect of Malaysian vegetables against enteric bacteria

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Asian Pacific Journal of Tropical Biomedicine, Vol. 6(3), 2016, 211-215

Objective: To investigate the antibacterial activities of green vegetables (pennywort, mint, garlic, parsley and celery) against four common enteric bacteria [*Salmonella enterica* (ATCC 25957) (*S. enterica*), *Shigella flexneri* (ATCC 12022) (*S. flexneri*), *Escherichia coli* (ATCC 43889) (*E. coli*) and *Enterobacter cloacae* (ATCC 13047) (*E. cloacae*)] as an alternative medicine for controlling food borne diarrhea disease and the synergistic effect of green vegetables against those bacteria. **Methods**: Five common vegetables (pennywort, mint, garlic, parsley and celery) were purchased and extracted. The antimicrobial activities of these extracts were tested against four common enteric bacteria (*S. enterica, S. flexneri, E. coli* and *E. cloacae*). Ten different concentrations of the extracts (from 640 to 1.25 mg/mL) were prepared and used for the study. The minimal inhibitory concentration (MIC) was

determined by the broth dilution method. The antimicrobial activities were assessed by using both well diffusion and disc diffusion methods. **Results**: Garlic extract showed excellent inhibitory effects on all enteric bacteria. Other plants (parsley, celery, mint and pennywort) were not effective against enteric bacteria. The MIC of garlic against *S. flexneri* and *E. cloacae* was 40 mg/mL. The MIC of *S. enterica* and *E. coli* were 20 and 10 mg/mL, respectively. The performance of the well diffusion method was better than that of the disc diffusion method with clear and sharp inhibition zones of tested bacteria against plant extracts. **Conclusions**: Garlic had excellent antimicrobial effects against enteric bacteria and was recommended to be given to patients with gastroenteritis. The other vegetables (pennywort, mint, parsley and celery) showed no inhibitory effects on enteric bacteria but still can be used for its richness in vitamins and fibers. The performance of the well diffusion method was better than that of the disc diffusion method in detecting the antibacterial effects of green vegetables.

Antimicrobial property of water and ethanol extract *Chlorella vulgaris*: a value-added advantage for a new wound dressing material

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International Medical Journal, Vol. 22(5), 2015, 399-401

Objective: *Chlorella vulgaris* (CV) is a unicellular green microalgae enriched with nutrients, vitamins and minerals. It has been reported to have better wound healing effect in comparison with calcium sodium alginate (brown algae) dressing. However, calcium sodium alginate dressing does not have antimicrobial property. The aim of our study was to determine the antimicrobial property of CV towards three gram-positive bacteria: *Staphylococcus aureus* ATCC 25923, *Streptococcus pyogenes* ATCC 12344, *Enterococcus faecalis* ATCC 29212, and two gram-negative bacteria: *Pseudomonas aeruginosa* ATCC 29212 and *Escherichia coli* ATCC 11230. **Methods**: The minimum inhibitory concentration (MIC) of water and ethanol extracts of CV was determined by agar-well diffusion method in different concentrations (100 mg/mL, 300 mg/mL and 500 mg/mL). Gentamicin disc was used for *Staphylococcus aureus* ATCC 25923, *Enterococcus faecalis* ATCC 29212, *Pseudomonas aeruginosa* ATCC 29212 and *Escherichia coli* ATCC 11230. Erythromycin disc was used for *Streptococcus pyogenes* ATCC12344 as positive control for inhibitory activity. **Results**: Ethanol extract of CV (all concentrations) showed inhibitory activity against all tested bacteria with mean diameter of inhibition zones between 6-14 ± 0.58 mm. The aqueous extracts of CV only showed minimal activity towards *Escherichia coli* ATCC 11230 with mean zone of inhibition of 7 ± 1.16 mm regardless of the concentrations used. On the other hand, the MIC values determined by broth macrodilution were between 125 g/mL to 1000 g/mL. **Conclusion**: CV has an antimicrobial activity in addition to its wound healing ability. CV has the potential to be developed as an alternative wound dressing material.

Effect of enzymatic hydrolysis on Angiotensin Converting Enzyme (ACE) inhibitory activity in swiftlet saliva

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International Food Research Journal, Vol. 23(1), 2016, 141-146

Angiotensin I-converting enzyme (ACE) plays an important role in reducing blood pressure and gives an anti-hypertensive effect. Inhibition of ACE mainly results in an overall antihypertensive effect. The objectives of this study were to determine the ACE inhibition activity in edible bird nest hydrolysates and the effect of different hydrolysis time of 30, 60, 90, 120, 180 and 240 minutes. Edible bird nest protein was hydrolysed by enzymatic hydrolysis with alcalase and papain to obtain ACE inhibitory peptides. The results suggested that 60 minutes of hydrolysis time using alcalase contributed to the best ACE inhibitory activity (IC_{50}=0.02mg protein/ml) which shows edible bird nest protein hydrolysate to be a potent ACE inhibitor that may be used to decrease blood pressure.

Effects of *Bifidobacterium longum* BB536 on lipid profile and histopathological changes in hypercholesterolaemic rats

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Beneficial Microbes, Vol. 6(5), 2015, 661-668

The present study investigated the effects of *Bifidobacterium longum* BB536 on lipid profile, liver and kidney function, and body fat in hypercholesterolaemic rats. 40 Sprague-Dawley rats were randomly divided into five groups. The negative control group received a standard diet. The positive control group received a cholesterol-enriched diet, whereas the intervention groups received a cholesterol-enriched diet supplemented with *B. longum* BB536 alone or in combination with inulin or *Mangifera pajang* fibrous polysaccharides. After 8 weeks, plasma lipids, and liver and kidney function were tested. Intake of the cholesterol-enriched diet increased total cholesterol, alanine aminotransferase, gamma-glutamyl transferase, creatinine, urea, liver weight, adipose tissue weight, liver lipid deposition and adipocyte size. *B. longum* BB536 supplementation significantly reduced total cholesterol, liver lipid deposition and adipocyte size, and positively affected liver and kidney function. These effects were significantly increased in the presence of inulin and *M. pajang* fibrous polysaccharides.

Optimum dose of sea cucumber (*Stichopus chloronotus*) extract for wound healing

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Medicine & Health, Vol. 12(1), 2017, 83-89

In Malaysia, sea cucumber is also known as Gamat. Among the Malays, Gamat is frequently used as a traditional or folk medicine to relieve pain, to treat wounds and burns. It is also used as a tonic to provide extra energy. *Stichopus chloronotus* is one of the species of sea cucumber which is found in Malaysia. An experimental study was carried out to determine the optimum dose of aqueous extract of *Stichopus chloronotus* on the healing of wounds in rat model. A series of concentrations 0.1%, 0.5% and 1% aqueous extract emulsifying ointment mixed with *Stichopus chloronotus* was applied once a day for 10 days on the excision wound model. Changes in the wound area were measured

using a caliper and photographs were taken on day 1, 3, 6, 8 and 10 after the wound creation. The wound reduction rate and macroscopic observation were evaluated to determine the optimum dose concentration. Results demonstrated that percentage of wound reduction and macroscopic observation of 0.5% aqueous extract *Stichopus chloronotus* emulsifying ointment mixed group was significantly higher than the other groups from day 6 following wound creation. In conclusion, 0.5% aqueous extract of *Stichopus chloronotus* emulsifying ointment mixture demonstrated the best dose for wound healing in a rat model.

Probiotics (*Bifidobacterium longum*) increase bone mass density and upregulate sparc and Bmp-2 genes in rats with bone loss resulting from ovariectomy

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Probiotics are live microorganisms that exert beneficial effects on the host, when administered in adequate amounts. Mostly, probiotics affect the gastrointestinal (GI) tract of the host and alter the composition of gut microbiota. Nowadays, the incidence of hip fractures due to osteoporosis is increasing worldwide. Ovariectomized (OVX) rats have fragile bone due to estrogen deficiency and mimic the menopausal conditions in women. Therefore, this study aimed to examine the effects of *Bifidobacterium longum* (*B. longum*) on bone mass density (BMD), bone mineral content (BMC), bone remodeling, bone structure, and gene expression in OVX rats. The rats were randomly assigned into 3 groups (sham, OVX, and the OVX group supplemented with 1 mL of *B. longum* 10^8-10^9 colony forming units (CFU)/mL). *B. longum* was given once daily for 16 weeks, starting from 2 weeks after the surgery. The *B. longum* supplementation increased ($\rho < 0.05$) serum osteocalcin (OC) and osteoblasts, bone formation parameters, and decreased serum C-terminal telopeptide (CTX) and osteoclasts, bone resorption parameters. It also altered the microstructure of the femur. Consequently, it increased BMD by increasing ($\rho < 0.05$) the expression of *Sparc* and *Bmp*-2genes. *B. longum* alleviated bone loss in OVX rats and enhanced BMD by decreasing bone resorption and increasing bone formation.

The effects of acacia honey on in-vitro corneal abrasion wound healing model

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BMC Cell Biology, Vol. 16(1), 2015, 2-12

Background: Acacia honey (AH) has been proven to improve skin wound healing, but its therapeutic effects on corneal epithelium has not been elucidated to date. This study aimed to investigate the effects of AH on cultured corneal epithelial cells (CEC) on *in vitro* corneal abrasion wound healing model. Six New Zealand white rabbits' CEC were isolated and cultured until passage 1. Circular wound area was created onto a confluent monolayer CEC using a corneal trephine which mimicked corneal abrasion and treated with 0.025% AH supplemented in basal medium (BM) and complete cornea medium (CCM). Wound healing was measured as the percentage of wound closure by the migration of CEC on day 0, day 3 and day 6, post wound creation. The morphological changes of CEC were assessed via phase contrast microscopy. Gene and protein expressions of cytokeratin (CK3), fibronectin and cluster of differentiation 44 (CD44) in AH treated groups and control groups were determined by real-time PCR and immunocytochemistry, respectively. **Results**: Cultured CEC exhibited similar morphology of polygonal shaped cells in all culture media. CEC cultured in AH-supplemented media showed higher percentage of wound closure compared to the controls. Gene expression of CK3 increased in AH-supplemented groups throughout the study. Fibronectin expression was increased at the initial stage while CD44 expression was increased at day 3, post wound creation. The protein expression of CEC cultured in all media was in accordance to their respective gene expressions. **Conclusion**: Supplementation of AH in BM and CCM media accelerates CEC wound closure of the in vitro corneal abrasion model by increasing the expression of genes and proteins associated with CEC wound healing.

Water extract of brewers' rice induces antiproliferation of human colorectal cancer (HT-29) cell lines via the induction of apoptosis

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European Review for Medical and Pharmacological Sciences, Vol. 19(6), 2015, 1022-1029

Objective: Brewers' rice, a mixture of broken rice, rice bran, and rice germ, is a rice by-product in the rice industry. The present study was designed to investigate the in vitro cytotoxicity of the water extract of brewers' rice (WBR) against colorectal cancer (HT-29) cells. **Materials and Methods**: The cytotoxicity activity was determined using the lactate dehydrogenase (LDH) assay. The morphological changes of the HT-29 cells were observed using inverted light and fluorescence microscope. Cell cycle and apoptotic cell death analyses were performed using flow cytometer. Besides that, the selected polyphenolic compounds in WBR were also analyzed using ultra performance liquid chromatography (UPLC). **Results**: The cytotoxicity results showed that WBR was more cytotoxic (but not significantly different) in HT-29 cells compared to the MBR, with IC_{50} value of 21.88 ± 12.43 μg/mL and 34.50 ± 5.92 μg/mL for WBR and MBR, respectively ($p>0.05$). WBR-treated HT-29 cells displayed the typical characteristics of apoptosis, as visualized using inverted light and fluorescence microscope. WBR also significantly increased the number of early and late apoptotic HT-29 cells compared to control cells ($p< 0.05$). Results from UPLC analysis demonstrated that ferulic acid (36.42 ± 2.97 μg/g) was found the highest level in WBR, followed by gallic acid (26.09 ± 2.01 μg/g) and p-coumaric acid (7.13 ± 0.36 μg/g). These phenolics are speculated to partially contribute to apoptotic cell death. **Conclusions**: Our results suggested that WBR derived from natural sources might represent a potential chemopreventive agent against colon cancer.

Scope 11

Nutrition Education, Promotion and Strategies

A complex behavioural change intervention to reduce the risk of diabetes and prediabetes in the pre-conception period in Malaysia: Study protocol for a randomised controlled trial

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Background: Over the past two decades, the population of Malaysia has grown rapidly and the prevalence of diabetes mellitus in Malaysia has dramatically increased, along with the frequency of obesity, hyperlipidaemia and hypertension. Early-life influences play an important role in the development of non-communicable diseases. Indeed, maternal lifestyle and conditions such as gestational diabetes mellitus or obesity can affect the risk of diabetes in the next generation. Lifestyle changes can help to prevent the development of type 2 diabetes mellitus. This is a protocol for an unblinded, community-based, randomised controlled trial in two arms to evaluate the efficacy of a complex behavioural change intervention, combining motivational interviewing provided by a community health promoter and access to a habit formation mobile application, among young Malaysian women and their spouses prior to pregnancy. **Method/ Design**: Eligible subjects will be Malaysian women in the age group 20 to 39 years, who are nulliparous, not diagnosed with diabetes and own a smartphone. With an alpha-value of 0.05, a statistical power of 90 %, 264 subjects will need to complete the study. Subjects with their spouses will be randomised to either the intervention or the control arm for an 8-month period. The primary endpoint is change in waist circumference from baseline to end of intervention period and secondary endpoints are changes in anthropometric parameters, biochemical parameters, change in health literacy level, dietary habits, physical activity and stress level. Primary endpoint and the continuous secondary endpoints will be analysed in a linear regression model, whereas secondary endpoints on an ordinal scale will be analysed by using the chi-squared test. A multivariate linear model for the primary endpoint will be undertaken to account for potential confounders. This study has been approved by the Medical Research and Ethics Committee of the Ministry of Health Malaysia (protocol number: NMRR-14-904-21963) on 21 September 2015. **Discussion**: This study protocol describes the first community-based randomised controlled trial, to examine the efficacy of a complex intervention in improving the pre-pregnancy health of young Malaysian women and their spouses. Results from this trial will contribute to improve policy and practices regarding complex behavioural change interventions to prevent diabetes in the pre-conception period in Malaysia and other low- and middle-income country settings.

A Qualitative study on the determination of healthy cafeteria practice in Selangor, Malaysia

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The prevalence of obesity around the world is increasing yearly. Dietary intake, physical inactivity, and sedentary lifestyle are the common causes of obesity. This situation has created an urge to improve a healthy eating environment in the community. Eating outside is more common nowadays especially during working hours. Workers normally will have their meal at the cafeteria. Their dietary intake is directly affected by the availability of food choices at the cafeteria. Thus, a qualitative study was conducted to identify the perceptions of healthy cafeteria among food operators in Selangor, Malaysia. Eleven food handlers at three selected cafeterias were recruited by a convenience sampling based on the inclusion criteria of the study. The respondents consist of three full-time managers, five full-time food handlers, and three full-time cleaners. Semi-structured interviews were conducted with the aid of video and audio recording. The phenomenon of interest was to explore the perceptions, suggestions, challenges and limitation of healthy cafeteria practice among cafeteria operators. The interview transcripts were analysed verbatim based on the objectives and identified themes of the study. Themes include food safety, food handling course, food availability, methods of cooking, foods' hygiene and sanitation. Findings showed that most of the respondents have the similar understanding of healthy cafeteria in which includes healthy menu and clean environment. The respondents also have the knowledge on food safety. The challenges faced by the food handlers were making sure every staff has the correct understanding of healthy foods, using the safe kitchen utensils and financial constraint. Regarding promoting healthy cafeteria environment, the respondents suggested to provide printed educational materials, serve healthy menu selections, organise healthy eating campaign and provide appropriates kitchen utensils. This study revealed that training on food safety and education on healthy food choices are important to provide a healthy eating environment.

A tailored dietary counselling via Diet Management Tool (DMT) helps dietitian improves short term glycaemic control among type 2 diabetes patients

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Background: Diet Management Tool (DMT) is a nutrition assessment system developed by the researchers from Dietetic Programme, School of Health Sciences, Universiti Sains Malaysia (USM). The system has been applied in dietary counselling for the treatment of patients with type 2 diabetes at Hospital Universiti Sains Malaysia (HUSM), replacing the untailored traditional counselling approach. **Aim**: This study examined the effectiveness of dietary counselling using DMT among type 2 diabetes patients. **Method and Material**: A parallel-design, controlled trial was performed on 50 participants aged between 30-55 years old with type 2 diabetes. Participants were randomly assigned to two groups: the traditional dietary counselling (control group, n= 22) and the DMT (intervention group, n= 28). The intervention group received dietary counselling based on DMT while the control group

received routine or traditional dietary counselling. The DMT consists of nutrition care modules that tailored to the patients' needs. Anthropometric (body mass index, BMI), biochemical (fasting blood sugar, estimated average glucose and HbA1c) and food pattern outcomes were measured at baseline, three month, six month and nine month. Data was collected between June 2009 and March 2010. **Results**: During the baseline study, 46.4% of participants from the intervention group and 45.5% of participants from the control group were classified as overweight based on World Health Organization (WHO) classification. Meanwhile, fasting blood sugar (FBS), estimated average glucose (eAG) and HbA1c level of both groups were higher than the normal range. Intake of energy was higher as compared to individual's energy requirements. Repeated measure of ANCOVA showed that dietary counselling by the dietitian using DMT significantly improved glycaemic control in terms of improving HbA1c and eAG compared to control group ($p< 0.05$). However, there were no significant changes in other parameters. **Conclusions**: In conclusion, tailored intervention approach using DMT gave positive results in improvement of glycaemic control among diabetic patients.

Applying the humanistic learning theory: Effects on the experience and learning pattern related to the prevention of child obesity

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'Children not interested to learn,' 'easily feel bored of learning' and 'having difficulty in understanding complex health knowledge' are among issues in childhood education. This paper discusses the effect of applying the humanistic learning theory on experiences and learning patterns of children. The strategy of the "child friendly" concept, which is guided by the concept in Carl Rogers's learning theory, is applied in the children's learning environment that involves 68 children from ages 3 to 6 years and implemented over a period of 32 weeks in a nursery school. The "child friendly" environment refers to a learning environment, which comprises learning notes and activities with special characteristics that are well liked by and suitable for children as well as providing a learning environment that attracts the interest of children towards learning health issues. The data on children's experiences and learning patterns were collected from video recordings, observations and anecdotal records throughout the implementation of the program and analysed using ATLAS.ti. The findings showed that the "child friendly" concept strategy that was guided by the humanistic learning theory applied in the children's learning environment had a positive effect on experiences and learning patterns that 'elated' (94.29%), 'excited' (90.02%), was 'accepted' (98.59%), and 'appreciated' (95.71%) by the children. In conclusion, the findings support the "child friendly" concept that was guided by the humanistic learning theory and used in the teaching-learning process of children from ages 3 to 6 years in order to determine experiences and learning patterns such as 'elation,' 'excitement,' 'acceptance' and 'appreciation.' This subsequently enhanced children's motivation to continue learning without feeling bored.

Awareness regarding the usage of repeatedly heated cooking oil in Kuala Lumpur, Malaysia

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Reusing cooking oil is a common practice in Malaysia. Oxidation and hydrolysis occur when oil is heated repeatedly due to thermal decomposition. It had been suggested that consumption of repeatedly heated oil could be a health hazard. It is therefore interesting to measure the awareness level amongst Kuala Lumpur residents regarding the usage of repeatedly heated cooking oil. A cross-sectional study was conducted to assess the level of awareness based on knowledge, attitude and practice regarding the usage of repeatedly heated cooking oil. The study involved convenience sampling of 500 respondents at various locations in Kuala Lumpur within a one-month period (April 2009). A questionnaire was designed as a tool to collect data from the respondents by face-to-face interview. It was found that the mean awareness score of Kuala Lumpur residents was moderate (7.8 out of 12 points) with the majority of respondents (42%) scoring moderately in their level of awareness regarding the usage of repeatedly heated cooking oil. Respondents with higher level of education and the highest level of income had significantly higher level of awareness regarding this issue. There was also a significant relationship between respondents' knowledge with their attitude and practice regarding the usage of repeatedly heated cooking oil. The results showed that Kuala Lumpur residents' awareness on the usage of repeatedly heated cooking oil needs to be increased. More aggressive public education campaign regarding this unhealthy practice is needed, which might help improve the health status of the general population.

Children`s reactions towards the use of `child-friendly' learning environments in an obesity prevention health education program

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Asian Social Science, Vol. 11(5), 2015, 235.

This article discusses the contribution of 'child-friendly' learning environments in an obesity prevention health education program for young children. The 'child-friendly' approach refers to a concept where in the situation, place, as well as the activities conducted include elements that children like or enjoy and are suitable to their level. A total of 68 children between the ages of 3-6 years participated in the study. The program was conducted for 32 weeks at a kindergarten using a 'child-friendly' approach. Data regarding children's reactions towards the approach were collected using video recordings and anecdotal records from in-situ observation. The data were analyzed using ATLAS.ti. Research results show that the 'child-friendly' learning environment contributed four positive reactions from the children; 94.29% of the children were recorded to be 'happy', 90.02% were recorded to be 'excited', 98.59% showed 'acceptance' and 95.71% showed 'appreciation'. In conclusion, the research findings support the use of the 'child-friendly' approach in the teaching and learning process of children aged between 3-6 years as they are able to experience learning in an enjoyable manner thus motivating them to learn.

Cost-effectiveness of e-mail Based Empowerment Programme (e-beep) among type II diabetes mellitus in Malaysia

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Brunei International Medical Journal, Vol. 11(3), 2015, s14

Introduction/Aim: Escalating health care cost for diabetes is one of the major public health challenges and growing economic burden for diabetes mellitus has been well documented worldwide. This study aimed to evaluate the cost-effectiveness of e -mail based empowerment programme (e-beEp) among Type II Diabetes Mellitus patients as compared to the standard care in primary care settings. **Methods**: The e-beEp was delivered for twelve weeks duration for intervention group with five different modules: weekly health note, forum, Tanya e-beEp, health reminder and monthly diabetes simulation. Cost for the provider's perspectives for year 2013 was obtained through macro-costing form. Meanwhile, cost for the patient's perspectives was obtained through health diary including clinic charges, transportation fee and waiting time. Cost for 1% reduction in HbA1c after six months of intervention were calculated for both group. **Results**: Average cost for one patient in intervention group to received treatment in primary care settings was RM 1,318.20 (± 540.02) and for the control group was RM 1,145.48 (± 557.25). Cost effectiveness analysis showed e-beEp intervention required only RM 62.77 to reduce HbA1c reading by 1% after six months of intervention as compared to the control group, RM 71.59. **Conclusion**: Combination of e-beEp and standard care is more cost-effective compared to the standard diabetes care alone to achieve significant reduction in HbA1c percentage for diabetes patients.

Do patients with type 2 diabetes mellitus know about specific dietary recommendations?

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Introduction: Diabetic patients generally have a good idea about healthy diet however their awareness regarding specific dietary recommendations is questionable. Thus, this paper aims to examine the awareness regarding specific dietary components among diabetic patients at a primary care clinic and its influence on self-reported dietary practice. **Materials and Methods**: The Summary of Diabetes Self-Care Activities (SDSCA) questionnaire (English-Malay version) was used. It was adapted with additional questions to assess respondents' awareness on: (1) healthful eating plan, (2) the quantity of one serving of fruits and vegetables, (3) choices and the allowed quantity of high fat food intake, (4) meaning of carbohydrate, and (5) carbohydrate spacing per day. **Results**: From the 360 respondents, 85.0% knew about healthful eating plan. However, those who were unaware of the meaning of carbohydrate, carbohydrate spacing, the allowed high fat food intake, and the quantity of one serving of fruits and vegetables were 34.1%, 47.5%, 40.0%, and 30.8% respectively. Generally, the dietary practice reported by those who knew 'one serving of fruits and vegetables' ($p<0.001$), 'allowed quantity of high fat food intake' ($p=0.001$), 'meaning of carbohydrate' ($p<0.001$), or 'carbohydrate spacing' ($p<0.001$) was significantly different than those who were unaware of these terms. **Conclusion**: Although most respondents knew about healthful eating plan, majority of them were unaware of the specific dietary components, suggesting superficial dietary knowledge. Unfortunately, poor dietary awareness significantly influenced their self-reported dietary practice which could be considered as inaccurate. Thus, strategies to improve their dietary knowledge is necessary at the primary care setting.

Effect of food safety training on food handlers' knowledge and practices: A randomized controlled trial

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Purpose: A successful food safety intervention must be based on firm theories and a consideration of all relevant variables. The purpose of this paper is to examine the extent of improvement in food safety knowledge and practices of food handlers in primary school canteens through food safety training. **Design/methodology/approach**: A list of 98 primary schools was randomized into intervention and control groups using a multistage sampling method. The training programme for the intervention group and questionnaires for evaluating knowledge and practices were developed. On-site observations were done to assess hygienic practices during the handling of raw food and cooking equipment. In total, 16 school canteens participated in this study. **Findings**: Knowledge about personal hygiene and related to rules for preparing safe food was significantly improved after the food safety intervention. Some of the improvement was sustained for up to 12 weeks after the intervention. The self-reported practice score of food safety and hygiene in the intervention group was significantly higher at post1 and post2 compared to baseline. A significant within-group and between-group improvement was demonstrated for the observed behaviour of raw food handling and equipment sanitation. **Originality/value**: The originality of this study is to provide a new framework for the design and implementation of food safety intervention in school canteens targeted towards a specific enabling factor for behavioural change. Provision of food safety training grounded by the theory of planned behaviour was associated with significantly improved food safety knowledge and behaviour amongst food handlers.

Effect of including glycaemic index nutrition education within the conventional healthy dietary recommendation framework, on body weight and composition on women with prior gestational diabetes mellitus

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Introduction: Women with previous gestational diabetes mellitus (GDM) have increased risks for obesity and its metabolic consequences. Conventional diets have limited success in achieving weight loss in this population. Lowering dietary glycaemic index (GI) is known to facilitate weight loss in insulin-resistant women. This study evaluated the effects of including GI education within the conventional healthy dietary recommendation (CHDR) framework, on body weight and composition of women post-GDM. **Methods**: Seventy-seven, non-diabetic, women with previous GDM (aged 20-

40 year, mean BMI: 26.4±4.6 kg/m^2) were randomised into two groups: subjects who received CHDR only (CHDR, n=38) and those who received low-GI education in addition (LGI, n=39). The outcome of these interventions on body weight, waist circumference (WC), waist-to-hip-ratio (WHR), body fat and dietary intakes were assessed after one year. Clinically significant weight loss was defined as achieving a minimum of 5% weight loss from the baseline body weight. **Results**: After one year, as compared to CHDR, a significantly greater proportion of LGI subjects had 7% (28.2% vs. 5.3%, p=0.01) and 10% (15.4% vs. 0%, p=0.025) weight loss from baseline. WC significantly reduced in both groups (p<0.004); however, only LGI subjects had significant WHR reduction (-0.02±0.04, p=0.035). One-year mean increases in total (1.2±2.4 kg, p=0.008) and trunk fat (0.65±1.4 kg, p=0.019) were significant only within the CHDR group, although the changes were not significantly different between the groups. After intervention, LGI as compared to CHDR diets, had lower GI (58±4 vs. 64±7, p<0.001) and higher dietary fibre (17±4 vs. 13±4 g, p<0.001). **Conclusion**: Including GI education within the CHDR framework for women with prior GDM, increases their likelihood of achieving ≥7% weight loss and significant WHR reductions in one year.

Effectiveness of the empower-par intervention in improving clinical outcomes of type 2 diabetes mellitus in primary care: A pragmatic cluster randomised controlled trial

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Background: The chronic care model was proven effective in improving clinical outcomes of diabetes in developed countries. However, evidence in developing countries is scarce. The objective of this study was to evaluate the effectiveness of EMPOWER-PAR intervention (based on the chronic care model) in improving clinical outcomes for type 2 diabetes mellitus using readily available resources in the Malaysian public primary care setting. **Methods**: This was a pragmatic, cluster-randomised, parallel, matched pair, controlled trial using participatory action research approach, conducted in 10 public primary care clinics in Malaysia. Five clinics were randomly selected to provide the EMPOWER-PAR intervention for 1 year and another five clinics continued with usual care. Patients who fulfilled the criteria were recruited over a 2-week period by each clinic. The obligatory intervention components were designed based on four elements of the chronic care model i.e. healthcare organisation, delivery system design, self-management support and decision support. The primary outcome was the change in the proportion of patients achieving HbA1c< 6.5%. Secondary outcomes were the change in

proportion of patients achieving targets for blood pressure, lipid profile, body mass index and waist circumference. Intention to treat analysis was performed for all outcome measures. A generalised estimating equation method was used to account for baseline differences and clustering effect. **Results**: A total of 888 type 2 diabetes mellitus patients were recruited at baseline (intervention: 471 vs. control: 417). At 1-year, 96.6 and 97.8% of patients in the intervention and control groups completed the study, respectively. The baseline demographic and clinical characteristics of both groups were comparable. The change in the proportion of patients achieving HbA1c target was significantly higher in the intervention compared to the control group (intervention: 3.0% vs. control: –4.1%, P< 0.002). Patients who received the EMPOWER-PAR intervention were twice more likely to achieve HbA1c target compared to those in the control group (adjusted OR 2.16, 95% CI 1.34– 3.50, P< 0.002). However, there was no significant improvement found in the secondary outcomes. **Conclusions**: This study demonstrates that the EMPOWER-PAR intervention was effective in improving the primary outcome for type 2 diabetes in the Malaysian public primary care setting.

Effects of lifestyle intervention towards obesity and blood pressure among housewives in Klang Valley: A quasi-experimental study

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Background: The obesity rate in Malaysia is the highest in Asia. Half its population is obese or overweight. The present study aims to determine the effects of lifestyle intervention on weight loss and blood pressure among Malaysian overweight and obese housewives in Klang Valley. **Methods**: A quasi-experimental study with 328 obese and overweight low socioeconomic status housewives aged 18–59 years old who met the screening criteria participated in the study. They were recruited into an intervention group (N = 169) or control group (N = 159). The intervention group received a lifestyle intervention consisting of a diet, physical activity and self-monitoring behavior package. The control group (delayed intervention group) received a women's health seminar package. Both groups were followed up for six months. Weight, body mass index (BMI), and blood pressure were evaluated both pre- and post-intervention. **Results**: A total of 124 participants from the intervention group and 93 participants from the control group completed the study. Mean weight loss was 1.13 ± 2.70 kg (P < 0.05) in the intervention group and 0.97 ± 2.60 kg (P < 0.05) in the control group. Systolic blood pressure (SBP) reductions in the intervention group were 5.84 ± 18.10 mmHg (P < 0.05). The control group showed reduction in SBP 6.04 ± 14.52 mmHg (P < 0.05). Both group had non-significant DBP reduction. Multivariate analysis via General Linear Model Repeated Measures observed no significant differences in terms of parameter changes with time in both groups for all parameters. **Conclusions**: The results indicate that the lifestyle interventions in this study resulted in modest weight loss and thus decreased BMI and blood pressure (SBP) within six months of intervention.

Factors associated with dental caries among selected urban school children in Kuala Lumpur, Malaysia

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This study aimed to assess the nutritional status (BMI), oral health behaviour, sugar consumption and the associated factors with dental caries among a group of 7 to 11 years old children in Kuala Lumpur, Malaysia. Three hundred and twelve students were recruited from February to July 2013. Information gathered were their socio-demographic characteristics, body mass index, sugar consumption, oral-health behaviour, oral hygiene index and decay-missing-filled teeth (dmft) index. Anthropometry measurements and sugar intake was measured using verified tools. Meanwhile, dmft was examined using the World Health Organization (WHO) criteria. 53.7% of the children were of the normal body weight with mean sugar consumption of 31.81±4.24 g/day. Prevalence of dental caries was reported at 44.6% (95% CI: 42.2, 53.3) with a mean (SD) dmft of 1.27(1.84). No association was found between dental caries and weight status distribution. Most children tend to brush their teeth 2 times or more in a day (75%), however, they spent lesser time in tooth brushing (5.4%) and do not practice flossing (78%). Regression analysis showed that age (pp<0.001), duration of teeth brushing (p= 0.023) and the oral hygiene index (p= 0.002) were significant predictors of dental caries among this group of children. Present findings suggest that younger children, longer time taken to brush teeth and poorer oral hygiene index were predisposing factors in dental caries, especially for young children. Hence, education on dental health is important to improve oral health behaviour and oral hygiene practices to further reduce dental caries incidences among young children.

Food hygiene's knowledge, attitudes and practices between urban and suburban adolescents

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An independent samples t-test was conducted to examine whether there was a significant difference between urban and suburban about the impact of parental influences towards food hygiene practices. The test revealed that there are no statistically significant difference between urban and suburban (t= 0.779, df= 394.29, p> 0.001). Urban adolescents (M= 19.615, SD= 3.024) reported significantly equal with the overall parental influences suburban adolescents (M= 19.390, SD= 2.743). The result indicates that similar parental influences due to increased food safety awareness and information communication technology can be easily passed down to their children.

Food safety and hygiene practice among hotel in Malaysia: Qualitative approach

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This study examines the effectiveness of food safety and hygiene practice (FSHP) among restaurants in a selected Malaysian hotel and impact of FSHP toward culinary intern. It is essential to examine effectiveness FSHP among the hotel restaurants and its impact on culinary intern towards producing competent food handler. Using qualitative method, five (5) of culinary intern were interviewed. The data were then transcribing and analyzed using Atlas.ti software. Finding of a current study confirming the effectiveness FSHP in a hotel restaurant in Malaysia depends on the type of hotel, star rating, and location.

Impact of food nutrition intervention on food handlers' knowledge and competitive food serving: A randomized controlled trial

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International Food Research Journal, Vol. 24(3), 2017, 1046-1056

The aim of this study was to evaluate the impact of Food Nutrition Intervention (FNI) for improving food handlers' knowledge and serving of competitive food in the primary school canteens. We randomized 16 out of 98 primary schools into intervention and control groups using a multistage sampling method. The training programme for the intervention group and questionnaires for evaluating knowledge were developed. On-site observations were done to document all competitive foods served in school canteens. Out of the 79 food handlers who participated in this study, 33 (41.8%) were in the intervention group and 46 (58.2%) were in the control group. The majority of food handlers were female, Malay, had education at middle levels, and at middle-aged. The commonest food category served was carbohydrate (75%), high-fat foods (34.4%) and food not recommended for sale (34.4%). Knowledge about healthy food choice in the intervention group at 6 weeks and 12 weeks post intervention were significantly higher than at baseline. The intervention group also demonstrated significantly better knowledge composite score at 6 weeks and 12 weeks following intervention. These improvements were also observed between intervention and control regardless of time. By six weeks, the number of vegetable menu served significantly increased in the intervention ($p= 0.040$) and by 12 weeks, the number of milk and milk products served also significantly increased ($p= 0.015$) as compared to the control group. Thus, the provision of FNI was associated with significantly improved healthy food knowledge amongst food handlers, the serving of vegetables and milk or milk products in school canteens.

Intensive lifestyle counselling intervention: Preventing maternal risk for gestational diabetes mellitus

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This study is aimed to evaluate the effectiveness of an intensive lifestyle counselling (ILC) designed to prevent gestational diabetes mellitus (GDM) among high risk mothers. A quasi-experimental trial was conducted in four selected health clinics (two clinics for intervention and two clinics for control) in Negeri Sembilan, Malaysia. Of the 320 subjects recruited, 148 respondents in the intervention group and 150 respondents in the control group had completed the study (response rate 93.1%). The intervention group was given a routine antenatal care (RC) and a package of structured ILC sessions on diet, physical activity (PA) and information on appropriate gestational weight gain (GWG) in five routine antenatal care visits until 39 weeks' gestation. The controls received only the RC. Both groups are comparable for sociodemographic characteristics ($p< 0.05$). GDM incidence is higher in control group (16.7%) compared to intervention group (6.1%), $p=0.046$. After controlling the covariates, the intervention group consistently showed protective for developing GDM, (aOR: 0.25, CI: 0.18 - 0.23, $p= 0.003$). The intervention group had significantly increased in PA (moderate intensity) mean score (660.3 ± 289.4 Met/min) compared to control group (571.36 ± 230.38 Met/min), $F(1, 296) = 10.418$, $p< 0.001$ and comply to dietary recommendation (50.7% in intervention versus 16.7% in control), $p< 0.001$. Total GWG significantly lesser in intervention (11.4 ± 2.5 Kg) than the control group (12.7 ± 2.9 Kg), $p< 001$. An ILC can reduce GDM incidence, by increasing PA, increase compliance to the dietary intake recommendation and lesser total GWG among high risk mothers.

Knowledge, attitudes and practices of post-operative nutrition among adults with surgical experience in Penang

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Health and the Environment Journal, Vol. 8 (1), 2017, 104-127

The aim of this study was to determine the knowledge, attitudes, and practices (KAP) of post-operative nutrition among adults with surgical experience in Penang. The main reason of selecting Penang as the study area is due to the increasing number of surgical cases in the state as well as its advantage of diverse ethnicity representative of Malaysia. A cross sectional study via face-to-face administered and developed questionnaire regarding postoperative nutrition was carried out among respondents (n= 60) (45% males and 55% females) aged 18 and above from three districts of Penang. Data collection was done at schools, colleges, markets, shops and hawker centres to represent adult population in Penang. Score grading system was used as score above 75% was graded as 'good', 50-74% as 'average' and below 50% as 'poor'. It is found that 50% of the respondents had poor knowledge of postoperative nutrition in overall and 88.3% of them had an average score of attitude towards post-operative nutrition. By using descriptive statistics, it is revealed that majority also tended to maintain the usual consumption of various types of food, rather than increasing their nutrient intakes as recommended for optimum wound healing. Knowledge and attitude differed significantly among different age groups ($p= 0.036$ and $p= 0.001$, respectively) and educational levels ($p= 0.017$ and $p= 0.022$, respectively) but did not differ significantly between gender and ethnicity using non-

parametric Mann-Whitney and Kruskal-Wallis tests. There was a correlation between knowledge and attitudes (p= 0.002) by using Spearman correlation test. The present study suggested that healthcare workers should provide adequate patient education, improve patient attitude and practise regarding post-operative nutrition which may help in promoting optimum nutritional care after surgery among surgical patients.

Nutrition knowledge, attitude and practices (NKAP) and health-related quality of life (HRQOL) status among overweight and obese children: An analysis of baseline data from the Interactive Multimedia-based Nutrition Education Package (IMNEP) Study

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Introduction: This randomised school-based controlled study aimed to evaluate the baseline results of nutrition knowledge, attitude, and practice (NKAP), health-related quality of life (HRQoL), and parents™ report of parenting skills (PRPS) among overweight and obese children. **Methods**: This study was performed on three intervention groups and one control group. It was conducted among Year Five students from primary schools who had overweight or obese status and were generally healthy without any chronic diseases. The children completed NKAP and child self-report of Pediatric Quality of Life (PedsQoL) questionnaires, while parents completed parent proxy report of PedsQoL and PRPS questionnaires. Descriptive statistics and parametric test in SPSS were utilised. **Results**: Out of 139 participants involved in the baseline study, 18.7% and 81.3% were overweight and obese respectively. This study revealed a significantly higher knowledge score among boys (p= 0.016) and among those who lived in urban areas (p = 0.019). The children™s selfreport PedsQoL recorded highest score for Social Functioning domain and lowest score for Emotional Functioning domain. A contradictory finding was obtained from the parent proxy report, where the Physical Functioning domain scored the lowest and the Emotional Functioning domain had the highest score. Notably, some of the findings from PRPS questionnaires completed by their parents were unfavourable. **Conclusion**: This study provided prospective evidence of the current status of NKAP, HRQoL among overweight and obese children as well as findings from PRPS among their parents.

Spectrum of feeding problems and gastrointestinal symptoms in children with Autism Spectrum Disorders: A scoping review

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Malaysian Journal of Nutrition, Vol. 21(1), 2015, 105-119

Introduction: Managing feeding problems and gastrointestinal (GI) symptoms in children with Autism Spectrum Disorders (ASD) is a challenging process for professionals and parents especially if they become persistent and longstanding. The aim of the study was to assess the evidence on feeding problems and GI symptoms among primary school children with ASD. **Methods**: A scoping review using electronic journal databases, published reports and other types of publication in the last 10 years was conducted. Key terms were defined in the searches and a scoping review framework was

used to chart the evidence on feeding problems and GI symptoms in children with ASD. Eighty three articles met the inclusion criteria and 50 articles were used in the review. **Results**: There is emerging literature reporting consistently on a wide spectrum of feeding problems and GI symptoms among children with ASD. In addition, there is little published literature reporting or investigating the impact of these problems in children with ASD which include financial, social and stress impact on parents, children and their families. This review indicates that many school-aged children with ASD can experience several types of feeding problems and GI symptoms. **Conclusion**: It is important for professionals working in the community or public health, and educational settings to be able to identify these issues at an early stage, so that professionals could support parents with appropriate information and advice. A specific tool is needed to assess feeding problems and GI symptoms in children with ASD.

Structured lifestyle intervention based on a trans-cultural diabetes-specific nutrition algorithm (tDNA) in individuals with type 2 diabetes: A randomized controlled trial

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Objective: Trans-cultural diabetes nutrition algorithm (tDNA) was created by international task force and culturally customized for Malaysian population. This study was designed to evaluate its effectiveness versus usual diabetes care in primary care settings. **Research design and methods**: We randomized 230 patients with overweight/obesity, type 2 diabetes, and glycated hemoglobin (A1c) 7%–11% to receive usual care (UC) or UC with tDNA for 6 months. The tDNA intervention consisted of structured low-calorie meal plan, diabetesspecific meal replacements, and increased physical activity. Participants were counseled either through motivational interviewing (tDNA-MI) or conventional counseling (tDNA-CC). The UC group received standard dietary and exercise advice through conventional counseling. All patients were followed for another 6 months after intervention. **Results**: At 6 months, A1c decreased significantly in tDNAMI (–1.1±0.1%, p<0.001) and tDNA-CC (–0.5±0.1%, p=0.001) but not in UC (–0.2±0.1%, p=NS). Body weight decreased significantly in tDNA-MI (–6.9±1.3 kg, p<0.001) and tDNA-CC (–5.3±1.2 kg, p<0.001) but not in UC (–0.8±0.5 kg, p=NS). tDNAMI patients had significantly lower fasting plasma glucose (tDNA-MI: –1.1±0.3 mmol/L, p<0.001;tDNA-CC: –0.6±0.3 mmol/L, p=NS; UC: 0.1±0.3 mmol/L, p=NS) and systolic blood pressure (tDNA-MI: –9±2 mm Hg, p<0.001; tDNA-CC: –9±2 mm Hg, p=0.001; UC: –1±2 mm Hg, p=NS). At 1 year, tDNA-MI patients maintained significant reduction in A1c (tDNA-MI: –0.5±0.2%, p=0.006 vs tDNA-CC: 0.1±0.2%, p=NS and UC: 0.02±0.01%, p=NS) and significant weight loss (tDNAMI: –5.8±1.3 kg, p<0.001 vs tDNA-CC: –3.3±1.2 kg, p=NS and UC: 0.5±0.6 kg, p=NS).**Conclusions**: Structured lifestyle intervention through culturally adapted nutrition algorithm and motivational interviewing significantly improved diabetes control and body weight in primary care setting.

Sustainability supplementation intervention of fish oil and health education among elderly with mild cognitive impairment

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Nutrition interventions has good potential in delaying cognitive decline among elderly with mild cognitive impairment (MCI). However, the sustainability of these programmes are still uncertain. Thus, a study has been conducted to determine the sustainability of fish oil supplementation and health education among elderly with MCI after one year of intervention. 18 subjects with MCI involved in this study with 6 persons were grouped into 3 different groups which is fish oil supplementation intervention (A), health education intervention (B) and control group (C), respectively. Analysis showed there were significant difference for intervention effect in Digit Span ($p<0.05$) and folat serum level ($p<0.05$) for group B with highest mean difference followed by group A and C. Health education and fish oil supplementation intervention have sustainability effect to increase folate serum level and to improve cognitive function using Digit Span Test. Thus, there is a need for health promotion and fish oil supplementation for cognitive function among elderly with MCI.

Whole school mapping to investigate environment's potential to promote a healthy diet and physical activity in Malaysia

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Introduction: The school is a vital part in the development of children's dietary practices as children consume a substantial proportion of their daily intake at school. The school environment offers an ideal location for health education and intervention against physical inactivity and poor nutritional intake. **Methods**: A mapping tool was developed to map the school environment on four levels: physical, economic, political, and socio-cultural that can potentially affect healthy eating and physical activity. The mapping was piloted and completed by interviewing twelve teachers (responsible for student affairs and the school curriculum), followed by observation at twelve randomly selected schools (six urban, six rural) in Terengganu, Eastern Peninsular Malaysia. **Results**: For physical environment, 55.0% of the criteria were met and while all schools taught nutrition and physical activity, this was not backed up with actual facilities for practicing physical activity or food preparation. For economic environment, 17.7% of the criteria were met and eleven out of twelve schools had mobile caterers outside their front gates selling energy-dense food/drink. For political environment, 52.1% of the criteria were met and all teachers were aware of the existence of the national catering and nutrition guidelines, but they reported a lack of resources for implementation and monitoring. For socio-cultural environment, 59.2% of the criteria were met and all schools used sweet foods and drinks as rewards at large events. **Conclusion**: The findings suggest potential avenues exist for intervention in schools to provide a supportive environment that promotes healthier eating and physical activity to prevent obesity.

Workplace health programme among individuals with metabolic syndrome

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Purpose: The purpose of this paper is to ascertain the effect of a physical activity intervention using a combination of Facebook and standing banners on improvements in metabolic syndrome. **Design/methodology/approach**: In all, 120 (82.8 per cent) government employees with metabolic syndrome completed the programme. A Lifecorder e-STEP accelerometer (Suzuken Company Limited, Nagoya, Japan) was utilized to quantify physical activity. Metabolic syndrome was defined according to "Harmonized" definition at baseline, post-intervention and follow-up. **Findings**: There were significantly higher step counts in the intervention group as compared to the control group over time. There were significant within-group differences in the step count at the baseline, post-intervention and follow-up assessments (po0.001) in both the intervention and control groups. The step count of the intervention group increased by 4,522 steps in the post-intervention assessment compared to the assessment at baseline. The step count of the intervention group in the follow-up assessment was lower than in the post-intervention assessment, but it was still 2,126 steps higher than at baseline. For control group, the difference between the post-intervention assessment and the assessment at baseline was 520 steps per day, while the difference between the follow-up assessment and assessment at baseline was 379 steps per day. The greatest decrease in the percentage of metabolic syndrome was observed in the intervention group, with a reduction of 88.6 per cent in the post-intervention assessment as compared to that at baseline. **Research limitations/implications**: Future studies should incorporate measures which will be of interest to employers. Greater understanding and assessment of desirable employer-related outcomes are warranted, such as decreased job stress, turnover, absenteeism and improved job satisfaction, productivity and exploration of how these associated with physical activity. **Practical implications**: The findings show that delivering information on physical activity through an easily implemented and low-cost physical activity intervention via a combination of Facebook and standing banners was successful in improving step counts and metabolic parameters among individuals with metabolic syndrome. **Social implications**: The findings draw on supporting evidence for advocacy, which is about influencing the larger environment of public policy, and raising awareness of a single programme is insufficient to create lasting social change. Public policy must be shaped in a way that will sustain change across institutions.

Scope 12

Methodologies

Candi ™ : A Malaysian-tailored dietary smartphone app for cancer patients and survivors

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Despite being effective in promoting healthy dietary behaviour, smartphone apps are scarcely available for our local communities and the majority of nutritional-related information is based on western food selections. Our new innovation aims to provide specific educational advice about recommended food intake, types, nutritional qualities and weight issues for cancer patients and survivors who suffer appetite problems and nutritional deficits. The Cancer Dietary (CanDi™) app was developed as a convenient, flexible and attractively engaging smartphone app containing healthy tips which are uniquely tailored to the local food choices, preferences and ingredients. This helps customise users' dietary needs besides permitting constant information up-dating. Features are broadly categorised into Healthy Eating Guide (advice from healthy eating to eating problems, weight loss prevention and increasing proteins and calories intake) and Malaysian Recipes For Cancer Patients (focusing on common Malaysian dishes, ingredients, treatment-based recipes and special diets). An additional Symptom Diary allows user's personal profile to be recorded and stored virtually online. Its feasibility and acceptability were further tested among 30 cancer patients, family caregivers and dieticians recruited from a public hospital in Terengganu, Malaysia. Very good feasibility (> 80%) and excellent acceptability (> 90%) were reported regarding its ease of operation, suitability of language used, attractiveness, knowledge enhancement and perceived usefulness. With this scientific yet creative innovation, routine dietary habits related to cancer conditions could be easily facilitated for both patients/survivors as well as family caregivers for their independent and healthy living.

A conceptual model for developing a valid and reliable questionnaire on nutritional knowledge and supplement habits among disabled athletes in Malaysia

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Current Research in Nutrition and Food Science, Vol. 5(3), 2017, 223-229

Disability sports has become more popular since the last the five decades. The increase in participation will cause pressure among athletes to achieve optimum sports performances. Through proper nutrition, the athletes' sports performance can be enhanced. The benefits of nutrition in sports performance among athletes can be attained if their level of nutritional knowledge and habits are identified. This paper intends to present the design of the questionnaires from previous literature and predicted questionnaire model for this study. This study aims to develop a questionnaire that combines both nutritional knowledge and supplement habits among disabled athletes in Malaysia, to validate and determine the reliability of the developed questionnaire. Expert validation, test-retest reliability, and internal consistency reliability will be used in this study. In expert validation, six experts in nutrition, dietetics and sports nutrition field will be involved, and the data will be measured using the content validity ratio (CVR). Pearson Correlation Coefficient and Cronbach Alpha will be applied to determine the internal consistency reliability and test-retest reliability in determining the reliability of the

developed questionnaire. As a result, a valid and reliable questionnaire that combines both nutritional knowledge and supplement habits specifically for Malaysian disabled athletes will be established, thus optimizing the growth of Malaysia disability sports. However, this research has not completed yet

A cross-cultural adaptation and linguistic validation of the Hypoglycaemia Symptom Rating Scale (HypoSRQ) among Malaysian patients with diabetes mellitus

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Med & Health, Vol. 11(1), 2016, 72-82

The Hypoglycaemia Symptom Rating Questionnaire (HypoSRQ) is potentially useful for local research on hypoglycaemia. However, it requires adaptation and validation in local settings. This study reports the process and results of cross-cultural adaptation and linguistic validation of HypoSRQ for Malay and English versions in our local setting. The HypoSRQ underwent forward and backward translation and adaptation with support from professional translators and a clinical psychologist. Cognitive debriefing was done among patients with Type 1 and Type 2 diabetes mellitus from varying sociodemographic backgrounds. Discussion was done together with the original developers of the HypoSRQ to decide on the best version for local use. The finalised versions were proofread and formatted with the help of Health Psychology Research. Cognitive debriefing for Malay version involved 7 patients and for the English version5 patients. Direct literal translation into Malay language was unsuitable due to technical terms which were difficult for laypersons to understand. Amendments were made based on findings from the cognitive debriefing process. Participants found the questionnaire fairly easy to understand. The HypoSRQ-My (Malay) and HypoSRQ-EMy (English) is easily understood by local participants. These tools may undergo psychometric evaluation for future use in local settings.

A framework for tracing the flavouring information to accelerate halal certification

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Halal industry is a new sector in the manufacturing industry in Malaysia and is a fast-growing global business. In Malaysia, JAKIM is the body responsible in matters relating to approve the halal certification. However, the process of issuing the halal certificate is time consuming. Based on the delay in issuing the halal certificate, this study conducted a case study to examine issues in halal certification. The reasons for the delay in issuing halal certification is the constraints in determining halal status of flavouring due to the absence of halal certificate when auditors were processing the documentation for applying certification. In addition, the inconsistent use of terms among the food producers and the auditors makes it difficult to trace halal status of flavouring. The case study also found that there is no framework that can help to trace the halal status of flavouring ingredient systematically. Thus, the study contributes a framework for tracing flavouring information to accelerate halal certification.

A tale of two construct validation analysis: Rasch model and exploratory factor analysis approach for Three-Factor Eating Questionnaire (TFEQ-R21) among Malaysian male workers

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Medical Journal of Malaysia, Vol. 70(3), 2015, 169-176

Introduction: This study aims for construct validation using two approaches, i.e., exploratory factor analysis and Rasch Model. **Methods**: A cross sectional of 313 male workers from multiple worksites had completed self-administered Malay translated version of Three-Factor Eating Questionnaire-R21. Data quality was assessed by misfit person criteria, dimensionality, summary statistic, item measure and rating (partial credit) scale followed by exploratory factor analysis and internal consistency reliability assessment. **Results**: The dual approaches of construct validation analysis were complement to each other. Rasch analysis supported the theoretical constructs of three eating behaviour dimensions among respondents. In contrary to exploratory factor analysis, it did show presence of a newfound factor (=0.04) came up from the separation of the cognitive restrain and uncontrolled eating however, the correlation between the two respective sub-factors were fair (r= 0.39) and weak (r= -0.08). Both analyses had detected three problematic items but those items were psychometrically fit for used for current study setting. The data had adequate psychometric properties. Cronbach's alpha for cognitive restraint, uncontrolled eating and emotional eating were 0.66, 0.79 and 0.87 respectively. Rating scale quality was conformed to standard criteria. **Conclusion**: Malay version TFEQ-R21 with promising psychometric properties and valid measures for eating behaviour dimensions among male workers aged between 20 to 60 years old is now available. Further development should focus on the items in relation to Malaysian cultural adaptation before its use for daily practice in future setting.

A web-based dietary intervention for people with type 2 diabetes: Development, implementation, and evaluation

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Int J Behav Med, 22 (3), 2015, 365-373

Background: Diabetes is becoming a very important health issue in rapidly developing nations and there is an urgent need to improve overall diabetes self-management education in these countries. Although e-health is an emerging theme, only a few successful web-based studies on diabetes self-management have been reported. **Purpose**: We describe the development, implementation, and process evaluation of an Internet-delivered dietary intervention program (*my*DIDeA) for diabetic patients in a developing country. **Method**: Specific dietary components to be included in the intervention module were first identified through a comprehensive review of literature and guidelines. The lesson plans and the study website were then developed based on the evidence, Transtheoretical Model's Stages of Change and user-centered design approach. Finally, the effectiveness of the website was tested through a randomized-controlled trial to promote dietary change in patients with type 2 diabetes. The participants in the intervention group (n=66) were given access to *my*DIDeA for 6 months. Process evaluation in form of intervention adherence and program reception were conducted at post intervention. **Results**: The response rate for the process evaluation was 89 %. On average,

each participant logged in at least once for each lesson plan and spent almost 12 min on the site. The participants' content satisfaction, acceptability, and usability scores were satisfactory. The primary outcome of the trial, Dietary Knowledge, Attitude, and Behavior score was strongly correlated with content satisfaction (r= 0.826, p< 0.001), acceptability (r= 0.793, p< 0.001) and usability of the website (r= 0.724, p< 0.001), and moderately correlated with frequency of log-in (r= 0.501, p< 0.05) and duration spent in the website (r= 0.399, p< 0.05). **Conclusion**: The process evaluation of *my*DIDeA demonstrates its feasibility, and future studies should identify the possibility of extending the use of Internet-based intervention programs to other health behaviors and issues related to self-management of chronic conditions. In addition, interactivity, peer support via social media, and other means to stimulate the interest of participants can be explored.

Accuracy of three android-based pedometer applications in laboratory and free-living settings

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Journal of Sports Sciences, Vol 35(1), 2017, 14-21

This study examines the accuracy of three popular, free Android-based pedometer applications (apps), namely, Runtastic (RT), Pacer Works (PW), and Tayutau (TY) in laboratory and free-living settings. Fortyeight adults (22.5 ± 1.4 years) completed 3-min bouts of treadmill walking at five incremental speeds while carrying a test smartphone installed with the three apps. Experiment was repeated thrice, with the smartphone placed either in the pants pockets, at waist level, or secured to the left arm by an armband. The actual step count was manually counted by a tally counter. In the free-living setting, each of the 44 participants (21.9 ± 1.6 years) carried a smartphone with installed apps and a reference pedometer (Yamax Digi-Walker CW700) for 7 consecutive days. Results showed that TY produced the lowest mean absolute percent error (APE 6.7%) and was the only app with acceptable accuracy in counting steps in a laboratory setting. RT consistently underestimated steps with APE of 16.8% in the laboratory. PW significantly underestimated steps when the smartphone was secured to the arm, but overestimated under other conditions (APE 19.7%). TY was the most accurate app in counting steps in a laboratory setting with the lowest APE of 6.7%. In the free-living setting, the APE relative to the reference pedometer was 16.6%, 18.0%, and 16.8% for RT, PW, and TY, respectively. None of the three apps counted steps accurately in the free-living setting.

Approaches in methodology for population-based longitudinal study on neuroprotective model for healthy longevity (TUA) among Malaysian older adults

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A number of longitudinal studies on aging have been designed to determine the predictors of healthy longevity, including the neuroprotective factors, however, relatively few studies included a wide range of factors and highlighted the challenges faced during data collection. Thus, the longitudinal study on neuroprotective model for healthy longevity (LRGS TUA) has been designed to prospectively investigate the magnitude of cognitive decline and its risk factors through a comprehensive multidimensional assessment comprising of biophysical health, auditory and visual function, nutrition and dietary pattern and psychosocial aspects. At baseline, subjects were interviewed for their status on sociodemographic, health, neuropsychological test, psychosocial and dietary intake. Subjects were also measured for anthropometric and physical function and fitness. Biospecimens including blood, buccal swap, hair and toenail were collected, processed and stored. A subsample was assessed for sensory function, i.e., vision and auditory. During follow-up, at 18 and 36 months, most of the measurements, along with morbidity and mortality outcomes will be collected. The description of mild cognitive impairment, successful aging and usual aging process is presented here. A total 2322 respondents were recruited in the data analysis at baseline. Most of the respondents were categorized as experiencing usual aging (73 %), followed by successful aging (11 %) and mild cognitive impairment (16 %). The LRGS TUA study is the most comprehensive longitudinal study on aging in Malaysia, and will contribute to the understanding of the aging process and factors associated with healthy aging and mental well-being of a multiethnic population in Malaysia.

Can Malaysian young adults report dietary intake using a food diary mobile application? A pilot study on acceptability and compliance

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Nutrients, Vol. 9(62), 2017, 1-11

Mobile applications may improve dietary reporting among young adults due to their high accessibility and embedded camera function. This pilot study aimed to (i) evaluate users' acceptability and compliance in reporting dietary intake using a newly developed food diary mobile application (food app); and (ii) identify issues and recommendations for improving dietary assessment using this food app via quantitative and qualitative protocols. Twenty-eight university students each used a food app for seven consecutive days and attended one of five focus group interviews. A 42% decrement in reporting compliance was observed throughout the seven-day recording period. An average of 5.9 recording days were reported and 4.8 occasions of meal data were uploaded each day. Based on questionnaires, high levels of agreement were reported in terms of perceived usefulness (69.3%), perceived ease of use (77.1%), attitude (73.6%), perceived enjoyment (62.6%), and smartphone experience (91.1%), but such agreement was not reported for intention to use (38.1%) and social influence (33.4%). Four major themes emerged from the focus group interviews, namely, (i) features; (ii) potential use; (iii) utility issues of the food app; and (iv) suggestions for improvements. While the food app was well-accepted by most of the young adults, the current prototype would benefit from incorporation of a barcode scanning function, customizable reminders, in-app tutorial, an entertainment component, and enhancement in overall appearance.

Data Mining Techniques for classification of childhood obesity among year 6 school children

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Today, data mining is broadly applied in many fields, including healthcare and medical fields. Obesity problem among children is one of the issues commonly explored using data mining techniques. In this paper, the classification of childhood obesity among year six school children from two districts in Terengganu, Malaysia is discussed. The data were collected from two main sources; a *Standard Kecergasan Fizikal Kebangsaan untuk Murid Sekolah* Malaysia/National Physical Fitness Standard for Malaysian School Children (SEGAK) Assessment Program and a set of distributed questionnaire. From the collected data, 4, 245 complete data sets were promptly analyzed. The data preprocessing and feature selection were implemented to the data sets. The classification techniques, namely Bayesian Network, Decision Tree, Neural Networks and Support Vector Machine (SVM) were implemented and compared on the data sets. This paper presents the evaluation of several feature selection methods based on different classifiers.

Development and validation of a food frequency questionnaire for dietary intake assessments among multi ethnic primary school children

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Singapore Medical Journal, Vol. 56(12), 2015, 687-94

Introduction: This study aimed to develop and validate a food frequency questionnaire (FFQ) to assess habitual diets of multi-ethnic Malaysian children aged 7-12 years. **Methods**: A total of 236 primary school children participated in the development of the FFQ and 209 subjects participated in the validation study, with a subsample of 30 subjects participating in the reproducibility study. The FFQ, consisting of 94 food items from 12 food groups, was compared with a three-day dietary record (3DR) as the reference method. The reproducibility of the FFQ was assessed through repeat administration (FFQ2), seven days after the first administration (FFQ1). **Results**: The results of the validation study demonstrated good acceptance of the FFQ. Mean intake of macronutrients in FFQ1 and 3DR correlated well, although the FFQ intake data tended to be higher. Cross-classification of nutrient intake between the two methods showed that < 7% of subjects were grossly misclassified. Moderate correlations noted between the two methods ranged from r = 0.310 ($p < 0.001$) for fat to r = 0.497 ($p < 0.001$) for energy. The reproducibility of the FFQ, as assessed by Cronbach's alpha, ranged from 0.61 (protein) to 0.70 (energy, carbohydrates and fat). Spearman's correlations between FFQ1 and FFQ2 ranged from rho = 0.333 ($p = 0.072$) for protein to rho = 0.479 ($p < 0.01$) for fat. **Conclusion**: These findings indicate that the FFQ is valid and reliable for measuring the average intake of energy and macronutrients in a population of multi-ethnic children aged 7-12 years in Malaysia.

Development and validation of a food frequency questionnaire for vitamin D intake among urban pregnant women in Malaysia

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Mal J Nutr, 21 (2), 2015, 179-190

Introduction: A culturally valid tool is lacking in order to assess vitamin D intake among Malaysians. This study aimed to develop and determine the validity and reliability of a semi-quantitative food frequency questionnaire (FFQ) for assessment of vitamin D intake among pregnant women living in urban areas of Malaysia. **Methods**: A total of 79 volunteer mothers (aged 18 to 40 years) in their fi rst trimester of pregnancy participated in this study voluntarily. They completed both the 3-day 24-hour dietary recalls (3DR) and semi-quantitative food frequency questionnaires (FFQ1). The FFQ1 was validated against vitamin D intake calculated from the 3DR. After one week, 41 (51.89%) subjects completed the same FFQ1 (now called FFQ2) for reliability assessment. **Results**: The median vitamin D intake from 3DR was 117.6 IU/day with an interquartile range (IQR) of 54.8 to 193.7 IU/ day. The median and IQR values from FFQ1 were 147.7 and 103.7 to 233.9 IU/ day, respectively. The Spearman correlation coefficient was strong and positive, r=0.810 (p=0.01); cross-classification analyses revealed no misclassification and the Bland-Altman plot showed good agreement between the two dietary methods. The intra-class correlation (ICC) for reliability of vitamin D intake was 0.98; the cross-classification analysis showed 95.12% and was classified into the same quartile which supported a consistent habitual eating pattern. **Conclusion**: The new FFQ developed to assess vitamin D intake showed high correlation and high agreement with the majority of the sample population classified into the same quartile. It is concluded that the new FFQ is a valid and reliable screening tool for vitamin D intake for pregnant women in the urban areas of Malaysia.

Development and validation of the bilingual (English-Malay) version of knowledge on calcium supplement-12 (KnowCas-12) questionnaire

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To date, specific questionnaire assessing knowledge on calcium supplement is unavailable. Thus, we aimed to develop and validate this questionnaire. Four areas of knowledge (calcium in general, dietary calcium, benefits and risk of calcium supplement, and practices that reduce its benefits) were identified through literature review and interviews with ten doctors. Twelve items were created in English and reviewed by two family medicine specialists, an orthopaedic surgeon, and a pharmacist. A bilingual (English-Malay) questionnaire was produced via back-to-back translation and face validity was tested

on seven patients. Discriminative validation was done by comparing knowledge scores between patients, medical students and doctors. Test-retest reliability was tested with a two weeks interval. Subsequently, the questionnaire was piloted on 100 patients. The KnowCaS-12 scores of doctors were significantly higher than those of patients ($p<0.001$) and students ($p<0.001$), indicating good discriminative validity. Although the Cronbach's alpha was 0.68, it had good test-retest reliability [Spearman's rho correlation: 0.40, $p=0.02$; pre- and post-test score median (IQR): 8.00 (3.00) and 9.00 (2.00) respectively, p-value of Wilcoxon Signed Ranks test: 0.08). The pilot study showed 52.5% of the participants took calcium supplement. Their median (IQR) for KnowCaS-12 was 7.00 (6.00), which was not significantly different from those who did not take calcium supplement. In conclusion, the bilingual KnowCaS-12 questionnaire appears to have good content validity, face validity, discriminative validity and test-retest reliability, thus it can be used for future studies. Practice of consuming calcium supplement seems to be common and users' knowledge regarding calcium supplement was only moderate.

Development and validation of the Malay version knowledge and attitude questionnaire on breastfeeding among postpartum mothers in the northeast region of Peninsular Malaysia

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Brunei International Medical Journal, Vol. 12(3), 2016, 104-115

Knowledge and attitude are important modifiable factors influencing exclusive breastfeeding practice. A valid and reliable questionnaire is needed to assess the knowledge and attitude among mothers towards breastfeeding. This study aims to develop and validate a Malay version Knowledge and Attitude Breastfeeding Questionnaire (KA-BFQ) and to describe the breastfeeding knowledge and attitude among postpartum mothers in Hospital Universiti Sains Malaysia. A cross-sectional validation study was conducted from the 1st October 2014 to 31st December 2014 among postpartum mothers who delivered vaginally to healthy infants and were able to initiate breastfeeding while in the postnatal ward. The interviewer-guided KA-BFQ contains 47 items assessing knowledge and 23 items assessing attitude were given. The questions on knowledge were adapted from previous study while questions on attitude were developed in stages for content validity. Face validity, item level characteristics and analysis, exploratory factor analysis, internal consistency reliability, and descriptive analysis of respondents' knowledge and attitude were conducted. A total of 150 postpartum mothers with mean age of 28.04 (SD 4.97) years participated in this study. Item analysis showed acceptable difficulty index with excellent discrimination index. Exploratory factor analysis constructed for knowledge domain leaving 41 items loaded from 0.19 to 0.82 and 11 items for attitude domain loaded from 0.53 to 0.86. Cronbach's alpha of the final questionnaire was 0.85 for knowledge and 0.79 for attitude. The mean total score was 29.34 (SD 6.23) for knowledge and 44.16 (SD 4.26) for attitude. The Malay version KA-BFQ is a valid and reliable tool to assess the breastfeeding knowledge and attitude among postpartum mothers.

Development of TUA-WELLNESS screening tool for screening risk of mild cognitive impairment among community-dwelling older adults

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Background and aim: Focus on screening for cognitive impairment has to be given particular importance because of the rising older adult population. Thus, this study aimed to develop and assess a brief screening tool consisting of ten items that can be self-administered by community dwelling older adults (TUA-WELLNESS). **Methodology**: A total of 1,993 noninstitutionalized respondents aged 60 years and above were selected for this study. The dependent variable was mild cognitive impairment (MCI) assessed using neuropsychological test batteries. The items for the screening tool comprised a wide range of factors that were chosen mainly from the analysis of ordinal logistic regression (OLR) and based on past literature. A suitable cut-off point was developed using receiver operating characteristic analysis. **Results**: A total of ten items were included in the screening tool. From the ten items, eight were found to be significant by ordinal logistic regression and the remaining two items were part of the tool because they showed strong association with cognitive impairment in previous studies. The area under curve (AUC), sensitivity, and specificity for cut-off 11 were 0.84%, 83.3%, and 73.4%, respectively. **Conclusion**: TUA-WELLNESS screening tool has been used to screen for major risk factors of MCI among Malaysian older adults. This tool is only suitable for basic MCI risk screening purpose and should not be used for diagnostic purpose.

Methodology of the body is fit and fabulous at home (MyBFF@home): an intervention study to combat obesity among housewives in Malaysia

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Research Article, J Womens Health Issues Care, Vol. 5(5), 2016, 1-8

Introduction: The National Health and Morbidity Survey Malaysia (NHMS 2011) finding showed that female adults (including housewives) are one of the high risk groups that require specific obesity intervention. This paper describes the development and methodology of the My Body is Fit and Fabulous at home (MyBFF@ home), an intervention study to combat obesity among housewives. **Methods**: The MyBFF@home was conducted in 2 phases and involved mixed quantitative and qualitative methods. Phase I (development of the intervention package) included scoping review, construction and development of initial package, in-depth interviews and, consultations with experts and stakeholders. Phase II (intervention) was a quasi-experimental study which involved pre-post intervention (6 months of weight loss intervention and 6 months of weight sustainability) among 18-59 year old housewives in Klang Valley, Malaysia. **Results**: Four components were identified for the Intervention Group: individual diet and physical activity (PA) counselling, selfmonitoring tools (food

diary and PA diary), group exercise (brisk walking and pillow dumbbell) and a reduced calorie diet. Weight loss was targeted at 5% from the initial weight, and implemented for 6 months of intervention, and another 6 months of weight sustainability. Monitoring of anthropometric, cardiometabolic parameters, body composition, dietary intake, PA, body pain, quality of life, symptoms related to weight loss and health literacy were included. The Control Group was involved in series of women's seminar and the self-monitoring tools. A total of 328 housewives were recruited from 14 low cost flats. **Conclusion**: MyBFF@home weight loss intervention for housewives was developed in a systematic manner. The methodology utilised local and international guidelines on the obesity management and it provides evidence on the community-based weight loss intervention among adult females in Malaysia. The package can be modified and adapted to the current weight loss programme to combat obesity among the Malaysian population.

Norms for Eating Disorder Examination Questionnaire (EDE-Q) among secondary school students in Kuala Lumpur, Malaysia

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Introduction: The Eating Disorder Examination Questionnaire (EDE-Q) has been widely used as a tool to detect eating disorders. We aimed to identify the EDE-Q normative data among secondary school students in Kuala Lumpur, Malaysia. **Methods**: This is a cross-sectional study involving four secondary schools in an urban area. The respondents of secondary school students were selected using stratified sampling. **Results**: There were 298 teenagers 12 to 17 years of age who participated in the study. The EDE-Q mean scores ± standard deviation was 1.27 ± 1.08 for the total score (Global Score), 0.78 ± 0.95 for Restraint Domain, 1.02 ± 1.03 for Eating Concern, 1.76 ± 1.55 for Shape Concern and 1.54 ± 1.43 for Weight Concern. **Conclusion**: Mean values obtained from this study were relatively lower when compared to western populations. Shape Concern and Weight Concern had higher scores compared to the other domains. These values are useful for EDE-Q interpretation in Malaysia.

Pre-pregnancy community-based intervention for couples in Malaysia: Application of intervention mapping

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Background: Malaysia is experiencing a nutrition transition with burgeoning obesity, particularly in women, and a growing prevalence of non-communicable disease. These health burdens have severe implications not only for adult health but also across generations. Pre-conception health promotion could address the intergenerational risk of metabolic disease. This paper describes the development of the "Jom Mama" intervention using Intervention Mapping (IM). The Jom Mama intervention aims to improve the health of young adult couples in Malaysia prior to conception. **Methods**: IM comprises of five steps prior to the last one, which involves the evaluation of the intervention. We used the five steps to develop the Jom Mama intervention. **Results**: Both the process and evidence is documented providing the rationale to the selection of the key objectives of the intervention: (i) increasing healthy dietary practice; (ii) increasing physical activity levels, (iii) reducing sedentary activity; and (iv) improving social support to offset stressful lifestyles. From the IM process, Jom Mama will be health-system centred approach that uniquely combines both community health promoters and an electronic-health platform to deliver the complex intervention. **Conclusion**: IM is an iterative process that systematically gathers "best" evidence, selects appropriate theories of behaviour change, and facilitates formative research so as to develop a complex intervention. Though the IM process is time consuming, complex, and costly, it has enriched the Jom Mama intervention with a number of notable advantages: (i) intervention fashioned on formative work with stakeholders and in the target group; (ii) intervention combines research evidence with theory; (iii) intervention acknowledges multiple dynamics of influence; and (iv) intervention is embedded within health service priorities in Malaysia for greater scale-up possibility.

Quality coding of malnutrition under the Casemix System in Hospital Universiti Sains Malaysia

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Introduction: Detailed clinical information is important for the Casemix System to generate valuable Case Based Group (CBG) for malnourished geriatric patients. Clinical coding for malnutrition provides useful information on the nutritional health of patients for treatment purposes. **Methods**: This cross-sectional study with purposive sampling involved a total of 130 geriatric patients (>60 years) at Hospital Universiti Sains Malaysia (USM). Nutritional assessments were performed such as anthropometrics measurement, Subjective Global Assessment (SGA), and biochemical assessment. The patients' medical records and coded data were systematically reviewed to observe the documentation of nutritional information and coding criteria based on the International Classification for Diseases (ICD-10). **Results**: The prevalence of malnutrition among the geriatric patients was 35.4%. Proper documentation of required nutritional information was found in less than 50% of the cases. None of the malnourished patients were documented and coded with malnutrition diagnosis, despite being given nutritional interventions. The reasons given for this omission were related to the lack of awareness (50%) and incomplete medical documentation (50%). Further analysis revealed that uncoded diagnosis, miscoding, missing, and unavailable codes for nutritional counselling and

oral nutritional supplementation were the main contributors to the incomplete records. **Conclusion**: The quality of clinical coding for malnourished geriatric patients in the hospital should be improved. A structured assessment and standard documentation is recommended to improve the quality of healthcare provision for malnourished geriatric patients.

Re-evaluation of Malnutrition Risk Screening Tool-Hospital (MRST-H) for geriatric patients: A multicentre study in Peninsular Malaysia

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Sains Malaysiana, Vol. 45(9), 2016, 1311–1317

A local Malnutrition Risk Screening Tool-Hospital (MRST-H) has been developed to identify the risk of malnutrition among hospitalized geriatric patients in Malaysia. The aims of this multicenter study were to evaluate the criterion validity of the MRST-H against the reference standard Subjective Global Assessment (SGA) and revise its scoring criteria among Malaysian geriatric patients. A cross-sectional study was conducted among 542 geriatric patients at eight general hospitals in Peninsular Malaysia from January 2011 to February 2013. The Malay version MRST-H and SGA were administered to all participants through face-to-face interviews. Sensitivity and specificity of MRST-H were established using the Receiver Operating Characteristic (ROC) curves and the optimal cut-off scores were determined. The MRST-H had area under the ROC curve (AUC) values of 0.84 and 0.88 when validated against the SGA-determined malnutrition (SGA B+C) and severe malnutrition (SGA C) status. These high AUC values indicated that the MRST-H has very good overall diagnostic accuracy. However, the original cut-off score of five points for MRST-H has undesirable sensitivity in identifying the malnutrition (sensitivity= 0.12) and severely malnutrition (sensitivity= 0.35) status. The optimal cut-off score of MRST-H in identifying malnourished and severely malnourished participants were both established at the cut-off score of two points. The sensitivity of MRST-H increased substantially at this point without compromising its specificity. Therefore, the established cut-off score of two points with optimal sensitivity and specificity was selected to replace to original cut-off score for screening of risk of malnutrition among hospitalized geriatric patients.

Reliability and validity of the Physical Activity Questionnaire for older children (PAQ-C) in Malay language

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Introduction: Physical activity assessment in children is first step in assessing the relationship between activity and health, as well as the determinants of childhood physical activity and changes in activity level. Physical Activity Questionnaire for Older Children (PAQ-C) is self- administered questionnaires to assess physical activity among older children. The objective of this study was to determine the validity and reliability of Physical Activity Questionnaire for Older Children in Malay language PAQ-C(M). **Methodology**: The validation study was done among 73 students aged 10 to 17 years old. The PAQ-C was translated into Malay language using forward and backward translation. The evaluation of the psychometric properties included internal consistency, test-retest reliability and criterion validity.

Reliability of PAQ-C(M) was determine using Cronbach alpha and intra-class correlation coefficient (ICC). The PAQ-C(M) was administered twice in one week interval to assess test-retest reliability. Criterion validity was assess between PAQ-C(M) and 3 Day Physical Activity Recall (3DPAR). **Results**: The internal consistency of PAQ-C(M) assessment calculated in this study was $\alpha = 0.75$ and $\alpha = 0.77$ for assessments one and two, respectively. The ICC between individual items of PAQ-C(M) was 0.59 to 0.91 indicate that moderate to good correlation. The Spearmen correlation coefficients between PAQ-C(M) and 3DPAR was acceptable (r=0.60, p<0.01). **Conclusion**: In conclusion, the findings of this study suggest that the PAQ-C(M) has moderate to good reliability and validity in assessing physical activity among older children and adolescent. Future validation of PAQ-C(M) against different measures such as accelerometer is recommended.

The Bahasa Melayu version of the Global Physical Activity Questionnaire: Reliability and validity study in Malaysia

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Asia-Pacific Journal of Public Health, Vol. 27(2), 2015, NP184-NP193

This study aimed to assess the reliability and concurrent validity of the Bahasa Melayu version of the Global Physical Activity Questionnaire (GPAQ-M) by comparing it with the short form of the International Physical Activity Questionnaire (IPAQ-S) and objectively measuring physical activity using a Yamax DigiWalker (Yamax, Tokyo, Japan) pedometer. A total of 100 adults aged between 20 and 58 years from Kelantan in Malaysia voluntarily participated in this study. The Wilcoxon signed-rank analysis showed no significant differences in 2-week test–retest scores for total metabolic equivalent minutes per week and 4 domains of the GPAQ-M. There was a low but significant relationship between time spent on total physical activity measured by the GPAQ-M and average steps per day recorded using the pedometer (rs= .265, P= .013). Significant correlations were also found between GPAQ-M and the IPAQ-S for varying levels of intensity during physical activities (rs= .309-.466, P< .01).

The cut-off values of anthropometric variables for predicting mild cognitive impairment in Malaysian older adults: A large population based cross-sectional study

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Purpose: Older adults are at risk of mild cognitive impairment (MCI), and simple anthropometric measurements can be used to screen for this condition. Thus, the aim of this study was to explore the cut-off values of body mass index (BMI) and waist circumference (WC) for predicting the risk of MCI in older Malaysian adults. **Methods**: A total of 2,240 Malaysian older adults aged $60 years were recruited using multistage random sampling in a population based cross-sectional study. Receiver

operating characteristic (ROC) curve was used to determine the cut-off values of BMI and WC with optimum sensitivity and specificity for the detection of MCI. Age, gender, years of education, smoking habit, alcohol consumption, depression, and medical conditions were used as confounding factors in this analysis. **Results**: A BMI cut-off value of 26 kg/m^2 (area under the receiver operating characteristic curve [AUC] 0.725; sensitivity 90.5%; specificity 38.8%) was appropriate in identifying the risk of getting MCI in both men and women. The optimum WC cut-offs for likelihood of MCI were 90 cm (AUC 0.745; sensitivity 78.0%; specificity 59.8%) for men and 82 cm (AUC 0.714; sensitivity 84.3%; specificity 49.7%) for women. The optimum calf circumference (CC) cut-off values for identifying MCI were 29 cm (AUC 0.731; sensitivity 72.6%; specificity 61.1%) for men and 26 cm (AUC 0.598; sensitivity 79.1%; specificity 45.3%) for women. **Conclusion**: The cut-off values could be advocated and used as part of the screening of MCI among older Malaysian adults. There is a need to further determine the predictive values of these cut-off points on outcomes through longitudinal study design.

The discriminative ability of waist circumference, body mass index and waist-to-hip ratio in identifying metabolic syndrome: Variations by age, sex and race

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Diabetes & Metabolic Syndrome: Clinical Research & Reviews, Vol. 9(2), 2015, 74-78

Objectives: Many studies have suggested that there is variation in the capabilities of BMI, WC and WHR in predicting cardiometabolic risk and that it might be confounded by gender, ethnicity and age group. The objective of this study is to examine the discriminative abilities of body mass index (BMI), waist circumference (WC) and waist-hip ratio (WHR) to predict two or more non-adipose components of the metabolic syndrome (high blood pressure, hypertriglyceridemia, low high density lipoprotein-cholesterol and high fasting plasma glucose) among the adult Malaysian population by gender, age group and ethnicity. **Methods**: Data from 2572 respondents (1044 men and 1528 women) aged 25-64 years who participated in the Non Communicable Disease Surveillance 2005/2006, a population-based cross sectional study, were analysed. Participants' socio-demographic details, anthropometric indices (BMI, WC and WHR), blood pressure, fasting lipid profile and fasting glucose level were assessed. Receiver operating characteristics curves analysis was used to evaluate the ability of each anthropometric index to discriminate MetS cases from non-MetS cases based on the area under the curve. **Results**: Overall, WC had better discriminative ability than WHR for women but did not perform significantly better than BMI in both sexes, whereas BMI was better than WHR in women only. Waist circumference was a better discriminator of MetS compared to WHR in Malay men and women. Waist circumference and BMI performed better than WHR in Chinese women, men aged 25-34 years and women aged 35-44 years. **Conclusions**: The discriminative ability of BMI and WC is better than WHR for predicting two or more non-adipose components of MetS. Therefore, either BMI or WC measurements are recommended in screening for metabolic syndrome in routine clinical practice in the effort to combat cardiovascular disease and type II diabetes mellitus.

The Malay version of antenatal and postnatal breastfeeding self-efficacy scale-short form: Reliability and validity assessment

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Maternal self-efficacy in breastfeeding is one of the potential modifiable factors which is consistently linked with positive breastfeeding outcomes. This study aimed to develop a Malay translation of the original English BSES-SF and to conduct a validity and reliability assessment on both antenatal and postnatal questionnaires among 101 pregnant women in their third trimester and 104 women on their first week postpartum. The Malay translation of the English BSES-SF was conducted by using back-to-back translation processes, followed by validity and reliability evaluation. The validated Malay version of the questionnaire BSES-SF was then administered on the respondents. The questionnaire comprised of socio-demographic, antenatal, and breastfeeding information. Furthermore, data on infant feeding method were collected via telephone call made to the respondents at four weeks postpartum. The Cronbach's Alpha value for antenatal BSES-SF questionnaire was0.94, while the value for postnatal BSES-SF questionnaire was 0.95. The factor analysis identified a one-dimensional structure which able to explain 59.02% of the variance for antenatal questionnaire and 60.43% of the variance for postnatal questionnaire. In addition, high antenatal and postnatal breastfeeding self-efficacy scores were significantly associated with the practice of exclusive breastfeeding at four weeks postpartum. As a conclusion, Both Malay versions of the antenatal and postnatal BSES-SF questionnaires are valid and reliable tools to assess breastfeeding self-efficacy among Malaysian mothers.

The physical activity and leisure motivation scale: A confirmatory study of the Malay language version

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The aim of this study is to validate a Malay language version of the Physical Activity and Leisure Motivation Scale (PALMS) using a confirmatory approach. Data collection was conducted in Kelantan, Malaysia. Participants were 634 university undergraduate students (female 63%, male 37%), mean age of 21 years. Motivation for physical activity was assessed using the 40-item PALMS, which measures eight motives. PALMS was first translated into Malay using standard forward and backward translation procedures. Participants then completed the PALMS-Malay (PALMS-M). Confirmatory factor analysis (CFA) was conducted, using Mplus 7.3 software, on the 8-motive PALMS-M model. The hypothesised model consisted of 40 observed items, and 8 latent variables. Employing CFA, this model did not result in a good fit to the data. Further examination of CFA results suggested modifications to the path model to improve fit indices. This modification included deleting two problematic items (items 10 and 18) and co-varying the error terms for items 19 and 31. This resulted in improved fit indices (RMSEA= .041 (90% CI: .038, .044), CIfitRMSEA= 1.000, CFI= .911, TLI= .901, SRMR= .052). The final measurement model consisted of 38 items. The majority of the items were retained and were considered acceptable for the present sample.

Translation and validation of the Healthcare teamwork survey questionnaire: study design for the Malaysian context

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Cross-professional teamwork in healthcare is necessary to support integrated service delivery. However, cross-professional teamwork has not been given sufficient attention in developing country contexts. This paper presents a study design for translating and validating a teamwork survey questionnaire (TSQ) for the Malaysian context. The original TSQ was previously used in a developed country context. The tool will be translated into Malay which is the national language of Malaysia. Survey data will be subject to exploratory factor analysis to assess construct validity and Cronbach's alpha test for reliability. The forward-backward translation approach of cross-cultural adaptation will be utilized. Two independent translators shall initially translate the questionnaire before reconciliation by the research team. The reconciled Malay version will then be back-translated into English. English translation will be contrasted against the original TSQ for further accuracy improvements in the Malay version. Face validation will be conducted with five academicians and five healthcare professionals to obtain feedback on necessary further adjustments. Upon finalizing the Malay version TSQ, interviews with service managers and senior healthcare professionals will be conducted to identify services with cross-professional teamwork at a designated hospital. A total of 150 respondents for survey validation will be recruited from identified services within the hospital. Different healthcare professionals having cross-communication and sharing patient care objectives will meet the criteria for a cross-professional team service. The validated Malay version TSQ could provide an invaluable tool for the assessment and improvement of cross-professional teamwork in the Malaysian healthcare context.

Triglyceride glucose index as a surrogate measure of insulin sensitivity in obese adolescents with normoglycemia, prediabetes, and type 2 diabetes mellitus: Comparison with the hypererinsulinemic- euglycemic clamp

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Pediatric Diabetes, Vol. 17(6), 2016, 458-465

Background: There is a need for simple surrogate estimates of insulin sensitivity in epidemiological studies of obese youth because the hyperinsulinemic–euglycemic clamp is not feasible on a large scale. **Objective**: (i) To examine the triglyceride glucose (TyG) index (Ln[fasting triglycerides (mg/dL) × fasting glucose (mg/dL)/^{2}]) and its relationship to *in vivo* insulin sensitivity in obese adolescents (OB) along the spectrum of glucose tolerance and (ii) to compare TyG index with triglyceride/high-density lipoprotein TG/HDL and 1/fasting insulin ($1/I_F$), other surrogates of insulin sensitivity. Patients and design: Cross-sectional data in 225 OB with normal glucose tolerance (NGT), prediabetes (preDM), and type 2 diabetes (T2DM) who had a 3-h hyperinsulinemic–euglycemic clamp and fasting lipid

measurement. **Results**: Insulin-stimulated glucose disposal (Rd) declined significantly across the glycemic groups from OB-NGT to OB-preDM to OB-T2DM with a corresponding increase in TyG index (8.3 ± 0.5, 8.6 ± 0.5, 8.9 ± 0.6, p<0.0001). The correlation of TyG index to Rd was –0.419 (p < 0.0001). The optimal TyG index for diagnosis of insulin resistance was 8.52 [receiver operating characteristic-area under the ROC curves (ROC-AUC) 0.750, p<0.0001]. The ROC-AUC for 1/IF was 0.836. In multiple regression analysis, 64.8% of the variance in Rd was explained by TyG index, $1/I_F$, body mass index (BMI) z-score, glycemic group, and sex. **Conclusion**: The TyG index affords an easily and widely available simple laboratory method as a surrogate estimate of insulin sensitivity that could be used repeatedly in large-scale observational and/or interventional cohorts of OB. Although not superior to $1/I_F$, TyG index offers the advantage of having a standardized method of measuring triglyceride and glucose, which is not the case for insulin assays.

Ultra-high performance liquid chromatographic determination of aflatoxin M1 in urine

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World Mycotoxin Journal, Vol. 8(4), 2015, 405-413

The development of analytical methods to detect aflatoxin B1 (AFB1) in foodstuffs and its metabolites in human biological samples is useful for risk assessment. The latter methodology, i.e. the measurement of AFB1 biomarkers, has become important to assess human aflatoxin exposure. AFB1-lysine adduct, AFB1-DNA adduct and urinary aflatoxin M1 (AFM1) are some of the AFB1 biomarkers that can be measured by several analytical methods, such as enzyme-linked immunosorbent assay, radioimmunoassay, and high performance liquid chromatography (HPLC). HPLC coupled to a fluorescence detector is useful and preferable due to its high degree of sensitivity, but the analysis may take time and consume large amount of solvents. Therefore, the present study extrapolated the HPLC method to ultra-HPLC for the determination of urinary AFM1. After the extraction procedure with an immunoaffinity column, chromatographic separation was done using a high performance 1.8 m microparticulate C18 column. The mean recovery from urine samples spiked with 0.5, 1.0 and 2.0 ng/ml AFM1 was 84.4±4.0%, with acceptable recovery values, interday (6.0 ± 5.3%) and intraday (2.6±0.6%) coefficients of variation. The retention time was 5.7 min. This method was used to measure urinary AFM1 in 71 subjects, of which 13 had AFM1 levels above the limit of detection (0.018 ng/ml). The mean urinary AFM1 level of the positive samples was 18.8 ± 28.6 pg/ml, ranging from 2.4 to 100.4 pg/ml. As this is one of the few studies investigating the occurrence of aflatoxin biomarkers in human biological samples in Malaysia, a study with a larger sample size is necessary to investigate the magnitude of aflatoxin exposure among the population.

Validation and reproducibility of a culturally specific Food Frequency Questionnaire (FFQ) for Malaysian Punjabis

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Malaysian Journal of Nutrition, Vol. 22(2), 2016, 245-255

Introduction: Validation of a culturally specific FFQ is important in assessing habitual dietary intake of ethnic population groups. This study aimed to assess the validity and reproducibility of a FFQ developed specifically for determining the dietary intake of Malaysian Punjabis. **Methods**: Subjects were approached through voluntary participation for the development and validation phase in the Klang Valley. A list of foods consumed by participants (n= 100) was documented through a 3-day dietary recall. The validation process was conducted by verifying the developed FFQ against another group of Punjabi adult volunteers (n= 101) who kept a 2-day dietary record. Macronutrients, dietary fibre, fatty acids, cholesterol, three types of minerals (calcium, sodium, iron) and four vitamins (B12, folate, C, A) were included in the analysis. Reproducibility was shown with intraclass correlation (ICC) values between FFQ1 vs FFQ2 that were administered 6 months apart among 32 participants. **Results**: In the validation study, the FFQ1 was found to have over-estimated almost all nutrients compared to those in the dietary records. The Spearman correlation coefficients for energy, carbohydrate, protein and fat intake based on the FFQ1 and 2-day dietary records were 0.54, 0.38, 0.47, and 0.31, respectively. The classification into the same and adjacent quartiles was between 61- 84% for the nutrients consumed. Bland Altman plots showed relatively good agreement (between ±2 standard deviation) for both the dietary methods used. Reproducibility analysis of ICC (FFQ1 vs FFQ2) was between 0.46-0.76 for macronutrients and 0.20-0.92 for micronutrients. **Conclusion**: The developed FFQ could be used as a valid tool for assessing dietary intake of Malaysian Punjabis, as it showed a moderate agreement with dietary record for intake of energy and macronutrients.

Validation of Food Frequency Questionnaire in Estimating Docosahexanoic Acids (DHA) intake among Malay primary school children

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Malaysian Journal of Nutrition, Vol. 22(2), 2016, 233-243

Introduction: Omega-3 Polyunsaturated Fatty Acids (PUFAs) play an important role in developing cognitive function in children, especially Docosahexanoic Acid (DHA). However, there is no suitable dietary assessment tool to assess DHA intake among Malaysian children. Thus, this study assessed the validity of an interviewer-administered semi-quantitative Food Frequency Questionnaire (FFQ) for estimating DHA intake among Malay school children in the Sepang District. **Methods**: Thirty 12-year-old Malay children (13 boys and 17 girls) were recruited through purposive sampling. Their DHA intake for one month duration was assessed using a 30-food item FFQ and validated against a 3-day food record. **Results**: The majority of the subjects (70%) had normal body mass index, 6.7% were overweight, 16.7% obese, whilst the rest were in the thin category. The reliability of FFQ was found to be good with a Cronbach's coefficient value of 0.815. Wilcoxon Signed Rank Test indicated no significant difference in mean intake between the two assessment methods. Significant and strong correlation between FFQ and the 3-day food record was found for total omega-3 PUFAs (r= 0.812) and DHA (r= 0.839) using both methods. BlandAltman analysis exhibited no apparent systematic bias between the two methods for DHA and total omega-3 PUFAs intake, whilst a quartile analysis assigned 73.3% of the subjects into the same quartile. **Conclusion**: The FFQ was found to be valid in estimating DHA intake among Malay school children, and it is recommended that its validity be tested on other ethnic population groups.

Validity and reliability of food safety knowledge and practices questionnaire among food handlers

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Health and the Environment Journal, Vol. 6(1), 2015, 11-30

Majority of food borne disease outbreaks resulted from poor knowledge and malpractice during food preparation. Therefore, there is a need to develop a valid and reliable tool to measure the knowledge and practice towards safe food preparation that contribute to this outbreak. A cross-sectional study was conducted to determine the validity and reliability of the Food Safety Knowledge and Practice questionnaire among food handlers in the primary school canteen operated in Kelantan. Item analysis was conducted to determine the difficulty and discrimination indexes of 40 knowledge items. Construct validity and reliability assessment was done on 30 items that measure four types of food preparation practices; personal hygiene; food hygiene and safety; environmental sanitation; and food storage. Ninety four food handlers completed the self-administered questionnaires. Item analysis revealed 6 items was answered correctly by more than 80%, and another 6 items correctly answered by less than 20% respondents. The discrimination index showed 9 items scored below 0.20. Considering the usefulness and practicality of the deleted items, 9 items were re-included resulted in 31 items retained under food safety knowledge section. Exploratory factor analysis of food safety practice section showed three factors with eigen values above 1 accounted for 48.6% of the variance. Nineteen problematic items were removed and remaining 11 items were loaded above 0.40. The internal consistency reliability was good with overall Cronbach's Alpha value was 0.724. This study proposes the Food Safety Knowledge and Practice questionnaire is a valid and reliable measure of knowledge and practice among food handlers toward safe food preparation.

Validity of point-of-care testing Mission Plus in detecting anaemia

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International Journal of Biomedicine, Vol. 5, 2015, 91-94

Background: Point-of-care testing, POCT, was widely used to assess hemoglobin status before proceeding with the confirmation test. Our study aimed to assess the validity of Mission® Plus Hb in detecting hemoglobin levels in a general population compared with a standard laboratory hematology analyser as the gold standard. **Methods**: Two types of samples, capillary and venous blood, were collected from all respondents by trained nurses. Both blood samples were tested using Mission® Plus while the remaining venous blood in EDTA test tubes was sent to the reference laboratory. **Results**: A total of 622 respondents participated in this study, 75% of them females. The mean Hb tested from capillary blood using Mission® Plus Hb was 11.80 ± 2.02 g/dl. For venous blood, the mean Hb concentrations using Mission® Plus Hb and Sysmex XE-2100 hematology analyser were 12.16 ± 1.84 g/dl and 13.07 ± 1.87 g/dl, respectively. Sensitivity and specificity in detecting anemia from venous samples were 98.8% and 73.4% respectively. Positive Predictive Value (PPV) was 58.5%, while Negative Predictive Value (NPV) was 99.4%. **Conclusion**: The findings of moderate PPV should alert the programme managers to the importance of a confirmatory test following screening using Mission® Plus Hb.

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