



# NUTRITION RESEARCH IN MALAYSIA

**Selected Bibliography of Published  
Journal Articles from 2011 to 2014**

**VOLUME II**

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

**2016**





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**2016**

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Preface by

**Deputy Director-General of Health  
(Public Health)**

The first volume on the compilation of the Selected Bibliography of Published Journal Articles of Nutrition Research was published in 2011. Since then, there have been a significant number of new published nutrition related researches in Malaysia. Therefore, the publication of second volume on the compilation of the Selected Bibliography of Published Journal is initiated.

The abstracts for this second volume of nutrition research (2012-2014) are mainly obtained from the local universities and research institutions. I sincerely hope that this compilation will benefit the users especially the programme managers for more evidence-based programme planning, implementation and evaluation.

I would like to express my appreciation to the Technical Working Group on Nutrition Research for the successful publication of this document. I would also like to extend my sincere thanks to all who have significantly contributed to the publication of this Nutrition Research in Malaysia Volume 2 - Selected Bibliography of Published Journal Articles from 2011 to 2014.



**DATUK DR. LOKMAN HAKIM BIN SULAIMAN**

Deputy Director General of Health (Public Health)

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Ministry of Health Malaysia.

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First and foremost, on behalf of The Technical Working Group on Nutrition Research under the National Coordinating Committee on Food and Nutrition (NCCFN), I would like to express my honorable felt, being mandated to compile the abstract on Malaysian nutrition research from year 2011 to 2014. This publication is the continuity of the previous compilation of abstract on Malaysian nutrition research from 1985 to 2010.

This bibliography consists of 12 nutrition research categories or scopes contribute to 644 entries of nutrition research in Malaysia dated from 2011 to 2014. Research abstracts were collected from local universities and organizations. The abstracts could be either in English or Bahasa Malaysia according to the originality of the research paper. Finally, I take immense pleasure in thanking all the editorial board members for their effort and hard work towards the publication of this bibliography "Nutrition Research in Malaysia- Selected Bibliography of Published Journal Articles from 2011 to 2014". Besides, an honorable mention goes to the following individuals and organizations for contributing towards the publication:

1. Director General of Health Malaysia

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2. Deputy Director General of Health (Public Health)

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3. National Coordinating Committee on Food and Nutrition (NCCFN)

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4. Technical Working Group on Nutrition Research

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30. Malaysian Nuclear Agency
31. Malaysian Palm Oil Board (MPOB)



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## List of Scientific Terms

<i>Allium Cepa</i>	=	onion
<i>Allium Fistulosum</i>	=	shallot
<i>Allium Sativum</i>	=	garlic
<i>Alpinia Galanga</i>	=	galangal (lengkuas)
<i>Ammi Visnaga</i>	=	khella
<i>Anadara Granosa</i>	=	cockle
<i>Andrographis Paniculata</i>	=	sam biloto/ 'King of Bitters'
<i>Anona Muricata</i> L	=	soursop
<i>Apium Graveolens</i>	=	celery
<i>Azadirachta Indica</i>	=	neem
<i>Baccaurea Angulata</i>	=	belimbing dayak
<i>Benincasa Hispida</i>	=	winter melon
<i>Brassica Juncea</i>	=	chinese mustard
<i>Brassica Oleracea</i> var <i>Cauliflora</i>	=	cauliflower
<i>Brassica Reptans</i>	=	round cabbage
<i>Camellia Sinensis</i>	=	a type of chinese tea
<i>Centella Asiatica</i>	=	pegaga
<i>Cinnamomum Zeylanicum</i>	=	cinnamon
<i>Citrus Hystrix</i>	=	kaffir lime (limau purut)
<i>Citrus Medica</i>	=	citron
<i>Citrus Microcarpa</i>	=	calamondin (limau kasturi)
<i>Citrus Suhuiensis</i>	=	'limau madu'
<i>Coleus Amboinicus</i> Lour	=	torbangun/ ati-ati plant
<i>Cosmos Caudatus</i>	=	ulam raja
<i>Crocus Sativus</i> L. <i>Iridaceae</i>	=	saffron
<i>Cucumis Sativus</i>	=	cucumber
<i>Cucurbita Pepo</i> L.	=	pumpkin
<i>Curcuma Longa</i>	=	turmeric
<i>Dacryodes Edulis</i>	=	African plum
<i>Dacryodes Rostrate</i>	=	'kembayau'
<i>Daucas Carota</i>	=	carrot
<i>Dioscorea Hispida</i> Dennst	=	wild yam
<i>Diplazium esculentum</i>	=	a kind of edible fern

## List of Scientific Terms

Etlingera Gingers	= 'bunga kantan'
Eugeissona Insignis	= in the family of arecaceae palm tree
Eurycoma Longifolia	= 'tongkat ali'
Ficus Deltoidea	= 'mas cotek'
Garcinia Atroviridis	= asam gelugur
Hibiscus Esculentus	= okra
Hopea Odorata	= cengal
Hydrocotyle Asiatica	= Indian pennywort
Hylocereus Polyrhizus	= dragon fruit
Ipomea Batatas	= sweet potato
Ipomoea Aquatic	= water spinach
Kappaphycus Alverazii	= seaweed
Labiatae	= aromatic herbs in mint family
Labisia Pumila	= 'kacip fatimah'
Lagerstroemia Speciosa	= queen crape myrtle
Lawsonia Inermis	= henna
Leonurus Sibiricus	= honeyweed / Siberian motherwort
Lonicera Japonica	= japanese honeysuckle
Lycopersicum Esculentum	= tomato
Malus Domestica	= apples
Manilkara Zapota	= sapodilla fruit (ciku)
Melaleuca Cajuputi	= gelam honey
Momordica Charantia	= bitter melon (peria)
Morinda Citrifolia	= mengkudu
Morus Alba	= white mulberry
Murraya Koenigii.	= curry leaves
Nannochloropsis Oculata	= a type of marine-water microalgae
Nephelium Lappaceum L	= rambutan
Nigella Sativa	= black cumin
Oreochromis Mossambica	= red tilapia
Orthosiphon Stamineus	= cat's whiskers
Oryza Rufipogon	= a kind of wild rice

## List of Scientific Terms

Pandanus Amaryllifolius	=	daun pandan
Parkia Speciose	=	petai
Peronema Canescens	=	'sungkai'
Phaseolus Aureus	=	green bean sprout
Phaseolus Vulgaris	=	French beans
Phyllanthus Amarus	=	'dukong anak'
Piper Betle	=	betel (sirih)
Piper Sarmentosum	=	'daun kadok'
Pithecellobium Jiringa	=	'jering'
Plantago	=	a type of banana (English plantain, broadleaf plantain)
Mangifera Pajang	=	'bambangan'
Pleurotus Porrigens	=	mushroom (angle's wings)
Polygonum Minus	=	'daun kesum'
Portulaca Oleracea	=	parsley/ pigweed
Sauropus Andragynus	=	sweet leaves
Schizophyllum Commune	=	split gill fungus
Solanum Melongena	=	long eggplant
Solanum Tuberosum	=	potato
Spinacia Oleracea	=	spinach
Stichopus SP1	=	sea cucumber
Strobilanthes Crispus	=	'pokok pecah kaca/ pokok pecah beling'
Tamarindus Indica	=	tamarind
Tetraselmis Suecica	=	a type of marine green algae
Thunbergia Laurifolia	=	laurel clock vine/ blue trumpet vine
Tinospora Cordifolia	=	heartleaf moonseed
Tinospora Crispa	=	'akar seruntum/akar patawali'
Trigonella Foenum-Graecum	=	halba
Vallis	=	bread flower
Vigna Sesquipedolis	=	long beans
Vignaradiata	=	mung bean sprouts
Zea Mays	=	maize/ corn
Zingiberofficinale	=	ginger

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**A**

**Maternal, Infant and  
Young Child  
Nutrition**

## Maternal, neonatal, and child health in Southeast Asia: Towards greater regional collaboration

Cecilia SA<sup>1</sup>, Geok LK<sup>2</sup>, Tippawan L<sup>3</sup>, Endang LA<sup>4</sup>, Thein TH<sup>5</sup>, Rebecca F<sup>6</sup> and Zulfiqar AB<sup>7</sup>

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The Lancet, Vol. 377(9764), 2011, 516-525

Although maternal and child mortality are on the decline in Southeast Asia, there are still major disparities, and greater equity is key to achieve the Millennium Development Goals. We used comparable cross-national data sources to document mortality trends from 1990 to 2008 and to assess major causes of maternal and child deaths. We present inequalities in intervention coverage by two common measures of wealth quintiles and rural or urban status. Case studies of reduction in mortality in Thailand and Indonesia indicate the varying extents of success and point to some factors that accelerate progress. We developed a Lives Saved Tool analysis for the region and for country subgroups to estimate deaths averted by cause and intervention. We identified three major patterns of maternal and child mortality reduction: early, rapid downward trends (Brunei, Singapore, Malaysia, and Thailand); initially high declines (sustained by Vietnam but faltering in the Philippines and Indonesia); and high initial rates with a downward trend (Laos, Cambodia, and Myanmar). Economic development seems to provide an important context that should be coupled with broader health-system interventions. Increasing coverage and consideration of the health-system context is needed, and regional support from the Association of Southeast Asian Nations can provide increased policy support to achieve maternal, neonatal, and child health goals.

## The effects of prenatal oxidative stress levels on infant adiposity development during the first year of life

Loy SL<sup>1</sup>, Sirajudeen KNS<sup>2</sup> and Hamid Jan JM<sup>1</sup>

<sup>1</sup>School of Health Sciences, Health Campus, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia, <sup>2</sup>Department of Chemical Pathology, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia.

Journal of Developmental Origins of Health and Disease, Vol. 5(2), 2014, 142-151

Although numerous studies have been conducted to examine the causal factors of childhood obesity, the implications of intrauterine oxidative stress on early postnatal adiposity development remain to be elucidated. The Universiti Sains Malaysia Birth Cohort Study aimed to investigate the effects of prenatal oxidative stress levels on the development of infant adiposity during the first year of life. This study was conducted on the healthy pregnant women aged 19-40 years, from April 2010 to December 2012 in Kelantan, Malaysia. Maternal blood samples were drawn in the second trimester to analyse for oxidative stress markers. Infant anthropometric measurements were taken at birth, 2, 6 and 12 months of age. A total of 153 pregnant women and full-term

infants were included in the analysis. Statistical test was conducted by using multiple linear regression. Through the infant first year of life, as maternal DNA damage level in the second trimester increased, infant weights at birth ( $\beta = -0.122$ ,  $P < 0.001$ ), 2 months ( $\beta = -0.120$ ,  $P = 0.013$ ), 6 months ( $\beta = -0.209$ ,  $P = 0.003$ ) and 12 months of age ( $\beta = -0.241$ ,  $P = 0.006$ ) decreased after adjusting for confounders. Similar results were noted when infant body mass index-for-age Z-scores and triceps skinfold-for-age Z-scores were used as the adiposity indicators. In conclusion, the present study shows a consistent inverse association between maternal DNA damage and infant adiposity during the first year of life. These infants with reduced growth and adiposity in early postnatal life may have a high tendency to experience catch-up growth during childhood, which could be strongly associated with later obesity.

A3

### **A prospective study on maternal oxidative stress in pregnancy and postpartum and infant adiposity development during the first year of life**

**Loy SL<sup>1</sup>, Hamid Jan JM<sup>1</sup> and Sirajudeen KNS<sup>2</sup>**

<sup>1</sup>School of Health Sciences, Health Campus, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia, <sup>2</sup>School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia.

Malaysian Journal of Medical Sciences, Vol. 21(5), 2014, 135-136

In Malaysia, obesity rates are on the rise, particularly among women and even children. Pregnancy is predicted as a critical time for increased risks of postpartum and childhood overweight or obesity. Plausibly, oxidative stress could be the underlying factor of adiposity development in later lives. The Universiti Sains Malaysia Birth Cohort Study was thus established in year 2009 to investigate the effects of maternal oxidative stress in pregnancy on the first year postpartum and infant adiposity development. Pregnant women were recruited in the second trimester and followed-up in the third trimester of pregnancy, after delivery, 2, 6 and 12 months postpartum. The study was conducted from April 2010 to December 2012 in Kelantan, Malaysia. A total of 153 women aged 19 to 40 years and full-term infants were included in the study. Maternal socio-demographic data and dietary intake were obtained using validated questionnaires. Blood samples were taken in the second and third trimesters for the analyses of lipid profiles and oxidative stress levels. Maternal hair samples were collected at delivery for nicotine analysis. Infant anthropometric measurement and feeding pattern were recorded. By using multiple linear regression analysis, prepregnancy body mass index (BMI) and nicotine level were positively associated with deoxyribonucleic acid (DNA) damage ( $P = 0.005$ ;  $P = 0.001$ ,  $R^2 = 0.217$ ), while total cholesterol and triglycerides were positively associated with malondialdehyde ( $P = 0.017$ ;  $P = 0.003$ ,  $R^2 = 0.207$ ) in the second trimester of pregnancy. Protein carbonyl level was decreased with increasing Healthy pattern score ( $P < 0.001$ ,  $R^2 = 0.249$ ). At 12 months postpartum, PPWR increased with total gestational weight gain (GWG) ( $P < 0.001$ ,  $R^2 = 0.236$ ). However, this relationship was not mediated through oxidative stress in pregnancy (partial posterior  $P$  value = 0.469). Through infant first year of life, as maternal DNA damage in the second trimester increased, infant weights at birth ( $P < 0.001$ ,  $R^2 = 0.305$ ), 2 months ( $P < 0.001$ ,  $R^2 = 0.358$ ), 6 months ( $P < 0.001$ ,  $R^2 = 0.281$ ) and 12 months of age decreased ( $P < 0.001$ ,  $R^2 = 0.269$ ). Similar results were noted when infant BMI-for-age Z-scores, abdominal circumference and triceps-skinfold-for-age Z-scores were used as the adiposity indicators. In conclusion, greater prepregnancy BMI, hyperlipidemia and increased nicotine exposure were associated with enhanced oxidative stress, while adherence to Healthy pattern was associated with decreased oxidative stress in the second trimester of pregnancy. Of the prenatal factors, total GWG was directly associated with 12 months PPWR, but this relationship was not mediated by oxidative stress in pregnancy. High DNA damage in the second trimester was related to reduced infant adiposity during the first year of life.

## A4 Socio-demographic factors associated with duration of exclusive breastfeeding practice among mothers in East Malaysia

Noor Hafizan MS<sup>1</sup>, Zainab T<sup>1</sup> and Rosnah S<sup>2</sup>

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IOSR Journal of Nursing and Health Science, Vol. 3(1), 2014, 52-56

Breastfeeding practice is common in Malaysia. However, sustaining the duration of exclusive breastfeeding (EBF) practice for up to 6 months as recommended by World Health Organization (WHO) is a problem for mothers. Numerous factors are associated with this good practice and one of the important ones is the socio-demographic factors. The study examined the association of socio-demographic factors and duration of EBF practice among mothers in Kuching, East Malaysia. A cross-sectional study among 159 mothers of children in the age group of 6 - 24 months through purposive sampling attending Maternal and Child Health (MCH) clinics in Kuching division was conducted between April and Mei 2009. Data was collected using a set of supervised self-completed questionnaire on EBF practice and mother's socio-demographic factors. Factors related to duration of EBF practice were analysed using logistic regression analysis. 88.1% of mothers reported that they initiated and breastfeed their child exclusively. Only 44.3% of mothers breastfeed their child exclusively till 6 months and the others were not. Being unemployed [AOR = 2.96, (95% CI: (1.44, 6.06))] and Pribumi mothers (Malays and others ethnic groups in Sarawak namely Bidayuh, Iban and Melanau) [AOR = 4.53, (95% CI: (1.41, 14.50))] were independently associated with duration of EBF practice. The prevalence of EBF practice in Kuching division was higher than the national figures. Employed mothers were less likely to practice EBF up to 6 months, implying the need for longer maternity leave and to provide privacy to nursing mother in work places. Chinese mothers need to give more attention and to educate on benefits of EBF practice up to 6 months.

4

## A5 Islamic dietary menu planning system for breastfeeding mothers

Nurdiana A<sup>1</sup>, Nurul Atiqah MA<sup>1</sup>, Chek Zaini H<sup>1</sup>, Roesnita I<sup>1</sup> and Mohd Nazmi AM<sup>2</sup>

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Middle-East Journal of Scientific Research 13 (Approaches of Halal and Thoyyib for Society, Wellness and Health), 2013, 36-42

Planning menus for individuals with different Personal Health Record (PHR) and individuals with special nutritional needs especially for pregnant and breastfeeding women are very challenging. The menus should guide the right amount of food intake for the mothers. This paper examines the user requirements for the development of an Islamic dietary menu planning system for breastfeeding mothers. The system provides guidelines on good nutrition and daily practices for lactating mothers. Most of the websites found in the Internet follow basic principles of menu planning but some are totally contrary to Islamic values. Therefore, this menu planning system not only provides on the calories intake and nutritional content in the food but also in line, according to the Islamic values.

A6

## Work related determinants of breastfeeding discontinuation among employed mothers in Malaysia

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<sup>1</sup>Department of Community Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia,

<sup>2</sup>Department of Social and Preventive Medicine, Universiti Malaya, Kuala Lumpur, Malaysia.

International Breastfeeding Journal, Vol. 6(4), 2011, 1-15

**Background:** This cross-sectional study assesses factors that contribute to discontinuing breastfeeding among employed mothers in Malaysia. **Methods:** A structured questionnaire was used in conducting this study involving all government health clinics in Petaling district between July and September 2006. Respondents were Malaysian women with children between the ages of six to twelve months who were formally employed. Factors studied were selected socio-demographic and work-related characteristics. **Results:** From a total of 290 respondents, 51% discontinued breastfeeding. The majority (54%) of mothers who discontinued breastfeeding had breastfed their babies for less than three months. Compared to Malay mothers, the risk of breastfeeding discontinuation were higher among Chinese (AOR 3.7, 95% CI: 1.7, 7.8) and Indian mothers (AOR 7.3, 95% CI 1.9, 27.4). Not having adequate breastfeeding facilities at the workplace was also a risk factor for breastfeeding discontinuation (AOR 1.8, 95% CI: 1.05, 3.1). **Conclusion:** It is important that workplaces provide adequate breastfeeding facilities such as a room in which to express breast milk and a refrigerator, and allow mothers flexible time to express breast milk.

A7

## Knowledge and beliefs about breastfeeding are not determinants for successful breastfeeding

Shareena I, Nur Azeanny MA, Lee KQ, M. Hasli S, Nor Azila R and Kazzoma GR

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Breastfeeding Medicine, Vol. 9(6), 2014, 308-312

A cross-sectional prospective study was performed to assess knowledge and attitude toward breastfeeding among mothers in a tertiary hospital in Malaysia and its influence on their breastfeeding practices. Two hundred thirteen women who had delivered healthy babies at term were enrolled. A structured questionnaire containing demographic data and the Iowa Infant Feeding Attitude Score were used, followed by a telephone interview after 8 weeks to determine the feeding outcome. Women of Malay ethnicity with higher education level who had received breastfeeding counseling had a significantly more favorable attitude toward breastfeeding. Ethnicity was found to be a significant determinant in the success of breastfeeding, whereas returning to work was a major reason for discontinuing breastfeeding. In ensuring a successful breastfeeding practice, apart from knowledge and attitude, issues surrounding culture and traditions as well as improving deliverance of readily available support should be addressed.

5





**B**

**Nutritional Status**

## Malnutrition among Malaysian adolescents: Findings from National Health and Morbidity Survey (NHMS) 2011

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International Journal of Public Health Research, Vol 3. (2), 2013, 282-289

Malnutrition can be associated as one of the factors which affect health status. The term is used to describe imbalance of nutrients either over- or under-nourished, resulting in measurable adverse effects on body composition, function and clinical outcome. The National Health and Morbidity Survey (NHMS) 2011 assessed 4304 individuals aged 10-17 years old through a household survey of Malaysian population. Thinness and obesity are the malnutrition indicators based on Centre for Disease Control (CDC) 2000 classification as recommended by WHO (2007). The findings of the survey showed that the national prevalence of thinness (BMI for age <-2SD), was 9.7% (95% Confidence Interval: 8.4-11.2). The state of Sabah/Labuan had the highest thinness of prevalence, 17.0% (11.1- 25.2) and lowest in Penang at 5.3% (2.7-10.0). The prevalence of thinness was higher in urban areas than in rural areas at 10.3% (8.5-12.3). Meanwhile; national prevalence of obesity (BMI for age ≥+2SD) was only 5.7% (4.9-6.7). The state of Perak had the highest obesity prevalence 10.0% (6.2-15.8) and lowest in Sabah/Labuan at 2.4% (1.4-4.1). The obesity prevalence was higher among adolescents in urban areas at 6.3% (5.2-7.6) than in rural areas. Thinness as a form of malnutrition is more prevalent than obesity. Even though the prevalence of obesity is low, the impact affects not only the adolescents, but also the family, the society and the nation in the future. The increasing prevalence of obesity will have significant public health implication related to non-communicable diseases.

## Changes in body mass index (BMI) and body composition in Malaysian army (MA) personnel following two weeks of strenuous military training

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Defence S and T Technical Bulletin Vol 5(2), 2012, 72-83

The purpose of this study is to evaluate the body composition of Malaysian Army (MA) personnel and to determine changes in body composition following two weeks of strenuous military training. A total of 40 male subjects, who were apparently healthy, passed the Army Fitness Assessment Test (AFAT) and aged between 18 to 35 years were selected. Body mass index (BMI) was determined as weight / height<sup>2</sup> while body composition was measured using the bioelectric impedance analysis (BIA) method. The mean BMI of the subjects (23.0 ± 3.0 kg.m<sup>-2</sup>) was found to be within the normal range. The two-week exercise resulted in a decrease of total body fat and increase in lean body mass due to higher physical activity. Body fat content showed a significant reduction (p < 0.05) between Days 1 and 14 of the training.



B3

### The association of maternal employment status on nutritional status among children in selected kindergartens in Selangor, Malaysia

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Asian Journal of Clinical Nutrition, Vol. 4 (2), 2012, 53-66

Maternal employment status exerts strong influence over child feeding practices thus it reflects child nutrition status. This study was conducted to investigate the association of maternal employment status on nutritional status among 142 children aged 4-6 years old in selected kindergartens in Selangor, Malaysia. 2 out of 9 kindergartens were located at rural area while the other 7 kindergartens were located at urban area. The nutritional status of the children were assessed using anthropometrical data and diet record. The anthropometrical data were taken and later were compared with the WHO and CDC growth charts. Whereas, the diet record were analyzed and later compared with RNI. Prevalence of severely wasting was higher in unemployed mothers' children (17%) than in employed mothers' children (8%). Overall, energy intake of the boys was higher than recommendation with 101% for employed mothers and 125% for unemployed mothers. Protein intake of the boys were also higher than recommendation in both employed (221%) and unemployed (278%) mothers. There was a positive relationship found between maternal working hours and child's weight ( $r = 0.16, p < 0.05$ ) and BMI ( $r = 0.21, p < 0.05$ ). While, negative relationship was found between maternal working hours and child's energy ( $r = -0.270, p < 0.001$ ), protein ( $r = -0.265, p < 0.001$ ) and fat ( $r = -0.243, p < 0.01$ ) intake. Nevertheless, no relationship was found between mother's working hours and child's height ( $p = 0.745$ ), calcium ( $p = 0.523$ ) and iron ( $p = 0.219$ ) intake. It is clearly proven that maternal employment status plays an essential role in determining child feeding practices which may influence child's health and development in later life.

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B4

### Comparison of malnutrition prevalence between haemodialysis and continuous ambulatory peritoneal dialysis patients: A cross-sectional study

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Malaysian Journal of Nutrition, Vol. 19(3), 2013, 271 - 283

**Introduction:** Malnutrition is a serious unresolved nutritional problem amongst dialysis patients associated with increased mortality and morbidity and prevalence differs according to dialysis modalities. This study compared protein-energy malnutrition (PEM) prevalence in haemodialysis (HD) and continuous ambulatory peritoneal dialysis (CAPO) patients. **Methods:** A total of 155 HD and 90 CAPO patients were enrolled. PEM prevalence was determined using body mass index (BMI), serum albumin, Dialysis Malnutrition Score (OMS) and dietary intake. **Results:** CAPO patients had significantly higher BMI ( $24.1 \pm 4.8 \text{ kg/m}^2$  vs.  $22.7 \pm 4.8 \text{ kg/m}^2$ ;  $p = 0.024$ ) and

mid-arm muscle area ( $32.1 \pm 12.4 \text{ cm}^2$  vs.  $29.5 \pm 15.9 \text{ cm}^2$ ;  $p=0.044$ ) than HD patients. They also had significantly lower serum albumin ( $31 \pm 5 \text{ g/L}$  vs.  $35 \pm 6 \text{ g/L}$ ;  $p<0.001$ ) and dietary protein intake ( $0.82 \pm 0.37 \text{ g/kg/day}$  vs.  $1.07 \pm 0.47 \text{ g/kg/day}$ ;  $p<0.001$ ) compared to the HD patients. PEM was more prevalent in CAPO patients compared to HD patients based on serum albumin  $<40 \text{ g/L}$  (97% vs. 81%) and dietary protein intake  $<1.2 \text{ g/kg/day}$  (79% vs. 67%). However, based on OMS scores (74% vs. 71%) and dietary energy intake  $<30 \text{ kcal/kg/day}$  (84% vs. 77%), the HD and CAPO patients had equally high PEM risks. BMI of  $<18.5 \text{ kg/m}^2$ , serum albumin of  $<40 \text{ g/L}$  and dialysis duration of  $>5$  years were independent risk factors of PEM in dialysis patients. **Conclusion:** Periodic nutritional assessments, education and dietary counseling should be emphasised in these patients as a preventive measure of PEM.

## B5 Bone health status and lipid profile among post-menopausal Malay women in Cheras, Kuala Lumpur

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Malaysian Journal of Nutrition, Vol.18 (2), 2012, 161-171

**Introduction:** A cross-sectional study was conducted to determine bone health status and nutrient intakes among post-menopausal women residing in low cost houses in Cheras, Kuala Lumpur. **Methods:** A total of 125 subjects aged 60 +/- 4 years who had attained menopause at age 50 +/- 5 years participated in this study. Subjects' weight and height were measured and calculated for body mass index (BMI). They were also assessed for bone health status using the Quantitative Ultrasound (QUS). Nutrient intake was assessed using a dietary history questionnaire. Fasting serum lipid and blood pressure measurements were also taken. **Results:** The majority of the subjects were overweight and obese (80%) based on BMI status. Calcaneal measurements using the QUS indicated that while 57% of the subjects had normal bone mineral density, 37% were osteopenic and 6% osteoporotic. Calcium intake of the subjects was  $505 \pm 263 \text{ mg/day}$ , which is only 50% of the Malaysian Recommended Nutrient Intake for calcium (1000 mg/d). About 74% of the subjects were hypercholesterolemic and 58% were hypertriglyceridemic. Two-thirds reported that they were taking medication for hypertension, diabetes mellitus and heart disease. **Conclusion:** The results showed low health and nutritional status among post-menopausal women living in low-cost flats in Kuala Lumpur. They have low bone mass which may be due to their predominantly non-milk based diets which places them at high risk of hip fractures. Apart from milk, other food sources of calcium, including soya bean products such as 'tempeh' and healthy ways of cooking should be recommended to older people.

## Association between household food insecurity and nutritional outcomes among children in Northeastern of Peninsular Malaysia

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Nutrition Research and Practice, Vol 8(3), 2014, 304-311

**Background/ Objectives:** The purpose of the study was to investigate the relationship between household food insecurity and nutritional status of children in low-income households. A cross sectional study involved a survey of households (n = 223) receiving the financial assistance. **Subjects/ Methods:** Eligible mothers that fulfilled the inclusion criteria such as non-pregnant, non-lactating mothers, aged 18 to 55 years with their youngest children aged 2 to 12 years, were purposively selected. The Radimer/Cornell hunger and food-insecurity instrument was administered and children's height and weight were measured. **Results:** About 16.1% of the households were food secure, while 83.9% experienced some kind of food insecurity. Out of food insecure category, 29.6% households were food insecure, 19.3% women were individual food insecure and 35.0% fell into the child hunger category. Education of the mother (P = 0.047), household size (P = 0.024), number of children (P = 0.024), number of children going to school (P = 0.048), total monthly income (P < 0.001), income per capital (P < 0.001), number of household members contributing to the income (P = 0.018) and food expenditure (P = 0.006) were significant risk factors for household food insecurity. The prevalence of underweight, stunting and wasting in children were 61.0%, 61.4% and 30.6% respectively. Based on multinomial logistic regression, children in food-insecure households were 2.15 times more likely to be underweight and three times to be stunted than children in the food-secure households. **Conclusions:** The findings suggest that household food insecurity is associated with the nutritional status of the children in the rural area of Northeastern Peninsular Malaysia.

## Nutritional status, academic performance and parental feeding practices of primary school children in a rural district in Kelantan, Malaysia

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Progress in Health Sciences, Vol. 4(1), 2014, 144-152

The increasing burden of undernutrition and overnutrition at both ends of the nutrition spectrum in children are often accompanied by adverse consequences in school performance. Children with poor nutritional status had lower scores on tests of cognitive functioning, lower activity levels, and poorer psychomotor development, whereas severe malnutrition often leads to impaired psychological and intellectual development. To investigate the relationship between children's nutritional status, their socioeconomic background as well as their parents's beliefs, attitudes and practices in child feeding with their academic achievement in school. Anthropometric measurements and socioeconomic background information were collected from systematically

selected school children aged 10 to 12 years old (n=309), while information regarding parental child feeding practices were obtained via a set of self-administered questionnaire. Based on the World Health Organization (WHO) growth charts, 10.7% and 18.1% of the children were thin and overweight or obese, respectively. Results also showed that children's nutritional status, household socioeconomic background and parental child feeding beliefs and practices were interrelated with the children's academic achievement. These findings justified the need for relevant health and nutrition interventions in schools, especially the children of bottom billion community living in the rural areas.

## **B8 Factors associated with malnutrition and school performance among primary school children in Bachok, Kelantan**

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Malaysian Journal of Medical Sciences, Vol. 21(5), 2014, 134-135

Malnutrition has long been identified as a public health threat to the community. Despite rapid economic development in the recent decades, the prevalence of undernutrition is still considerably high, particularly in the rural areas where the villagers have not fully benefited from the developments in the country. As malnutrition among children is one of the most severe health threats, it is important for parents, teachers and policymakers to understand its underlying causes and outcomes. The objective of this cross-sectional study was to determine the prevalence of malnutrition among primary school children aged 10 to 12 years old in the rural district of Bachok, Kelantan. The relationship between malnutrition with the children's food intake, socioeconomic status and school performance was mapped. Anthropometric measurements and dietary data were obtained from 412 school children that were systematically selected from a few primary schools in the district. Their nutrition knowledge, attitudes and practices, as well as the parents' child feeding beliefs, attitudes and practices were also investigated using appropriate tools and questionnaires. Using the Centers for Disease Control and Prevention (CDC)/National Center for Health Statistics (NCHS) growth reference, the prevalence of malnutrition among the children was 47.3%. Statistical analyses showed that malnourished children had significantly lower energy ( $P < 0.001$ ), protein ( $P = 0.004$ ), carbohydrate ( $P = 0.023$ ) and fat intake ( $P < 0.001$ ) and were weaker in school performance ( $P = 0.034$ ) compared to their non-malnourished peers. There was no relationship between malnutrition and household income. Mother's education level was significantly associated with malnutrition among the children ( $OR = 0.16$ ,  $P = 0.012$ ). Children whose parents attained college or university education ( $P < 0.001$ ), had higher income ( $P < 0.001$ ) and achieved higher weight-for-age Z-scores ( $P = 0.039$ ) fared better in school. In relation to parental child feeding beliefs, attitude and practices, parents who perceived themselves ( $P = 0.001$ ) and their children ( $P = 0.004$ ) as heavier and were more restrictive on their children's intake of unhealthy, high fat and high sugar foods ( $P = 0.011$ ) had better school performance. About 51.0% of the children surveyed had poor nutrition knowledge. Children whose parents attained higher levels of education in college or university ( $P < 0.001$ ), had higher income ( $P < 0.001$ ) and were more restrictive on their children's intake of certain unhealthy food items ( $P = 0.012$ ) had better nutrition knowledge. It was indicated that malnutrition is still a prevailing problem among Malaysian children, and children's demographic and socioeconomic background, food intake and breakfast consumption, nutrition knowledge, as well as parental child-feeding practices were interrelated with the children's nutritional status and school performance. These findings justified the need for relevant health and nutrition interventions in children. Efforts in continuing the battle against malnutrition among children from the government and individual levels should be called for.

**B9****Factors associated with physical activity level among adolescents in Sarawak, Malaysia****Leh SL<sup>1</sup>, Mohd Nasir MT<sup>1</sup> and Hazizi AS<sup>1</sup>**

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Journal of Physical Activity, Sports and Exercise, Vol. 2 (1), 2014

Physical inactivity among adolescents has been reported to be on an uprising trend and has been gaining attention among public health practitioners and policy makers. This cross-sectional study was conducted to investigate associations between sociodemographic, psychological, physical environmental characteristics, and body weight status with physical activity level among adolescents at four randomly selected national multi-racial secondary schools in Sibu, Sarawak, Malaysia. Data collection was carried out by using a self-administered questionnaire whereas body weight and height of the students were measured using a TANITA electronic weighing scale and a SECA portable body meter. A total of 375 students were recruited (male: 32.0%, female: 68.0%). Overall, physical activity level among the adolescents was low, with 65.9% of the students categorized in the low category, 31.7% in moderate and only 2.4% in the high category. In bivariate analysis, sex, ethnicity, eating attitudes, physical activity self-efficacy, neighborhood recreation facilities, land-use mixed-access, street connectivity, walking/cycling facilities, neighbourhood aesthetics, and pedestrian and automobile traffic safety were significantly associated with physical activity level. In multiple linear regression, physical activity self-efficacy, sex, ethnicity, neighborhood aesthetics, land-use mixed access, and eating attitudes were found to contribute to 31.2% of the variance in physical activity level of the adolescents. Any future intervention programs to promote physical activity among adolescents in Malaysia should consider incorporating the factors identified in the present study into its planning to increase their effectiveness.

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**B10****Ethnic differences in the relationship between body mass index and percentage body fat among Asian children from different backgrounds****Liu A<sup>1</sup>, Byrne NM, Kagawa M, Ma G, Poh BK, Ismail MN, Kijboonchoo K, Nasreddine L, Trinidad TP and Hills AP**

<sup>1</sup>National Institute of Nutrition and Food Safety, Chinese Center for Disease Control and Prevention, Beijing, China.

The British Journal of Nutrition, Vol.106 (9), 2011, 1390-1397

Overweight and obesity in Asian children are increasing at an alarming rate; therefore a better understanding of the relationship between BMI and percentage body fat (%BF) in this population is important. A total of 1039 children aged 8-10 years, encompassing a wide BMI range, were recruited from China, Lebanon, Malaysia, The Philippines and Thailand. Body composition was determined using the 2H dilution technique to quantify total body water and subsequently fat mass, fat-free mass and %BF. Ethnic differences in the BMI-%BF relationship were found; for example, %BF in Filipino boys was approximately 2 % lower than in their Thai and Malay counterparts. In contrast, Thai girls had approximately 2.0 % higher %BF values than in their Chinese, Lebanese, Filipino and Malay counterparts at a given BMI. However, the ethnic difference in the BMI-%BF relationship varied by BMI. Compared with Caucasian children of the same age,

Asian children had 3-6 units lower BMI at a given %BF. Approximately one-third of the obese Asian children (%BF above 25 % for boys and above 30 % for girls) in the study were not identified using the WHO classification and more than half using the International Obesity Task Force classification. Use of the Chinese classification increased the sensitivity. Results confirmed the necessity to consider ethnic differences in body composition when developing BMI cut-points and other obesity criteria in Asian children.

### **B11 Ethnic differences in body fat distribution among Asian pre-pubertal children: A cross-sectional multicenter study**

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BMC Public Health, Vol. 26(11), 2011, 500

**Background:** Ethnic differences in body fat distribution contribute to ethnic differences in cardiovascular morbidities and diabetes. However few data are available on differences in fat distribution in Asian children from various backgrounds. Therefore, the current study aimed to explore ethnic differences in body fat distribution among Asian children from four countries.

**Methods:** A total of 758 children aged 8-10 y from China, Lebanon, Malaysia and Thailand were recruited using a non-random purposive sampling approach to enrol children encompassing a wide BMI range. Height, weight, waist circumference (WC), fat mass (FM, derived from total body water [TBW] estimation using the deuterium dilution technique) and skinfold thickness (SFT) at biceps, triceps, subscapular, supraspinale and medial calf were collected. **Results:** After controlling for height and weight, Chinese and Thai children had a significantly higher WC than their Lebanese and Malay counterparts. Chinese and Thais tended to have higher trunk fat deposits than Lebanese and Malays reflected in trunk SFT, trunk/upper extremity ratio or supraspinale/upper extremity ratio after adjustment for age and total body fat. The subscapular/supraspinale skinfold ratio was lower in Chinese and Thais compared with Lebanese and Malays after correcting for trunk SFT. **Conclusions:** Asian pre-pubertal children from different origins vary in body fat distribution. These results indicate the importance of population-specific WC cut-off points or other fat distribution indices to identify the population at risk of obesity-related health problems.

### **B12 The Universiti Sains Malaysia pregnancy cohort study: Maternal-infant adiposity development until the first year of life**

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Health and the Environment Journal, Vol. 5(1), 2014, 50-64

Increasing rates of overweight and obesity have prompted the need to prevent the risk from early life. This idea was originated from the 'Developmental Origins of Adult Disease' hypothesis. Historical cohort studies had indicated that maternal nutritional status was associated with later

obesity development. However, little attention has been paid on the specific roles of prenatal oxidative stress status and adipokines levels in affecting postpartum and infant obesity. The Universiti Sains Malaysia (USM) Pregnancy Cohort Study was thus established in year 2009 to measure the prenatal environment of 153 Malay women aged 19 to 40 years, and then followed-up these women and their delivered infants until the first year of life. Healthy women in the second trimester of pregnancy were recruited from two clinics in Kelantan, Malaysia. Maternal blood and breast milk samples were collected for analyzing oxidative stress and adipokines profiles, together with the maternal and infant anthropometric measurements, nicotine exposure, dietary intakes and physical activities. Preliminary findings that indicated the association of maternal environment based on the aspects of prenatal dietary intake and pregnancy symptoms with birth outcomes were presented. Overall, this paper seeks to provide a brief introduction to the USM Pregnancy Cohort Study, to summarize the study content, to consider the strengths and weaknesses of the study and to address the issue of challenges that was faced throughout the study. An overview of the study and preliminary findings are important to serve as a basic reference of the project implementation for future studies.

### **B13 Associations between prenatal nicotine exposure, oxidative stress, and postpartum visceral fat**

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Women and Health, Vol.54 (2), 2014, 145-160

This study aimed to examine the associations among prenatal nicotine exposure, oxidative stress, and postpartum visceral fat among women exposed to secondhand smoke (SHS). The study was conducted in Kelantan, Malaysia, from April 2010 to December 2012. Blood samples were collected in the second and third trimesters from 135 healthy pregnant women who were followed-up at delivery, 2 months, 6 months and 12 months postpartum. Maternal hair nicotine and oxidative stress markers during pregnancy were measured. Visceral fat was assessed by bioelectrical impedance. Multiple linear regression analysis revealed that maternal hair nicotine concentration was associated with increased DNA damage (tail moment:  $\beta=0.580$ ,  $p=0.001$ ) and decreased glutathione peroxidase ( $\beta=-12.100$ ;  $p=0.009$ ) in the second trimester of pregnancy. Increased DNA damage, protein oxidation and total antioxidant capacity in the second trimester were associated with 2, 6, and 12 months postpartum visceral fat. No direct association was found between prenatal hair nicotine level and postpartum visceral fat; however, these results suggest that any relation of SHS to visceral adiposity may be indirect, mediated via enhanced oxidative stress.

## **B14** Quality of life and nutrition during pregnancy

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Journal of Social Science Research, Vol. 4(1), 2014, 428-441

A community's transition towards modernity and urbanization leads to lifestyle changes that influence an individual's health through modifications in physical activity and nutritional habits. Women of childbearing age, particularly during pregnancy require special attention with regards to nutrition because their health potentially affects the well-being of the entire community beside herself and the fetus. The aim of this study was to explore the association between quality of life and the nutrition knowledge and dietary intake among a group of pregnant women in Malaysia. A cross sectional survey was carried out to explore the association of knowledge, attitudes and healthy nutritional practices with quality of life during the second and third trimester of pregnancy. In this study, nutritional habits during pregnancy were significantly associated with social functioning, vitality and physical functioning. A basic understanding of the influence a healthy lifestyle has on physical and emotional well-being during pregnancy helps the mother and family members to have a positive attitude towards the need for healthy behaviors in regard to nutrition and physical activity. The findings of this study show the importance of nutritional intake and behavior with respect to their effects on dimensions of health quality.

## **B15** Association of nutritional status with quality of life in breast cancer survivors

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Asian Pacific Journal of Cancer Prevention, Vol.14 (12), 2013, 7749-7755

Nutritional status and dietary intake play a significant role in the prognosis of breast cancer and may modify the progression of disease. The aim of this study was to determine the influence of nutritional status on the quality of life of Iranian breast cancer survivors. Cross-sectional data were collected for 100 Iranian breast cancer survivors, aged 32 to 61 years, attending the oncology outpatient clinic at Golestan Hospital, Ahvaz, Iran. Nutritional status of subjects was assessed by anthropometric measurements, Patient-Generated Subjective Global Assessment (PG-SGA) and three non-consecutive 24-hour diet recalls. The European Organization of Research and Treatment of Cancer Quality of Life form (EORTC QLQ-C30) was used to assess quality of life. Ninety-four percent of the survivors were well-nourished, 6% were moderately malnourished or suspected of being malnourished while none were severely malnourished. Prevalence of overweight and obesity was 86%. Overall, participants had an inadequate intake of vitamin D, E, iron and magnesium according to dietary reference intake (DRI) recommendations. Survivors with better nutritional status had better functioning scales and experienced fewer clinical symptoms. It appears important to provide educational and nutritional screening programs to improve cancer survivor quality of life.



## B16 Nutritional status of children living with HIV and receiving antiretroviral (ARV) medication in the Klang Valley, Malaysia

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Malaysian Journal of Nutrition, Vol. 17(1), 2011, 19 - 30

**Introduction:** Nutrition and HIV are closely related. Any immune impairment as a result of HIV leads to malnutrition, which in turn, can also lead to reduced immunity, thus contributing to a more rapid progression to AIDS. **Methods:** This cross-sectional study determined the nutritional status of children living with HIV and are receiving antiretroviral medication in the Klang Valley. A total of 95 children aged one to eighteen years old were recruited between September 2008 and February 2009. Data collected included socio-economic status, anthropometric measurements, dietary intake, medical history and serum levels of selected micronutrients specific for immunity. **Results:** The mean age of the children was 8.4±3.9 years and the mean duration on antiretroviral medications was 68.3±38.3 months. Anthropometric assessment found that 9.5% of the children were underweight and 31.6% were overweight. In contrast, 20.8% were stunted and 14.6% severely stunted. Biochemical indicators showed that 10.4% had deficiency in vitamin A while 12.5% had deficiency in selenium. Total cholesterol and HDL-C levels were found to be low in 30.5% and 10.5% of the children respectively. **Conclusion:** Dietary assessment showed almost all the children did not achieve the recommended energy intake for their age groups and almost half of the children did not achieve the RNI for selenium and vitamin A. This study provides an insight on the nutritional status of children living with HIV.

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## B17 Nutritional status and the use of protease inhibitors among HIV-infected children in Klang Valley, Malaysia

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This study determined the association between nutritional status and the use of protease inhibitors (PI) containing regimen among HIV-infected children receiving treatment at the referral centres in Klang Valley. A total of 95 children currently on antiretroviral (ARV) therapy, aged one to eighteen years, were recruited using purposive sampling. Demographic data, anthropometric measurements, medical history, were collected using a structured questionnaire. Serum micronutrients levels and lipid profile were also examined using blood samples. Mean age was 8.8 3.9 years and 44.2% were on PI. Age ( $\chi^2 = 10.351$ ,  $p = .006$ ), weight-for-age ( $\chi^2 = 6.567$ ,  $p = .010$ ), serum selenium ( $\chi^2 = 4.225$ ,  $p = .040$ ) and HDL-C ( $\chi^2 = 7.539$ ,  $p = .006$ ) were significantly associated with the use of PI. Fewer children on PI were deficient in selenium as compared to those not on PI. On the contrary, more children on PI were underweight and had low HDL-C. The use of PI was found to have both positive and negative effects with better selenium level but poorer HDL-C level and weight status.

## B18 Comparison of nutritional status of university students of two Asian countries

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Nutrition & Food Science, Vol. 42 (5), 2012, 332 - 338

**Purpose:** The purpose of this paper is to compare energy and macro-nutrients intake in university hostel students in two countries of Asia. **Design/ methodology/ approach:** Female students from the hostels of International Islamic University, Malaysia (IIUM), Kuantan Campus and NWFP, Agricultural University Peshawar, Pakistan were assessed for energy and macro-nutrients intake. A total of 140 students were registered who volunteered to participate in this study. The age range of the registered students was 22-26 years. On the day of the registration, age, height and weight were recorded; also, food frequency questionnaires (FFQs) were provided. The participants were asked to record alternately for three days whatever they ate during the prescribed week. Out of 140 students 139 returned the FFQs. From the anthropometry, the BMI was used to assess the under, ideal, over-weight and obese students. From the FFQs, energy and nutrient intakes were calculated using the food composition tables for Malaysia and Pakistan and compared with the recommended nutrients intakes (RNIs). **Findings:** The body weight for the required height among the Malaysian students was lower by 7.81 per cent than the reference value, whereas the body weight of Pakistani students matched to the reference weight for height. The Malaysian students were 28.0, 61.0, 5.5 and 0.9 per cent under, ideal, over-weight and obese, respectively, whereas Pakistani students were 100 per cent in the category of ideal-body weight. The total energy consumption was higher among Malaysian students by 9.93 per cent compared to the reference requirements, whereas the Pakistani students claimed to meet the requirements. In terms of nutrients balancing the Malaysian students were having the ideal combination of the macro-nutrients and it was within the recommended range of 55-60, 15-20 and 25-30 per cent for carbohydrates, protein and fat, respectively; whereas the balancing of the macro-nutrients was poor among the Pakistani students and met the energy requirements at the expense of fat consumption.

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## B19 Factors affecting nutritional status of children below 24 months in Pekan district, Pahang, Malaysia

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Malaysian Journal of Nutrition, Vol. 20 (2), 2014, 197-207

**Introduction:** This study aimed to assess the nutritional status of children below 24 months in the district of Pekan, Pahang, and identify the contributing factors. **Methods:** Using a cross-sectional methodology, a total of 910 children was selected by random sampling from four public

health clinics. Anthropometric measurements were taken and weight-for-age, height-for-age, and weight-for-height were calculated in Z scores. Immediate caregivers of children were interviewed by using a pretested validated questionnaire to assess their socio-economic, demographic, educational and occupational status. **Results:** Of the 910 children who participated in the study, the majority were Malay (70.1%), while the remaining comprised indigenous or Orang-Asli (OA) children. Prevalence of wasting, stunting and underweight were 28.7 %, 15.6 % and 19.0% respectively. There were more underweight males than females. Wasting was most common among children aged below 6 months. Stunting was more prevalent in children between 12 to 24 months. Obesity was seen in 7.3% of the sample. Maternal education, employment and socio-economic status had a significant influence on wasting and underweight. Children were vulnerable to stunting as age advanced, whereas prevalence of wasting tended to decrease. **Conclusion:** Malnutrition exists in significant proportions among children below 24 months in the Pekan district. This study identified low birth weight along with age, race, gender, large family size and socio-economic status as important risk factors of malnutrition.

## **B20 The association of gestational weight gain and the effect on pregnancy outcome defined by BMI group among women delivered in Hospital Kuala Lumpur (HKL), Malaysia: A retrospective study**

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Asian Journal of Clinical Nutrition, Vol. 4, 2012, 160-167

This study attempts to determine the association of gestational weight gain and the effect on pregnancy outcome defined by their Body Mass Index (BMI) among pregnant women. Retrospective study involved 436 singleton pregnancy women who delivered in Hospital Kuala Lumpur (HKL) from 1st January to 31st December 2010. The subjects were stratified into four BMI group according to World Health Organization (WHO) (underweight <18.5 kg m<sup>-2</sup>, normal: 18.5-24.9 kg m<sup>-2</sup>, overweight: 25-30 kg m<sup>-2</sup> and obese: 30 kg m<sup>-2</sup>). Each of BMI group then, classified into 3 categories of Gestational Weight Gain (GWG) (lower increment, normal and high increment). This classifying of GWG group was done according to the US Institute of Medicine (IOM), 2009 guidelines. Pregnancy outcome been analyzed according to the GWG during pregnancy for each BMI group and calculated the crude OR from simple logistic regression modules. 15.1, 40.1, 28.7 and 16.1% of the subjects were underweight, normal BMI, overweight and obese, respectively. In normal BMI women, gestational age outcome and neonatal outcome were significantly associated with inadequate weight gain during pregnancy ( $p = 0.046$  and  $p = 0.002$ ). Among low GWG of normal BMI women, the crude OR for premature birth and low birth weight were 2.872 and 4.976 (95% CI = 1.009-8.170 and 1.316-18.815), respectively compared with normal GWG. This study shows that normal BMI with lower GWG may result in adverse outcome. In addition, inadequate weight gain during pregnancy can result in significant complication.

## **B21 Nutritional status and dietary intakes of children aged 6 months to 12 years: Findings of the nutrition survey of Malaysian children (SEANUTS Malaysia)**

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The British Journal of Nutrition, Vol. 110 (3), 2013, 21-35

The dual burden of malnutrition reportedly coexists in Malaysia; however, existing data are scarce and do not adequately represent the nutritional status of Malaysian children. The Nutrition Survey of Malaysian Children was carried out with the aim of assessing the nutritional status in a sample of nationally representative population of children aged 6 months to 12 years. A total of 3542 children were recruited using a stratified random sampling method. Anthropometric measurements included weight, height, mid-upper arm circumference, and waist and hip circumferences. Blood biochemical assessment involved analyses of Hb, serum ferritin, and vitamins A and D. Dietary intake was assessed using semi-quantitative FFQ, and nutrient intakes were compared with the Malaysian Recommended Nutrient Intakes (RNI). The prevalence of overweight (9.8%) and obesity (11.8%) was higher than that of thinness (5.4%) and stunting (8.4%). Only a small proportion of children had low levels of Hb (6.6%), serum ferritin (4.4%) and vitamin A (4.4%), but almost half the children (47.5%) had vitamin D insufficiency. Dietary intake of the children was not compatible with the recommendations, where more than one-third did not achieve the Malaysian RNI for energy, Ca and vitamin D. The present study revealed that overnutrition was more prevalent than undernutrition. The presence of high prevalence of vitamin D insufficiency and the inadequate intake of Ca and vitamin D are of concern. Hence, strategies for improving the nutritional status of Malaysian children need to consider both sides of malnutrition and also put emphasis on approaches for the prevention of overweight and obesity as well as vitamin D insufficiency.

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## **B22 Nutritional status, dietary intake patterns and nutrition knowledge of children aged 5-6 years attending kindergartens in the Klang Valley, Malaysia**

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Malaysian Journal of Nutrition, Vol. 18(2), 2012, 231-242

**Introduction:** Early childhood is a period during which many factors influence the development of lifelong eating habits. This study aimed to assess the nutritional status of young children and to determine factors related to eating habits. **Methods:** A total of 992 children aged 5-6 years attending kindergartens that participated in the Bright Start Nutrition programme in the Klang Valley were included in the study. Anthropometric measurements were taken and body mass index (BMI) calculated. A questionnaire to assess the children's nutrition knowledge was

administered through interviews, while their mothers self-administered another set of questionnaires regarding knowledge, attitude and practice on nutrition. **Results:** The mean BMI was 15.7 +/- 2.7 kg/m<sup>2</sup> in boys and 15.4 +/- 2.4 kg/m<sup>2</sup> in girls. Based on the WHO 2007 growth reference, the prevalence of overweight and obesity were 9.1% and 9.3%, respectively; while the prevalence of thinness and stunting were 5.8% and 3.9%, respectively. Most of the children consumed breakfast (86.4%), lunch (94.1%) and dinner (93.4%) daily. The majority liked fruits (95.1%), snacks (93.8%), Western fast food (93.3%) and milk (90.8%), while less than two-thirds (65.1%) liked vegetables. The mean nutrition knowledge scores for the children and mothers were 73.2 +/- 9.8% and 60.2 +/- 18.8%, respectively. Maternal nutrition knowledge was correlated positively with children's vegetable intake ( $r=0.111$ ,  $p<0.05$ ) and negatively with snack intake ( $r = -0.134$ ,  $p<0.05$ ). **Conclusion:** These results showed a higher prevalence of overweight and obesity than underweight and thinness among the urban young children studied. As mother's nutrition knowledge was found to exert a positive influence on children's eating habits, it is important to provide nutrition education to both mothers and children when conducting intervention programmes.

### **B23 Sensitivity and specificity of visual clinical assessment as compared to WHO 2006 Standard and NCHS 1977 Reference in measuring the growth status of Malaysian infants**

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Journal of The American College of Nutrition, Vol.30 (6), 2011, 522-528

**Objective:** To study the validity of the visual clinical assessment of weight relative to length and length relative to age as compared to the World Health Organization (WHO) 2006 standard and National Center for Health Statistics (NCHS) 1977 reference in assessing the physical growth of children younger than 1 year. **Materials and Methods:** A prospective cohort study was carried out among 684 infants attending government health clinics in 2 states in Malaysia. Body weight, length, and clinical assessment were measured on the same day for 9 visits, scheduled every month until 6 months of age and every 2 months until 12 months of age. All of the 3 z-scores for weight for age (WAZ), length for age (HAZ), and weight for length (WHZ) were calculated using WHO Anthro for Personal Computers software. **Results:** The average sensitivity and specificity for the visual clinical assessment for the detection of thinness were higher using the WHO 2006 standard as compared with using NCHS 1977. However, the overall sensitivity of the visual clinical assessment for the detection of thin and lean children was lower from 1 month of age until a year as compared with the WHO 2006 standard and NCHS 1977 reference. The positive predictive value (PPV) for the visual clinical assessment versus the WHO 2006 standard was almost doubled as compared with the PPV of visual clinical assessment versus the NCHS 1977 reference. The overall average sensitivity, specificity, PPV, and negative predictive value for the detection of stunting was higher for visual clinical assessment versus the WHO 2006 standard as compared with visual clinical assessment versus the NCHS 1977 reference. **Conclusion:** The sensitivity and specificity of visual clinical assessment for the detection of wasting and stunting among infants are better for the WHO 2006 standard than the NCHS 1977 reference.

## **B24 Relationship between anthropometric indicators and cognitive performance in Southeast Asian school-aged children**

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British Journal of Nutrition, Vol. 110, Issue SUPPL.3, 57-64

Nutrition is an important factor in mental development and, as a consequence, in cognitive performance. Malnutrition is reflected in children's weight, height and BMI curves. The present cross-sectional study aimed to evaluate the association between anthropometric indices and cognitive performance in 6746 school-aged children (aged 6-12 years) of four Southeast Asian countries: Indonesia; Malaysia; Thailand; Vietnam. Cognitive performance (non-verbal intelligence quotient (IQ)) was measured using Raven's Progressive Matrices test or Test of Non-Verbal Intelligence, third edition (TONI-3). Height-for-age z-scores (HAZ), weight-for-age z-scores (WAZ) and BMI-for-age z-scores (BAZ) were used as anthropometric nutritional status indices. Data were weighted using age, sex and urban/rural weight factors to resemble the total primary school-aged population per country. Overall, 21% of the children in the four countries were underweight and 19% were stunted. Children with low WAZ were 3.5 times more likely to have a non-verbal IQ < 89 (OR 3.53 and 95% CI 3.52, 3.54). The chance of having a non-verbal IQ < 89 was also doubled with low BAZ and HAZ. In contrast, except for severe obesity, the relationship between high BAZ and IQ was less clear and differed per country. The odds of having non-verbal IQ levels < 89 also increased with severe obesity. In conclusion, undernourishment and non-verbal IQ are significantly associated in 6-12-year-old children. Effective strategies to improve nutrition in preschoolers and school-aged children can have a pronounced effect on cognition and, in the longer term, help in positively contributing to individual and national development.

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## **B25 Design of the South East Asian nutrition survey (SEANUTS): A four-country multistage cluster design study**

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The British Journal of Nutrition, Vol. 110 (3), 2013, 2-10

Nutrition is a well-known factor in the growth, health and development of children. It is also acknowledged that worldwide many people have dietary imbalances resulting in over- or undernutrition. In 2009, the multinational food company FrieslandCampina initiated the South East Asian Nutrition Survey (SEANUTS), a combination of surveys carried out in Indonesia, Malaysia, Thailand and Vietnam, to get a better insight into these imbalances. The present study describes the general study design and methodology, as well as some problems and pitfalls encountered. In each of these countries, participants in the age range of 0.5-12 years were recruited according to a multistage cluster randomised or stratified random sampling methodology. Field teams took care of recruitment and data collection. For the health status of children, growth and body composition, physical activity, bone density, and development and

cognition were measured. For nutrition, food intake and food habits were assessed by questionnaires, whereas in subpopulations blood and urine samples were collected to measure the biochemical status parameters of Fe, vitamins A and D, and DHA. In Thailand, the researchers additionally studied the lipid profile in blood, whereas in Indonesia iodine excretion in urine was analysed. Biochemical data were analysed in certified laboratories. Study protocols and methodology were aligned where practically possible. In December 2011, data collection was finalised. In total, 16,744 children participated in the present study. Information that will be very relevant for formulating nutritional health policies, as well as for designing innovative food and nutrition research and development programmes, has become available.

## **B26 Assessment of hydration status and body composition of athlete and non-athlete subjects using bioelectrical impedance analysis**

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Journal of Physical Education and Sport, Vol.13 (2), 2013, 157-162

Recent research in the field of sports nutrition is the identification of specific factors in improving athlete's sports performance. The aim of this review is to provide a trend on sports nutrition knowledge and practices towards glycemic index (GI) among selected national athletes. A validated sport nutrition knowledge, attitude and practices questionnaire was used as a tool to assess knowledge and practices of GI among athletes. A total of 19 national cyclists were involved in a preliminary study during the 21st SEA games in 2001. Results revealed that 59% of the cyclist chose high GI food while 24% preferred intermediate GI and only 17% correctly selected low GI food as their pre-exercise meal. Different scenario can be seen 10 years later, in which 6 cyclists who underwent general preparation (GPP) training after World Championship at Australia Training Camp, showed that about 67% of them ingested low GI type of CHO containing food before their training, 70% of them took high GI during exercise and 63% reported intake of high GI types of food immediately after their training session. Recently a study on GI knowledge was carried out among 38 junior footballers at National Sports Institute. Responses indicated that 92% of the athletes were not aware of GI definition and function. However, 55% of them knew that fructose and galactose are among the low GI types of sugars. Only 58% of the athletes were knowledgeable about the meaning of GI and glycaemic load. However, the majority of them (90%) knew that rice is considered as high GI and can be taken after training or exercise. Overall, the level of knowledge and practices about the glycaemic index (GI) is improving among athletes and more research is needed for better implementation and understanding of its effect on athlete's specific performance.

## B27 Association between caregiver burden with feeding problems and functional status of patients with dementia

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Malaysian Journal of Nutrition, Vol.20 (1), 2014, 27 - 37

**Introduction:** Feeding difficulty and functional disability are common problems among patients with dementia but their influence on caregivers' burden has not been addressed comprehensively. Thus, this study aimed to determine the association between feeding problems, functional status and caregiver burden among patients with dementia who receive outpatient treatment at Universiti Kebangsaan Malaysia Medical Centre (LTKIvIMC) in Kuala Lumpur, Malaysia, as compared to their non-demented counterparts. **Methods:** A cross-sectional comparative study was conducted among 30 patients with dementia (12 men, 18 women, mean age  $75 \pm 7$  years old) and 60 subjects without dementia (25 men, 35 women, mean age  $69 \pm 7$  years), as well as their caregivers. Subjects' functional status, feeding problems and also caregiver burden were assessed using Activities of Daily Livings (ADLs) and Instrumental Activities of Daily Living (IADL) questionnaire, The Edinburgh Feeding Evaluation in Dementia Questionnaire (EdFED-Q) and Zarit Burden Interview (ZBI), respectively. Subjects were also measured for height and weight. **Results:** Patients with dementia needed supervision (50%) and physical help during mealtime (40%). The mean functional status score of these patients was higher than the patients without dementia ( $p < 0.05$ ). Caregiver burden score was positively correlated with the EdFED-Q score ( $r = 0.405$ ,  $p < 0.05$ ) but negatively correlated with functional status score ( $r = -0.475$ ,  $p < 0.01$ ). Further, multiple regression analysis showed that after adjustment for age, EdFED-Q score and functional status remained correlated with caregiver burden at  $R^2$  of 0.210. **Conclusion:** Caregiver burden is associated with feeding problems and functional disability among patients with dementia. There is a need to educate the caregivers in order to improve the quality of life of both carers and the demented patients.

## B28 Nutritional status among pediatric cancer patients: A comparison between hematological malignancies and solid tumors

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Journal for specialists in pediatric nursing, Vol.17 (4), 2012, 301-311

**Purpose:** This study aimed to compare the nutritional status of pediatric patients with hematological malignancies and solid tumors. **Design and Methods:** A total of 74 pediatric cancer patients were assessed for anthropometric status, biochemical profiles, and dietary intake. **Results:** The prevalence of undernutrition was higher among patients with solid tumors as reflected in their lower dietary intakes of energy and nutrients compared with patients with hematological malignancies. **Practice Implication:** Adequate dietary intake is important for pediatric cancer patients, but nurses need to pay more attention to the diets of patients with solid tumors as compared with those with hematological malignancies.



## B29 Nutritional status and dietary intake of children with acute leukaemia during induction or consolidation chemotherapy

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Journal of Human Nutrition and Dietetics Vol 1, 2013, 23-33

**Background:** The assessment of nutritional status among paediatric patients is important for the planning and execution of nutritional strategies that strive to optimise the quality of life and growth among sick children. The present study aimed to evaluate the nutritional status and dietary intake among children with acute leukaemia. **Methods:** This cross-sectional study included 53 paediatric patients aged 3-12 years old, who were diagnosed with either acute lymphoblastic leukaemia or acute myelogenous leukaemia and were undergoing chemotherapy treatments (induction or consolidation phase). Patients were matched for sex, age ( $\pm 6$  months) and ethnicity with healthy children as controls. Weight, height, body mass index, waist circumference, mid-upper arm circumference, triceps skinfold thickness, mid-upper arm muscle area and fat area were determined. Dietary intake was assessed using 3-day food records. **Results:** Anthropometric variables were generally higher among patients compared to controls, although the differences were not statistically significant ( $P > 0.05$ ). The prevalence of overnutrition among patients according to body mass index-for-age, waist circumference-for-age, mid-upper arm circumference-for-age and triceps skinfold-for-age were 24.5%, 29.1%, 17.0% and 30.2%, respectively. Mean energy [ $5732 \pm 1958$  kJ ( $1370 \pm 468$  kcal) versus  $6945 \pm 1970$  kJ ( $1660 \pm 471$  kcal),  $P < 0.01$ ], protein ( $50.0 \pm 19.7$  g versus  $62.3 \pm 22.3$  g,  $P < 0.01$ ) and fat ( $43.6 \pm 18.9$  g versus  $58.3 \pm 16.7$ ,  $P < 0.001$ ) intakes of patients were significantly lower than controls. **Conclusions:** The prevalence of being overweight and obesity in children with acute leukaemia was higher despite lower energy intake compared to controls. Studies assessing physical activity, the complex interaction and the effects of treatment drugs are warranted to better manage malnutrition among paediatric patients.

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## B30 Influence of physical activity on bone strength in children and adolescents: A systematic review and narrative synthesis

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Journal of Bone and Mineral Research, Vol. 29(10), 2014, 2161-2181

A preponderance of evidence from systematic reviews supports the effectiveness of weight-bearing exercises on bone mass accrual, especially during the growing years. However, only one systematic review (limited to randomized controlled trials) examined the role of physical activity (PA) on bone strength. Thus, our systematic review extended the scope of the previous review by including all PA intervention and observational studies, including organized sports participation studies, with child or adolescent bone strength as the main outcome. We also sought to discern the skeletal elements (eg, mass, structure, density) that accompanied significant bone strength

changes. Our electronic-database, forward, and reference searches yielded 14 intervention and 23 observational studies that met our inclusion criteria. We used the Effective Public Health Practice Project (EPHPP) tool to assess the quality of studies. Due to heterogeneity across studies, we adopted a narrative synthesis for our analysis and found that bone strength adaptations to PA were related to maturity level, sex, and study quality. Three (of five) weight-bearing PA intervention studies with a strong rating reported significantly greater gains in bone strength for the intervention group (3% to 4%) compared with only three significant (of nine) moderate intervention studies. Changes in bone structure (eg, bone cross-sectional area, cortical thickness, alone or in combination) rather than bone mass most often accompanied significant bone strength outcomes. Prepuberty and peripuberty may be the most opportune time for boys and girls to enhance bone strength through PA, although this finding is tempered by the few available studies in more mature groups. Despite the central role that muscle plays in bones' response to loading, few studies discerned the specific contribution of muscle function (or surrogates) to bone strength. Although not the focus of the current review, this seems an important consideration for future studies.

### **B31 Influence of physical activity, sedentary lifestyle and bone biomarkers on bone health among adolescents in Kota Bharu, Kelantan**

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Malaysian Journal of Medical Sciences, Vol. 21(5), 2014, 138-139

Maximum attainment of peak bone mass (PBM) during the growing years is ultimately important to reduce the risk of osteoporotic fracture later in life. Understanding and identification of lifestyle factors such as physical activity (PA) and other lifestyle practices that are associated with higher bone mass accruals in children and adolescents is important in order to optimize the PBM during these critical years of growth. The main objective of the study was to determine the influence of PA, sedentary behavioural practice and blood biomarkers of bone remodeling on bone health status, as assessed by a dual energy X-ray absorptiometry (DXA) in 455 adolescent boys and girls of Malay and Chinese-origins aged 12 to 19 years of age in Kota Bharu, Kelantan. Validated questionnaires were used to assess PA, sedentary small screen recreation (SSR) practice assessments, and dietary food intakes, whereas body composition and muscular strength of the upper and lower extremities were determined using anthropometry measurements, handgrip and isokinetic-dynamometers. For the bone health status, bone mineral content (BMC), bone area (BA) and bone mineral density (BMD) were assessed for total body (TB), at the lumbar spine (L2-L4), proximal femur and specific regions of interest using the DXA device. Mean age of the adolescents were 15.4 years (SD 1.9), with majority (72.5%) had a normal ranges of body mass index (BMI). Sex-specific comparisons on lifestyle practices showed that adolescent boys had significantly higher levels of daily PA status (1.5hours vs 1.0hours;  $P < 0.001$ ) and intense moderate-to-vigorous PA (MVPA) (1.2 vs 0.4 hours; all,  $P < 0.001$ ), compared to the girl participants. In contrast, sedentary SSR practices were similar between genders (3.1 vs 3.3hours/day). In general, about two-thirds of adolescents (63.3%) had low daily active PA practice, as determined by the MVPA less than one hour per day, with higher proportion found in girls (80%) than in adolescent boys (34%). Multiple linear regression analyses showed that age ( $P = 0.012$ ) and sex ( $P < 0.001$ ) emerged as significant negative determinants on daily MVPA levels, after adjusting for ethnicity, socio-demographic status and dietary behaviours. Moreover, age ( $P <$

0.001) and daily breakfast consumption ( $P < 0.05$ ) emerged as negative independent determinants; whereas ethnicity ( $P < 0.01$ ) was significant positive independent determinant on sedentary SSR levels. The influence of these lifestyle factors was further examined based on duration spent on PA levels and sedentary SSR levels. It showed that participant boys with higher total PA group  $> 1.5$  hours/day and MVPA group  $> 1$  hour/day, respectively, had a significantly higher size-adjusted BMC of TB, intertrochanter and leg region (all,  $P < 0.05$ ) and the BMD of the TB, PF, LS, regional arm and leg region (at least,  $P < 0.01$ ) than that of those at low PA and MVPA levels. Only a significant positive influence was found between high total PA and MVPA with BMC and BMD of the TB and leg region in adolescent girls. Furthermore, boys with high MVPA levels showed significantly higher of muscle strength of the handgrip ( $P < 0.01$ ) and lower extremity strength of the quadriceps ( $P < 0.05$ ) and the hamstring strength ( $P < 0.001$ ) than those at lowest MVPA level. Only a significant positive association was found between high MVPA level and hamstring muscle strength in girls ( $P < 0.01$ ). On the other hand, sedentary lifestyle practices was also found to be negatively associated with bone health profiles assessed in girls, in which high SSR practice showed a significantly lower lumbar spine BMD ( $P < 0.05$ ) and bone area of the TB ( $P < 0.05$ ), arm ( $P < 0.01$ ) and leg region ( $P < 0.05$ ) compared to those who only practiced low SSR level. Blood biomarkers of bone remodeling were significantly and negatively associated with all skeletal sites assessed, after adjustments for pubertal growth and ethnicity. The main findings of the study showed that higher habitual total and intense PA level could contributed to positive bone mass profiles in these adolescents, and it has profoundly influence on weight-loaded skeletal region assessed. In addition, sedentary lifestyle practices also exert a negative influence on bone health assessed in adolescent girls. Therefore, encouragement of active lifestyle practices in children and adolescents should be promoted to optimize the peak bone mass accretion during the critical years of growth.

### B32 Meal patterns of Malaysian adults: Findings from the Malaysian Adults Nutrition Survey (MANS)

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Malaysian Journal of Nutrition, Vol. 18 (2), 2012, 221-230

**Introduction:** Meal patterns have received little attention in nutrition studies. The aim of this study is to present the findings on general meal patterns of Malaysian adults. **Methods:** The Malaysian Adults Nutrition Survey (MANS), carried out in 2002 and 2003, involved 6,928 adults selected by stratified random sampling from all households by zone in Peninsular Malaysia, Sabah and Sarawak. **Results:** In general, the results showed that most respondents (74.16%) ate three meals per day; 89.20% of the respondents consumed breakfast, while 88.57% consumed lunch and 91.97% consumed dinner with no significant difference in terms of sex. In Peninsular Malaysia, the Northern Zone had the highest number of people consuming breakfast compared to other

zones. Meanwhile, the population in Sarawak had the largest proportion of people consuming lunch and dinner, but the smallest proportion of people consuming breakfast. A significantly higher number of the rural population consumed breakfast and lunch than urbanites; however there was no significant difference in dinner consumption. Generally, breakfast consumption increased with age whereby significant difference existed between the 18 to 19 years age group and the age group of 30 years and older. Lunch intake among the age groups showed no significant difference. In contrast, dinner consumption was significantly lower among the 18 to 19 years age group compared to all other age groups. Comparison among the ethnic groups showed that the Indian population had the lowest percentage of having breakfast and lunch while the Orang Asli had the lowest percentage of consuming dinner. However, the Orang Asli recorded the highest percentage for taking breakfast and lunch while the Chinese had the highest percentage of taking dinner. **Conclusion:** Considering that Malaysian adults consumed their conventional breakfast, lunch and dinner, these findings indicate that Malaysians are maintaining their traditional meal patterns.

### **B33 Association between anthropometric status, dietary intake and physical activity with bone health status among premenopausal Chinese women in the Klang Valley, Malaysia**

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Malaysian Journal of Nutrition, Vol. 19 (3), 2013, 293-302

**Introduction:** There is lack of information on bone health status of premenopausal women in Malaysia. This study investigated the bone health status of premenopausal women and its associations with anthropometric, dietary and physical activity. **Methods:** Bone mineral density (BMD) was measured using dual X-ray absorptiometry (DEXA) at the lumbar spine, femoral neck, total hip and total body. Serum osteocalcin, parathyroid hormone (PTH), beta-crosslaps were also determined. **Results:** A total of 73 Chinese premenopausal women were recruited in the study with a mean age of 39.3±5.0 years. Average BMI, body fat percentage and lean body mass were 22.2±3.4 kg/m<sup>2</sup>, 33.9±4.6% and 34.5V4.4 kg, respectively. Mean BMD at the spine. Total hip, femoral neck and total body were 1.025±0.118 g/cm<sup>2</sup>, 0.876±0.109 g/cm<sup>2</sup>, 0.739±0.110 g/cm<sup>2</sup> and 1.061±0.755 g/cm<sup>2</sup>, respectively. Their serum beta-crosslaps and PTH were within normal range, but serum osteocalcin (8.5±4.2 ng/ml) was low. On average, calorie intake (1506±427 kcal/day) was below the Malaysian Recommended Nutrient Intake (RNI) while their calcium intake achieved only 67% of RNI. Their mean metabolic equivalent score (MET) was 771.4±926.1 min/week. Body weight and related indices (BMI, lean mass, fat mass) were significantly positively correlated with BMD at all skeletal sites. **Conclusion:** The study revealed that Chinese premenopausal women in Klang Valley have low calcium intake and low level of physical activity.



**C**

**Food Intake, Dietary  
Practices and  
Physical Activity**

## C1 Association between dietary folate intake and blood status of folate and homocysteine in Malaysian adults

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Journal of Nutritional Science and Vitaminology, Vol. 57(2), 2011, 150-155

Folate is of prime interest among investigators in nutrition due to its multiple roles in maintaining health, especially in preventing neural tube defects and reducing the risk of cardiovascular diseases. We investigated the effect of dietary folate intake on blood folate, vitamin B (12), vitamin B (6), and homocysteine status. One hundred subjects consisting of Chinese and Malay subjects volunteered to participate in this cross-sectional study. Dietary folate intake was assessed by 24-h dietary recall and a food-frequency questionnaire (FFQ). Serum and red blood cell folate were analyzed using a microbiological assay, while serum vitamin B (12) was determined by electrochemiluminescence immunoassay (ECLIA), and high-performance liquid chromatography (HPLC) was used for the determination of serum vitamin B(6) and homocysteine. The mean folate intake, serum folate, RBC folate, serum vitamin B (12), and B (6), were higher in female subjects, with the exception of serum homocysteine. The Chinese tended to have higher folate intake, serum folate, RBC folate, and vitamin B (12). A positive association was found between folate intake and serum folate while a negative association was found between folate intake and serum homocysteine. Stepwise linear regression of serum folate showed a significant positive coefficient for folate intake whilst a significant negative coefficient was found for serum homocysteine when controlling for age, gender, and ethnicity. In conclusion, high dietary folate intake helps to increase serum folate and to lower the homocysteine levels.

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## C2 Influence of Sahour meal on exercise performance and physiological responses in well-trained Muslim runners during Ramadan

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Journal of Fasting and Health, Vol.1, (1), 2013, 28-37

The objective of this study was to examine the influence of sahur meal on exercise performance, and physiological responses to a 10Km Time-Trial (10KTT) at two different times of the day during Ramadan. **Method:** Three well-trained Muslim runners participated (age, 25±0.8years; maximal oxygen uptake, 54.87±3.45 ml.kg<sup>-1</sup>.min<sup>-1</sup>; body weight, 52.4±1.99 kg; height, 162.7±3.55 cm). Subjects ran a 10KTT on four occasions: 8.00am (Am), and 5.00pm (Pm), separated by one day rest two weeks before Ramadan (BRam) and during the second week of Ramadan (DRam). BRam, subjects consumed their usual diet. DRam, subjects consumed a standardized sahur meal containing 15.6±0.6kcal/kgBW; 2.3±0.1gCHO/kgBW; 0.6±0.0g Protein/kgBW; 0.5±0.0gFat/kgBW. During each 10KTT, the subject ran at 85%VO<sub>2</sub>max for the first two Km, and then at a self-selected speed then onwards. Blood samples were collected before the run, and at 2, and the end of 10 Km. Time to complete 10KTT were recorded. Urine specific gravity was measured before each run. **Results:** There was no difference in hydration status for the Am and Pm runs BRam and DRam.

Running performance DRamAM, was better compared to the DRamPm. There were also no changes in blood glucose BRam and DRam. Serum Testosterone was highest at the end of 10KTT DRamPm when compared to the DRamAm, and was generally higher than BRam. Serum Cortisol showed no differences between the trials. All runners did not experience dehydration, lack of energy nor drop in performance DRam. **Conclusion:** The results from this study suggest that when athletes are provided with a balanced sahour meal, during Ramadan, they can maintain their performance.

### C3 Eating attitude, body image, body composition and dieting behaviour among dancers

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Asian Journal of Clinical Nutrition, Vol.3 (3), 2011, 92-102

Dancers are prone to have high risk of eating disorder, obsess to be physically thin and generally will have body image distortion. This research has studied the prevalence of risk of eating disorder among dancers, comparison of the body composition between dancers and control subjects and to examine the relationship between eating attitude, body image concern, body composition and dieting behaviour. A set of self-administered questionnaires that consist of Eating Attitude Test (EAT-26), Body Attitude Test (BAT) and Dieting Behaviour were conducted on 23 dancers and 50 lean subjects. Measurement on weight, height, mid upper arm circumference and skinfold thickness of triceps, abdomen, suprailiac and thigh was taken. The result showed dancers have high prevalence of risk of eating disorder (21.74%) compared to control subjects (12.00%). There were also significant mean differences in percentage of fats and percentage of lean body weight, when  $p < 0.05$ . In addition, there were significant positive strong correlation between eating attitude and body image concern ( $p = 0.002$ ,  $r = 0.606$ ) as well as correlation between dieting behaviour and body image concern ( $p = 0.012$ ,  $r = 0.515$ ). Moreover, the relationship between BMI and dieting behaviour showed positive strong correlation when  $p = 0.002$  and  $r = 0.614$  where dancers choosed to use diet pills ( $p = 0.001$ ), vomit and taken laxatives ( $p = 0.016$ ) for dieting. In conclusion, dancers were very concern about body figure, appearance and fear of gaining weight which can lead to unhealthy dieting habits.

### C4 Dieting status influences associations between dietary patterns and body composition in adolescents: A cross-sectional study

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Nutrition Journal, Vol.12 (51), 2013

**Background:** Associations between food choice and body composition in previous studies of adolescents have been inconsistent. This may be due to the body composition measures used, or these associations may be affected by the dieting status of adolescents. The objective of this study was to investigate the association between dietary patterns and body composition in

adolescents, and determine if these associations are moderated by dieting status. **Methods:** Information on food consumption and current dieting status was collected, using a web-based survey, in 681 adolescents (mean age 15.8 (SD 0.9) years) from schools in Otago, New Zealand. Non-dieters were defined as those reporting not being on a diet as they were “happy with their weight”. Principal components analysis (PCA) was used to determine dietary patterns. Body mass index (BMI), waist circumference (WC), waist-to-height ratio (WHtR), fat mass index (FMI), and fat-free mass index (FFMI) were examined as outcomes. Generalized estimating equations were used to examine associations between dietary patterns and body composition. **Results:** PCA produced three dietary patterns: ‘Treat Foods’, ‘Fruits and Vegetables’, and ‘Basic Foods’. A standard deviation increase in ‘Basic Foods’ was associated with a 3.58% decrease in FMI (95%CI -6.14, -0.94) in the total sample. When separate sex analysis was undertaken significant negative associations were found in boys only, between the ‘Basic Food’ score and WC, WHtR, FMI, and FFMI, while the ‘Fruits and Vegetables’ pattern was negatively associated with FMI. Associations between ‘Treat Foods’ and BMI, WC, and WHtR in non-dieters were positive, while these associations were negative for all other participants. **Conclusions** Significant associations were found between dietary patterns and indices of both central and total adiposity, but not BMI. Therefore using only BMI measures may not be useful in this age group. Since our results were significant for boys and not girls, nutrition messages designed to prevent obesity may be particularly important for adolescent boys. As an interaction between dieting status and ‘Treat Foods’ existed, future studies should also explore the role of dieting when investigating food choice and body composition.

## C5 The impact of Animal Source Food (ASF) on the growth of malnourished children in Kelantan, Malaysia: Randomized controlled intervention trial

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Journal of Nutrition and Food Sciences, Vol. 4(6), 2014, 4-6

The aim of this study was to evaluate the effect of Animal Source Food on the growth of Malaysian malnourished children in Bachok Kelantan. A six months Animal Source Food (ASF) intervention trial was carried out with 90 malnourished children, aged 2-10 years, from food insecure households in Bachok, Malaysian. Children were randomized into three groups: Milk Group (n=30) consumed two boxes of 250 ml milk daily over the study period, Egg Group (n=30) received two eggs daily and Control Group (n=30) children who did not receive any food intervention. Anthropometric data were collected at baseline, after 3 and 6 months of the intervention trial. Over the 6 months study period there was a significant increase in children’s height for all groups (Milk Group; 3.62 cm; p<0.001, Egg Group; 3.51cm , p<0.001, Control Group; 2.55 cm, p<0.001), weight (Milk Group; 1.72 kg; p<0.001, Egg Group; 1.67 kg, p<0.001, Control Group; 0.87 kg, p<0.001), and mid upper arm circumference (MUAC) (Milk Group; 0.80 cm; p<0.001, Egg Group; 0.78 cm, p<0.001, Control Group; 0.31 cm; p=0.023). The impact of the intervention was positive but the effectiveness was not large enough to define as success of the intervention program.



## Dietary health behaviors of women living in high rise dwellings: A case study of an urban community in Malaysia

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Journal of Community Health, Vol.38 (1), 2013, 163-171

Diet-related non-communicable disease (DR-NCD) occurrence is a serious problem amongst Malaysian women and urbanization is probably a challenge to their achieving the nutritional environment conducive to healthy eating. This case study aimed to determine diet quality of an urban community using women respondents from high rise dwellings in Kuala Lumpur. The sample consisted of 135 households and a healthy eating index (HEI) scale was used to evaluate the women's diet quality. A total of 128 women (Malays = 45, Chinese = 56, Indian = 27) participated. Total HEI score was significantly different ( $P < 0.05$ ) within ethnicity (Indians =  $75.7 \pm 8.1$  < Malays =  $80.5 \pm 7.4$  < Chinese =  $80.1 \pm 8.1$ ) and affected by component scores for fruit (range 3.8-6.2,  $P = 0.044$ ), sodium (range 7.8-9.0,  $P = 0.006$ ) and food variety (range 9.3-9.9,  $P = 0.001$ ). Dairy foods rated poorly (range 2.0-3.9,  $P > 0.05$ ) regardless of ethnicity. Income strata ( $\rho = 0.159$ ,  $P = 0.048$ ) and eating out frequency ( $\rho = -0.149$ ,  $P = 0.046$ ) also independently affected HEI scores. Income negatively correlated with sodium restriction score ( $\rho = -0.294$ ,  $P = 0.001$ ) but positively with cereals ( $\rho = 0.181$ ;  $P = 0.025$ ), fruits ( $\rho = 0.178$ ;  $P = 0.022$ ), dairy products ( $\rho = 0.198$ ;  $P = 0.013$ ) and food variety ( $\rho = 0.219$ ,  $P = 0.007$ ). Decreased vegetable intake ( $\rho = -0.320$ ;  $P < 0.001$ ) and sodium excess ( $\rho = -0.135$ ,  $P = 0.065$ ) were associated with eating out frequency and poor HEI scores. This case study suggests health promotion for DR-NCD prevention is needed at the community level to improve diet quality of urban women.

## Social and psychological factors affecting eating habits among university students in a Malaysian medical school: A cross-sectional study

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Nutrition Journal, Vol.11 (48), 2012

**Background:** Eating habits have been a major concern among university students as a determinant of health status. The aim of this study was to assess the pattern of eating habits and its associated social and psychological factors among medical students. **Methods:** A cross sectional study was conducted among 132 medical students of pre-clinical phase at a Malaysian university. A self-administered questionnaire was used which included questions on socio-demography, anthropometry, eating habits and psychosocial factors. **Results:** Mean ( $\pm$ SD) age of the respondents was 22.7 ( $\pm$ 2.4) years and (the age) ranged from 18 to 30 years. More than half had regular meals and breakfast (57.6% & 56.1% respectively). Majority (73.5%) consumed fruits

less than three times per week, 51.5% had fried food twice or more a week and 59.8% drank water less than 2 liters daily. Eating habits score was significantly low among younger students (18-22 years), smokers, alcohol drinkers and those who did not exercise ( $p < 0.05$ ). Four psychological factors out of six, were significantly associated with eating habits ( $p < 0.05$ ). In multivariate analysis, age and 'eating because of feeling happy' were significantly associated with eating habits score ( $p < 0.05$ ). **Conclusion:** Most of the students in this study had healthy eating habits. Social and psychological factors were important determinants of eating habits among medical students.

## C8 Patterns of fruits and vegetable consumption among adults of different ethnics in Selangor, Malaysia

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International Food Research Journal, Vol.19 (3), 2012, 1095-1107

A survey was conducted to investigate patterns of fruits and vegetables consumption among Malaysian adults residing in Selangor, Malaysia. Two hundred forty two subjects comprises of male (28%) and female (72%) of major ethnics (Malays-52.3%; Chinese-30.5%; Indians-16.9%) with the mean age of  $43.5 \pm 18$  years were studied from July to November 2002. Consumption data for vegetables were collected using 24 hours duplicate samples method while for fruits 24-hour diet record was used. The results showed that most frequently consumed leafy, leguminous, root, brassica and fruits vegetables were celery (*Apium graveolens*), spinach (*Spinacia oleracea*), water spinach (*Ipomoea aquatic*), long beans (*Vigna sesquipedolis*), French beans (*Phaseolus vulgaris*), carrot (*Daucus carota*), potato (*Solanum tuberosum*), Chinese mustard (*Brassica juncea*), round cabbage (*Brassica reptans*), cauliflower (*Brassica oleracea var cauliflora*), chillies (red, green, small or dried) (*Capsicum sp.*), tomato (*Lycopersicum esculentum*), cucumber (*Cucumis sativus*), long eggplant (*Solanum melongena*) and okra (*Hibiscus esculentus*). While most consumed ulam and traditional vegetables were petai (*Parkia speciosa*), sweet leaves (*Sauropus andragynus*) and Indian pennywor (*Hydrocotyle asiatica*). Other vegetables inclusive spices and flavorings that were preferred by subjects were shallot (*Allium fistulosum*), garlic (*Allium sativum*), onion (*Allium cepa*), green bean sprout (*Phaseolus aureus*) and curry leaves (*Murraya koenigii*). The most preferred fruits were banana (*Musa spp.*) and apples (*Malus domestica*). A total consumption of fruits and vegetables among adults in Selangor was 173 g/day and the consumption among Malays (202 g/day) was significantly higher ( $P < 0.005$ ) were shown for consumption of different vegetable categories among different ethnic groups. Study subjects consumed more brassica vegetables compared to other vegetable categories and the Malays preferred traditional vegetables compared to the other two ethnics. Most vegetables were consumed as soup and boiled least was consumed as raw and salad form.

## Vitamin D intake and sun exposure among Malaysian athletes in National Sports Institute, Bukit Jalil

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Malaysian Journal of Medicine and Health Sciences, Vol. 9(1), 2013, 21-28

Vitamin D plays an important role in maintaining the physical health as well as the performance of athletes. This cross-sectional analytical study was conducted to determine vitamin D intake, sun exposure and skin types of both indoor and outdoor Malaysian athletes in the National Sports Institute, Bukit Jalil. **Method:** A total of 28 indoor (badminton, shooting, wushu and fencing) and 36 outdoor (athletics, football and hockey) athletes were recruited for this study. The dietary vitamin D intake was estimated using Vitamin D-specific Food Frequency Questionnaire (FFQ). The Sun Exposure Index (SEI) was calculated from Seven-day Sun Exposure Record while the skin types of athletes were determined using Fitzpatrick Skin Typing Questionnaire. **Results:** The mean age of the athletes was  $21.02 \pm 4.11$  years and their mean Body Mass Index (BMI) was  $22.20 \pm 2.22$  kg/m<sup>2</sup>. The mean body fat percentage of outdoor athletes was significantly lower than indoor athletes ( $p < 0.001$ ). Forty two athletes (65.6%) met the recommended nutrient intake (RNI) value for vitamin D and the outdoor athletes had significantly greater amount of vitamin D intake compared to RNI ( $p < 0.05$ ) and the indoor athletes ( $p < 0.05$ ). The indoor athletes spent significantly less time outdoor per day ( $p < 0.05$ ) and had lower SEI per day ( $p < 0.05$ ) than outdoor athletes. Most of the indoor athletes (53.6%) had type II of Fitzpatrick skin type while the outdoor athletes (47.2%) had type III of Fitzpatrick skin type. **Conclusion:** The outdoor athletes had higher intake of vitamin D and more sun exposure than indoor athletes. There is a need to ensure the adequacy intake of vitamin D among indoor athletes.

## Food consumption patterns and nutrition transition in South-East Asia

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Public Health Nutrition, Vol.16 (9), 2013

**Objective:** The present study was done to confirm the relationship between changes in food patterns and nutrition transition in three South-East Asian countries, namely the Philippines, Malaysia and Indonesia. **Design:** This was a cross-sectional study conducted between August 2008 and August 2009 using three methods: interviews, focus group discussions and analyses of government reports. **Setting:** The study was conducted in rural and urban areas in Manila and Calabanga (Philippines), Selangor and Kuala Selangor (Malaysia), and Padang, Pariaman Tanah Datar and Limapuluh Kota (West Sumatra, Indonesia). **Subjects:** Adults aged 18 to 77 years. **Results:** The results showed that Filipinos, Malaysians and Indonesians have retained many aspects of their traditional diets. In fact, most participants in the study considered Western-style and franchise fast foods as snack or recreational foods to be consumed once in a while only. However, a significant difference was noted between urban and rural areas in food varieties consumed. Participants in urban areas consumed more varieties of traditional foods owing to their availability and the participants' food purchasing power. Although traditional food patterns

were maintained by most of the participants, more sugar and vegetable oils were consumed and added to the traditional recipes. **Conclusions:** The rapid nutrition transition in this region may be due, instead, to increasing food availability and food purchasing power, rather than to a shift in food preferences towards modern Western foods.

## C11 Antenatal calcium intake in Malaysia

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The Journal of Obstetrics and Gynaecology, Vol. 40 (4), 2014, 983-987

**Aim:** To determine the adequacy of antenatal calcium intake in Malaysia, and the influencing factors. **Methods:** A cross-sectional study was conducted among postnatal women who delivered in two tertiary hospitals. Data were collected from antenatal cards, hospital documents and diet recall on daily milk and calcium intake during pregnancy. SPSS version 19.0 was used for statistical analyses. **Results:** A total of 150 women were studied. The total daily calcium intake was  $834 \pm 43$  mg (mean  $\pm$  standard error of the mean), but the calcium intake distribution curve was skewed to the right with a median intake of 725 mg daily. When calcium intake from milk and calcium supplements was excluded, the daily dietary calcium intake was only  $478 \pm 25$  mg. Even with inclusion of milk and calcium supplements, more than a third ( $n=55$  or 36.7%) of the women consumed less than 600 mg calcium in their daily diet. The adequacy of daily calcium intake was not influenced by maternal age, ethnicity, income or maternal job or educational status as well as parity. **Conclusion:** The daily dietary calcium intake of the Malaysian antenatal population is far from adequate without the addition of calcium supplements and milk.

## C12 Child feeding practices, food habits, anthropometric indicators and cognitive performance among preschoolers in Peninsular Malaysia

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*Appetite*, Vol.58 (2), 2012, 525-530

This study aimed to determine the relationship between child feeding practices, food habits, and anthropometric indicators with cognitive performance of preschoolers aged 4-6 years in Peninsular Malaysia ( $n = 1933$ ). Parents were interviewed on socio-demographic background, nutrition knowledge, child feeding practices and food habits. Height and weight of the preschoolers were measured; BMI-for-age, weight-for-age and height-for-age were determined. Cognitive performance was assessed using Raven's Colored Progressive Matrices. The mean monthly household income was RM3610 and 59.6% of parents attained secondary education. Thirty-three percent of parents had good knowledge on nutrition, 39% satisfactory and 28% poor. For child feeding practices, perceived responsibility had the highest mean score ( $M = 3.99$ ,  $SD = 0.72$ ), while perceived child weight had the lowest ( $M = 2.94$ ,  $SD = 0.38$ ). The prevalence of possible risk of overweight, being overweight, and obesity were 3.9%, 7.9% and 8.1%,

respectively, whereas the prevalence of underweight and stunting were 8.0% and 8.4%, respectively. Breakfast was the second most frequently skipped meal (16.8%) after dinner (18.1%). The mean cognitive score was 103.5 (SD = 14.4). Height-for-age and consumption of dinner were found to contribute significantly towards cognitive performance after controlling for socio-demographic background and parent's nutrition knowledge.

### **C13 Factors that restrict young generation to practice Malay traditional festive foods**

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Procedia-Social & Behavioral Science, Vol.101, 2013, 239-247

This study attempted to recognize factors restrict young generations to practice Malay traditional festive foods. The study employs the observation method to tap on the actual food preparation process of the Malay festive celebration. Limited knowledge and skills of Malay traditional food and lack of family support the factors that identified to restrict young generation to practice Malay traditional festive foods. Through traditional food knowledge, it enables individual to continue practice and transfer or pass down the knowledge to the young generations in order to ensure the food traditions continue and evolve.

### **C14 Nutritional status and eating practices among children aged 4-6 years old in selected urban and rural kindergarten in Selangor, Malaysia**

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Asian Journal of Clinical Nutrition, Vol. 4 (4), 2012, 116-131

Nutritional status and eating practices varies among urban and rural area because there are differences in environment and socioeconomic status. This cross-sectional study was aimed to compare and investigate the relationship between the nutritional status and eating practices among children aged 4-6 years old in urban and rural area in Selangor, Malaysia. 142 children from urban (n = 100) and rural (n = 42) participated in this study. The nutritional status of the subjects were evaluated by assessing their anthropometry values which were weight, height and Body Mass Index (BMI) and later compared with standard growth chart. The diet intake of the subjects were obtained using 3 days diet record and later compared with Malaysian Recommended Nutrient Intake (RNI). The t-test showed, there was a significant differences for weight for age and height for age among children from urban and rural area (p<0.05). Prevalence of wasting was higher among rural children (31%) than urban children (22%). Two-way ANOVA test showed that there were significant differences in nutrient intake between children from urban and rural area (p<0.05) with calorie intake among rural children higher (23%) than RNI, higher protein intake among urban (114%) and rural (165%) than RNI, calcium intake were lowered than RNI for urban (35%) and rural (17%). There was also a positive relationship between children' BMI with fast food intake (r = 0.274, p<0.05) and eating out (r = 0.207, p<0.05). As a

conclusion, rural children had higher prevalence of undernutrition compared to the urban children but the prevalence of obesity were same in both areas.

### C15 High glycemic load diet, milk and ice cream consumption are related to acne vulgaris in Malaysian young adults: A case control study.

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BMC Dermatology, Vol. 12(13), 2012.

**Background:** The role of dietary factors in the pathophysiology of acne vulgaris is highly controversial. Hence, the aim of this study was to determine the association between dietary factors and acne vulgaris among Malaysian young adults. **Methods:** A case-control study was conducted among 44 acne vulgaris patients and 44 controls aged 18 to 30 years from October 2010 to January 2011. Comprehensive acne severity scale (CASS) was used to determine acne severity. A questionnaire comprising items enquiring into the respondent's family history and dietary patterns was distributed. Subjects were asked to record their food intake on two weekdays and one day on a weekend in a three day food diary. Anthropometric measurements including body weight, height and body fat percentage were taken. Acne severity was assessed by a dermatologist. **Results:** Cases had a significantly higher dietary glycemic load ( $175 \pm 35$ ) compared to controls ( $122 \pm 28$ ) ( $p < 0.001$ ). The frequency of milk ( $p < 0.01$ ) and ice-cream ( $p < 0.01$ ) consumptions was significantly higher in cases compared to controls. Females in the case group had a higher daily energy intake compared to their counterparts in the control group,  $1812 \pm 331$  and  $1590 \pm 148$  kcal respectively ( $p < 0.05$ ). No significant difference was found in other nutrient intakes, Body Mass Index, and body fat percentage between case and control groups ( $p > 0.05$ ). **Conclusions:** Glycemic load diet and frequencies of milk and ice cream intake were positively associated with acne vulgaris.

### C16 Knowledge and practices on food safety among secondary school students in Johor Bahru, Johor, Malaysia

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Pakistan Journal of Nutrition, Vol. 11 (2), 2012, 110-115

The issue of food safety is an issue that is discussed widely, but cases of food poisoning in particular, are still continuing. This may be associated with their own level of knowledge and practices on food safety. This study was aimed to examine the level of food safety knowledge and practices from two secondary school students, to investigate the association between food safety knowledge and practices with gender, to identify the correlation between food safety

knowledge levels with practices and to compare the difference of knowledge and practices level between both of the school. Information concerning demographic, food safety knowledge and practices were collected using self-administered questionnaire. 339 students comprising 202 male and 197 female from two schools were randomly selected to answer the questionnaire provided. Analyzed data obtained stated that knowledge on food safety was good for both school and their also practiced on food safety by 79.1% included in good practice range. Results also showed that a high level of food safety knowledge and practices was possessed by both groups, male and female students in quite similar value of means. Correlation between food safety knowledge and practices on food safety indicated, there was a small positive correlation with [ $r = 0.148$ ,  $n = 221$ ,  $p < 0.05$ ] for Sekolah Tinggi Arab Maahad and [ $r = 0.053$ ,  $n = 178$ ,  $p < 0.5$ ] for Sekolah Menengah Kebangsaan Gelang Patah.

**C17 The relationship between mothers' educational level and feeding practices among children in selected kindergartens in Selangor, Malaysia: A cross-sectional study**

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Asian Journal of Clinical Nutrition, Vol.4 (2), 2012, 39-52

Child feeding practices was directly influence nutritional status of a child. Maternal education level has long been associated with child feeding practices. Thus, this study aims to compare the various feeding practices and nutritional status of the children according to different level of maternal education. This was a cross-sectional study which was conducted among kindergarten school children aged 4 to 6 years old in Selangor, Malaysia. One hundred forty two children ( $n = 142$ ) of mothers from secondary school qualification ( $n = 70$ ) and diploma and above qualification ( $n = 72$ ) from urban (7 kindergartens) and rural (2 kindergartens) area were involved in this study. A feeding practices questionnaire comprising of questions regarding sociodemographic data, anthropometry measurement, feeding practices and three days diet record. Overall, children of mothers with secondary school qualification had higher prevalence of wasted (14.3%), 67.1% mothers had exclusively breastfed them up to 6 months and their mother had higher rate of using reward (82.9%). However, children of mothers from diploma and above qualification had higher prevalence of obese (13.9%), had higher fast food intake (70.8%) and had higher frequency of skipped breakfast (47.2%). There is a significant different ( $p < 0.05$ ) between energy and fat intakes among boys and girls of mothers from different education level. In addition, there is significant ( $p = 0.05$ ) negative ( $r = -0.26$ ) excellent relationship between children's BMI of mothers from secondary school qualification and their energy intake. The findings of this study suggested that education levels of mother were affecting the child feeding practices and finally determined the child's nutritional status.

## C18 Fasting calorie restriction improved the quality of dietary intake among aging men in Klang Valley, Malaysia.

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Pakistan Journal of Nutrition, Vol.12 (7), 2013, 607-614

This study used the new model of Fasting Calorie Restriction, which aimed at providing a feasible way of controlling eating. The present study aimed at determining the changes in dietary patterns following a three-month Fasting Calorie Restriction intervention. Twenty-five apparently healthy men (aged 50-70 years, BMI 23.0-29.9 kg/m<sup>2</sup>) were randomized into Fasting Calorie Restriction or Control groups. Those assigned to the Fasting Calorie Restriction group were instructed to restrict their daily energy intake to 2100 kJ/day and practice Muslim Sunnah fasting for 2 days a week for three months. Dietary data and Healthy Eating Index were obtained using a Diet History Questionnaire at the baseline, 6 and 12 weeks. Statistical analysis was carried out using a repeated measured of Analysis of Covariance using the baseline data as covariate. Energy intake decreased significantly ( $p < 0.01$ ) in the Fasting Calorie Restriction group. We also found a significant increase ( $p < 0.05$ ) in thiamine, riboflavin and niacin intakes in the Fasting Calorie Restriction group throughout the intervention period. Analysis of the Healthy Eating Index showed a significant main effect ( $p < 0.05$ ) for fat, saturated fat and cholesterol scores. Food variability decreased significantly ( $p < 0.001$ ) ( $9.5 \pm 0.9$  at the baseline to  $8.1 \pm 1.1$  at week 12) in the Fasting Calorie Restriction group. Fasting Calorie Restriction in this study was beneficial in reducing overall energy and fat intake. However, it also decreased the food variability among subjects. There is a need to evaluate the long-term effects of Fasting Calorie Restriction on food variability and micronutrient status.

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## C19 Dietary patterns and cognitive ability among 12 to 13 year-old adolescents in Selangor, Malaysia

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Public Health Nutrition, 2014, 1-10.

**Objective:** The present study aimed to identify dietary patterns and determine the relationship between dietary patterns and cognitive ability among 12- to 13 year-old Malay adolescents in the urban areas of Gombak district in Selangor, Malaysia. **Design:** Data on sociodemographic background were obtained from parents. Height and weight were measured and BMI-for-age was determined. Adolescents were interviewed on their habitual dietary intakes using a semi-quantitative FFQ. Cognitive ability was assessed using the Wechsler Nonverbal Scale of Ability in a one-to-one manner. Dietary patterns were constructed using principal component analysis based on thirty-eight food groups of the semi-quantitative FFQ. **Setting:** Urban secondary public schools in the district of Gombak in Selangor, Malaysia. **Subjects:** Malay adolescents aged 12 to 13 years (n 416). **Results:** The mean general cognitive ability score was 101.8 (sd 12.4). Four major dietary patterns were identified and labelled as 'refined-grain pattern', 'snack-food pattern', 'plant-based food pattern' and 'high-energy food pattern'. These dietary patterns explained 39.1



% of the variance in the habitual dietary intakes of the adolescents. The refined-grain pattern was negatively associated with processing speed, which is a construct of general cognitive ability. The high-energy food pattern was negatively associated with general cognitive ability, perceptual reasoning and processing speed. Monthly household income and parents' educational attainment were positively associated with all of the cognitive measures. In multivariate analysis, only the high-energy food pattern was found to contribute significantly towards general cognitive ability after controlling for socio-economic status. **Conclusions:** Consumption of foods in the high-energy food pattern contributed towards general cognitive ability after controlling for socio-economic status. However, the contribution was small.

## **C20 Knowledge, attitude and practices of university students regarding the use of nutritional information and food labels**

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Asian Journal of Clinical Nutrition, Vol.3 (3), 2011, 79-91

The food nutrition label provides the nutrition information that helps consumers on food choices and used to give us information so that customer can choose between foods. This study was aimed to determine the association between knowledge, attitude and practices on food label use and to determine the factors that influence the use of food labels during making food purchasing decision among university students. A cross-sectional study of undergraduate students at UiTM Puncak Alam in the Kuala Selangor district of Malaysia was conducted in June until July 2011. Three hundred twenty nine students (n = 329) volunteered to complete a Food Label Use Questionnaire (FLUQ) which included question about sociodemographics, level of knowledge about food and nutrition, attitude and practices related to using food labels and factors affecting the use of food labelling. Hypothesis testing was completed using Independent t-test, Pearson chi-square and descriptive analysis in which the statistical significant level was set at  $\alpha = 0.05$ . The results show that, only 21.6% of the students "often" use the food label during food purchasing decision. These study shows that the practices by read the nutrition information were significantly associated with the use of food label ( $p < 0.05$ ). The important aspect during buying food product was expiry date (98.5%), taste (95.7%), price (92.4%) and nutrient content (90.5%) were significantly associated with the use of food label. The students attitude which is do not know how to use nutritional information label ( $p = 0.028$ ) and label was not attractive ( $p = 0.037$ ) were significantly associated on food label use.

## C21 The influence of body composition, pubertal growth status and dietary food pattern on bone health among adolescents in Kota Bharu, Kelantan

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Malaysian Journal of Medical Sciences, Vol. 21(5), 2014, 136-137

Childhood and adolescence are critical periods for bone mass acquisition as peak bone mass (PBM), a major determinant of risk for osteoporosis later in life, is achieved during these growing years. Hence, understanding factors that influencing bone mass accrual is critical to optimize PBM during growth. The main objective of the study was to investigate the relationship between body composition profiles, pubertal growth status, dietary behaviours and dietary food pattern and bone health profiles among 455 boy and girl adolescents aged 12 to 19 years in Kota Bharu, Kelantan. Dietary intake and lifestyle behavioural practices of the participants were assessed using validated questionnaires, while dietary intakes were determined using validated food frequency questionnaire (FFQ). Anthropometry and body composition profiles of lean body mass (LBM) and total body fat (TBF) were assessed using both anthropometry and a dual-energy  $\chi$ -ray absorptiometry (DXA) device, whereas bone mass profiles such as bone mineral content (BMC), bone area (BA) and bone mineral density (BMD) of skeletal sites of whole body (WB), lumbar spine (LS) and proximal femur (PF) were assessed using DXA. Dietary food pattern was determined using a principal component analysis (PCA). The result showed that, mean age of participants was 15.3 years (SD 1.9), with most of them (73%) were in normal body mass index (BMI) ranged. Majority of the participants were in Tanner stage II to V. In general, boys tended to have significantly higher lean body mass (LBM) and bone masses of skeletal sites than the girls, except for the lumbar spine BMD (at least,  $P < 0.05$ ), whereas girls exhibited a significantly higher level of total body fat (TBF) as compared to their boy counterparts. For the dietary behaviours, boys had significantly a higher frequency of weekly fast-food consumption than their girl counterparts, whereas girls had significantly higher consumption of soft drink beverages ( $P < 0.001$ ) and frequency of daily snacking consumption ( $P < 0.01$ ) compared to boys. In term of ethnicity differences, Chinese adolescents had significantly higher frequency of breakfast ( $P < 0.01$ ) and milk consumption ( $P < 0.05$ ) than Malays. Most of the nutrients intakes of the participants were higher than recommendations (RNI) except for energy, calcium, iron (girls only) and vitamin D intake. Three dietary food patterns were derived from PCA and labelled as healthy, western-based and typical food patterns. Generally, the partial Pearson correlation and ANCOVA analysis showed significant relationships between anthropometrical and body composition profiles, pubertal growth, consumption of milk and soft drink and dietary food patterns and bone mass profiles in both genders. Further, analysis by multiple regression revealed that LBM, consumption of milk and healthy food pattern emerged as the positive determinants on BMC of all skeletal sites assessed in boys, whereas height, consumption of soft drink and western-based food pattern appeared as negative significant determinants on BMC. Similar determinants emerged for the BA of all skeletal sites measured in this study, with addition of Tanner stage of genitalia growth and TBF as positive determinants on BA. In addition, similar determinants found in boys were found in girls except for puberty growth, in which age at menarche emerged as negative determinant on BMC and BA for all skeletal sites measured but not the Tanner stage of breast and pubic hair development. In addition, milk consumption did not appear as determinants on BMC or BA of skeletal sites measured, however soft drink consumption emerged as determinants on most of the bone mass parameters in girls except for LSBA and PFBA. Meanwhile, the findings suggested that LBM had stronger influence on bone mass in both gender

except for LSBMC and WBBA in girls, whereby TBF appeared as strong determinants on this skeletal sites of girls. The present findings of the study show that higher intake of healthy-based diet such as vegetables, fruits, milk and dairy products exerts significant beneficial influence on bone health status compared to those had lower intake of healthy-based diet. In addition, lean body mass had significant stronger influences on most bone mass parameters assessed compared to the total body fat both in boys and girls. Therefore, the consumption of healthy-based foods that high in fruit, vegetables and dairy products should be highly emphasised among these growing children and adolescents to maximum the attainment of peak bone mass accretion, in addition, active lifestyle to maintain high lean body mass during growing years is also crucial to achieve higher bone mass and consequently could helps to prevent or reduce the risk of osteoporotic fractures in later life.

## **C22 Nutrition knowledge and supplements intake among Royal Malaysian Navy personnel**

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Sains Malaysiana, Vol. 42(8), 2013, 1181-1190

Studies on nutrition knowledge in various population groups have often been reported but such studies among the Armed Forces are rarely reported. The purpose of the study was to evaluate the status of nutrition knowledge and the intake of supplements among the Royal Malaysian Navy (RMN) personnel. A total of 909 RMN personnel based in Lumut, Kuantan and Johor had participated in this study. Questionnaire was used to assess the socio demographic variables, nutrition knowledge and supplements intake. Anthropometric measurements included height and weight. The results showed that the mean nutrition knowledge score was 62.5% corresponding to a moderate level of knowledge. Nutrition knowledge score was higher in subjects from Lumut base, older ages, more educated, officers and overweight personnel. The most common sources of nutrition information were from television/radio (27.3%), courses/seminar (24.9%) and doctors/ nurses (21.6%). Of the 36% subjects that were reported, taking at least one or more supplements, 5.8% used them daily. This baseline study is expected to provide useful information to the Malaysian Armed Forces and it is suggested that nutrition education be incorporated in the RMN training programmes to ensure that the good health status of the personnel to be maintained.

## **C23 Knowledge, attitude and practices on healthy eating among special needs boarding school students**

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International Journal of Dairy Science, Vol. 6, 2011, 278-286

Nutrition information is important for everyone in order to get healthy lifestyle and free from any diseases. This study was attempt to determine the effectiveness of the nutrition programme among special needs students aged 13 to 17 years old by evaluating their changes in knowledge, attitude and practice on healthy eating. Eighty students were involved in this study in which 40 students recruited as intervention group were from Sekolah Menengah Pendidikan Khas (visual impaired). Another 40 students were from Sekolah Menengah Pendidikan Khas Vokasional (hearing impaired) were assigned as control group. They were distributed with questionnaires for pre-test and post-test and a nutrition programme was implemented to the intervention group. A significant improvement in students' nutrition scores among intervention group before ( $36.30 \pm 4.78$ ) and after ( $36.55 \pm 3.34$ ) attending the nutrition education programme ( $t = -4.03$ ,  $df = 39$ ,  $p < 0.05$ ). Improvement in attitude scores also seen when intervention group decreased significantly ( $t = 2.48$ ,  $df = 39$ ,  $p < 0.05$ ) from  $18.55 (\pm 4.17)$  to  $17.03 (\pm 2.79)$ . However, for practice scores in intervention and control group shows no significant changes. For knowledge and attitude scores among control group showed no significant differences. In conclusion, this study showed nutrition education also may help to give positive impact to the special needs students in healthy eating lifestyle.

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## **C24 Dietary intake assessment in adults and its association with weight status and dental caries**

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Pakistan Journal of Nutrition, Vol. 11 (11), 2012, 1066-1072

This cross-sectional study was designed to determine the relationship between dietary intake with Body composition and dental caries experience among adults at the dental clinic in Universiti Kebangsaan Malaysia (UKM). The dietary compositions of the participants were estimated by using a multiple-pass 24-hour recall method. A sugar checklist was used to determine the most popular sugary food/beverages categories consumed. Anthropometric measurements (height and weight measurements) were taken. Dental caries experience was charted clinically and was reported using the Decayed/Missing/Filled Teeth Index (DMFT). Participant's consumption for cereal groups, meat groups, fruits and vegetables group met the recommendation of the Malaysian food pyramid. Male participants consumed significantly higher energy, carbohydrate, fat and sugar than female participants. The total daily added sugar intake among the caries-free group was significantly lower than that in the group with caries. There was no significant difference in energy in take, protein intake, fat intake and total sugar intake between BMI classes; however the carbohydrate intake was significantly different. A significant correlation was found

between carbohydrate consumption and BMI. There was also a significant correlation between BMI and DMFT score. The most popular sugary food/ beverages category among participants was sugar and sweeteners added to beverages followed by biscuits and pastry. The least popular choice was breakfast cereal. The results indicated that adults with caries consumed significantly higher amounts of added sugar in their daily diet. The study shows that sugar remains an undeniable risk for dental caries and highlights that sugary foods and beverage remains a favorite of participants.

## **C25 Association between vitamin A, vitamin E and apolipoprotein E status with mild cognitive impairment among elderly people in low-cost residential areas**

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Nutritional Neuroscience, Vol.16 (1), 2013, 6-12

**Rationale:** The influence of nutritional parameters and genetic susceptibility on poor cognitive impairment has been documented; however, the association between lipid-soluble vitamins with genetic susceptibility on mild cognitive impairment (MCI) has not yet been studied extensively. **Objectives:** The aim of the present study was (1) to determine the prevalence of MCI and its associated risk factors and (2) to investigate the influence of the apolipoprotein E (APOE)  $\epsilon$ 4 allele on peripheral vitamin A and E concentration in MCI and non-MCI groups. **Methods:** A total of 333 subjects aged 60 years and above, residing in public housing areas in Kuala Lumpur, Malaysia were interviewed to obtain information on their neuropsychological status. Fasting venous blood was taken for determination of vitamin A and vitamin E concentration using high-performance liquid chromatography. Restriction fragment length polymorphism analysis was performed to determine the APOE genotypes. **Results:** The prevalence of MCI was 21.1%. Binary logistic regression indicated that the predictors of MCI were being married, overweight or obesity, and had vitamin A deficiency. In non-MCI subjects, vitamin E levels were lower among APOE $\epsilon$ 4 allele carriers as compared to the non-carriers ( $P < 0.05$ ). **Conclusion:** The study highlighted the importance of maintaining good nutritional status and vitamin A status for optimal cognitive function. The presence of APOE $\epsilon$ 4 allele has a prominent role in affecting vitamin E levels, particularly among cognitively healthy elderly in our unique population.

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## **C26 Relationship between dietary pattern and body mass index among primary school children**

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Asian Journal of Clinical Nutrition, Vol.4 (4), 2012, 142-150

Currently, childhood obesity has been growing at an alarming rate and it is a common nutritional problem among children in developed countries as well as in developing countries. It has become one of the most serious public health challenges of the 21st century. This study attempts to determine the relationship between dietary pattern and Body Mass Index among primary school

children. This is a cross-sectional study involving 204 students aged seven to ten years old from Sekolah Kebangsaan Abdul Samat, Kapar, Selangor. Anthropometric data including height and weight were obtained. Data was obtained by interview using of questionnaire. The prevalence of children being overweight (28.9%) and obesity (12.7%) was high. The finding revealed that types of diet were significantly associated with body mass index. Breakfast consumption and number of meals per day did not show any association with the children's BMI. In conclusion, body mass index of school children in this study showed to have association with types of diet intakes but showed no association with number of meals per day and breakfast consumption.

## **C27 Impact of healthy eating practices and physical activity on quality of life among breast cancer survivors**

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Asian Pacific Journal of Cancer Prevention, Vol.14 (1), 2013, 481-487

Following breast cancer diagnosis, women often attempt to modify their lifestyles to improve their health and prevent recurrence. These behavioral changes typically involve diet and physical activity modification. The aim of this study was to determine association between healthy eating habits and physical activity with quality of life among Iranian breast cancer survivors. A total of 100 Iranian women, aged between 32 to 61 years were recruited to participate in this cross-sectional study. Eating practices were evaluated by a validated questionnaire modified from the Women's Healthy Eating and Living (WHEL) study. Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ). A standardized questionnaire by the European Organization of Research and Treatment of Cancer Quality of Life and its breast cancer module (EORTC QLQ-C30/+BR-23) were applied to determine quality of life. Approximately 29% of the cancer survivors were categorized as having healthy eating practices, 34% had moderate eating practices and 37% had poor eating practices based on nutrition guidelines. The study found positive changes in the decreased intake of fast foods (90%), red meat (70%) and increased intake of fruits (85%) and vegetables (78%). Generally, breast cancer survivors with healthy eating practices had better global quality of life, social, emotional, cognitive and role functions. Results showed that only 12 women (12%) met the criteria for regular vigorous exercise, 22% had regular moderate-intensity exercise while the majority (65%) had low-intensity physical activity. Breast cancer survivors with higher level of physical activity had better emotional and cognitive functions. Healthy eating practices and physical activity can improve quality of life of cancer survivors. Health care professionals should promote good dietary habits and physical activity to improve survivors' health and quality of life.

## **C28 Subjective perception of sports performance, training, sleep and dietary patterns of Malaysian junior Muslim athletes during Ramadan intermittent fasting**

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Asian Journal of Sports Medicine, Vol. 2(3), 2011, 167-176

**Purpose:** To examine the subjective perception of daily acute fasting on sports performance, training, sleep and dietary patterns of Muslim athletes during the Ramadan month. **Methods:** Seven hundred and thirty-four (411 male and 323 female) Malaysian Junior-level Muslim athletes (mean age  $16.3 \pm 2.6$  y) participated in the survey which was designed to establish the personal perception of their sport performance, sleep pattern, food and fluid intake during Ramadan fasting. The survey was conducted during and immediately after the month of Ramadan in 2009. **Results:** Twenty-four percent of the athletes perceived that there was an adverse effect of the Ramadan fast on their sporting performance and 29.3% reported that quality of training during Ramadan was also negatively influenced. Majority (48.2%) of the athletes stated that Ramadan fasting did not affect their normal sleep pattern but 66.6% of them complained of sleepiness during the daytime. Half of the athletes (41.4%) maintained the caloric intake during Ramadan as they normally would with the majority of them (76.2%) reporting that they consumed more fluids during Ramadan. **Conclusions:** Overall, Malaysian Junior-level Muslim athletes showed diverse views in their perception of changes in their training, sleep and dietary patterns during Ramadan fast. These individual differences probably indicate differences in the athletes' adaptability and coping strategies during fasting and training in Ramadan.

## C29 Efficacy of fasting calorie restriction on quality of life among aging men

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Physiology and Behavior, Vol.104 (5), 2011, 1059-1064

Calorie restriction (CR) has been promoted to increase longevity. Previous studies have indicated that CR can negatively affect mood and therefore the effect of CR on mood and quality of life (QOL) becomes crucial when considering the feasibility of CR in humans. We conducted a three month clinical trial on CR (reduction of 300 to 500 kcal/day) combined with two days/week of Muslim sunnah fasting (FCR) to determine the effectiveness of FCR on QOL among aging men in Klang Valley, Malaysia. A total of 25 healthy Malay men (age  $58.8 \pm 5.1$  years), with no chronic diseases and a BMI of 23.0 to 29.9 kg/m<sup>2</sup> were randomized to FCR (n=12) and control (n=13) groups. Body composition measurements and QOL questionnaires were ascertained at baseline, week 6 and week 12. QOL was measured using the Short-Form 36, sleep quality was determined using the Pittsburgh Sleep Quality Index, the Beck Depression Inventory II was used to measure mood and the Perceived Stress Scale was used to measure depression. The FCR group had a significant reduction in body weight, BMI, body fat percentage and depression ( $P < 0.05$ ). The energy component of QOL was significantly increased in FCR group ( $p < 0.05$ ). There were no significant changes in sleep quality and stress level between the groups as a result of the intervention. In conclusion, FCR resulted in body weight and fat loss and alleviated depression with some improvement in the QOL in our study and has the potential to be implemented on a wider scale.

### C30 Stages of change to increase fruit and vegetable intake and its relationships with fruit and vegetable intake and related psychosocial factors

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Nutrition Research and Practice, Vol. 8(3), 2014, 297-303

**Background/Objectives:** Understanding individual's intention, action and maintenance to increase fruit and vegetable intake is an initial step in designing nutrition or health promotion programs. This study aimed to determine stages of change to increase fruit and vegetable intake and its relationships with fruit and vegetable intake, self-efficacy, perceived benefits and perceived barriers. **Subjects/Methods:** This cross-sectional study was conducted among 348 public university staff in Universiti Putra Malaysia. A pre-tested self-administered questionnaire and two days 24-hour diet recall were used. Results: Half of the respondents (50%) were in preparation stage, followed by 43% in action/maintenance, 7% in pre-contemplation/contemplation stages. Respondents in action/maintenance stages had significantly higher self-efficacy ( $F = 9.17, P < 0.001$ ) and perceived benefits ( $F = 5.07, P < 0.01$ ) while respondents in pre-contemplation/contemplation and preparation stages had significantly higher perceived barriers ( $F = 4.83, P < 0.05$ ). Perceived benefits tend to outweigh perceived barriers preceding to taking action. Self-efficacy is important in motivating individuals to increase fruit and vegetable intake as self-efficacy and perceived barriers crossed over between preparation and action/maintenance. Respondents in action/maintenance stages had the highest adjusted mean serving of fruit and vegetable intake ( $F = 4.52, P < 0.05$ ) but the intake did not meet recommendation. **Conclusion:** Intervention strategies should emphasize on increasing perceived benefits and building self-efficacy by providing knowledge and skills to consume a diet high in fruits and vegetables in order to promote healthy changes in having high fruit and vegetable intake.

### C31 Nutrient intake pattern of vegetarians and non-vegetarians in Kuala Lumpur, Malaysia

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Pakistan Journal of Nutrition, Vol. 12 (4), 2013, 371-376

Vegetarians adhering to a well-planned diet are assumed to meet nutrient requirements. This study was designed to evaluate the nutrient intake of adult vegetarians and non-vegetarians in Kuala Lumpur. A cross-sectional comparison between three types of diet practices was carried out in Kuala Lumpur, with 35 respondents in each group (non-vegetarian, ovolacto-vegetarian and strict-vegetarian). Anthropometric indices such as weight and body fat composition were measured using TANITA electronic balance scale, while three-day dietary recalls were assessed using a computer dietary analysis software programme, Nutritionist-pro. Statistical analysis has shown non-significant difference in the three diet practices with respect to anthropometric indices.



The benefits of vegetarian practices were obviously presented in the dietary intake of nutrients. Both ovo-lacto-vegetarians and strict-vegetarians had significantly higher mean dietary intake of fiber, folate, magnesium, vitamin A and vitamin C than non-vegetarians ( $p < 0.01$ ). Surprisingly, some of the potential nutrient deficiencies among strict-vegetarians such as calcium, iron and zinc achieved the Recommended Nutrient Intakes (RNI) for Malaysia. However, the dietary habits of vegetarians were very heterogeneous and some of them did not comply with the requirements for calcium, iron zinc and vitamin B12. Malaysian vegetarians in this study generally have a better nutrient intake than non-vegetarians. Education on proper meal planning should be implemented among vegetarians to prevent potential nutritional deficiencies.

### C32 Association between home environment, dietary practice, and physical activity among primary school children in Selangor, Malaysia

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Malaysian Journal of Nutrition, Vol. 20(1), 2014, 1 - 14

The home environment plays an influential role in affecting dietary and physical activity practices of children. This study aimed to determine the association between the home environment, dietary practice and physical activity among primary school children in Selangor. **Methods:** This cross-sectional study was conducted in five primary schools selected using multistage stratified sampling. A total of 293 children (32.8% males and 67.2% females) (mean age of  $11.0 \pm 0.9$  years) and their parents (10.7% fathers and 89.3% mothers) completed the study. Dietary practice of the children was assessed using a two-day dietary recall. Energy expenditure and physical activity of the children were assessed using a two-day physical activity recall. Parents of the children completed the Home Environment Survey (HES). **Results:** The mean energy intake of the children was  $1765 \pm 416$  kcal/day with 75.0% not achieving the Malaysian Recommended Nutrient Intake (RNI) for energy. Almost all children (96.5%) were physically inactive, with a mean energy expenditure of  $1269 \pm 342$  kcal/day. High availability of fruit/vegetable at home was associated with high vegetable intake ( $r = 0.128$ ,  $p < 0.05$ ) and low fat intake ( $r = -0.115$ ,  $p < 0.05$ ). High availability of fats/sweets at home ( $r = 0.125$ ,  $p < 0.05$ ) and parental role modelling of healthy eating ( $r = 0.117$ ,  $p < 0.05$ ) were associated with high fruit intake. High availability of physical activity equipment at home was associated with high energy expenditure ( $r = 0.123$ ,  $p < 0.05$ ). Parental role modelling of physical activity was associated with high energy expenditure ( $r = 0.123$ ,  $p < 0.05$ ) and high physical activity ( $r = 0.123$ ,  $p < 0.05$ ). **Conclusion:** The results indicate the important roles of parents in promoting healthy eating and active lifestyles among children.





**D**

**Micronutrient**

## D1 Association between dietary folate intake and blood status of folate and homocysteine in Malaysian adults

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Journal of Nutritional Science and Vitaminology, Vol. 57(2), 2011, 150-155

Folate is of prime interest among investigators in nutrition due to its multiple roles in maintaining health, especially in preventing neural tube defects and reducing the risk of cardiovascular diseases. We investigated the effect of dietary folate intake on blood folate, vitamin B (12), vitamin B (6), and homocysteine status. One hundred subjects consisting of Chinese and Malay subjects volunteered to participate in this cross-sectional study. Dietary folate intake was assessed by 24-h dietary recall and a food-frequency questionnaire (FFQ). Serum and red blood cell folate were analyzed using a microbiological assay, while serum vitamin B(12) was determined by electrochemiluminescence immunoassay (ECLIA), and high-performance liquid chromatography (HPLC) was used for the determination of serum vitamin B(6) and homocysteine. The mean folate intake, serum folate, RBC folate, serum vitamin B (12), and B (6), were higher in female subjects, with the exception of serum homocysteine. The Chinese tended to have higher folate intake, serum folate, RBC folate, and vitamin B (12). A positive association was found between folate intake and serum folate while a negative association was found between folate intake and serum homocysteine. Stepwise linear regression of serum folate showed a significant positive coefficient for folate intake whilst a significant negative coefficient was found for serum homocysteine when controlling for age, gender, and ethnicity. In conclusion, high dietary folate intake helps to increase serum folate and to lower the homocysteine levels.

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## D2 Prevalence of vitamin D insufficiency and its associating factors in Malaysian men

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Osteoporosis International, Vol. 25(5), 2014, 630

**Aims:** Vitamin D insufficiency is prevalent even in tropical regions. The data on vitamin D status in Malaysian men is inadequate. This study aimed to determine the prevalence of vitamin D insufficiency in Malaysian Chinese and Malay men and its correlates. **Methods:** 383 Chinese and Malay men living in Klang Valley, Malaysia were recruited in this cross-sectional study. Their age, ethnicity and anthropometric measurements (height, body weight and BMI) were recorded. Their physical activity status was assessed using International Physical Activity Questionnaire and was ranked as high, moderate and low. Their bone health was determined using quantitative ultrasound method and was expressed in calcaneal speed of sound (SOS). Their fasting blood was collected for serum 25-hydroxyvitamin D [25(OH) D], intact PTH, total calcium and inorganic phosphate measurements. The serum 25(OH) D level was determined using immunoassay kit. The cutoff value for vitamin D insufficiency was set at 50 nmol/l. The association between serum 25(OH) D level and its correlates was determined using multiple linear regression. **Results:** The overall prevalence of vitamin D insufficiency was 22.7%. Vitamin D insufficiency was more prevalent in the Malays (34.0%) compared to the Chinese (15.5%). Being Chinese ( $\beta=0.205$ ;  $p<0.001$ ), older

age ( $\beta=0.150$ ;  $p=0.003$ ) and having high physical activity status ( $\beta=0.131$ ;  $p=0.034$ ) were significantly associated with having a higher serum 25(OH) D level. An increase in BMI ( $\beta=0.136$ ;  $p=0.007$ ) was significantly associated with a decrease in serum 25(OH) D level. Bone health of the subjects as reflected via calcaneal SOS was not associated with serum 25(OH)D, intact PTH, total calcium and inorganic phosphate levels ( $p<0.05$ ). **Conclusions:** A substantial proportion of Malaysian men are suffering from vitamin D insufficiency. Men who are of Malay ethnicity, young age, overweight/obese and sedentary have higher risk of suffering from vitamin D insufficiency. These risk factors should be acknowledged and steps should be taken to retard the progression of vitamin D insufficiency in Malaysian men.

### D3 Vitamin D status in Malaysian men and its associated factors

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Nutrients, Vol. 6, 2014, 5419-5433

Vitamin D insufficiency is a global health problem. The data on vitamin D status in Malaysian men is insufficient. This study aimed to investigate vitamin D status among Chinese and Malay men in Malaysia and its associating factors. A cross-sectional study was conducted on 383 men aged 20 years and above, residing in Klang Valley, Malaysia. Their age, ethnicity, body anthropometry and calcaneal speed of sound (SOS) were recorded. Their fasting blood was collected for serum 5-hydroxyvitamin D (25(OH) D), intact parathyroid (PTH), total calcium and inorganic phosphate assays. Vitamin D deficiency was defined as a serum 25(OH) D level  $<30$  nmol/L and insufficiency as a serum 25(OH) D level between 30 and 50 nmol/L. The overall prevalence of vitamin D deficiency was 0.5%, and insufficiency was 22.7%. Vitamin D deficiency and insufficiency were more prevalent in the Malays compared to the Chinese. Being Chinese, older in age, having lower body mass index (BMI) and a high physical activity status were associated significantly with a higher serum 25(OH)D level ( $p<0.05$ ). The serum PTH level was inversely associated with the serum 25(OH) D level ( $p<0.05$ ). As a conclusion, a significant proportion of Malaysian men have vitamin D insufficiency, although deficiency is uncommon. Steps should be taken to correct the vitamin D status of these men.

### D4 Maternal serum and breast milk vitamin D levels: Findings from the Universiti Sains Malaysia pregnancy cohort study

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Plos One, Vol. 9(7), 2014, 1-8

**Background:** Vitamin D deficiency has become a global health issue in pregnant women. This study aimed to assess the adequacy of maternal vitamin D status by measuring maternal serum and breast milk 25-hydroxyvitamin D [25(OH)D] levels and to determine the association between maternal serum and milk 25(OH)D levels. **Methods:** Data was obtained from the Universiti Sains Malaysia Pregnancy Cohort Study. This study was conducted from April 2010 to December 2012 in the state of Kelantan, Malaysia. Blood samples from pregnant women aged 19 to 40 years were drawn in the second and third trimesters of pregnancy, while breast milk samples at delivery, 2, 6 and 12 months postpartum were collected to analyze for 25(OH) D levels. A total of 102 pregnant women were included in the analysis. **Results:** Vitamin D deficiency [25(OH) D <50 nmol/L] was detected in 60% and 37% of women in the second and third trimesters of pregnancy, respectively. There were 6% and 23% of women who reached normal level of vitamin D status in the second trimester and the third trimester, respectively. Multivitamin intakes during pregnancy were significantly associated with higher serum 25(OH) D levels in the second trimester ( $\beta = 9.16$ ,  $p = 0.005$ ) and the third trimester ( $\beta = 13.65$ ,  $p = 0.003$ ). 25(OH)D levels in breast milk during the first year of lactation ranged from 1.01 to 1.26 nmol/L. Higher maternal serum 25(OH)D level in the second trimester of pregnancy was associated with an elevated level of 25(OH)D in breast milk at delivery ( $\beta = 0.002$ ,  $p = 0.026$ ). **Conclusions:** This study shows that high proportions of Malay pregnant women are at risk of vitamin D deficiency. Maternal vitamin D status in the second trimester of pregnancy was found to influence vitamin D level in breast milk at delivery.

## D5 Micronutrient interventions on cognitive performance of children aged 5-15 years in developing countries

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Asia Pacific Journal of Clinical Nutrition, Vol. 21(4), 2012, 476-486

It is estimated that more than 200 million young children worldwide fail to reach their potential in cognitive development owing to undernutrition. Numerous studies have assessed the effects of micronutrient supplementation on growth and cognitive development in infants, toddlers and preschoolers. However, micronutrient interventions on the cognitive performance of older children are limited. This article seeks to provide an update on micronutrient interventions and cognitive outcomes among children aged 5-15 years in developing countries. A total of 13 randomized controlled trials published since 2000 were identified. Majority of these studies assessed the effects of micronutrient-fortified foods on various domains of cognitive function. Among key micronutrients assessed were iron, zinc, iodine and vitamin A. This review found a lack of consistency in the impact of micronutrient supplementation on intelligence, long term mental functions and school examination grades of the children. A beneficial effect of micronutrient supplementation on short term memory was more consistently reported. Overall, the evidence from this review for the impact of micronutrients on cognitive performance in older children remains equivocal. In light of the growing interest on the influence of nutrition on cognition, it is important that culturally-appropriate and sufficiently sensitive assessment tools be used for measuring the desired cognitive outcomes that are most likely to be affected by the nutrients under study.

D6

## High prevalence of vitamin D insufficiency and its association with BMI-for-age among primary school children in Kuala Lumpur, Malaysia

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BMC Public Health, Vol.11 (95), 2011

**Background:** Deficiencies of micronutrients can affect the growth and development of children. There is increasing evidence of vitamin D deficiency world-wide resulting in nutritional rickets in children and osteoporosis in adulthood. Data on the micronutrient status of children in Malaysia is limited. The aim of this study was to determine the anthropometric and micronutrient status of primary school children in the capital city of Kuala Lumpur. **Methods:** A cross sectional study of primary aged school children was undertaken in 2008. A total of 402 boys and girls aged 7-12 years, attending primary schools in Kuala Lumpur participated in the study. Fasting blood samples were taken to assess vitamin D [as 25(OH) D], vitamin B12, folate, zinc, iron, and ferritin and haemoglobin concentrations. Height-for-age and body mass index for age (BMI-for-age) of the children were computed. **Results:** Most of the children had normal height-for-age (96.5%) while slightly over half (58.0%) had normal BMI-for-age. A total of 17.9% were overweight and 16.4% obese. Prevalence of obesity was significantly higher among the boys (25%) than in the girls (9.5%) ( $\chi^2 = 22.949$ ;  $P < .001$ ). Most children had adequate concentrations of haemoglobin, serum ferritin, zinc, folate and vitamin B12. In contrast, 35.3% of the children had serum 25(OH) D concentrations indicative of vitamin D deficiency ( $\leq 37.5$  nmol/L) and a further 37.1% had insufficiency concentrations ( $> 37.5 - \leq 50$  nmol/L). Among the boys, a significant inverse association was found between serum vitamin D status and BMI-for-age ( $\chi^2 = 5.958$ ;  $P = .016$ ). **Conclusions:** This study highlights the presence of a high prevalence of sub-optimal vitamin D status among urban primary school children in a tropical country. In light of the growing problem of obesity in Malaysian children, these findings emphasize the important need for appropriate interventions to address both problems of obesity and poor vitamin D status in children.

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D7

## Iodized salt supplementation and its effects on thyroid status amongst Orang Asli in Hulu Selangor, Malaysia

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Asia Pacific Journal of Clinical Nutrition, Vol. 22(1), 2013, 41-47

This research was performed to determine the prevalence of iodine deficiency disorder (IDD) and the effects of iodized salt supplementation on thyroid status amongst Orang Asli in Hulu Selangor, Malaysia. Study respondents were from three target groups, i.e. pre-school children (PSC), primary school-going children (SGC) and adult women. Each household was supplied with iodized salt fortified with iodate fortificant for a period of 12 months and the iodine levels in the salt ranged from 20 to 30  $\mu\text{g/L}$ . Samples collected before and after 6 and 12 months of introduction to iodized salt were urine from all groups, as well as serum samples from adult women. A total of 200 respondents were recruited; 58 (29.0%) PSC, 65 (32.5%) SGC and 77 (38.5%) adult women. The median urine-iodine concentration (mUIC) in all groups were of moderately low

before the iodized salt intervention, but increased significantly in all study groups after 6 and 12 months of intervention. However, at the end of the study, there was an increase in severe iodine deficiency (mUIC <20 µg/L) from 7.5% to 12% and about 9% of PSC and SGC respondents had mUIC level of more than 300 µg/L while the adult women showed a significant increase in free triiodothyronine (fT3) levels. The study demonstrated that iodized salt supplementation was able to show an improvement in iodine level amongst Orang Asli. However, an increase in severe iodine deficiency and iodine excess indicated that the iodized salt programme needs to be carefully monitored.

## **D8 Inadequate iodine intake among school children in Terengganu- Findings from the National Iodine Deficiency Disorder Survey 2008**

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International Journal of Public Health Research, Vol. 3(1), 2013, 198-203

Iodine deficiency is still prevalent worldwide and it is the main cause of goiter, thyroid dysfunction and mental retardation. The aim of the study was to determine the iodine status and goiter prevalence among the school children in Terengganu. The representative sample consists of 1163 primary school children aged 8-10 years old randomly selected from urban and rural schools in Terengganu using stratified systematic random sampling technique. Urinary iodine levels in spot urine were determined by in house modified micro-method while goiter assessment was carried out by palpation of thyroid gland. The status of iodine deficiency was determined by the median urinary iodine concentrations (UIC) and total goiter prevalence (TGP) in accordance with the WHO criteria. The result showed the median [inter-quartile range (IQR)] urinary iodine concentrations was 78.7µg/L (50.1µg/L -120.0µg/L) indicating the iodine intake was slightly lower than recommended range of 100 µg/L. The rural school children had a significantly lower Iodine levels (median UIC=72.4µg/L, IQR=46.7µg/L -113.0µg/L) than the urban school children (median UIC=87.7µg/L, IQR=54.5 µg/L - 127.5µg/L). The total goiter prevalence (TGP) was 5.7%. The prevalence of goiter was significantly higher in rural (TGP=6.9%) compared to urban areas (TGP=3.6%). The study revealed that school children in Terengganu showed mild iodine deficiency and the condition is more pronounced in children from rural areas. The findings emphasize the importance of intervention implementation, universal salt iodization to ensure sufficient intake of iodine among the Terengganu school children.

## **D9 Prevalence of iodine deficiency disorder amongst Orang Asli in Hulu Selangor, Malaysia**

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Medical and Health Science Journal (MHSJ), Vol. 11, 2012, 2-6

Iodine deficiency disorder (IDD) remains a significant global public health problem. The aim of this study was to assess the prevalence of IDD amongst Orang Asli in semi-urban areas. A cross



sectional study was conducted in April of 2006 in whom 346 children and adult women participated. UIC was performed in 97 (28.0%) pre-school children (PSC) aged 1-6 years old, 115 (33.2%) primary school going children (SGC) aged 7-12 years old and 134 (38.8%) adult women (â(c)3/4 15 years old). The median UIC of the studied population was 45.11 Î1/4g/L while the median UIC was 49.43 Î1/4g/L, 47.81 Î1/4g/L and 38.98 Î1/4g/L for PSC, SGC and adult women respectively. Moderate to severe IDD was present in 50% of PSC, 53.9% of SGC and 70.1% of adult women. Therefore, the Universal salt Iodization (USI) approach may have eliminate IDD in the areas.

## D10 Does religious fasting affect energy and macro-nutrients intakes?

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Nutrition and Food Science, Vol.43 (3), 2013, 254-260

**Purpose:** This study was designed with the aim of assessing the energy and nutrient intakes of male university students before and during Ramadan and comparing it with the Recommended Nutrient Intake (RNI) of Malaysia. **Design/ methodology/ approach:** A total of 30 male students aged between 19-24 years from International Islamic University Malaysia (IIUM) Kuantan Campus were recruited before Ramadan. The height, weight, waist and hip circumferences were recorded on day one of Ramadan and also recorded on day 21 of Ramadan to assess the changes. From the weight and height, the body mass index was calculated and from the waist and hip circumference, the waist-to-hip ratios were calculated. The respondents were requested to keep three days food record in household measurements; once prior to fasting and once during the third week of Ramadan. The records were then analyzed using Malaysian Food Composition Table and Food Atlas to get the averages of energy and macronutrients intakes of the subjects. **Findings:** After 21 days of Ramadan, the results revealed that there was reduction in the body weight and there was significant (P<0.05) improvement in the waist-to-hip ratio of the subjects. The effect was more prominent in the normal-weight compared to overweight respondents. The mean energy and protein intakes were significantly (P<0.001) lower than the RNI for Malaysians of similar age group. However, mean energy and protein intakes increased during Ramadan compared to the first day of Ramadan. This study indicates that Ramadan fasting does not affect energy and macronutrients intake but only the routine of intake is affected. **Research limitations/ implications:** This research was limited to a specific group of normal and overweight students who were residing on campus of the IIUM. Their intakes might not be consistent with those at home or living outside the university campus. Another thing is that the students might have over-reported their energy and macro\_nutrients intakes compared to what they have consumed in reality. So, the self-reported intakes could not be ascertained. The stated factors might have confounding effects on the finding of this research. **Practical implications:** Most research argues that the body weight loss during Ramadan fasting is due to reduced energy consumption; however, this is not true in all cases. This study infers that there is no reduction in the total energy consumption, rather there is a change in the pattern of energy intake. This brief study would help researchers planning to conduct research on Ramadan fasting and will caution fasting readers about the intakes. **Originality/ value:** This study indicates that during Ramadan fasting does not affect energy and macro-nutrients intake but only the schedule of intake is affected

## D11 Association between vitamin A, vitamin E and apolipoprotein E status with mild cognitive impairment among elderly people in low-cost residential areas

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Nutritional Neuroscience, Vol.16 (1), 2013, 6-12

**Rationale:** The influence of nutritional parameters and genetic susceptibility on poor cognitive impairment has been documented; however, the association between lipid-soluble vitamins with genetic susceptibility on mild cognitive impairment (MCI) has not yet been studied extensively. **Objectives:** The aim of the present study was (1) to determine the prevalence of MCI and its associated risk factors and (2) to investigate the influence of the apolipoprotein E (APOE)  $\epsilon$ 4 allele on peripheral vitamin A and E concentration in MCI and non-MCI groups. **Methods:** A total of 333 subjects aged 60 years and above, residing in public housing areas in Kuala Lumpur, Malaysia were interviewed to obtain information on their neuropsychological status. Fasting venous blood was taken for determination of vitamin A and vitamin E concentration using high-performance liquid chromatography. Restriction fragment length polymorphism analysis was performed to determine the APOE genotypes. Results: The prevalence of MCI was 21.1%. Binary logistic regression indicated that the predictors of MCI were being married, overweight or obesity, and had vitamin A deficiency. In non-MCI subjects, vitamin E levels were lower among APOE $\epsilon$ 4 allele carriers as compared to the non-carriers ( $P < 0.05$ ). **Conclusion:** The study highlighted the importance of maintaining good nutritional status and vitamin A status for optimal cognitive function. The presence of APOE $\epsilon$ 4 allele has a prominent role in affecting vitamin E levels, particularly among cognitively healthy elderly in our unique population.

## D12 Iodine deficiency and mental performance: A review

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International Journal of Public Health Research, Vol. 3(2), 2013, 312-317

**Introduction:** Iodine deficiency disorders (IDD) is responsible for a lot of adverse health effects and it is one of the most common causes of preventable mental impairment. Impaired cognitive function is an outcome of impaired neurodevelopment process during early pregnancy due to iodine deficiency. **Methods:** A few cross sectional studies found differences in mental performance between areas with high iodine found naturally in the environment (well water) and those with low iodine level, but other studies showed otherwise. **Results:** Intervention studies with iodine also give variety of results ranging from significant improvement of mental performance to non-significant findings. **Conclusions:** Malaysia faces with challenges in iodine supplementation among the population but it can be dealt with effectively if the programme is well executed and monitored.



**E**

**Overweight and  
Obesity**

## E1 Identification of circulating microRNAs in young men with central obesity

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Asian Pacific Journal of Tropical Disease, Vol. 4(3), 2014, 236

**Introduction:** Central obesity has been identified as a stronger risk factor than overall obesity for morbidity and mortality of chronic diseases. Currently, studies showed that microRNAs (miRNAs) can be found in adipose tissue and blood circulation of obese persons. Thus, miRNAs can be a potential candidate as a biomarker. **Objectives:** To determine miRNAs expression in circulating blood of central obese young men compared to non-central obese young men. Significant miRNAs will be validated individually through qPCR. **Methods:** Sixteen young men with mean age of  $32.75 \pm 5.93$  years old were recruited around Selangor and Kuala Lumpur. The central obese group was comprised of subjects with mean BMI of  $31.59 \pm 2.92 \text{ kg/m}^2$ , mean waist circumference of  $101.92 \pm 7.61 \text{ cm}$ , mean TC of  $5.52 \pm 1.12 \text{ mmol/L}$ , mean TG of  $1.85 \pm 0.74 \text{ mmol/L}$ , mean HDL of  $0.93 \pm 0.07 \text{ mmol/L}$  and mean LDL of  $3.75 \pm 1.01 \text{ mmol/L}$ . Meanwhile, the control group was comprised of subjects with mean BMI of  $23.86 \pm 2.38 \text{ kg/m}^2$ , mean waist circumference of  $80.17 \pm 3.97 \text{ cm}$ , mean TC of  $4.9 \pm 0.33 \text{ mmol/L}$ , mean TG of  $0.78 \pm 0.20 \text{ mmol/L}$ , mean HDL of  $1.30 \pm 0.15 \text{ mmol/L}$  and mean LDL of  $3.24 \pm 0.31 \text{ mmol/L}$ . The blood was collected for qPCR-based profiling using miRCURY LNA(tm) Serum/ Plasma Focus microRNA PCR Panel. The data were analysed by GenEx software and SPSS version 16. **Results & Discussion:** Twenty four significant miRNAs were found to be differentially expressed in central obese group compared to normal group ( $P < 0.05$ ). Twenty miRNAs were up-regulated and four miRNAs were down-regulated. Among these, miR-34a has been identified as the most up-regulated miRNA. The aberrantly elevated hepatic miR-34a was found to impair  $\beta\text{KL/FGF19}$  signaling pathway in obesity by targeting directly on  $\beta\text{KL mRNA}$ . The role of this miRNA was found in patient with nonalcoholic liver fatty disease and insulin resistance through the FGF19 signaling. **Conclusion:** This study has identified miRNAs that were differentially expressed in blood circulation of central obese young men. However, these miRNAs must be validated before proceeding to exploratory downstream research.

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## E2 Reduced fibrinogen, fibrinolytic biomarkers, and physical parameters after a weight-loss program in obese subjects

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North American Journal of Medical Sciences, Vol.6 (8), 2014, 377-382

Obese subjects are at risk of multiple comorbidities including stroke and coronary heart disease (CHD), which is partly due to disturbances in the hemostatic system. The aims of the present

study were to determine the effects of a weight-loss program on fibrinogen and fibrinolytic markers. Twenty-eight obese subjects were involved in a weight-loss program consisted of exercise and nutritional education for 12-weeks duration. Physical parameters were documented and blood specimen was tested at pre and post-intervention for fibrinogen, tissue plasminogen activator (t-PA), plasminogen activator inhibitor-1 (PAI-1), and thrombin activatable fibrinolysis inhibitor (TAFI). Paired t-test was used for statistical analysis. There was a significant decline in the levels of t-PA, PAI-I, TAFI and fibrinogen following the weight-loss program ( $P < 0.01$  for each). A significant positive correlation between tPA levels and body weight, body mass index (BMI), waist circumference, and fat-free mass were found. There was also a significant correlation between BMI and other blood parameters. Reduced fibrinogen, fibrinolytic, and physical parameters were demonstrated in obese subjects following the weight reduction program. These findings suggest the possible beneficial effects of this program on the hemostatic burden particularly on the fibrinolytic biomarkers.

### E3 Optimal waist circumference cut-off values for predicting cardiovascular risk factors in a multi-ethnic Malaysian population

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Obesity Research and Clinical Practice, Vol. 8(2), 2014

**Introduction:** Previous studies have proposed the lower waist circumference (WC) cutoffs be used for defining abdominal obesity in Asian populations. **Objective:** To determine the optimal cut-offs of waist circumference (WC) in predicting cardiovascular (CV) risk factors in the multi-ethnic Malaysian population. **Methods:** We analysed data from 32,703 respondents (14,980 men and 17,723 women) aged 18 years and above who participated in the Third National Health and Morbidity Survey in 2006. Gender-specific logistic regression analyses were used to examine associations between WC and three CV risk factors (diabetes mellitus, hypertension, and hypercholesterolemia). The Receiver Operating Characteristic (ROC) curves were used to determine the cut-off values of WC with optimum sensitivity and specificity for detecting these CV risk factors. **Results:** The odds ratio for having diabetes mellitus, hypertension, and hypercholesterolemia, or at least one of these risks, increased significantly as the WC cut-off point increased. Optimal WC cut-off values for predicting the presence of diabetes mellitus, hypertension, hypercholesterolemia and at least one of the three CV risk factors varied from 81.4 to 85.5 cm for men and 79.8 to 80.7 cm for women. **Conclusions:** Our findings indicate that WC cut-offs of 81 cm for men and 80 cm for women are appropriate for defining abdominal obesity and for recommendation to undergo cardiovascular risk screening and weight management in the Malaysian adult population.

## E4 Optimal BMI cut-off values for predicting diabetes, hypertension and hypercholesterolaemia in a multi-ethnic population

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Public Health Nutrition, Vol.16 (3), 2013, 453-459

**Objective:** To determine the optimal cut-offs of BMI for Malaysian adults. **Design:** Population-based, cross-sectional study. Receiver operating characteristic curves were used to determine the cut-off values of BMI with optimum sensitivity and specificity for the detection of three cardiovascular risk factors: diabetes mellitus, hypertension and hypercholesterolaemia. Gender-specific logistic regression analyses were used to examine the association between BMI and these cardiovascular risk factors. **Setting:** All fourteen states in Malaysia. **Subjects:** Malaysian adults aged  $\geq 18$  years (n 32 703) who participated in the Third National Health and Morbidity Survey in 2006. **Results:** The optimal BMI cut-off value for predicting the presence of diabetes mellitus, hypertension, hypercholesterolaemia or at least one of these cardiovascular risk factors varied from 23.3 to 24.1 kg/m<sup>2</sup> for men and from 24.0 to 25.4 kg/m<sup>2</sup> for women. In men and women, the odds ratio for having diabetes mellitus, hypertension, hypercholesterolaemia or at least one cardiovascular risk factor increased significantly as BMI cut-off point increased. **Conclusions:** Our findings indicate that BMI cut-offs of 23.0 kg/m<sup>2</sup> in men and 24.0 kg/m<sup>2</sup> in women are appropriate for classification of overweight. We suggest that these cut-offs can be used by health professionals to identify individuals for cardiovascular risk screening and weight management programmes.

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## E5 Serum osteocalcin is significantly related to indices of obesity and lipid profile in Malaysian men

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International Journal of Medical Sciences, Vol.11 (2), 2014, 5151-5157

**Background and aim:** Recent studies revealed a possible reciprocal relationship between the skeletal system and obesity and lipid metabolism, mediated by osteocalcin, an osteoblast-specific protein. This study aimed to validate the relationship between serum osteocalcin and indices of obesity and lipid parameters in a group of Malaysian men. **Methods:** A total of 373 men from the Malaysian Aging Male Study were included in the analysis. Data on subjects' demography, body mass index (BMI), body fat (BF) mass, waist circumference (WC), serum osteocalcin and fasting lipid levels were collected. Bioelectrical impedance (BIA) method was used to estimate BF. Multiple linear and binary logistic regression analyses were performed to analyze the association between serum osteocalcin and the aforementioned variables, with adjustment for age, ethnicity and BMI. **Results:** Multiple regression results indicated that weight, BMI, BF mass, BF %, WC were significantly and negatively associated with serum osteocalcin ( $p < 0.001$ ). There was a

significant positive association between serum osteocalcin and high density lipoprotein (HDL) cholesterol ( $p = 0.032$ ). Binary logistic results indicated that subjects with low serum osteocalcin level were more likely to be associated with high BMI (obese and overweight), high BF%, high WC and low HDL cholesterol ( $p < 0.05$ ). Subjects with high osteocalcin level also demonstrated high total cholesterol level ( $p < 0.05$ ) but this association was probably driven by high HDL level. These variables were not associated with serum C-terminal of telopeptide crosslinks in the subjects ( $p > 0.05$ ). **Conclusion:** Serum osteocalcin is associated with indices of obesity and HDL level in men. These relationships should be validated by a longitudinal study, with comprehensive hormone profile testing.

## **E6 Improved insulin sensitivity, central systolic pressure and inflammatory indicators achieved with minor weight reduction in overweight and obese subjects given education on lifestyle modification**

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Asian Biomedicine, Vol. 8(2), 2014, 185-194

Obesity is a global epidemic disease; lifestyle modification is an approach in the prevention and management of obesity. We determined the effects of education on modified lifestyle intervention on arterial stiffness, metabolic and inflammatory markers. Twenty-five generally healthy overweight and obese subjects completed nine months education on modified lifestyle intervention at Hospital Universiti Sains Malaysia, Kota Bharu. Subjects were regularly counselled to increase physical activity and modify their diet during intervention. Arterial stiffness was measured noninvasively using carotid femoral pulse wave velocity (PWV) and pulse wave analysis (PWA). Anthropometric measurements, body fat percentage and visceral fat, central and brachial blood pressures, lipid profile, the inflammatory marker high sensitivity C-reactive protein (hsCRP) and insulin sensitivity were also recorded. After nine months, a significant weight loss of 2.2 kg was observed associated with significant reductions in waist and hip circumference, aortic systolic blood pressure, serum fasting insulin, insulin resistance, and hsCRP levels. Insulin sensitivity was increased, while body fat and visceral fat percentages were marginally reduced ( $p = 0.058$  and  $p = 0.059$ ). No significant differences were seen in arterial stiffness, fasting plasma glucose and lipid profile. Education on modified lifestyle intervention improved insulin sensitivity and resistance, reduced hsCRP and aortic systolic blood pressure despite the small weight reduction achieved

## Sleep habits, food intake, and physical activity levels in normal and overweight and obese Malaysian children

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Obesity Research and Clinical Practice, Vol.8 (1), 2014, 70-80

**Objective:** This study aimed to determine the association between sleep habits (including bedtime, wake up time, sleep duration, and sleep disorder score) and physical characteristics, physical activity level, and food pattern in overweight and obese versus normal weight children. **Design:** Case control study. **Subjects:** 164 Malaysian boys and girls aged 6-12 years. **Methods:** Anthropometric measurements included weight, height, waist circumference, and body fat percentage. Subjects divided into normal weight (n = 82) and overweight/obese (n = 82) group based on World Health Organization 2007 BMI-for-age criteria and were matched one by one based on ethnicity, gender, and age plus minus one year. Questionnaires related to sleep habits, physical activity, and food frequency were proxy-reported by parents. Sleep disorder score was measured by Children Sleep Habit Questionnaire. **Results:** Sleep disorder score and carbohydrate intake (%) to total energy intake were significantly higher in overweight/ obese group (p < 0.01 and p < 0.05, respectively). After adjusting for age and gender, sleep disorder score was correlated with BMI (r = 0.275, p < 0.001), weight (r = 0.253, p < 0.001), and WC (r = 0.293, p < 0.001). Based on adjusted odd ratio, children with shortest sleep duration were found to have 4.5 times higher odds of being overweight/ obese (odd ratio: 4.536, 95% CI: 1.912–8.898) compared to children with normal sleep duration. The odds of being overweight/obese in children with sleep disorder score higher than 48 were 2.17 times more than children with sleep disorder score less than 48. **Conclusion:** Children who sleep less than normal amount, had poor sleep quality, and consumed more carbohydrates were at higher risk of overweight/ obesity.

## Perceived physical activity barriers related to body weight status and sociodemographic factors among Malaysian men in Klang Valley

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BMC Public Health, Vol. 13 (1), 2013

**Background:** Physical inactivity has been acknowledged as a public health issue and has received increasing attention in recent years. This cross-sectional study was conducted to determine the barriers to physical activity among Malaysian men. These barriers were analyzed with regards to sociodemographic factors, physical activity level, BMI and waist circumference. **Methods:** Subjects in this study included 308 Malay men and 422 Chinese men aged 20 years and older.



Subjects completed the International Physical Activity Questionnaire (IPAQ) and a questionnaire on barriers to physical activity, categorized into personal and psychological, physical and social environment barriers. Weight, height and waist circumference were also measured and BMI was calculated. Results: Descriptive analyses showed that 79.3% of subjects were married, 52.1% had secondary educational level, 68.8% were still working, and 39.7% had household income between RM1500 to RM3500. The perception that other recreational activities with family and friends were more fun was the most frequently reported barrier, followed by weather, lack of discipline, lack of free time, lack of money, and lack of friends. Marriage status, educational level, household income, BMI, and physical activity status were shown to be associated with perceived barriers. **Conclusions:** To increase participation in physical activity, policy makers should consider significant personal, social and environmental barriers when developing appropriate intervention programmes. Health-promoting strategies that increase awareness, knowledge, skills and motivation related to physical activity are required.

### **E9 Overweight problem among primary health care workers in suburban district of Hulu Langat, Selangor, Malaysia**

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Pakistan Journal of Nutrition, Vol.12 (3), 2013, 291-296

Globally, overweight has become the epidemic due to world growth in industry, economy, urbanization and globalization. This study was conducted to highlight the overweight problem and its associated factors among health care workers in Suburban District of Hulu Langat, Selangor, Malaysia. A cross sectional study was conducted using IPAQ short version and Food Frequency Questionnaire to measure fat intake while knowledge was measured using a set of validated questionnaire. The anthropometric measurement was carried out using a calibrated SECA scale, body meter and measurement tape. Data was analyzed using software Diet 4. The overweight prevalence in this study is 46.1%. Age, sex, marital status, length of service, parity, education and income were significantly associated with overweight. However logistic regression showed that only education level and income has significant associations with overweight. It is concluded that the overweight prevalence among health workers is higher compared to previous studies in Malaysia. Higher income and low level of education are the predictors of overweight among health care workers.

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### **E10 Sensitivity and specificity of waist circumference as a single screening tool for identification of overweight and obesity among Malaysian adults**

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Generalised obesity and central obesity are risk factors for Type II diabetes mellitus and cardiovascular diseases. Waist circumference (WC) has been suggested as a single screening tool for identification of overweight or obese subjects in lieu of the body mass index (BMI) for weight management in public health program. Currently, the recommended waist circumference cut-off points of  $>$  or  $=$  94cm for men and  $>$  or  $=$  80cm for women (waist action level 1) and  $>$  or  $=$  102cm for men and  $>$  or  $=$  88cm for women (waist action level 2) used for identification of overweight and obesity are based on studies in Caucasian populations. The objective of this study was to assess the sensitivity and specificity of the recommended waist action levels, and to determine optimal WC cut-off points for identification of overweight or obesity with central fat distribution based on BMI for Malaysian adults. Data from 32,773 subjects (14,982 men and 17,791 women) aged 18 and above who participated in the Third National Health Morbidity Survey in 2006 were analysed. Sensitivity and specificity of WC at waist action level 1 were 48.3% and 97.5% for men; and 84.2% and 80.6% for women when compared to the cut-off points based on BMI  $>$  or  $=$  25kg/m<sup>2</sup>. At waist action level 2, sensitivity and specificity were 52.4% and 98.0% for men, and 79.2% and 85.4% for women when compared with the cut-off points based on BMI ( $>$  or  $=$  30 kg/m<sup>2</sup>). Receiver operating characteristic analyses showed that the appropriate screening cut-off points for WC to identify subjects with overweight ( $>$  or  $=$  25kg/m<sup>2</sup>) was 86.0cm (sensitivity=83.6%, specificity=82.5%) for men, and 79.1cm (sensitivity=85.0%, specificity=79.5%) for women. Waist circumference cut-off points to identify obese subjects (BMI  $>$  or  $=$  30 kg/m<sup>2</sup>) was 93.2cm (sensitivity=86.5%, specificity=85.7%) for men and 85.2cm (sensitivity=77.9%, specificity=78.0%) for women. Our findings demonstrated that the current recommended waist circumference cut-off points have low sensitivity for identification of overweight and obesity in men. We suggest that these newly identified cut-off points be considered.

## E11 Physical activities and sedentary behaviour among adolescents in Petaling District, Selangor, Malaysia

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Malaysian Journal of Medicine and Health Sciences, Vol.7 (1), 2011, 83-93

Physical inactivity is strongly associated with obesity and an increased risk of cardiovascular disease in children and adolescents. A cross-sectional study using multistage random sampling was conducted to determine associations between demographic characteristics, sedentary behaviours and physical activity among adolescents. Data were collected from 785 (414 males and 371 females) Form four students attending 15 schools in Petaling District, Selangor using an adapted self-administered questionnaire. Results showed that more females (50.1%) were physically inactive compared to males (39.6%) (Adjusted odds ratio (OR): 1.55, 95% confidence interval (CI): 1.12-2.15). Physically inactive adolescents were less likely to participate in intramural/house league sports (OR: 1.71, 95% CI: 1.19-2.44), school team sports (OR: 1.45, 95% CI: 1.03-2.04) and individual physical activities outside school (OR: 1.53, 95% CI: 1.11-2.12) compared to their physically active counterparts. Physically inactive adolescents were also less engaged in sedentary activities, such as television watching (OR: 0.69, 95% CI: 0.50-0.94), playing computer/video game (OR: 0.44, 95% CI: 0.28-0.72), talking on the telephone/mobile

phone text messaging (OR: 0.47, 95% CI: 0.32-0.69) and reading (OR: 0.45, 95% CI: 0.24-0.86) compared to those who were physically active. In this study, physical activity coexists with sedentary behaviour in adolescents. Sedentary activities may not necessarily displace physical activity among youth. In addition, these data suggest that promoting organised sports in school and outside the school among youths may be a potential strategy for increasing physical activity in this population.

## E12 Saffron: A natural potent antioxidant as a promising anti-obesity drug

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Antioxidants, Vol.2 (4), 2013, 293-308

Obesity is associated with various diseases, particularly diabetes, hypertension, osteoarthritis and heart disease. Research on possibilities of herbal extracts and isolated compounds from natural products for treating obesity has an upward trend. Saffron (*Crocus Sativus* L. Iridaceae) is a source of plant polyphenols/carotenoids, used as important spice and food colorant in different parts of the world. It has also been used in traditional medicine for treatment of different types of illnesses since ancient times. Many of these medicinal properties of saffron can be attributed to a number of its compounds such as crocetin, crocins and other substances having strong antioxidant and radical scavenger properties against a variety of radical oxygen species and pro-inflammatory cytokines. The aim of this article is to assess the potential role of saffron and its constituents in the regulation of metabolic functions, which can beneficially alter obesity pathophysiology.

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## E13 Overweight and obesity in Malaysia: An epidemiology survey

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Journal of Hypertension, Vol.30 (220), 2012

**Background and Objective:** In Malaysia, the prevalence of overweight and obesity (>18 years old) is escalating with 16.6% and 4.4% in 1996, 29.1% and 14.0% in 2006, and 33.6% and 19.5% in 2008. This study aims to continue monitoring the prevalence and its associations as it is strongly related to cardiovascular death. **Design and Method:** A community-based cross-sectional study, was carried out in Malaysia between 2007 and 2010, using cut-off points body mass index (BMI) of 23 and 27.5 kg/m<sup>2</sup> for overweight and obese. Data was analysed using STATA version 11. **Results:** A total of 10,963 subjects with complete BMI readings, out of 11,572

adult (>18 years old) subjects' (mean age 51.2+/-11.0) data were analysed. The age-adjusted prevalence of overweight and obese were 38.3% (95% CI: 37.7- 39.1) and 34.0% (95% CI: 33.0-34.8), with female was significantly more obese (36.7%, CI; 35.4-37.8) than male (30.4%, CI; 29.1-31.7) ( $p<0.001$ ) and urban population was significantly more obese (36.9%, CI; 35.6-38.1) than rural population (30.9%, CI; 29.6-32.1) ( $p<0.001$ ). Highest prevalence of obesity were in Malays (38.9%, CI; 37.8-39.9), followed by Indians (35.8%, CI; 30.7-41.2) and lowest in Chinese (17.4%, CI; 15.2-19.5). Obese subjects were 1.8 (CI; 1.44-2.33), 1.7 (CI; 1.04-2.81), 2.38 (CI; 1.34-4.23) and 2.4 (CI; 1.91-3.01) more likely to have dyslipidaemia, impaired fasting glucose (IFG), newly diagnosed diabetes and hypertension, when compared to normal BMI, respectively. Conclusion: This study highlights the serious rise in obesity prevalent which deem the health system into action strategy at national level, as suggested by WHO in fighting globesity.

#### **E14 USM Behavioural Lifestyle Modification Program reduces lipid-based cardiovascular risk in obese adults: A pilot study**

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International Medical Journal, Vol. 21(6), 2014, 1-4

To evaluate the effectiveness of USM behavioural lifestyle modification program in reducing lipid-based cardiovascular risk and to determine the association between body compositions and lipid parameters in obese participants. An interventional study was conducted over two years period involving 34 obese adults, all of whom were recruited from the Obesity Clinic, Hospital Universiti Sains Malaysia. Twenty nine out of 34 obese adults completed the 12 weeks program consisting of diet and exercise interventions. Anthropometric, body compositions and blood levels of lipid profile were obtained from the participants at week 0 (baseline) and 13. Data were compared between pre- and post-interventions using paired-t or Wilcoxon signed-rank test. The correlation analyses were conducted using Pearson or Spearman's rank correlation coefficient. Body weight, BMI, fat mass, triglyceride and VLDL-cholesterol levels were significantly reduced after the program. However, total cholesterol, LDL-cholesterol and HDL-cholesterol levels showed no significant changes at the end of the 12 weeks program. There was no significant correlation between body compositions and lipid parameters. Our preliminary findings support the beneficial effects of USM behavioural lifestyle modification program conducted at USM in reducing lipid-based cardiovascular risk in obese adults.

#### **E15 Association of changes in body composition with changes in systemic oxidative stress following weight loss program in obese adults attending Obesity Clinic, Hospital Universiti Sains Malaysia**

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The Open Obesity Journal, Vol.6, 2014, 60-64

The main objective of the present study was to evaluate the association of changes in body composition with changes in systemic oxidative stress markers among obese adults participating in a weight loss program. Thirty four obese adults were recruited from the Obesity Clinic, Hospital Universiti Sains Malaysia (USM) to voluntarily participate in a weight loss program comprising of physical exercise and dietary modification. Levels/activities of oxidative stress markers were measured before and after the program. Mean body weight, body mass index (BMI), waist circumference (WC), hip circumference (HC) and percentage of body fat mass decreased significantly while mean body lean mass and body water increased significantly after the weight loss program. Plasma glutathione peroxidase (GPx) activity and 4- hydroxynonenal (4-HNE) concentration increased significantly while other enzymatic antioxidant activities such as catalase (CAT) and superoxide dismutase (SOD) were not significantly increased. The ratio of reduced glutathione (GSH) to oxidized glutathione (GSSG) was significantly decreased. There was no significant association between changes in body composition and changes in systemic oxidative stress markers among obese adults. In conclusion, changes in body composition were not associated with changes in systemic oxidative stress markers among obese adults.

## **E16 Prevalence of overweight and obesity among adult Malaysians: An update**

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Asia Pacific Journal of Clinical Nutrition, Vol. 20(1), 2011, 35-41

A total of 4428 adults (>18 years old) from 5 different selected regions in Peninsular and East Malaysia participated in this health survey. Using World Health Organization recommendations for body mass index (BMI), the prevalence of overweight and obesity were found to be 33.6% (95% CI= 32.2, 35.0) and 19.5% (95% CI= 18.3, 20.7) respectively. There were more females who were obese (22.5%, 95% CI=20.9, 24.0) compared to males (14.1%, 95% CI=12.3, 15.9). Highest prevalence of obesity were among the Indians (24.6%, 95% CI=20.3, 29.3), followed closely by the Malays (23.2%, 95% CI=21.6, 24.8%) and lowest prevalence was among the Chinese subjects (8.2%, 95% CI=6.2, 10.6). More than 43% of the 531 younger subjects (<30 years old) were either overweight (20%, 95% CI=16.6, 23.6) or obese (13.9%, 95% CI=11.1, 17.2%). All subjects who claimed to be non-diabetes were required to undergo 75 g glucose tolerance test. Compared to subjects with normal BMI (18.5-24.9 kg/m<sup>2</sup>), there was a 3- and 2-folds increase in the prevalence of newly diagnosed diabetes and impaired glucose tolerance respectively, among obese subjects (BMI>30 kg/m<sup>2</sup>) who initially claimed to have no diabetes. This study highlights a need for more active, inter-sectoral participation advocating a health-promoting environment in order to combat obesity in this country.

## E17 Factors influencing abdominal obesity by waist circumference among normal BMI population

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Malaysian Journal of Public Health Medicine, Vol. 13 (1), 2013, 37-47

The population with normal body mass index (BMI) but with abdominal obesity are most of the time the 'neglected' population in terms of health interventions. The aim of this study is to study the prevalence of abdominal obesity and to explore the factors causing abdominal obesity by using waist circumference (WC) measurement. A cross sectional study was conducted among a group of respondents in Tanjung Karang, Selangor, Malaysia from January until June 2010, among those aged 18 years old and above, to explore the demographic (gender and ethnics), lifestyle factors (physical activity, carbohydrate intake and smoking status) and measurement of body weight, height and waist circumference. A total of 629 subjects with normal BMI were studied. The prevalence of abdominal obesity was 36.1% based on WC (40.0% males and 70.0% females). The predictor model revealed that being non-Malay (aOR = 2.1; 95% CI: 1.35-3.20) and being female (aOR = 3.6; 95% CI: 2.51-5.06) were the associated factors of having abdominal obesity in normal BMI population. In conclusion, females and non-Malay were factors that were found to be associated with abdominal obesity in normal BMI population. This is important in targeting this vulnerable population with risk factors that can develop non communicable diseases for early interventions.

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## E18 Waist circumference percentile curves for Malaysian children and adolescents aged 6.0-16.9 years

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International Journal of Pediatric Obesity, Vol. 6(3-4), 2011, 229-235

**Background:** The prevalence of obesity is increasing rapidly and abdominal obesity especially is known to be a risk factor for metabolic syndrome and other non-communicable diseases. Waist circumference percentile curves are useful tools which can help to identify abdominal obesity among the childhood and adolescent populations. **Objective:** To develop age-and sex-specific waist circumference (WC) percentile curves for multi-ethnic Malaysian children and adolescents aged 6.0-16.9 years. **Subjects and methods:** A total of 16,203 participants comprising 8,093 boys and 8,110 girls recruited from all regions of Malaysia were involved in this study. Height, weight, WC were measured and BMI calculated. Smoothed WC percentile curves and values for the 3rd, 5th, 10th, 25th, 50th, 75th, 90th, 95th and 97th percentiles were constructed using the LMS Method. **Results:** WC was found to increase with age in both sexes, but boys had higher WC values at every age and percentile. Z-scores generated using the UK reference data shows that Chinese children had the highest WC compared to Malays, Indians and other ethnicities. Comparisons with other studies indicate that at the 50th percentile, Malaysian curves did not differ from the UK, Hong Kong and Turkish curves, but at the 90th percentile, Malaysian curves were higher compared with other countries, starting at 10 years of age. The 90th percentile was

adopted as the cut-off point to indicate abdominal obesity in Malaysian children and adolescents. **Conclusion:** These curves represent the first WC percentiles reported for Malaysian children, and they can serve as a reference for future studies.

## **E19** Obesogens as an environmental risk factor for obesity

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Malaysian Journal of Public Health Medicine, Vol. 14 (3), 2014, 63-70

Obesity is a main public health problem predisposes many to the obesity-related health problems worldwide. Malaysia was ranked as sixth in Asia with high prevalence of obesity by the World Health Organisation in 2010. It is multifactorial origin and depends on many internal and external interactions; between human beings and the environment. In this review article, the focus will be on the example of chemical obesogens that present silently in the daily diet, pharmaceutical or industrial compounds that predispose people to obesity through altering and disrupting normal bodily metabolic processes.

## **E20** *Trigonella foenum-graecum* seeds lowers postprandial blood glucose in overweight and obese individuals

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Journal of Nutrition and Metabolism, Vol. 2014, Article ID 964873, 5 pages

This study determined the effects of fenugreek on postprandial plasma glucose (PPG) and satiety among overweight and obese individuals. Fourteen subjects were studied in the morning after overnight fasts on four separate occasions. Glycaemic responses elicited by 50g carbohydrate portions of white bread and jam with or without 5.5g of fenugreek and fried rice with or without 5.5g fenugreek were determined over 2 h. The primary endpoint was the incremental area under the plasma glucose response curve (IAUC). Adding fenugreek to both foods significantly reduced the IAUC compared to the food alone: white bread and jam,  $180 \pm 22$  versus  $271 \pm 23$  mmol x min/L ( $P = 0.001$ ); fried rice,  $176 \pm 20$  versus  $249 \pm 25$  mmol x min/L ( $P = 0.001$ ). Fenugreek also significantly reduced the area under the satiety curve for white bread with jam ( $134 \pm 27$  versus  $232 \pm 33$  mm x hr,  $P = 0.01$ ) and fried rice ( $280 \pm 37$  versus  $379 \pm 36$  mm x hr,  $P = 0.01$ ). It is concluded that fenugreek significantly decreased the PPG response and increased satiety among overweight and obese individuals.

## E21 Dietary weight loss practice among government working women who successfully lose weight in Malaysia

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Pakistan Journal of Nutrition, Vol.13 (8), 2014, 486-491

Overweight and obesity is a public health concern. Previously, obesity was exclusive to developed country only but nowadays, it is on the rise in developing countries as well. The purpose of this study was to determine the pattern of dietary weight loss practice among Malaysian government working women who are working in selected public funded institutions in Malaysia. This cross-sectional study involved two phases; firstly 639 adult Malaysian working women were recruited and underwent weight loss screening process and secondly 120 working women identified from the screening process based on their experience of losing at least 10% of their highest lifetime body weight, which is a criterion for successful weight loss. Simple random sampling method was used to select 4 ministries in Putrajaya vicinity, Kuala Lumpur and 25 schools in Bandar Baru Bangi. Data were collected via a survey using a set of self-administered questionnaire that includes socio-demographic characteristics, weight history and anthropometric measurements (weight, height, waist circumference, body fat). The study was conducted within one year duration from June 2011 to June 2012. The prevalence of successful weight loss among government working women was 18.8% (120/639). The mean age of women who experienced successful weight loss in this study was 33.2±7.7 years old. Majority of these women were married (72.5%), of Malay ethnicity (96.7%), had 1.3±1.5 children and had college or university degree (79.2%). Eat more fruits and vegetables was the predominant dietary weight loss strategy used (50.8%), followed by reduce the amount of eating food (49.2%) and reduce fatty food intake (42.5%). The prevalence of successful weight loss was low (18.8%) among government working women in selected public funded institutions in Malaysia. Eat more fruits and vegetables, reduce the amount of eating food and reduce fatty food intake were the main dietary weight loss strategies used by these women.

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## E22 Sleep pattern and sleep disorders among a sample of Malaysian children

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Sleep and Biological Rhythms, Vol 11. (3), 2013, 185-193

Sleep problems and sleep disturbances have been associated with several health-related issues especially in children. However, there are limited data regarding sleep pattern and sleep disorders among Malaysian children. Subjects comprised 183 Malaysian children aged 6-12 years old. Children sleep habit questionnaires were proxy reported by the parents of the seven primary school children. Weight and height were measured and body mass index (BMI) was calculated



accordingly. Data were analyzed and differences according to age, gender, body mass index, and area of living (urban and rural) were noted. There were no significant differences in sleep duration, bedtime, and wake up time between genders, area of living, or among different BMI categories. Sleep duration decreased as age increased. A total number of 41.5% of children did not get enough sleep with significant differences among different ages. Sleep disorder scores were significantly lower among children who are living in rural areas and in children with BMI at normal levels. The present data showed that these children sleep less than what they actually need and sleep disturbances are prevalent among those who are living in urban areas and also among overweight and obese children.

### **E23 The Third National Health and Morbidity Survey: Prevalence of obesity, and abdominal obesity among the Malaysian elderly population**

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Asia-Pacific Journal of Public Health, Vol. 24(2), 2012, 318-329

Obesity is an emerging public health threat in the elderly population in developing countries. Hence, the Third National Health and Morbidity Survey has assessed 4746 individuals aged 60 years and older recruited through a household survey to determine the prevalence of adiposity using body mass index and waist circumference. The national's prevalence of overweight and obesity in men was 29.2% (95% confidence interval [CI] = 27.2-31.3) and 7.4% (95% CI = 6.4-8.6), respectively. However, the prevalence decreased with age. The figures in women were 30.3% (95% CI = 28.5-32.1) and 13.8% (95% CI = 12.5-15.2), respectively. The prevalence of abdominal obesity was 21.4% (95%CI = 20.2-22.6), with 7.7% (95% CI = 6.7-9.0) in men and 33.4% (95% CI = 31.4-35.3) in women. Predictors of adiposity include the following: Malay and Indian ethnicity, higher education level, higher household income, from urban area, and being married. In conclusion, adiposity affects about one third of the Malaysian elderly population, especially those of the younger age group, women, and those with higher socioeconomic status.

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### **E24 Randomized controlled trial of a good practice approach to treatment of childhood obesity in Malaysia: Malaysian Childhood Obesity Treatment Trial (MASCOT)**


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International Journal of Pediatrics Obesity, Vol. 6(2-2), 2011, 62-69

**Context:** Few randomized controlled trials (RCTs) of interventions for the treatment of childhood obesity have taken place outside the Western world. **Aim:** To test whether a good practice intervention for the treatment of childhood obesity would have a greater impact on weight status and other outcomes than a control condition in Kuala Lumpur, Malaysia. **Methods:** Assessor-blinded RCT of a treatment intervention in 107 obese 7- to 11-year olds. The intervention was relatively low intensity (8 hours contact over 26 weeks, group based), aiming to change child sedentary behavior, physical activity, and diet using behavior change counselling. Outcomes were

measured at baseline and six months after the start of the intervention. Primary outcome was BMI z-score, other outcomes were weight change, health-related quality of life (Peds QL), objectively measured physical activity and sedentary behavior (Actigraph accelerometry over 5 days). **Results:** The intervention had no significant effect on BMI z score relative to control. Weight gain was reduced significantly in the intervention group compared to the control group (+1.5 kg vs. +3.5 kg, respectively, t-test  $p < 0.01$ ). Changes in health-related quality of life and objectively measured physical activity and sedentary behavior favored the intervention group. **Conclusions:** Treatment was associated with reduced rate of weight gain, and improvements in physical activity and quality of life. More substantial benefits may require longer term and more intensive interventions which aim for more substantive lifestyle changes.



**F**

**Diet Related  
Non-communicable  
Diseases**

## F1 The correlates of body composition with heart rate recovery after step test: An exploratory study of Malaysian adolescents

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PLoS One, Vol. 8(12), 2013, 82893

**Background:** In adults, heart rate recovery is a predictor of mortality, while in adolescents it is associated with cardio-metabolic risk factors. The aim of this study was to examine the relationship between body composition measures and heart rate recovery (HRR) after step test in Malaysian secondary school students. **Methods:** In the Malaysian Health and Adolescents Longitudinal Research Team (MyHEART) study, 1071 healthy secondary school students, aged 13 years old, participated in the step test. Parameters for body composition measures were body mass index z-score, body fat percentage, waist circumference, and waist height ratio. The step test was conducted by using a modified Harvard step test. Heart rate recovery of 1 minute (HRR1min) and heart rate recovery of 2 minutes (HRR2min) were calculated by the difference between the peak pulse rate during exercise and the resting pulse rate at 1 and 2 minutes, respectively. Analysis was done separately based on gender. Pearson correlation analysis was used to determine the association between the HRR parameters with body composition measures, while multiple regression analysis was used to determine which body composition measures was the strongest predictor for HRR. **Results:** For both gender groups, all body composition measures were inversely correlated with HRR1min. In girls, all body composition measures were inversely correlated with HRR2min, while in boys all body composition measures, except BMI z-score, were associated with HRR2min. In multiple regression, only waist circumference was inversely associated with HRR2min ( $p=0.024$ ) in boys, while in girls it was body fat percentage for HRR2min ( $p=0.008$ ). **Conclusion:** There was an inverse association between body composition measurements and HRR among apparently healthy adolescents. Therefore, it is important to identify cardio-metabolic risk factors in adolescent as an early prevention of consequent adulthood morbidity. This reiterates the importance of healthy living which should start from young.

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## F2 Tocotrienols: The other half of natural vitamin E

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Research Journal of Pharmaceutical, Biological and Chemical Sciences, Vol. 5(2), 2014, 533-543

Vitamin E, the most essential lipid-soluble antioxidant, are hydrophobic fat-soluble compounds found in a wide variety of food sources such as vegetable oils, fruits, corn oil, peanuts, nuts, and green leafy vegetables. Vitamin E occurs in nature in at least eight different isoforms:  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\delta$  tocopherols and  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\delta$  tocotrienols. The small structural differences between vitamin E isoforms have a significant influence on vitamin E metabolism. All forms of vitamin E possess

antioxidant activity however, tocotrienols have been shown to have more powerful antioxidant potential than tocopherols. In addition to their potent antioxidant activity, tocotrienols have other significant functions, particularly in maintaining a healthy cardiovascular system and a possible role in protection against cancer and other diseases. In this review, the benefits and superior function of tocotrienols including their role and potential in cardiovascular disease and cancer are elaborated.

### F3 Prevalence and determinants of cardiovascular disease risk factors among the residents of urban community housing projects in Malaysia

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BMC Public Health, Vol. 14 (3), 2014, 3.

**Objectives:** The objectives are to assess the prevalence and determinants of cardiovascular disease (CVD) risk factors among the residents of Community Housing Projects in metropolitan Kuala Lumpur, Malaysia. **Method:** By using simple random sampling, we selected and surveyed 833 households which comprised of 3,722 individuals. Out of the 2,360 adults, 50.5% participated in blood sampling and anthropometric measurement sessions. Uni and bivariate data analysis and multivariate binary logistic regression were applied to identify demographic and socioeconomic determinants of the existence of having at least one CVD risk factor. **Results:** As a Result, while obesity (54.8%), hypercholesterolemia (51.5%), and hypertension (39.3%) were the most common CVD risk factors among the low-income respondents, smoking (16.3%), diabetes mellitus (7.8%) and alcohol consumption (1.4%) were the least prevalent. Finally, the results from the multivariate binary logistic model illustrated that compared to the Malays, the Indians were 41% less likely to have at least one of the CVD risk factors (OR = 0.59; 95% CI: 0.37 - 0.93). **Conclusion:** In conclusion, the low-income individuals were at higher risk of developing CVDs. Prospective policies addressing preventive actions and increased awareness focusing on low-income communities are highly recommended and to consider age, gender, ethnic backgrounds, and occupation classes.

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### F4 Clustering of metabolic syndrome factors in Malaysian population: Asian criteria revisited

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**Introduction:** Metabolic syndrome (MetS) had been known as clustering of risk factors for cardiovascular disease and diabetes. Over the years, clinical criteria had been revised to highlight importance of various risk factors in defining MetS. Studies had reported different clustering of factors based on different population characteristics. **Objective:** Our study aimed to identify the clustering factors among our Malaysian population based on sexes and 4 major ethnic groups namely Malay, Chinese, Indian and other minor ethnic. **Methods:** A national cross sectional study was done covering both Peninsular and East Malaysia. Subjects' sociodemographic, body mass index (BMI), waist, hip and neck circumference, blood pressure, fasting triglycerides (TG) and HDL-cholesterol and glucose, urine microalbumin and serum insulin were taken. Principal component factor analysis with Varimax rotation was done to identify the clustering based on sex and ethnic groups. **Results:** One thousand two hundred and sixty eight male and 2355 female subjects were recruited. Majority of subjects were Malays (63.0%) followed by Chinese (13.3%), Indian (7.4%) and other ethnic groups (13.8%) which followed the population composition in Malaysia. Four factors were identified for both men and women. The factors were anthropometry, glycemia, blood pressure and dyslipidemia given the cumulative percent of variance of 69.4 and 65.9 respectively. There are 4 factors identified for Malay, Chinese and Aborigines but 5 factors for Indian ethnic groups given cumulative percent of variance explained ranged from 65.1 to 77.7. Discussion and **Conclusion:** BMI, neck circumference, blood pressure, Fasting TG and HDL had a high factor loading in both sexes suggesting that for field screening, diagnostic criteria would be adequate criteria. These factors also showed a similar pattern of loading by different ethnic groups. In conclusion, in Malaysian population, at least one measurement from each components namely anthropometric, blood pressure, glycemia and dyslipidemia is adequate to diagnose MetS.

## F5 Weighing the evidence of low glycemic index dietary intervention for the management of gestational diabetes mellitus: An Asian perspective

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International Journal of Food Sciences and Nutrition, Vol. 65(2), 2014, 144-150

This review aims to evaluate the effectiveness of low glycemic index (GI) dietary intervention for the treatment of gestational diabetes mellitus (GDM), specifically from the Asian perspective. A systematic review of the literature using multiple databases without time restriction was conducted. Three studies were retrieved based upon a priori inclusion criteria. While there was a trend towards improvement, no significant differences were observed in overall glycemic control and pregnancy outcomes in GDM women. However, a tendency for lower birth weight and birth centile if the intervention began earlier was noted. Low GI diets were well accepted and had identical macro-micronutrient compositions as the control diets. However, due to genetic, environment and especially food pattern discrepancies between Western countries and Asians, these results may not be contributed to Asian context. Clearly, there are limited studies focusing on the effect of low GI dietary intervention in women with GDM, particularly in Asia.

Chee HP<sup>1</sup>, Hazizi AS<sup>1, 2</sup>, Barakatun Nisak MY<sup>1</sup> and Mohd Nasir MT<sup>1</sup>

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Sains Malaysiana, Vol. 43(8), 2014, 1165-1174

This study aimed to assess the metabolic risk factors among government employees in Putrajaya, Malaysia. Government employees (n=675) were recruited from five government agencies in Putrajaya using a multi-stage random sampling method. Data on sociodemographic characteristics, stages of change for physical activity, anthropometric and biochemical and clinical examinations were collected. A total of 154 (23.4%) men and 505 (76.6%) women with the mean age of 34.49±8.80 years participated in this study. The number of government employees that met the metabolic syndrome criteria based on a 'Harmonized' definition (48.9%) was higher than that in the general Malaysian population. High blood pressure was higher in men (56.5%) compared to women (39.8%). The male participants had a significantly higher mean ± standard deviation in all the metabolic risk factors except HDL-cholesterol, compared to a significance level of 0.05 in the female participants. A high proportion of government employees (84.5%) had at least one metabolic risk factor. Men were 54% more likely to have metabolic syndrome than women based on 'Harmonized' definition. Participants in the pre- contemplation stage for physical activity were approximately 17 times more likely to have metabolic syndrome compared to participants in the maintenance stage according to 'Harmonized' definition. In general, this study suggested that a high proportion of government employees (84.5%) had at least one metabolic risk factor. There is a pressing need to commence intervention programs in the workplace to identify and manage government employees at high risk for cardiovascular disease and diabetes.

Cheong KC<sup>1</sup>, Ghazali SM<sup>1</sup>, Hock LK<sup>1</sup>, Yusoff AF<sup>1</sup>, Selvarajah S<sup>1</sup>, Haniff J<sup>1</sup>, Zainuddin AA<sup>1</sup>, Ying CY<sup>1</sup>, Lin KG<sup>1</sup>, Rahman JA<sup>1</sup>, Shahar S<sup>1</sup> and Mustafa AN<sup>1</sup>.

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Obesity Research and Clinical Practice, Vol.8 (2), 2014, 154-162

**Introduction:** Previous studies have proposed the lower waist circumference (WC) cutoffs be used for defining abdominal obesity in Asian populations. **Objective:** To determine the optimal cut-offs of waist circumference (WC) in predicting cardiovascular (CV) risk factors in the multi-ethnic Malaysian population. **Methods:** We analysed data from 32,703 respondents (14,980 men and 17,723 women) aged 18 years and above who participated in the Third National Health and Morbidity Survey in 2006. Gender-specific logistic regression analyses were used to examine associations between WC and three CV risk factors (diabetes mellitus, hypertension, and hypercholesterolemia). The Receiver Operating Characteristic (ROC) curves were used to determine the cut-off values of WC with optimum sensitivity and specificity for detecting these CV risk factors. **Results:** The odds ratio for having diabetes mellitus, hypertension, and hypercholesterolemia, or at least one of these risks, increased significantly as the WC cut-off point increased. Optimal WC cut-off values for predicting the presence of diabetes mellitus,

hypertension, hypercholesterolemia and at least one of the three CV risk factors varied from 81.4 to 85.5 cm for men and 79.8 to 80.7 cm for women. Conclusions: Our findings indicate that WC cut-offs of 81 cm for men and 80 cm for women are appropriate for defining abdominal obesity and for recommendation to undergo cardiovascular risk screening and weight management in the Malaysian adult population.

## F8 Optimal BMI cut-off values for predicting diabetes, hypertension and hypercholesterolaemia in a multi-ethnic population

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Public Health Nutrition, Vol. 16(3), 2013, 453-459

**Objective:** To determine the optimal cut-offs of BMI for Malaysian adults. Design: Population-based, cross-sectional study. Receiver operating characteristic curves were used to determine the cut-off values of BMI with optimum sensitivity and specificity for the detection of three cardiovascular risk factors: diabetes mellitus, hypertension and hypercholesterolaemia. Gender-specific logistic regression analyses were used to examine the association between BMI and these cardiovascular risk factors. **Setting:** All fourteen states in Malaysia. **Subjects:** Malaysian adults aged  $\geq 18$  years (n 32 703) who participated in the Third National Health and Morbidity Survey in 2006. **Results:** The optimal BMI cut-off value for predicting the presence of diabetes mellitus, hypertension, hypercholesterolaemia or at least one of these cardiovascular risk factors varied from 23.3 to 24.1 kg/m<sup>2</sup> for men and from 24.0 to 25.4 kg/m<sup>2</sup> for women. In men and women, the odds ratio for having diabetes mellitus, hypertension, hypercholesterolaemia or at least one cardiovascular risk factor increased significantly as BMI cut-off point increased. **Conclusions:** Our findings indicate that BMI cut-offs of 23.0 kg/m<sup>2</sup> in men and 24.0 kg/m<sup>2</sup> in women are appropriate for classification of overweight. We suggest that these cut-offs can be used by health professionals to identify individuals for cardiovascular risk screening and weight management programmes.

## F9 Metabolic syndrome among 13 year old adolescents: Prevalence and risk factors

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BMC Public Health, Vol.14 (3), 2014, 7.

**Background:** Obesity and metabolic syndrome is prevalent among Malaysian adolescents and has been associated with certain behavioural factors such as duration of sleep, screen time and physical activity. The aim of the study is to report the prevalence of overweight/ obesity, metabolic syndrome and its risk factors among adolescents. **Methods:** A multi-staged cluster sampling method was used to select participants from urban and rural schools in Selangor, Perak and



Wilayah Persekutuan Kuala Lumpur. Participants underwent anthropometric measurement and physical examination including blood pressure measurement. Blood samples were taken for fasting glucose and lipids and participants answered a self-administered questionnaire. Overweight and obesity was defined using the extrapolated adult body mass index (BMI) cut-offs of  $>25 \text{ kg/m}^2$  and  $>30 \text{ kg/m}^2$ , according to the International Obesity Task Force (IOTF) criteria. Metabolic syndrome was defined based on International Diabetes Federation (IDF) 2007 criteria. Results: Data were collected from 1361 participants. After excluding incomplete data and missing values for the variables, we analysed a sample of 1014 participants. Prevalence of overweight and obesity in this population was 25.4% (N = 258). The prevalence of metabolic syndrome was 2.6% in the population and 10% among the overweight and obese adolescents. Participants who slept between 7 and 9 hours a day has a lower risk of developing metabolic syndrome OR 0.38(0.15-0.94). **Conclusion:** Our results provide the prevalence of metabolic syndrome in Malaysian adolescents. Adequate sleep between 7 and 9 hours per day reduces the risk of developing metabolic syndrome.

## **F10 Oxidative stress: Oxidative DNA damage, total antioxidant capacity and selenium status in type 2 diabetes mellitus patients and healthy subjects**

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Malaysian Journal of Medical Sciences, Vol. 21(5), 2014, 133-134.

An antioxidant and environmental factor have been associated to oxidative stress, and oxidative damage that consequently lead to T2DM development. Selenium, a trace mineral acts as antioxidant in the body and has also been ascribed as DNA regulator and free radical scavenger. Despite its valuable effect in redox metabolism, it is recently connected to T2DM risk. The aim of this study was to determine the association of oxidative DNA damage, total antioxidant capacity, dietary selenium and plasma selenium between T2DM and healthy control. A case control study had been conducted from March 2011 until September 2011 in outpatient clinic of Hospital Universiti Sains Malaysia. This study has enrolled 82 T2DM patients, who had been diagnosed in less than three years with diabetes and paired with 82 healthy controls. To determine oxidative DNA damage (tail DNA and tail moment) and antioxidant capacity, Comet Assay and FRAP test were utilized respectively. Selenium status was determined in plasma and by dietary assessment using validated questionnaire. Oxidative DNA damage markers (Tail DNA and tail moment) were significantly elevated in T2DM compared to the control group. TAC level and plasma selenium showed no significant difference between the T2DM and the control group after confounding factors adjustment. It was observed that plasma selenium showed positive association with oxidative DNA damage study groups. A significant association was noted in T2DM patients, where each unit (ug/L) of plasma selenium increased 0.005 of log tail moment in oxidative DNA damage. Overall dietary selenium intake showed positively and significantly to oxidative DNA damage (log tail moment) in the control group. Despite that, the lowest tertile selenium intake seemed to be beneficial in the control group as each unit (ug/d) of selenium intake reduced 0.41 of log tail moment oxidative DNA damage ( $P < 0.001$ ). There was no significant association between dietary selenium intake and oxidative DNA damage in T2DM. The connection between oxidative DNA damage, antioxidant and selenium status in this study revealed the strong influential role of gender, adiposity and clinical status.

## F11 Bioavailability of tocotrienols: Evidence in human studies

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Nutrition and Metabolism, Vol.11 (1), 2014

As a minor component of vitamin E, tocotrienols were evident in exhibiting biological activities such as neuroprotection, radio-protection, anti-cancer, anti-inflammatory and lipid lowering properties which are not shared by tocopherols. However, available data on the therapeutic window of tocotrienols remains controversial. It is important to understand the absorption and bioavailability mechanisms before conducting in-depth investigations into the therapeutic efficacy of tocotrienols in humans. In this review, we updated current evidence on the bioavailability of tocotrienols from human studies. Available data from five studies suggested that tocotrienols may reach its target destination through an alternative pathway despite its low affinity for  $\alpha$ -tocopherol transfer protein. This was evident when studies reported considerable amount of tocotrienols detected in HDL particles and adipose tissues after oral consumption. Besides, plasma concentrations of tocotrienols were shown to be higher when administered with food while self-emulsifying preparation of tocotrienols was shown to enhance the absorption of tocotrienols. Nevertheless, mixed results were observed based on the outcome from 24 clinical studies, focusing on the dosages, study populations and formulations used. This may be due to the variation of compositions and dosages of tocotrienols used, suggesting a need to understand the formulation of tocotrienols in the study design. Essentially, implementation of a control diet such as AHA Step 1 diet may influence the study outcomes, especially in hypercholesterolemic subjects when lipid profile might be modified due to synergistic interaction between tocotrienols and control diet. We also found that the bioavailability of tocotrienols were inconsistent in different target populations, from healthy subjects to smokers and diseased patients. In this review, the effect of dosage, composition and formulation of tocotrienols as well as study populations on the bioavailability of tocotrienols will be discussed.

## F12 Fitness level and body composition indices: Cross-sectional study among Malaysian adolescent

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BMC Public Health, Vol. 14(3), 2014, 5

**Background:** The importance of fitness level on the well-being of children and adolescent has long been recognised. The aim of this study was to investigate the fitness level of school-going Malaysian adolescent, and its association with body composition indices. **Methods:** 1071 healthy secondary school students participated in the fitness assessment for the Malaysian Health and Adolescents Longitudinal Research Team (MyHEART) study. Body composition indices such as

body mass index for age, waist circumference and waist height ratio were measured. Fitness level was assessed with Modified Harvard Step Test. Physical Fitness Score was calculated using total time of step test exercise and resting heart rates. Fitness levels were divided into 3 categories - unacceptable, marginally acceptable, and acceptable. Partial correlation analysis was used to determine the association between fitness score and body composition, by controlling age, gender, locality, ethnicity, smoking status and sexual maturation. Multiple regression analysis was conducted to determine which body composition was the strongest predictor for fitness. Results: 43.3% of the participants were categorised into the unacceptable fitness group, 47.1% were considered marginally acceptable, and 9.6% were acceptable. There was a significant moderate inverse association ( $p < 0.001$ ) between body composition with fitness score ( $r = -0.360, -0.413$  and  $-0.403$  for body mass index for age, waist circumference and waist height ratio, respectively). Waist circumference was the strongest and significant predictor for fitness ( $\beta = -0.318, p = 0.002$ ). **Conclusion:** Only 9.6% of the students were fit. There was also an inverse association between body composition and fitness score among apparently healthy adolescents, with waist circumference indicated as the strongest predictor. The low fitness level among the Malaysian adolescent should necessitate the value of healthy lifestyle starting at a young age.

### **F13 Prevalence of metabolic syndrome among staff in a Malaysian public university based on Harmonised, International Diabetes Federation and National Cholesterol Education Program definitions**

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Malaysian Journal of Nutrition, Vol. 19(1), 2013, 77-86

**Introduction:** Metabolic syndrome (MetSyn) as defined by the latest Harmonised definition and the agreement between the Harmonised definition and other definitions is poorly studied among Malaysians. This study was conducted to determine and compare the prevalence of MetSyn according to the Harmonised, International Diabetes Federation (IDF) and National Cholesterol Education Program (NCEP ATP III) definitions among Malay staff of Universiti Putra Malaysia (UPM). **Methods:** Subjects aged between 20 to 65 years were recruited by convenient sampling. Waist circumference, blood pressure, lipid profiles and fasting plasma glucose levels were assessed. The agreement between the Harmonised and other definitions was determined by Kappa statistics. **Results:** A total of 227 subjects with a mean  $\pm$  SD age of 37.9  $\pm$  9.6 years participated in the study. The overall prevalence of MetSyn was 38.3%, 38.8% and 33.5% according to Harmonised, IDF and NCEP ATP III definitions, respectively. Generally, men had higher prevalence of MetSyn than women. The prevalence increased with age in both genders with a more progressive trend in women. Men in the age group of 20-39 years had a high prevalence of metabolic syndrome. A strong agreement was found between the Harmonised and the IDF definitions (Kappa index = 0.991), and between the Harmonised and the NCEP ATP III definitions (Kappa index = 0.857). **Conclusion:** Regardless of definitions used, the prevalence of metabolic syndrome in the study, especially in young men, was high and warrants further investigation. The Harmonised definition is suitable for diagnosing metabolic syndrome in any population with similar sociodemographic characteristics.

## **F14 Prevalence and determinants of overweight, obesity, and type 2 diabetes mellitus in adults in Malaysia**

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Asia- Pacific Journal of Public Health, Vol. 27(2), 2015, 123-135

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.

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## **F15 Women are at a higher risk of metabolic syndrome in rural Malaysia**

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Women & Health, Vol. 53(4), 2013, 335-348

Metabolic syndrome has been associated with an increased risk of cardiovascular disease and diabetes mellitus. The objective of this study was to determine gender differences in the prevalence and factors associated with metabolic syndrome in a rural Malay population. This cross-sectional study, conducted in Bachok, Kelantan, involved 306 respondents aged 18 to 70 years. The survey used a structured questionnaire to collect information on demographics, lifestyle, and medical history. Anthropometric measurements, such as weight, height, body mass index, waist and hip circumference, and blood pressure were measured. Venous blood samples were taken by a doctor or nurses and analyzed for lipid profile and fasting glucose. The overall prevalence of metabolic syndrome was 37.5% and was higher among females (42.9%). Being unemployed or a housewife and being of older age were independently associated with metabolic syndrome in a multivariate analysis. Weight management and preventive community-based programs involving housewives, the unemployed, and adults of poor education must be reinforced to prevent and manage metabolic syndrome effectively in adults.

## **F16 Potential role of virgin coconut oil in reducing cardiovascular risk factors**

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Experimental and Clinical Cardiology, Vol.20 (8), 2014, 3399-3410

Cardiovascular disease is one of the leading causes of death in many countries. It has multiple risk factors which include obesity, diabetes mellitus, dyslipidemia, hypertension, sedentary life style, stress and dietary habits. Herbal treatments are the most popular form of traditional medicine and are highly lucrative in the international market. There is a growing interest in traditional medicines of plant origin due to several factors such as availability, affordable cost, safety and efficacy. Recently, virgin coconut oil (VCO) has been very popular as a food supplement to maintain good health. Although VCO and copra oil have similar fatty acid composition, VCO, however, retains a higher concentration of unsaponifiable components such as polyphenols, tocopherols, tocotrienols,  $\beta$ -carotenes and phytosterols which compensate for its higher saturated fatty acid content. VCO has potential role in reducing cardiovascular disease risk factors as it has been reported to have a high antioxidant property, a favorable effect on serum lipid profile as well as the ability to reduce visceral adiposity, oxidative stress-induced hypertension and improve cardiac morphological changes.

## **F17 Nigella sativa and its protective role in oxidative stress and hypertension**

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Evidence-Based Complementary and Alternative Medicine. Vol. 2013, Article ID: 253479

Hypertension increases the risk for a variety of cardiovascular diseases, including stroke, coronary artery disease, heart failure, and peripheral vascular disease. The increase in oxidative stress has been associated with the pathogenesis of hypertension. Increase of blood pressure is due to an imbalance between antioxidants defence mechanisms and free radical productions. Excessive production of reactive oxygen species reduces nitric oxide bioavailability leading to an endothelial dysfunction and a subsequent increase in total peripheral resistance. Hypertension can cause few symptoms until it reaches the advanced stage and poses serious health problems with lifelong consequences. Hypertensive patients are required to take drugs for life to control the hypertension and prevent complications. Some of these drugs are expensive and may have adverse reactions. Hence, it is timely to examine scientifically, complimentary therapies that are more effective and with minimal undesirable effects. *Nigella sativa* (NS) and its active constituents have been documented to exhibit antioxidant, hypotensive, calcium channel blockade and diuretic properties which may contribute to reduce blood pressure. This suggests a potential role of NS in the management of hypertension, and thus more studies should be conducted to evaluate its effectiveness.

**F18 The association of glycemic index and dietary fiber with plasma adiponectin and leptin concentrations among multiethnic patients with type 2 diabetes mellitus in Penang General Hospital**

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Malaysian Journal of Medical Sciences, Vol. 21(5), 2014, 135

Adiponectin and leptin, the adipocyte-derived hormones have been implicated in the control of blood glucose and chronic inflammation in type 2 diabetes mellitus (T2DM). However, limited studies have evaluated dietary predictors of plasma adiponectin and leptin concentrations, especially among Malaysian patients with T2DM. This study aimed to investigate the association between dietary glycemic index and fiber with plasma adiponectin and leptin concentrations in patients with T2DM. A cross-sectional study was conducted in 305 diabetic patients aged 40 to 75 years from the Outpatient Department, Penang General Hospital. Socio-demographic information was collected using a standard questionnaire while anthropometric measurement includes weight, height, waist circumference and body fat composition. Plasma adiponectin and leptin concentrations were measured using a commercial ELISA kit. Dietary details were determined by using a pre-validated semi-quantitative food-frequency questionnaire. Data was analyzed using multiple linear regressions. After multivariate adjustment, dietary glycemic index was inversely associated with plasma adiponectin concentrations ( $\beta = -0.272$ , 95% CI  $-0.262, -0.094$ ;  $P < 0.001$ ). It was found out that in individuals who consumed 1 unit of food containing high dietary glycemic index the plasma adiponectin level reduced by 0.3 ug/mL. In contrast, intake of fiber was positively associated with increased plasma adiponectin levels, adjusting for lifestyle factors ( $\beta = 0.350$ , 95% CI  $0.101, 0.433$ ;  $P = 0.002$ ). One-gram consumption of fiber will lead to an increment of 0.2 ug/mL adiponectin concentrations. Thirty two percent (31.9%) of the variation in adiponectin concentrations was explained by age, sex, race, smoking status, BMI, waist circumference, HDL-C, triglycerides, magnesium, fiber and dietary glycemic index according to the multiple linear regression model ( $R^2 = 0.319$ ). There were no correlation between dietary glycemic index and fiber with plasma leptin concentrations illuminated by scatter plots. These results support the hypothesis that dietary factors influences plasma adiponectin concentrations in patients with T2DM. Controlled clinical trials are required to confirm our findings and to elucidate the underlying mechanism.

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**F19 An exploratory study on risk factors for chronic non-communicable diseases among adolescents in Malaysia: Overview of the Malaysian Health and Adolescents Longitudinal Research Team study (The MyHeART study)**

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**Background:** The National Health & Morbidity Survey (NHMS) IV (2011) observed that the prevalence of obese children aged less than 18 years in Malaysia is 6.1% compared to 5.4% overweight and obese in NHMS III (2006). As such, this observation is of public health importance as obesity is a forewarning risk factor for chronic diseases such as type-2 diabetes, cardiovascular diseases (CVD) and certain types of cancers. This MyHeART (Malaysian Health and Adolescents longitudinal Research Team) study aims to examine risk factors of non-communicable diseases (NCD) among adolescents. **Methods/design:** The MyHeART study is longitudinal cohort study of 1361 schoolchildren (13-years old) attending 15 public secondary schools from the central (Kuala Lumpur and Selangor) and northern (Perak) regions of Peninsular Malaysia. The study used a stratified sampling design to select the study participants. Data collected at baseline included socio-economic, lifestyle (e.g. smoking, physical activity assessment, fitness assessment, seven-day diet history), and environmental information, anthropometric measurements, blood pressure, handgrip strength and bone mineral density. Blood samples for fasting blood glucose and lipid profiles, full blood count, renal profile, as well as bone profile and serum vitamin D were taken. This study cohort will be followed up again when participants turn 15, 17 and lastly, after a period of ten years (around the age of 27). **Results:** Nine percent of the adolescents from this study were obese. More male participants smoked compared to female participants (15.4% vs. 4.7%). Adolescent males had higher fasting blood glucose but the female participants had lower high density lipoprotein (HDL-cholesterol) and higher low density lipoprotein (LDL-cholesterol). In addition, adolescents from the rural area had higher fasting blood glucose, diastolic blood pressure, total cholesterol and LDL-cholesterol. **Discussion:** Our results demonstrated that adolescents from the rural area are at higher risk of NCDs compared to their urban counterpart. Tailor made public health interventions are highly recommended for adolescents as this may minimise the dreadful NCD burden in adulthood and health disparity between the rural and urban in the near future.

## F20 Nutrient intake and nutritional status of newly diagnosed patients with cancer from the East Coast of Peninsular Malaysia

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BMC Research Notes, Vol. 30 (7), 2014, 680.

**Background:** Cancer therapy in Malaysia primarily focuses on the clinical management of patients with cancer and malnutrition continues to be one of the major causes of death in these patients. There is a dearth of information on the nutrient intake and status of newly diagnosed patients with cancer prior to the initiation of treatment. The present study aims to assess the nutrient intake and status of newly diagnosed patients with cancer from the East Coast of Peninsular Malaysia. **Methods:** A cross-sectional study was conducted using a convenient sample of newly diagnosed adult patients with cancer (n = 70) attending the Oncology clinic, Hospital Universiti Sains Malaysia in the East Coast of Peninsular Malaysia. Information on socio-demographic characteristics, clinical status, anthropometry, dietary intake and biochemical data including blood samples was obtained. **Results:** The mean (SD) age, triceps skin fold (TSF), mid upper arm circumference (MUAC) and body mass index (BMI) of participants was 21.1(3.9) years, 17.6(7.9) mm, 24.1(5.5) cm, and 21.1(3.9) Kg/m<sup>2</sup>, respectively; 39% participants had BMI <18.5 Kg/m<sup>2</sup>. One-third of newly diagnosed patients with cancer were undernourished (i.e. women: MUAC

<220 mm; men: <230 mm). The proportion (%) of participants with low haemoglobin (<120 g/L) and serum albumin (<38 g/dL) were 62% and 26%, respectively. The older women had significantly lower macro and micro nutrient intakes compared to men in the same age group (P <0.05). Conclusions: At the time of diagnosis, greater than one-third of patients with cancer from the East Coast of Peninsular Malaysia were underweight and undernourished. The majority of patients with cancer had poor micronutrient intakes; the older women had a poor macro and micronutrient intakes. Before the initiation of rigorous clinical management of patients with cancer, screening for nutritional status, subsequent nutrition counseling, and interventions are essential to improve their nutritional status; consequently, response to cancer therapy, survival and quality of life.

## F21 Prevalence of metabolic syndrome and its risk factors in adult Malaysians: Results of a nationwide survey

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Diabetes Research and Clinical Practice, Vol. 91(2), 2011, 239-245

**Aim:** To report the national prevalence of metabolic syndrome (MetS) and its risk factors among adult Malaysians (>18 years old) based on World Health Organization (WHO), the National Cholesterol Education Program Expert Panel III (ATP III)(,) International Diabetes Federation (IDF) and the 'Harmonized' criteria. **Methods:** A multi-stage stratified sampling method was used to select 4341 subjects from Peninsular and East Malaysia. Subjects underwent physical and clinical examinations. **Results:** Based on the WHO, ATP III, IDF and Harmonized definitions, the overall crude prevalences of MetS were 32.1, 34.3, 37.1 and 42.5%, respectively. Regardless of the criteria used, MetS was higher in urban areas, in females, in the Indian population and increased significantly with age. Risk factors also increased with age; abdominal obesity was most prevalent (57.4%), was higher in females (64.2%) and was highest in Indians (68.8%). Hypertension was higher in males (56.5%) and highest among Malaysians (52.2%). In contrast, the Chinese had the highest prevalence of hypertriglyceridaemia (47.4%). **Conclusions:** Malaysia has a much higher prevalence of MetS compared with other Asian countries and, unless there is immediate intervention to reduce risk factors, this may pose serious implications on the country's healthcare costs and services.

## F22 Adiponectin correlates in Malaysians: A comparison of metabolic syndrome and healthy respondents

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Several studies have demonstrated that adiponectin has strong association with metabolic syndrome and its factors like obesity, insulin resistance, type 2 diabetes, dyslipidemia and coronary artery disease. A total 152 subjects were registered in this study. Among the respondents 76 were with metabolic syndrome (based on the criteria of the International Diabetes Federation (IDF) world-wide definition) and another 76 matching healthy respondents. The factors which were studied for possible differences and association include central obesity (body mass index (BMI) & waist circumference (WC), hypertension (systolic blood pressure (SBP), diastolic blood pressure (DBP), dyslipidemia (total cholesterol (Tc), high density lipoprotein Cholesterol (HDL-c), low density lipoprotein Cholesterol (LDL-c), Triglyceride (TG) and Adiponectin (AD), fasting plasma glucose and history of smoking. The data collected was statistically analyzed using SPSS statistical software version 12.0. Two tests were performed including paired t-test and Pearson correlation analysis. The collected data revealed some interesting differences for the healthy and metabolic syndrome respondents. There were significant ( $P < 0.01$ ) differences for central obesity and hypertension. There were also significant ( $P < 0.01$ ,  $P < 0.1$ ,  $P < 0.01$ ) differences for TG, HDL and fasting plasma glucose. More importantly, AD concentration was significantly ( $P < 0.05$ ) higher in normal healthy respondents. The AD showed strong negative association ( $r = -2.91$ ,  $P < 0.001$ ) with FBG and positive association ( $r = 2.89$ ,  $P < 0.001$ ) with HDL-c. The present study provides baseline information on the predication of metabolic syndrome in Malaysian population.

## F23 Religious fasting: An alternative approach to improve hyperlipidaemia

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Nutrition & Food Science, Volume 42 (4), 2012, 241-249

**Purpose:** The purpose of this paper is to evaluate the effect of fasting on blood lipid profile in fasting obese and non-obese subjects. **Design/ methodology/ approach:** Male and female subjects from the International Islamic University, Malaysia (IIUM), Kuantan Campus were assessed for body compositional changes during Ramadan fasting. In total, 25 males and females volunteered to participate in this study in the holy month of Ramadan. The mean age of the volunteers was  $26.5 \pm 5.86$  years and the age range was 21-45 years. The age, weight and height of the volunteers were recorded on day 1 of Ramadan and weight was also recorded on day 21. The volunteers were asked for donation of blood samples on days 1, 7, 14 and 21 of the Ramadan. The blood serum was separated and stored at  $-20^{\circ}\text{C}$  immediately after each collection. The serum samples stored at  $-20^{\circ}\text{C}$  were analyzed for serum glucose and lipid profile. The analysis of serum lipid profile was performed with the help of clinical kits from Bayer Health Care using Bayer

Express Plus Clinical analyzer. The serum was used for the estimation of total cholesterol (TC), HDL-cholesterol (HDL-c) and triglycerides (TG) concentrations using kit reagents from M/s Bayer Diagnostics, whereas low density lipoprotein cholesterol (LDL-c) was determined by calculation. The statistics were performed using MINITAB statistical software (release 8.2). **Findings:** The serum triglyceride concentration was significantly reduced and the reduction was 17.48 percent from day 1-21. The serum TC concentration also reduced from day 1-21 and the reduction was 15.93 percent. The serum LDL-c concentration also significantly reduced from day 1-21 and the reduction was 21.67 percent. The serum HDL-c concentration decreased in the first week and second week but an improving trend was observed on day 21 of the Ramadan. **Research limitations/ implications:** This study was not a controlled one and was conducted on free-living individuals and therefore there is need to have controlled or adjusted physical activities studies in fasting individuals. It is always difficult to conduct experiment on human beings in the metabolic area. Furthermore, in this study it was not possible since it was a religious fasting. Another limitation is that the size of the sample was smaller than is advisable for this kind of study. However, the results were confirmed in the following month of Ramadan, as described in the paper.

## F24 Prevalence of abnormal glucose tolerance and risk factors in urban and rural Malaysia

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Diabetes Care, Vol.34 (6), 2011, 1362-1364

**Objective:** To determine the prevalence of prediabetes and diabetes among rural and urban Malaysians. **Research design and methods:** This cross-sectional survey was conducted among 3,879 Malaysian adults (1,335 men and 2,544 women). All subjects underwent the 75-g oral glucose tolerance test (OGTT). **Results:** The overall prevalence of prediabetes was 22.1% (30.2% in men and 69.8% in women). Isolated impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) were found in 3.4 and 16.1% of the study population, respectively, whereas 2.6% of the subjects had both IFG and IGT. Based on an OGTT, the prevalence of newly diagnosed type 2 diabetes was 12.6% (31.0% in men and 69.0% in women). The prediabetic subjects also had an increased prevalence of cardiovascular disease risk factors. **Conclusions:** The large proportion of undiagnosed cases of prediabetes and diabetes reflects the lack of public awareness of the disease.

## F25 Hypertension among HIV-infected adults receiving highly active antiretroviral therapy (HAART) in Malaysia

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There are increasing researches about non-communicable disease such as elevated blood pressure among people living with HIV before and after initiation of highly active antiretroviral therapy (HAART). This cross-sectional study was designed to determine the prevalence of hypertension and associated risk factors among 340 HIV-infected patients on antiretroviral therapy at a Malaysian public hospital providing HIV-related treatment. Data on socioeconomic background, anthropometry, medical history and dietary intake of the patients were collected. Hypertension is defined as blood pressure  $\geq 130/85$  (mm Hg). Prevalence of hypertension was 45.60% (n=155) of which 86.5% of the hypertensive group were male (n=134). The results showed that increase in age (OR 1.051, 95% confidence interval (CI) 1.024-1.078), higher body mass index (OR 1.18, 95%CI 1.106-2.71), bigger waist circumference (OR 1.18, 95%CI 1.106-2.71), higher waist-hip ratio (OR 1.070, 95%CI 1.034-1.106), higher fasting plasma glucose (OR 1.332, 95%CI 0.845-2.100) and percentage energy intake from protein  $>15$  (OR 2.519, 95%CI 1.391-4.561) were significant risk factors for hypertension ( $p < 0.001$ ). After adjusting for other variables, increasing age (adjusted odds ratio (aOR) 1.069 95%CI 1.016-1.124,  $p = 0.010$ ), being male (aOR 3.026, 95%CI 1.175-7.794,  $p = 0.022$ ) and higher body mass index (aOR 1.26, 95%CI 1.032-1.551,  $p = 0.024$ ) were independently associated with hypertension. None of the antiretroviral therapy and immunologic factors was linked to hypertension. In conclusion hypertension among PLHIV was linked to the well-known risk factors such as age, gender and body mass index. With HAART, people can live longer by making monitoring and control of some reversible factors, especially excessive weight gain for maintaining quality of life.

## **F26 Tocotrienols: Inflammation and cancer**

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Annals of the New York Academy of Sciences, Vol. 1229, 2011, 18-22

Inflammation is an organism's response to environmental assaults. It can be classified as acute inflammation that leads to therapeutic recovery or chronic inflammation, which may lead to the development of cancer and other ailments. Genetic changes that occur within cancer cells themselves are responsible for many aspects of cancer development but are dependent on ancillary processes for tumor promotion and progression. Inflammation has long been associated with the development of cancer. The distinct characteristics of cancer cells to proliferate, metastasize, evade apoptotic signals, and develop chemoresistance have been linked to the inflammatory response. Due to the involvement of multiple genes and various pathways, current drugs that target single genes have not been effective in providing a therapeutic cure. On the other hand, natural products target multiple genes and therefore have better success compared to drugs. Tocotrienols, the potent isoforms of vitamin E, are such a natural product. This review will discuss the relationship between cancer and inflammation with particular focus on the roles played by NF- $\kappa$ B, STAT3, and COX-2.

## **F27 Heated vegetable oils and cardiovascular disease risk factors**

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Vascular Pharmacology, Vol. 61(1), 2014, 1-9

Cardiovascular disease (CVD) is one of the leading major causes of morbidity and mortality worldwide. It may result from the interactions between multiple genetic and environmental factors including sedentary lifestyle and dietary habits. The quality of dietary oils and fats has been widely recognised to be inextricably linked to the pathogenesis of CVD. Vegetable oil is one of the essential dietary components in daily food consumption. However, the benefits of vegetable oil can be deteriorated by repeated heating that leads to lipid oxidation. The practice of using repeatedly heated cooking oil is not uncommon as it will reduce the cost of food preparation. Thermal oxidation yields new functional groups which may be potentially hazardous to cardiovascular health. Prolonged consumption of the repeatedly heated oil has been shown to increase blood pressure and total cholesterol, cause vascular inflammation as well as vascular changes which predispose to atherosclerosis. The harmful effect of heated oils is attributed to products generated from lipid oxidation during heating process. In view of the potential hazard of oxidation products, therefore this review article will provide an insight and awareness to the general public on the consumption of repeatedly heated oils which is detrimental to health.

## **F28 Diabetes Mellitus: Treatment challenges and the role of some herbal therapies**

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Middle East Journal of Scientific Research, Vol. 20(7), 2014, 786

Diabetes mellitus (DM) is a chronic metabolic disorder with devastating complications affecting millions of individuals across the world. Alarming, the incidence of DM continues to rise steadily. Hence, it is not surprising that both modern and traditional medicine researchers have been consistently experimenting antidiabetic agents for the treatment of DM and its complications. Despite the promises and convincing scientific evidence that lie beneath the prescription of drugs, a significant number of DM patients opt for herbal preparations. The popularity of herbal supplements for treating DM and its complications is attributed to the cost effectiveness and lesser side effects. The three main domains of complementary and alternative medicine i.e. western herbalism, Chinese and Ayurvedic medicine have been tried for the effective treatment of DM. The main aim of the present review is to highlight the advances of the used herbal antidiabetic preparations. Besides, we have discussed the various macrovascular and microvascular complications occurring in DM with the potential role of herbal supplements in this regard. For the purpose of this review, we have retrieved some related articles from Pubmed, Ebsco and ScienceDirect published between the years 1980 and 2013.

## F29 Prevalence of metabolic syndrome and its relation to body composition in Chinese elderly

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Asian Journal of Gerontology & Geriatrics, Vol. 8 (2), 2013

**Objective:** This study evaluated the prevalence of metabolic syndrome (Mets) and its relation to body composition, dietary intake, and physical activity among Chinese elderly. **Methods:** 67 men and 63 women residing in primary care centres in the Klang Valley, Malaysia were included in this cross-sectional study. Their body weight, height, body mass index, waist circumference, mid-upper arm muscle circumference, and blood pressure were measured, as were visceral fat level and total body fat percentage, as well as fasting blood glucose, high-density lipoprotein cholesterol, total cholesterol, and triglycerides. Dietary intake was evaluated through a semi-quantitative food frequency questionnaire. Physical activity was assessed using the physical activity scale for elderly questionnaire. **Results:** In this cohort, the prevalence of Mets was 46%; those with Mets had an increased prevalence of obesity ( $p < 0.001$ ), as characterised by higher body mass index, total body fat, visceral fat adiposity, mid-upper arm circumference, and waist-to height ratio. Dietary intake was not significantly different in those with and without Mets, but physical activity level was significantly higher in the latter. After controlling for age and gender, physical activity was a predictor of Mets (odds ratio, 0.989; 95% CI, 0.979-0.999). **Conclusion:** Mets was prevalent among Chinese elderly residing in primary care centres in Klang Valley, Malaysia, and its severity was associated with body composition.

## F30 Roles of diet, lifetime physical activity and oxidative DNA damage in the occurrence of prostate cancer among men in Klang Valley, Malaysia

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Asian Pacific Journal of Cancer Prevention, Vol. 12(3), 2011, 605-611.

**Background:** There is a paucity of information on risk factors of prostate cancer, especially those related to dietary and lifestyle among Asian populations. **Objective:** This study aimed to determine the relationship between dietary intake (macronutrients, fruits, vegetables and lycopene), lifetime physical activity and oxidative DNA damage with prostate cancer. **DESIGN:** A case control study was carried out among 105 subjects (case  $n=35$ , control  $n=70$ ), matched for age and ethnicity. Data on sociodemographic, medical, dietary intake, consumption of lycopene rich food and lifetime physical activity were obtained through an interview based questionnaire. Anthropometric measurements including weight, height and waist hip circumferences were also carried out on subjects. A total of 3 mL fasting venous blood was drawn to assess lymphocyte oxidative DNA damage using the alkaline comet assay. **Results:** Cases had a significantly higher intake of fat ( $27.7 \pm 5.5\%$ ) as compared to controls ( $25.1 \pm 5.9\%$ ) ( $p < 0.05$ ). Mean intakes of fruits and

vegetables ( $3.11 \pm 1.01$  servings/d) ( $p < 0.05$ ), fruits ( $1.23 \pm 0.59$  servings/d) ( $p < 0.05$ ) and vegetables ( $1.97 \pm 0.94$  servings/d) were higher in controls than cases ( $2.53 \pm 1.01$ ,  $0.91 \pm 0.69$ ,  $1.62 \pm 0.82$  servings/d). A total of 71% of cases did not meet the recommendation of a minimum of three servings of fruits and vegetables daily, as compared to 34% of controls ( $p < 0.05$ ) (adjusted OR 6.52 (95% CI 2.3-17.8)) ( $p < 0.05$ ). Estimated lycopene intake among cases ( $2,339 \pm 1,312$  mcg/d) were lower than controls ( $3881 \pm 3120$  mcg/d) ( $p < 0.01$ ). Estimated lycopene intake of less than 2,498 mcg/day (50th percentile) increased risk of prostate cancer by double [Adjusted OR 2.5 (95% CI 0.99-6.31)]. Intake of tomatoes, watermelon, guava, pomelo, papaya, mango, oranges, dragon fruit, carrot, tomato sauce and barbeque sauce were higher in controls compared to cases. Intake of tomato sauce of more than 2.24 g/d (25th percentile), papaya more than 22.7 g/d (50th percentile) and oranges more than 19.1g/h (50th percentile) reduced prostate cancer risk by 7.4 (Adjusted OR 7.4 (95% CI 1.17-46.8)), 2.7 (adjusted OR 2.75 (95% CI 1.03-7.39)) and 2.6 times (adjusted OR = 2.6 (95% CI=1.01-6.67)), respectively ( $p < 0.05$  for all parameters). No oxidative damage was observed among subjects. Past history of not engaging with any physical activities at the age of 45 to 54 years old increased risk of prostate cancer by approximately three folds (Adjusted OR 2.9(95% CI = 0.8-10.8)) ( $p < 0.05$ ). In conclusion, low fat diet, high intake of fruits, vegetables and lycopene rich foods and being physical active at middle age were found to be protective. Thus, it is essential for Malaysian men to consume adequate fruits and vegetables, reduce fat intake and engage in physical activity in order to reduce prostate cancer risk.

### F31 Dietary changes among breast cancer patients in Malaysia

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Cancer Nursing, Vol. 36(2), 2013, 131-138

**Background:** Breast cancer patients often show an interest in making dietary changes after diagnosis of breast cancer to improve their health condition and prevent cancer recurrence. **Objective:** The objective of the study was to determine changes in dietary intake 2 years after diagnosis among breast cancer patients. **Methods:** One hundred sixteen subjects were asked to complete a semi quantitative food frequency questionnaire, diet recalls, and dietary changes questionnaire to assess dietary intake before and after diagnosis. The information on sociodemographic background, cancer treatment history, and anthropometric indices was also collected. **Results:** Seventy-two subjects considered diet as a contributing factor to breast cancer, and 67 subjects changed their dietary habits after breast cancer diagnosis. The reasons for changes in diet were physician and dietitian advice and desire to cure cancer. The sources of information were derived from their physician, mass media, and family members. Total energy, protein, total fat, fatty acids, and vitamin E intake were significantly decreased after diagnosis. Meanwhile, the intake of  $\beta$ -carotene and vitamin C increased significantly after diagnosis. The changes included reduction in red meat, seafood, noodles, and poultry intake. An increased consumption of fruits, vegetables, fish, low-fat milk, and soy products was observed. The subjects tended to lower high-fat foods intake and started to eat more fruits and vegetables. **Conclusion:** Breast cancer patients had changed to a healthier diet after breast cancer diagnosis, although the changes made were small. **Implications for practice:** This will be helpful to dietitians in providing a better understanding of good eating habits that will maintain patients' health after breast cancer diagnosis.

## F32 The use of complementary and alternative medicine among Malay breast cancer survivors

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Alternative Therapies in Health and Medicine, Vol. 17(1), 2011, 50-60

**Background:** A cross-sectional study was carried out to determine the prevalence of complementary and alternative medicine (CAM) use by breast cancer survivors. **Methods:** A descriptive survey design was developed. Information on sociodemographic characteristics, cancer clinical treatment history, and use of CAM were obtained through a modified self-administered questionnaire from 116 Malay breast cancer survivors aged 21 to 67 years who were 2 years post diagnosis and currently undergoing follow-up treatment at breast cancer clinics at Hospital Kuala Lumpur and Universiti Kebangsaan Malaysia Medical Centre. **Results:** Data suggest that 64% of the participants were identified as CAM users; dietary supplements were the most common form used, followed by prayer and Malay traditional medicine. Within the wide range of dietary supplements, multivitamins were most often taken followed by spirulina, vitamin C, evening primrose oil, and herbal products. Contrary to other findings, the CAM users were found to be older, had secondary education levels, and were from middle-income households. However, there was no significant difference between CAM users and nonusers in this study. Family members played an important role as the main source of information along with doctors/health care providers, friends, and printed materials/mass media. The reasons participants gave for using CAM were mainly to assist in healing the body's inner strength, to cure cancer, and to reduce stress. Only half of the participants consulted with their physicians regarding the safety of CAM use. The participants began to use CAM while undergoing clinical treatments. Most of the participants used CAM for more than a year. About RM100 to RM149 (31.88 USD to 47.50 USD at press time) were spent monthly on CAM by 32% of the participants. The CAM use was found to be effective and beneficial for patients' disease states, and they were contented with the usage of the CAM therapies. Multivariate analysis revealed that the decision to use or not to use CAM was not dependent on sociodemographic background or cancer clinical treatment history. **Conclusions:** CAM was commonly used by breast cancer survivors as a coping mechanism to battle the disease.

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## F33 Healthy eating index and breast cancer risk among Malaysian women

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European Journal of Clinical Prevention, Vol. 22(4), 2013, 342-347

Healthy Eating Index-2005 (HEI-2005), an index-based dietary pattern, has been shown to predict the risk of chronic diseases among Americans. This study aims to examine the ability of HEI-2005 in predicting the probability for risk of premenopausal and postmenopausal breast cancer among Malaysian women. Data from a case-control nutritional epidemiology study among 764 participants including 382 breast cancer cases and 382 healthy women were extracted and scored.

Multivariate odds ratios (OR) with 95% confidence intervals (CI) were used to evaluate the relationship between the risk of breast cancer and quartiles (Q) of HEI-2005 total scores and its component, whereas the risk prediction ability of HEI-2005 was investigated using diagnostics analysis. The results of this study showed that there is a significant reduction in the risk of breast cancer, with a higher HEI-2005 total score among premenopausal women (OR Q1 vs. Q4=0.34, 95% CI; 0.15-0.76) and postmenopausal women (OR Q1 vs. Q4=0.20, 95% CI; 0.06-0.63). However, HEI-2005 has a sensitivity of 56-60%, a specificity of 55-60%, and a positive predictive value and negative predictive value of 57-58%, which indicates a moderate ability to predict the risk of breast cancer according to menopausal status. The breast cancer incidence observed poorly agrees with risk outcomes from HEI-2005 as shown by low  $\kappa$  statistics ( $\kappa=0.15$ ). In conclusion, although the total HEI-2005 scores were associated with a risk of breast cancer among Malaysian women, the ability of HEI-2005 to predict risk is poor as indicated by the diagnostic analysis. A local index-based dietary pattern, which is disease specific, is required to predict the risk of breast cancer among Malaysian women for early prevention.

### F34 Healthy eating index and breast cancer risk among Malaysian women

Shahril MR<sup>1,2</sup>, Sulaiman S<sup>1</sup>, Shaharudin SH<sup>1</sup> and Akmal SN<sup>3</sup>

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European Journal of Cancer Prevention, Vol. 22(4), 2013, 342-347

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### F35 A qualitative study on hypertensive care behavior in primary health care settings in Malaysia

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Patient Prefer Adherence, Vol. 8, 2014, 1597-1609

**Purpose:** The aim of this study was to explore patients' experiences with their illnesses and the reasons which influenced them in not following hypertensive care recommendations (antihypertensive medication intake, physical activity, and diet changes) in primary health clinic settings. **Patients and methods:** A qualitative methodology was applied. The data were gathered from in-depth interviews with 25 hypertensive patients attending follow-up in nine government primary health clinics in two districts (Hulu Langat and Klang) in the state of Selangor, Malaysia. The transcribed data were analyzed using thematic analysis. **Results:** There was evidence of lack of patient self-empowerment and community support in Malaysian society. Most of the participants did not take their antihypertensive medication or change their physical activity and diet after diagnosis. There was an agreement between the patients and the health care professionals before starting the treatment recommendation, but there lacked further counseling and monitoring. Most of the reasons given for not taking antihypertensive medication, not doing physical activity and not following diet recommendations were due to side effects or fear of the side effects of antihypertensive medication, patients' attitudes, lack of information from health care professionals and insufficient social support from their surrounding environment. We also observed the differences on these reasons for nonadherence among the three ethnic groups. **Conclusion:** Health care professionals should move toward supporting adherence in the management of hypertensive patients by maintaining a dialogue. Patients need to be given time to enable them to overcome their inhibition of asking questions and to accept the recommendations. A self-management approach must be responsive to the needs of individuals, ethnicities, and communities.

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### F36 Low glycaemic index diets improve glucose tolerance and body weight in women with previous history of gestational diabetes: A six months randomized trial

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Nutrition Journal, Vol.12 (68), 2013

**Background:** Gestational Diabetes Mellitus (GDM) increases risks for type 2 diabetes and weight management is recommended to reduce the risk. Conventional dietary recommendations (energy-restricted, low fat) have limited success in women with previous GDM. The effect of lowering Glycaemic Index (GI) in managing glycaemic variables and body weight in women post-GDM is unknown. **Objective:** To evaluate the effects of conventional dietary recommendations administered with and without additional low-GI education, in the management of glucose tolerance and body weight in Asian women with previous GDM. Method: Seventy seven Asian,

non-diabetic women with previous GDM, between 20- 40y were randomised into Conventional healthy dietary recommendation (CHDR) and low GI (LGI) groups. CHDR received conventional dietary recommendations only (energy restricted, low in fat and refined sugars, high-fibre). LGI group received advice on lowering GI in addition. Fasting and 2-h post-load blood glucose after 75 g oral glucose tolerance test (2HPP) were measured at baseline and 6 months after intervention. Anthropometry and dietary intake were assessed at baseline, three and six months after intervention. The study is registered at the Malaysian National Medical Research Register (NMRR) with Research ID: 5183. **Results:** After 6 months, significant reductions in body weight, BMI and waist-to-hip ratio were observed only in LGI group ( $P<0.05$ ). Mean BMI changes were significantly different between groups (LGI vs. CHDR:  $-0.6$  vs.  $0$  kg/m<sup>2</sup>,  $P=0.03$ ). More subjects achieved weight loss  $\geq 5\%$  in LGI compared to CHDR group (33% vs. 8%,  $P=0.01$ ). Changes in 2HPP were significantly different between groups (LGI vs. CHDR: median (IQR):  $-0.2(2.8)$  vs.  $+0.8(2.0)$  mmol/L,  $P=0.025$ ). Subjects with baseline fasting insulin  $\geq 2$   $\mu$ IU/ml had greater 2HPP reductions in LGI group compared to those in the CHDR group ( $-1.9\pm 0.42$  vs.  $+1.31\pm 1.4$  mmol/L,  $P<0.001$ ). After 6 months, LGI group diets showed significantly lower GI ( $57\pm 5$  vs.  $64\pm 6$ ,  $P<0.001$ ), GL ( $122\pm 33$  vs.  $142\pm 35$ ,  $P=0.04$ ) and higher fibre content ( $17\pm 4$  vs.  $13\pm 4$  g,  $P<0.001$ ). Caloric intakes were comparable between groups. **Conclusion:** In women post-GDM, lowering GI of healthy diets resulted in significant improvements in glucose tolerance and body weight reduction as compared to conventional low-fat diets with similar energy prescription.

### F37 The effectiveness of a life style modification and peer support home blood pressure monitoring in control of hypertension: Protocol for a cluster randomized controlled trial

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BMC Public Health, Vol.14 (3), 2014, 4

**Background:** Death rates due to hypertension in low and middle income countries are higher compared to high income countries. The present study is designed to combine life style modification and home blood pressure monitoring for control of hypertension in the context of low and middle income countries. **Methods:** The study is a two armed, parallel group, un-blinded, cluster randomized controlled trial undertaken within lower income areas in Kuala Lumpur. Two housing complexes will be assigned to the intervention group and the other two housing complexes will be allocated in the control group. Based on power analysis, 320 participants will be recruited. The participants in the intervention group ( $n = 160$ ) will undergo three main components in the intervention which are the peer support for home blood pressure monitoring, face to face health coaching on healthy diet and demonstration and training for indoor home based exercise activities while the control group will receive a pamphlet containing information on hypertension. The primary outcomes are systolic and diastolic blood pressure. Secondary outcome measures include practice of self-blood pressure monitoring, dietary intake, level of physical activity and physical fitness. **Discussion:** The present study will evaluate the effect of lifestyle modification and peer support home blood pressure monitoring on blood pressure control, during a 6 month intervention period. Moreover, the study aims to assess whether these effects can be sustainable more than six months after the intervention has ended.

### F38 Dietary carbohydrate, fiber and sugar and risk of breast cancer according to menopausal status in Malaysia

Sulaiman S<sup>1</sup>, Shahril MR<sup>2</sup>, Wafa SW<sup>2</sup>, Shaharudin SH<sup>1</sup> and Hussin SN<sup>3</sup>

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Asian Pacific Journal of Cancer Prevention, Vol. 15(14), 2014, 5959-5964

**Background:** Dietary carbohydrate, fiber and sugar intake has been shown to play a role in the etiology of breast cancer, but the findings have been inconsistent and limited to developed countries with higher cancer incidence. **Objective:** To examine the association of premenopausal and postmenopausal breast cancer risk with dietary carbohydrate, fiber and sugar intake. **Materials and methods:** This population based case-control study was conducted in Malaysia with 382 breast cancer patients and 382 controls. Food intake pattern was assessed via an interviewer-administered food frequency questionnaire. Logistic regression was used to compute odds ratios (OR) with 95% confidence intervals (CI) and a broad range of potential confounders were included in analysis. **Results:** A significant two fold increased risk of breast cancer among premenopausal (OR Q4 to Q1=1.93, 95%CI: 1.53-2.61, p-trend=0.001) and postmenopausal (OR Q4 to Q1=1.87, 95%CI: 1.03-2.61, p-trend=0.045) women was observed in the highest quartile of sugar. A higher intake of dietary fiber was associated with a significantly lower breast cancer risk among both premenopausal (OR Q4 to Q1=0.31, 95%CI: 0.12-0.79, p-trend=0.009) and postmenopausal (OR Q4 to Q1=0.23, 95%CI: 0.07-0.76, p-trend=0.031) women. **Conclusions:** Sugar and dietary fiber intake were independently related to pre- and postmenopausal breast cancer risk. However, no association was observed for dietary carbohydrate intake.

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### F39 Dietary carbohydrate, fiber and sugar and risk of breast cancer according to menopausal status in Malaysia

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Asian Pacific Journal of Cancer Prevention, Vol. 15(14), 2014, 5959-5964

**Background:** Dietary carbohydrate, fiber and sugar intake has been shown to play a role in the etiology of breast cancer, but the findings have been inconsistent and limited to developed countries with higher cancer incidence. **Objective:** To examine the association of premenopausal and postmenopausal breast cancer risk with dietary carbohydrate, fiber and sugar intake. **Materials and methods:** This population based case-control study was conducted in Malaysia with 382 breast cancer patients and 382 controls. Food intake pattern was assessed via an interviewer-administered food frequency questionnaire. Logistic regression was used to compute odds ratios (OR) with 95% confidence intervals (CI) and a broad range of potential confounders were included in analysis. **Results:** A significant two fold increased risk of breast cancer among premenopausal (OR Q4 to Q1=1.93, 95%CI: 1.53-2.61, p-trend=0.001) and postmenopausal (OR

Q4 to Q1=1.87, 95%CI: 1.03-2.61, p-trend=0.045) women was observed in the highest quartile of sugar. A higher intake of dietary fiber was associated with a significantly lower breast cancer risk among both premenopausal (OR Q4 to Q1=0.31, 95%CI: 0.12-0.79, p-trend=0.009) and postmenopausal (OR Q4 to Q1=0.23, 95%CI: 0.07-0.76, p-trend=0.031) women. **Conclusions:** Sugar and dietary fiber intake were independently related to pre- and postmenopausal breast cancer risk. However, no association was observed for dietary carbohydrate intake.

#### **F40 Fat intake and its relationship with pre- and post-menopausal breast cancer risk: A case-control study in Malaysia**

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Asian Pacific Journal of Cancer Prevention, Vol. 12(9), 2011, 2167-2178

**Background:** Fat intake has been shown to play a role in the etiology of breast cancer, but the findings have been inconsistent. Objective: To assess the association of premenopausal and postmenopausal breast cancer risk with fat and fat subtypes intake. **Methodology:** This is a population based case-control study conducted in Kuala Lumpur, Malaysia from January 2006 to December 2007. Food intake pattern was collected from 382 breast cancer patients and 382 control group via an interviewer-administered food frequency questionnaire. Logistic regression was used to compute odds ratios (OR) with 95% confidence intervals (CI) and a broad range of potential confounders was included in analysis. **Results:** This study showed that both premenopausal and postmenopausal breast cancer risk did not increase significantly with greater intake of total fat [quartile (Q) 4 versus Q1 OR=0.76, 95% CI, 0.23-2.45 and OR=1.36, 95% CI, 0.30-3.12], saturated fat (ORQ4 to Q1=1.43, 95% CI, 0.51-3.98 and ORQ4 to Q1=1.75, 95% CI, 0.62-3.40), monounsaturated fat (ORQ4 to Q1=0.96, 95% CI, 0.34-1.72 and ORQ4 to Q1=1.74, 95% CI, 0.22-2.79), polyunsaturated fat (ORQ4 to Q1=0.64, 95% CI, 0.23-1.73 and ORQ4 to Q1=0.74, 95% CI, 0.39-1.81), n-3 polyunsaturated fat (ORQ4 to Q1=1.10, 95% CI, 0.49-2.48 and ORQ4 to Q1=0.78, 95% CI, 0.28-2.18), n-6 polyunsaturated fat (ORQ4 to Q1=0.67, 95% CI, 0.24-1.84 and ORQ4 to Q1=0.71, 95% CI, 0.29-1.04) or energy intake (ORQ4 to Q1=1.52, 95% CI, 0.68-3.38 and ORQ4 to Q1=2.21, 95% CI, 0.93-3.36). **Conclusion:** Total fat and fat subtypes were not associated with pre-and postmenopausal breast cancer risk after controlling for age, other breast cancer risk factors and energy intake. Despite the lack of association, the effects of total fat and fat subtypes intake during premenopausal years towards postmenopausal breast cancer risk still warrant investigation.

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#### **F41 Fat intake and its relationship with pre- and post-menopausal breast cancer risk: A case-control study in Malaysia**

**Sulaiman S<sup>1</sup>, Shahril MR<sup>1,2</sup>, Shaharudin SH<sup>1</sup>, Emran NA<sup>3</sup>, Muhammad R<sup>4</sup>, Ismail F<sup>5</sup>, Nurismah MI<sup>6</sup> and Sharifah NA<sup>6</sup>**

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Asian Pacific Journal of Cancer Prevention, Vol. 12(9), 2011, 2167-2178

**Background:** Fat intake has been shown to play a role in the etiology of breast cancer, but the findings have been inconsistent. **Objective:** To assess the association of premenopausal and postmenopausal breast cancer risk with fat and fat subtypes intake. **Methodology:** This is a population based case-control study conducted in Kuala Lumpur, Malaysia from January 2006 to December 2007. Food intake pattern was collected from 382 breast cancer patients and 382 control group via an interviewer-administered food frequency questionnaire. Logistic regression was used to compute odds ratios (OR) with 95% confidence intervals (CI) and a broad range of potential confounders was included in analysis. **Results:** This study showed that both premenopausal and postmenopausal breast cancer risk did not increase significantly with greater intake of total fat [quartile (Q) 4 versus Q1 OR=0.76, 95% CI, 0.23-2.45 and OR=1.36, 95% CI, 0.30-3.12], saturated fat (ORQ4 to Q1=1.43, 95% CI, 0.51-3.98 and ORQ4 to Q1=1.75, 95% CI, 0.62-3.40), monounsaturated fat (ORQ4 to Q1=0.96, 95% CI, 0.34-1.72 and ORQ4 to Q1=1.74, 95% CI, 0.22-2.79), polyunsaturated fat (ORQ4 to Q1=0.64, 95% CI, 0.23-1.73 and ORQ4 to Q1=0.74, 95% CI, 0.39-1.81), n-3 polyunsaturated fat (ORQ4 to Q1=1.10, 95% CI, 0.49-2.48 and ORQ4 to Q1=0.78, 95% CI, 0.28-2.18), n-6 polyunsaturated fat (ORQ4 to Q1=0.67, 95% CI, 0.24-1.84 and ORQ4 to Q1=0.71, 95% CI, 0.29-1.04) or energy intake (ORQ4 to Q1=1.52, 95% CI, 0.68-3.38 and ORQ4 to Q1=2.21, 95% CI, 0.93-3.36). **Conclusion:** Total fat and fat subtypes were not associated with pre- and postmenopausal breast cancer risk after controlling for age, other breast cancer risk factors and energy intake. Despite the lack of association, the effects of total fat and fat subtypes intake during premenopausal years towards postmenopausal breast cancer risk still warrant investigation.

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## F42 Involvement of liver in diabetes mellitus: Herbal remedies

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La Clinica Terapeutica, Vol. 165(4), 2014, 223-230

Liver disease is considered as one of the major complications in oxidative stress disorders like diabetes mellitus (DM). DM presents with deterioration in carbohydrate metabolism which is characterized with chronic hyperglycemia. The organ which involves in glucose or carbohydrate metabolism and is most likely to be affected is the liver. Deterioration in liver architecture and metabolism in DM, are considered as common findings. In the present review both biochemical and histological changes occurring in diabetic liver are conferred in detail. To counteract the oxidative stress disorders and its untoward complications, antioxidant or herbs have emerged as alternative medicine. The present review focuses on several herbs with antioxidant properties towards diabetic liver disease such as Liquorice, Pelargonium graveolens, Momordica charantia, Propolis from bee hives, Dihar, Curcuma Longa, Tinospora cordifolia, Kangen-karyu, Parsley, Chard, Green tea Catechins and Piper sarmentosum (P.s). The herbs or the compounds present in herbs have potential to improve the liver metabolism and maintain the integrity of liver tissue in DM. The review also opens the door for effective use of herbal products for complications involved in the diabetic liver disease.

#### F43 Risk of metabolic syndrome among children living in metropolitan Kuala Lumpur: A case control study

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BMC Public Health, Vol.11 (333), 2011

**Background:** With the increasing prevalence of childhood obesity, the metabolic syndrome has been studied among children in many countries but not in Malaysia. Hence, this study aimed to compare metabolic risk factors between overweight/obese and normal weight children and to determine the influence of gender and ethnicity on the metabolic syndrome among school children aged 9-12 years in Kuala Lumpur and its metropolitan suburbs. **Methods:** A case control study was conducted among 402 children, comprising 193 normal-weight and 209 overweight/ obese. Weight, height, waist circumference (WC) and body composition were measured, and WHO (2007) growth reference was used to categorise children into the two weight groups. Blood pressure (BP) was taken, and blood was drawn after an overnight fast to determine fasting blood glucose (FBG) and full lipid profile, including triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) and total cholesterol (TC). International Diabetes Federation (2007) criteria for children were used to identify metabolic syndrome. **Results:** Participants comprised 60.9% (n = 245) Malay, 30.9% (n = 124) Chinese and 8.2% (n = 33) Indian. Overweight/obese children showed significantly poorer biochemical profile, higher body fat percentage and anthropometric characteristics compared to the normal-weight group. Among the metabolic risk factors, WC  $\geq$ 90th percentile was found to have the highest odds (OR = 189.0; 95%CI 70.8, 504.8), followed by HDL-C  $\leq$ 1.03 mmol/L (OR = 5.0; 95%CI 2.4, 11.1) and high BP (OR = 4.2; 95%CI 1.3, 18.7). Metabolic syndrome was found in 5.3% of the overweight/obese children but none of the normal-weight children ( $p < 0.01$ ). Overweight/ obese children had higher odds (OR = 16.3; 95%CI 2.2, 461.1) of developing the metabolic syndrome compared to normal-weight children. Binary logistic regression showed no significant association between age, gender and family history of communicable diseases with the metabolic syndrome. However, for ethnicity, Indians were found to have higher odds (OR = 5.5; 95%CI 1.5, 20.5) compared to Malays, with Chinese children (OR = 0.3; 95%CI 0.0, 2.7) having the lowest odds. **Conclusions:** We conclude that being overweight or obese poses a greater risk of developing the metabolic syndrome among children. Indian ethnicity is at higher risk compared to their counterparts of the same age. Hence, primary intervention strategies are required to prevent this problem from escalating.

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#### F44 Diet and physical activity in relation to weight change among breast cancer patients

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Asian Pacific Journal of Cancer Prevention, Vol.15 (1), 2014, 39-44

**Background:** This study aimed to provide an overview of lifestyle changes after breast cancer diagnosis and to examine the relationship between dietary and physical activity changes with

weight changes in breast cancer patients. Women with breast carcinomas (n=368) were recruited from eight hospitals and four breast cancer support groups in peninsular Malaysia. Dietary and physical activity changes were measured from a year preceding breast cancer diagnosis to study entry. Mean duration since diagnosis was 4.86±3.46 years. Dietary changes showed that majority of the respondents had decreased their intake of high fat foods (18.8-65.5%), added fat foods (28.3-48.9%), low fat foods (46.8-80.7%), red meat (39.7%), pork and poultry (20.1-39.7%) and high sugar foods (42.1-60.9%) but increased their intake of fish (42.7%), fruits and vegetables (62.8%) and whole grains (28.5%). Intake of other food groups remained unchanged. Only a small percentage of the women (22.6%) had increased their physical activity since diagnosis where most of them (16.0%) had increased recreational activities. Age at diagnosis ( $\beta = -0.20$ ,  $p = 0.001$ ), and change in whole grain ( $\beta = -0.15$ ,  $p = 0.003$ ) and fish intakes ( $\beta = 0.13$ ,  $p = 0.013$ ) were associated with weight changes after breast cancer diagnosis. In summary, the majority of the women with breast cancer had changed their diets to a healthier one. However, many did not increase their physical activity levels which could improve their health and lower risk of breast cancer recurrence.

## F45 Dietary patterns and risk of colorectal cancer: A systematic review of cohort studies (2000-2011)

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Asian Pacific Journal of Cancer Prevention, Vol. 13(9), 2012, 4713-4717

**Objectives:** This systematic review of cohort studies aimed to identify any association between specific dietary patterns and risk of colorectal cancer (CRC). Dietary patterns involve complex interactions of food and nutrients summarizing the total diet or key aspects of the diet for a population under study. **Methods and materials:** This review involves 6 cohort studies of dietary patterns and their association with colorectal cancer. An exploratory or a posteriori approach and a hypothesis-oriented or a priori approach were employed to identify dietary patterns. **Results:** The dietary pattern identified to be protective against CRC was healthy, prudent, fruits and vegetables, fat reduced/diet foods, vegetables/ fish/ poultry, fruit/ wholegrain/ dairy, healthy eating index 2005, alternate healthy eating index, Mediterranean score and recommended food score. An elevated risk of CRC was associated with Western diet, pork processed meat, potatoes, traditional meat eating, and refined grain pattern. **Conclusion:** The Western dietary pattern which mainly consists of red and processed meat and refined grains is associated with an elevated risk of development of CRC. Protective factors against CRC include a healthy or prudent diet, consisting of vegetables, fruits, fish and poultry.

## F46 The prevalence of metabolic syndrome according to various definitions and hypertriglyceridemic-waist in Malaysian adults

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International Journal of Preventive Medicine, Vol.2 (4), 2011, 229-237

**Objectives:** Metabolic syndrome can be diagnosed according to several different criteria such as the latest International Diabetes Federation (IDF), National Cholesterol Education Program Adult Treatment Program III (NCEP ATP III), and World Health Organization (WHO). The objectives of this study were to determine the prevalence of metabolic syndrome and the concordance between the above mentioned definition, and hypertriglyceridemic-waist criteria. **Methods:** This cross sectional study was done in Bachok, Malaysia and involved 298 respondents aged between 18 to 70 years. Multistage random sampling method was used to identify study locations while convenient random sampling method was applied to select individuals. Hypertriglyceridemic waist was defined from an internationally acceptable cut-off criterion. Kappa statistic ( $\kappa$  test) was used to determine the concordance between various definitions and hypertriglyceridemic-waist. **Results:** The prevalence of metabolic syndrome based on different definitions was 32.2% (IDF), 28.5% (NCEP ATP III) and 12.4% (modified WHO). The prevalence of hypertriglyceridemic-waist was 19.7% and based on the IDF criteria a total of 97.5% participants with hypertriglyceridemic-waist had metabolic syndrome. The IDF criteria showed the highest concordance with NCEP ATP III criteria ( $\kappa = 0.63$ ), followed by hypertriglyceridemic-waist criteria ( $\kappa = 0.62$ ) and WHO criteria ( $\kappa = 0.26$ ). **Conclusions:** The prevalence of metabolic syndrome was highest using the IDF criteria compared to NCEP ATP III, modified WHO and hypertriglyceridemic-waist. There was a good concordance of IDF criteria with NCEP ATP III and hypertriglyceridemic-waist criteria.

## F47 Food insecurity and the metabolic syndrome among women from low income communities in Malaysia

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Asia Pacific Journal of Clinical Nutrition, Vol.23 (1), 2014, 138-147

This cross-sectional study examined the relationship between household food insecurity and the metabolic syndrome (MetS) among reproductive-aged women (n=625) in low income communities. The Radimer/ Cornell Hunger and Food Insecurity instrument was utilized to assess food insecurity. Anthropometry, diet diversity, blood pressure and fasting venous blood for lipid and glucose profile were also obtained. MetS was defined as having at least 3 risk factors and is in accordance with the Harmonized criteria. The prevalence of food insecurity and MetS was 78.4% (household food insecure, 26.7%; individual food insecure, 25.3%; child hunger, 26.4%) and 25.6%, respectively. While more food secure than food insecure women had elevated glucose



(food secure, 54.8% vs food insecure, 37.3-46.1%), total cholesterol (food secure, 54.1% vs food insecure, 32.1-40.7%) and LDL-cholesterol (food secure, 63.7% vs food insecure, 40.6-48.7%), the percentage of women with overweight/ obesity, abdominal obesity, hypertension, high triglyceride, low HDL-cholesterol and MetS did not vary significantly by food insecurity status. However, after controlling for demographic and socioeconomic covariates, women in food insecure households were less likely to have MetS (individual food insecure and child hunger) ( $p < 0.05$ ), abdominal obesity (individual food insecure and child hunger) ( $p < 0.01$ ), elevated glucose (household food insecure), total cholesterol (child hunger) ( $p < 0.05$ ) and LDL-cholesterol (household food insecure and child hunger) ( $p < 0.05$ ) compared to food secure women. Efforts to improve food insecurity of low income households undergoing nutrition transition should address availability and accessibility to healthy food choices and nutrition education that could reduce the risk of diet-related chronic diseases.

## **F48 Potential effect of herbs on diabetic hypertension: Alternative medicine treatment modalities**

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La Clinica Terapeutica, Vol. 164 (6), 2013, 529-535

Diabetes mellitus is commonly known to lead to life threatening complications. Among them, hypertension is one complication which may be highlighted. In modern medical society, several drugs and treatment regimen have developed to treat diabetes mellitus. Although they obtain positive impacts, yet there are certain limitations encountered in the management of the disease due to their adverse effects and non-compliance by the patients. Herbs have been valued as a supplement in treating chronic oxidative stress disorder like diabetes mellitus. In the present review, some of the herbs which possess both anti-hyperglycemic and anti-hypertensive properties are being highlighted. Potential herbs which include *Andrographis Paniculata*, *Ammi Visnaga*, *Allium sativum*, *Phyllanthus amarus*, *Ginkgo biloba*, *Solanum tuberosum*, *Tuberosum L.* *Piper sarmentosum* and *Lamiaceae* family are known to possess antihypertensive properties. Various researches have been conducted on these herbs and positive results have been obtained. Based on these results, the present review article discusses the alternative management of diabetic hypertension with the herbal medicine. In conclusion, the present review article stresses on the need to ensure global awareness about the traditional medicines while treating diabetic hypertension.





**G**

**Nutrient and  
Non-nutrient  
Components in Foods**

## G1 Phenolic composition, antioxidant, anti-wrinkles and tyrosinase inhibitory activities of cocoa pod extract

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BMC Complementary and Alternative Medicine, Vol.14, 2014, 381

**Background:** Cocoa pod is an outer part of cocoa fruits being discarded during cocoa bean processing. Authors found out that data on its usage in literature as cosmetic materials was not recorded in vast. In this study, cocoa pod extract was investigated for its potential as a cosmetic ingredient. **Methods:** Cocoa pod extract (CPE) composition was accomplished using UHPLC. The antioxidant capacity were measured using scavenging assay of 1,2-diphenyl-2-picrylhydrazyl (DPPH),  $\beta$ -carotene bleaching assay (BCB) and ferric reducing antioxidant power (FRAP). Inhibiting effect on skin degradation enzymes was carried out using elastase and collagenase assays. The skin whitening effect of CPE was determined based on mushroom tyrosinase assay and sun screening effect (UV-absorbance at 200-400 nm wavelength). **Results:** LC-MS/MS data showed the presence of carboxylic acid, phenolic acid, fatty acid, flavonoids (flavonol and flavones), stilbenoids and terpenoids in CPE. Results for antioxidant activity exhibited that CPE possessed good antioxidant activity, based on the mechanism of the assays compared with ascorbic acid (AA) and standardized pine bark extract (PBE); DPPH: AA > CPE > PBE; FRAP: PBE > CPE > AA; and BCB: BHT > CPE > PBE. Cocoa pod extract showed better action against elastase and collagenase enzymes in comparison with PBE and AA. Higher inhibition towards tyrosinase enzyme was exhibited by CPE than kojic acid and AA, although lower than PBE. CPE induced proliferation when tested on human fibroblast cell at low concentration. CPE also exhibited a potential as UVB sunscreen despite its low performance as a UVA sunscreen agent. **Conclusions:** Therefore, the CPE has high potential as a cosmetic ingredient due to its anti-wrinkle, skin whitening, and sunscreen effects.

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## G2 Phytochemistry and Pharmacological Properties of Thunbergia Laurifolia: A Review

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Pharmacognosy Journal, Vol. 3(24), 2011, 1

Commonly known as blue trumpet vine or laurel clock vine, *Thunbergia laurifolia* is a popular ornamental vine in the tropics. Flowers are attractive with pale purplish-blue petals and a yellow throat. Leaves are heart-shaped with a pointed tip and slightly serrated leaf margin. In Thailand, leaves of *T. laurifolia* are believed to have detoxifying effects. They are used as an antidote for poisons and drugs, including the treatment of drug addiction. The plant has also been reported to have antioxidant, anti-diabetic, anti-inflammatory, and antipyretic properties. Local herbal companies are producing herbal teas and capsules of *T. laurifolia*, known as Rang Jeud in Thai. Compounds isolated from the leaves included iridoid glucosides, grandifloric acid, glucopyranosides, and derivatives of apigenin. Other compounds found in leaves and flowers were delphinidin derivatives, and phenolic acids of chlorogenic, caffeic, gallic, and protocatechuic. Current knowledge on the pharmacological properties of the species is reviewed. Properties

reviewed include antioxidant, antimicrobial, antiproliferative, hepatoprotective, and anti-inflammatory activities, as well as detoxifying, anti-diabetic, and non-toxic effects.

### G3 Determination of folate content in commonly consumed Malaysian foods

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International Food Research Journal, Vol. 19(1), 2012, 189-197

Currently, data concerning the content of naturally occurring dietary folate in Malaysian foods is scarce. The aim of this study was to determine the folate content of vegetables, fruits, legumes and cereals that were commonly consumed among Malaysians. The total folate content of 156 samples (51 vegetables, 33 fruits, 22 legumes and legume products, and 50 cereals and cereal products) available in Malaysia was determined by microbiological assay using *Lactobacillus casei* (L. casei) after trienzyme treatment with protease,  $\alpha$ -amylase and folate conjugase (from rat serum). An internal quality control system was used throughout the study by analyzing CRM 121 (wholemeal flour) and CRM 485 (lyophilized mixed vegetables); percent recovery (as mean  $\pm$  SD) of  $97 \pm 2.0$  and  $101 \pm 4.0$  was obtained. The range of folate content in vegetables, fruits, legumes and cereals were 1-11  $\mu\text{g}/100\text{g}$  and 1-31 on the basis of fresh weight and 1-31  $\mu\text{g}/100\text{g}$  and 2-156  $\mu\text{g}/100\text{g}$  on the basis of dry weight, respectively. This study has shown that some of these underutilized vegetables and fruits are good sources of folate and could fulfill the recommended dietary intake of total folate.

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### G4 Folate content and availability in Malaysian cooked foods

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Malaysian Journal of Nutrition, Vol. 18(3), 2012, 383-391

**Introduction:** Data on folate availability of Malaysian cooked foods would be useful for estimation of dietary folate intake; however such information is scarce. **Methods:** A total of 53 samples of frequently consumed foods in Malaysia were selected from the Nutrient Composition of Malaysian Foods. Folate content was determined using HPLC method hyphenated with a stainless steel C18 column and ultraviolet detector ( $\lambda = 280\text{ nm}$ ). The index of folate availability was defined as the proportion of folate identified as monoglutamyl derivatives from the total folate content. **Results:** Total folate content of different food samples varied from 30-95  $\mu\text{g}/100\text{g}$  fresh weight. Among rice-based dishes, the highest and the lowest total folate was in coconut milk rice (nasi lemak) and ghee rice (nasi minyak), respectively. In noodle dishes, fried rice noodle (kuey teow goreng) and curry noodle (mee kari) had the highest folate contents. The highest index of folate availability was in a flat rice noodle dish (kuey teow bandung) (12.13%), while the lowest was in a festival cake (kuih bakul) (0.13%). Folate content was found to be negatively related to its availability. **Conclusion:** This study determined folate content and folate availability in

commonly consumed cooked foods in Malaysia. The uptake of folate from foods with high folate content may not be necessarily high as folate absorption also depends on the capacity of intestinal deconjugation and the presence of high fibre in the foods.

## G5 Vitamin E and beta carotene composition in four different vegetable oils

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American Journal of Applied Sciences, Vol. 8 (5), 2011, 407

**Problem statement:** Some vegetable oils contains natural antioxidants such as beta carotene and vitamin E namely tocopherol and tocotrienol. Different vegetable oils contained different amount of vitamin E and  $\beta$ -carotene. **Approach:** Study was carried out to investigate the natural antioxidants (vitamin E and beta carotene) composition in four different vegetable oils [Red Palm Olein (RPO), palm olein (PO), Corn Oil (CO) and Coconut Oil (COC)]. **Results:** The results showed that RPO contained the highest amount of vitamin E and  $\beta$ -carotene compared to the other three types of vegetable oils studied. **Conclusion:** The RPO can be considered as a good source of natural antioxidant (tocopherol, tocotrienol and  $\beta$ -carotene).

## G6 Fatty acids composition of four different vegetable oils (Red Palm Olein, Palm Olein, Corn Oil and Coconut Oil) by gas chromatography

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International Research Journal of Biochemistry and Bioinformatics, Vol. 1 (7), 2011, 184-189

The objective of the study was to evaluate the fatty acids composition of four different vegetable oils [red palm olein (RPO), palm olein (PO), corn oil (CO) and coconut oil (COC)] by Gas chromatography. Four different vegetable oils were analyzed for fatty acid concentration by gas chromatography. The results showed that the predominant component of RPO and PO was oleic acid (18:0) (44.616% and 49.482%) and palmitic acid (16:0) (42.465% and 36.768%) respectively whilst the CO was rich in linoleic acid (18:0) 47.189% but COC was rich in lauric acid (12:0) 46.458% compared to the other oil samples. The fatty acid composition of red palm olein and palm olein contains a healthy mixture of all types of fatty acids saturated and unsaturated fatty acids.

## G7 Nutritional values of *Tempe* inoculated with different strains of *Rhizopus*: Its $\gamma$ -aminobutyric acid content and antioxidant property

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Journal of Tropical Agriculture and Food Science, Vol. 40(2), 2012, 181-192

The  $\gamma$ -aminobutyric acid (GABA) content and antioxidant profile of fermented soybean inoculated

with eight different strains of *Rhizopus* sp. were studied. The ability of these strains, which were obtained from the Centre of Functional Food Cultures (CFFC) collection at MARDI, to produce GABA were compared to wild strains obtained from commercial tempe. Results showed that Tempe inoculated with *Rhizopus* strains of MARDI contained higher GABA, mostly above 0.060 g/100 g dry weight compared to commercial Tempe. The highest GABA content was seen in the *Tempe* inoculated with *Rhizopus* 5351 strain with a concentration of up to 0.154 g/100 g dry weight at 48 h fermentation. The amount of beneficial free and essential amino acids of this *Tempe* were also more than 1.70 g and 0.50 g/100 g dry weight respectively. *Tempe* inoculated with *Rhizopus* 5351 strain had the highest sensory score in organoleptic acceptability as evaluated by 14 experienced panellists. In addition, the antioxidant content of this *Tempe* was within the range of commercial *Tempe*. Overall, *Tempe* inoculated with *Rhizopus* 5351 strain had better nutritional value compared to current commercial *Tempe* available in Malaysia. Obviously, *Rhizopus* 5351 strain can be introduced as a commercial starter culture for making Tempe in Malaysia.

G8

### **Nutritive value between fermented and germinated soybean: $\gamma$ -aminobutyric acid, amino acids content and antioxidant properties**

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Borneo Science Journal, Vol.31, 2012, 130-137

In this study, soybean was subjected to both fermentation and germination process that was exposed either in an aerobic or anaerobic condition or combination of both. The  $\gamma$ -aminobutyric acid (GABA), amino acids content and antioxidants properties of both fermented and germinated soybean were analyzed. In all cases, the fermented soybean inoculated with *Rhizopus* 5351 strain were noted to have high content of GABA, essential amino acids and better antioxidant activities than germinated soybean. It was observed that fermented soybean subjected to both combination of aerobic and anaerobic incubation treatment (FSB3) had the highest content of GABA with the abundant of beneficial free and essential amino acids content, which was 0.328, 3.212 and 1.104 g/100g dry weight, respectively. In addition, sample FSB3 also showed the highest content of total phenolic compound (22.56 mg gallic acid equivalent/g extract) and antioxidant activity with the lowest IC50 value of 20 mg extract/mL among other soybean treatment. Within germination process, anaerobic germinated soybean at 72 h appeared to have better yield of GABA and amino acids content with higher antioxidant activities than other germinated soybean under aerobic condition. This sample was observed to contain higher amount of total phenolic compound and ferric reducing antioxidant power with lower value of IC50. This study showed that the fermented soybean inoculated with *Rhizopus* 5351 strain is able to produce better nutritive value when compared to germinated soybean either in aerobic or anaerobic condition.

## G9 Nutritional value and glycemic index of Bario rice varieties

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Journal of Tropical Agriculture and Food Science, Vol. 42 (1), 2014, 1-8

Many indigenous crops of Malaysia have great potential to become important in the future, which are essential for attainment of both food security and health. Among the potential crops are the Bario rice varieties which are famous for their soft texture, pleasant aroma and exquisite taste. There are four Bario rice varieties, namely *Adan Halus*, *Bario Tuan*, *Bario Merah* and *Bario Celum*. Analysis of nutritional values shows that these rice varieties can be labelled as main sources of protein (5.85-7.30 g/100 g), high in thiamine (0.46-0.63 g/100 g) and low in fat (0.5-1.05 g/100 g). These attributes showed that all Bario rice varieties have great potential to be promoted as ingredient for health foods. Analysis of glycemic index (GI) by human subject's glucose tolerance test method on the rice varieties shows that *Bario Celum* and *Bario Tuan* are classified as moderate GI rice with index of 60.9 and 62.2 respectively. Foods with low and moderate GI are reported to be good for controlling human blood glucose.

## G10 Amylose and amylopectin in selected Malaysian foods and its relationship to glycemic index

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Sains Malaysiana, Vol. 40 (8), 2011, 865-870

The aim of this study was to determine the nutrient contents and to evaluate the relationship between amylose and amylopectin content to glycemic index of diet commonly eaten by Malaysian. The food samples consisted of nasi lemak, fried rice, fried rice noodle, fried macaroni, sandwich sardine, doughnut, curry puff and roti canai with dhal. Each sample was prepared based on standard recipe (except doughnut, roti canai with dhal and curry puff were bought from 3 different locations) in two different cycles. Moisture, ash, crude protein and crude fat were analyzed using proximate analysis whereas amount of carbohydrate was calculated "by difference". Total dietary fiber was analyzed using AOAC 991.43. The content of amylose and amylopectin were analyzed using colorimetric method and calculated "by difference", respectively. Our results showed that doughnut contained the highest carbohydrate ( $49.49 \pm 1.24$  g/100 g) while nasi lemak had the lowest carbohydrate ( $25.04 \pm 0.56$  g/100 g). Roti canai with dhal had the highest total dietary fiber content ( $3.89 \pm 0.43$  g/100 g). The highest amylose content was found in roti canai with dhal ( $11.75 \pm 1.38\%$ ) while highest amylopectin content was in nasi lemak ( $94.19 \pm 0.48\%$ ). The amylose content of tested samples ranged from 5 to 12%. In conclusion, results showed that there was no significant relationship between the ratio of amylose to amylopectin and glycemic index but negative trend existed which indicated increase in amylose content will lower the glycemic index of a food.



## G11 Nutritional compositions and antioxidative capacity of the silk obtained from immature and mature corn

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Journal of King Saud University-Science, Vol.26 (2), 2014, 119-127

The silks of immature and mature corn were evaluated for their variations in nutritional compositions, mineral content and antioxidant capacity. Both immature and mature silks were good source of nutritional compositions. Immature silks contained significantly higher moisture (89.31%) (fresh basis), lipid (1.27%) and protein (12.96%) content than the mature silk. Mature silks contained higher composition of ash (5.51%), carbohydrate (29.74%) and total dietary fiber (51.25 g/100 g), than the immature silk, but the difference was not significant. In mineral determination, immature silk was rich source of Ca (1087.08  $\mu$ g/g), Mg (1219.17  $\mu$ g/g), Cu (5.60  $\mu$ g/g) and Zn (46.37  $\mu$ g/g) than the mature silks. In contrast, other minerals such as K (35671.67  $\mu$ g/g), Na (266.67  $\mu$ g/g), Fe (4.50  $\mu$ g/g) and Mn (35.57  $\mu$ g/g) were found higher in the mature silk. The silks were extracted with ethyl acetate, ethanol and water using the Soxhlet extraction method to determine the polyphenol and ABTS radical scavenging capacity. From this study, the highest content of total polyphenol of immature silks was exhibited by ethanol extract (92.21 mg GAE/g) while water extract (64.22 mg GAE/g) had the highest polyphenol content among mature silk extracts. Total flavonoid content of both immature and mature silks was higher in the water extract at 8.40 mg CAE/g and 2.31 mg CAE/g, respectively. In the ABTS free radical assay method, all immature silk extracts had higher percentage of inhibition compared to the mature silks. Among all three crude extracts, the ethanol extract of immature (EC<sub>50</sub> = 0.478 mg/ml) and mature silk (EC<sub>50</sub> = 0.799 mg/ml) exhibited the strongest antioxidant capacity followed by the water and ethyl acetate extract.

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## G12 Proximate composition and antioxidant activity of dried Belimbing Dayak (*Baccaurea Angulata*) fruits

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Sains Malaysiana, Vol. 42(2), 2013, 129-134

*Baccaurea angulata* or locally known as 'belimbing dayak' or 'belimbing hutan' is an underutilized fruit indigenous to Borneo with its proximate analysis and antioxidant values are yet to be explored. Proximate analysis and antioxidative properties of oven-dried *B.angulata* fruits of three fractions; whole fruit, skins and berries were evaluated. From the analysis conducted, whole fruit, berries and skins fraction of *B. angulata* contained 2.83%, 5.15% and 0.28% of total fat; 3.11%,

3.43% and 3.89% of protein; 16.66%, 19.09% and 11.37% of moisture; 4.57%, 3.68% and 7.28% of total ash and water activity (*A<sub>w</sub>*) of 0.41, 0.44 and 0.44, respectively. Evaluation of antioxidant activities using ferric reducing ability of plasma (FRAP), 1, 1-diphenyl-2-picrylhydrazyl (DPPH) and Trolox/ABTS equivalent antioxidant capacity (TEAC) revealed that the skins fraction exhibits highest antioxidant activities ( $p<0.05$ ) followed by whole fruit and berries fractions. The antioxidant activities were significantly correlated ( $p<0.05$ ) with total phenolic and total flavonoid content but not to anthocyanins. Considering the nutritional values it contained, *B. angulata* is another good source of natural antioxidants with significant health benefits and high value for commercialization.

### **G13 Variability in nutritional composition and phytochemical properties of red pitaya (*Hylocereus polyrhizus*) from Malaysia and Australia**

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International Food Research Journal, Vol. 21 (4), 2014, 1689

The present work sought to investigate the nutritional composition and phytochemical properties of red pitaya (*Hylocereus polyrhizus*) juices from Malaysia and Australia and to determine the optimum ethanol concentration (in the range of 0 - 100% ethanol) for the extraction of phenolic, flavonoid and betacyanin contents. The predominant macronutrient in red pitaya juice was carbohydrate while potassium and vitamin A were the major mineral and vitamin content. Red pitaya juice from Malaysia achieved optimal total phenolic content at 20% of ethanol (20 mL ethanol in 100 mL water, v/v); total flavonoid content at 60% (v/v); and betacyanin content at 0% (v/v). Red pitaya juice from Australia achieved the maximum total phenolic content at 60% (v/v); total flavonoid content at 20% (v/v); and betacyanin content at 80% (v/v). Nutritional composition and the phytochemical properties of red pitaya in Malaysia and Australia were significantly different suggested the role of environmental factors like soil and climate on the phytochemical properties of red pitaya.

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### **G14 Proximate nutritional composition and antioxidant properties of 'Oryza Rufipogon', a wild rice collected from Malaysia compared to cultivated rice, MR219**

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Australian Journal of Crop Science, Vol.6 (11), 2012

Wild rice (*Oryza rufipogon* L) is known as an important germplasm that has specific desirable attributes and a high genetic diversity. The physicochemical and antioxidant properties of *O. rufipogon* Griff. (acc. IRGC105491), a wild rice collected from Malaysia that was used in a

breeding program and a QTL mapping study, were assessed to determine the rice's nutritional value compared with a commonly consumed rice cultivar MR219 (*O. sativa* subsp. *indica*). To identify and quantify the phenolic compounds in the rice extracts, Ultra Performance Liquid Chromatography (UPLC) coupled with a photodiode array detector (PDA) was applied. The results obtained were supported by a determination of the total phenolic compounds (TPC), 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging, tocopherols, tocotrienols, and the ferric reducing ability power (FRAP) of the respective extracts originating from the whole grain. The results indicated that *O. rufipogon*, irrespective of its poor appearance, contained high proximate nutritional composition and antioxidant properties. The grain of *O. rufipogon* consisted of 8.0% protein, 2.2% fat, and 25.0% amylose content all significantly higher than the ratios of MR219. Except for the percentage of inhibition DPPH radical, which was statistically at par with MR219, the antioxidant activity of *O. rufipogon* was higher than that of MR219. The high antioxidant activity of *O. rufipogon* was supported by the presence of high tocochromanol content higher than MR219. *Oryza rufipogon* extracts were also the most effective in antioxidative reactions. This study demonstrated that wild rice can be considered a valuable source of bioactive components with high antioxidant properties in breeding programs.

### **G15 Red pericarp advanced breeding lines derived from *Oryza Rufipogon* Ñ— *Oryza Sativa*: Physicochemical properties, total antioxidant activity, phenolic compounds and vitamin E content**

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Advance Journal of Food Science & Technology, Vol. 4 (3), 2012, 155

Two new red pericarp transgressive variants (advanced breeding lines from BC2F7 generation) with high yield, derived from a cross between the wild relative, *O. rufipogon* Griff. and *O. sativa* subsp. *indica* cv. MR219, were analysed to determine their proximate composition, total antioxidant activity, phenolic acid composition and tocochromanol content in comparison with two commonly consumed rice varieties, MR219 (brown coloured) and Thailand rice (red coloured). The red pericarp variants were not significantly different in grain quality related traits. For fat content, neither variant showed any significant difference to the recurrent parent MR219, however for amylose content they possessed lower levels compared to MR219 but for both traits results were comparable to Thailand red rice. Variants G33 and G37 produced significantly ( $p < 0.05$ ) higher total phenolic content (0.49 and 0.51 mgGAE/g, respectively) than the white control sample, MR219 (0.32 mgGAE/g) but lower than Thailand red rice (1.59 mgGAE/g) ( $p < 0.05$ ). Ferric-Reducing Ability Power (FRAP) was significantly ( $p < 0.01$ ) higher in both variants compared to MR219 but lower than in Thailand red rice. For DPPH radical scavenging, both variants were not significantly different from both controls. Caffeic and ferulic acid detected in all samples were in higher amounts compared to the other compounds and hydroxycinnamic acids were considered as the main phenolic acids. Across all samples, the content of total E vitamin was higher in G37 and (-)tocotrienol, which was the most abundant tocol. In conclusion both red pericarp variants can be used in cultivar development program for red rice with high nutritional value.

## G16 Oil palm vegetation liquor: a new source of phenolic bioactives

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The British Journal of Nutrition, Vol.106 (11), 2011, 1655-1663

Waste from agricultural products represents a disposal liability, which needs to be addressed. Palm oil is the most widely traded edible oil globally, and its production generates 85 million tons of aqueous by-products annually. This aqueous stream is rich in phenolic antioxidants, which were investigated for their composition and potential in vitro biological activity. We have identified three isomers of caffeoylshikimic acid as major components of oil palm phenolics (OPP). The 2, 2-diphenyl-1 picrylhydrazyl assay confirmed potent free radical scavenging activity. To test for possible cardioprotective effects of OPP, we carried out in vitro LDL oxidation studies as well as ex vivo aortic ring and mesenteric vascular bed relaxation measurements. We found that OPP inhibited the Cu-mediated oxidation of human LDL. OPP also promoted vascular relaxation in both isolated aortic rings and perfused mesenteric vascular beds pre-contracted with noradrenaline. To rule out developmental toxicity, we performed teratological studies on rats up to the third generation and did not find any congenital anomalies. Thus, these initial studies suggest that OPP is safe and may have a protective role against free radical damage, LDL oxidation and its attendant negative effects, as well as vascular constriction in mitigating atherosclerosis. Oil palm vegetation liquor thus represents a new source of phenolic bioactives.

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## G17 Determination of total phenolic, flavonoid content and free radical scavenging activities of common herbs and spices

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Journal of Pharmacognosy and Phytochemistry, Vol.3 (3), 2014, 104-108

Antioxidants present in herbs and spices could be an effective tool to prevent the non-communicable diseases like cancer, diabetes and myocardial infarction as they have the capacity to stabilize the free radicals which are one of the causative factors of these diseases. This study aims to quantify the total phenolic and flavonoid content of commonly used herbs & spices and determination of their free radical scavenging activities expressed as inhibitory concentration (IC50). The results of this study depict that the tested herbs & spices have considerable amount of phenols and flavonoids and a high scavenging power of free radicals.

## G18 Nutritional composition of ready-to-eat cereals in the Malaysian market

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Malaysian Journal of Nutrition, Vol. 20 (3), 2014, 417-427

**Introduction:** This study aimed to determine the nutrient content of cornflakes and muesli, ready-to-eat cereal products available in the Malaysian market. Cornflakes and muesli were chosen due to their popularity as a breakfast meal especially in urban areas. **Methods:** A total of six brands each for cornflakes and muesli were purchased from supermarkets in the Klang Valley using stratified random sampling. All samples were analysed using AOAC official methods of analysis. The validity of the test data was monitored with the application of internal quality controls in line with the requirements of ISO 17025. **Results:** Proximate analysis revealed significantly higher mean levels of carbohydrate ( $86.94 \pm 0.59$  mg/100 g), minerals such as iron ( $8.48 \pm 1.72$  mg/100 g) and sodium ( $674.83 \pm 102.99$  g/100 g), B3 as niacinamide ( $25.87 \pm 6.14$  g/100 g) and sucrose ( $5.10 \pm 0.90$  mg/100 g) in cornflakes than in muesli. However, muesli contained significantly more mean moisture ( $10.23 \pm 0.72$  mg/100 g), protein ( $10.07 \pm 0.79$  mg/100 g), total dietary fibre ( $12.49 \pm 1.44$  mg/100 g), magnesium ( $113.22 \pm 7.93$  mg/100 g), zinc ( $1.65 \pm 0.16$  mg/100 g), copper ( $0.25 \pm 0.02$  mg/100 g), total sugar ( $18.75 \pm 2.05$  mg/100 g), glucose ( $7.70 \pm 1.77$  mg/100 g) and fructose ( $8.68 \pm 1.76$  mg/100 g) than cornflakes. Most of the fatty acids analysed were not detected or of low value in both the cereal products. **Conclusion:** The nutrient analysis of cornflakes and muesli suggests that both ready-to-eat cereals are nutritionally good choice as breakfast for consumers as it provides carbohydrate, minerals, fibre and vitamins. The data provides additional information to the Malaysian Food Composition Database.

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## G19 Phenolic acids in selected tropical citrus

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Asian Journal of Plant Biology, Vol. 1, 2013, 1-5

In spite of wide research on plant phenolics, limited data are available on the phenolic acid content in selected tropical citrus. Phenolic acids are known to contribute health benefits to humans. In this study, free and ester conjugated phenolic acid in selected tropical citrus was successfully identified and quantified using the Gas Chromatography Mass Spectrometry (GCMS). Citrus microcarpa, Citrus medica, Citrus hystrix and Citrus suhuiensis were among the tropical citrus analysed for their free and ester conjugated phenolic acids. C. microcarpa contains high amount of free and ester conjugated phenolic acid, which may suitable to be applied in health food products.

## G20 Nutritional compositions and bioactivities of *Dacryodes* species: A review

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Food Chemistry, Vol.165, 2014, 247-255

*Dacryodes* species are evergreen, perennial trees with fleshy fruits and belong to the family Buseraseae. Many *Dacryodes* species are underutilized but are widely applied in traditional folk medicine to treat malaria, fever and skin diseases. The nutritional compositions, phytochemicals and biological activities of *Dacryodes edulis*, *Dacryodes rostrata*, *Dacryodes buettneri*, *Dacryodes klaineana* and *Dacryodes hexandra* are presented. The edible fruits of *D. edulis* are rich in lipids, proteins, vitamins, fatty acids and amino acids. Its extracts (leaf, fruit and resin) exhibit antioxidant, anti-microbial, anti-carcinogenic and other bioactivities. *D. rostrata* fruit has significant nutrient content, and is rich in proteins, lipids and minerals. These fruits are also highly rich in polyphenols, anthocyanins and antioxidant activities. This comprehensive review will assist the reader in understanding the nutritional benefits of *Dacryodes* species and in identifying current research needs.

## G21 Proximate composition of Malaysian underutilised fruits

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Journal of Tropical Agriculture and Food Science, Vol.42 (1), 2014, 63 - 72

The proximate compositions of 42 varieties of underutilised fruits were analysed including *ceri Terengganu* (5 varieties), *bambangan (Mangifera pajang)* (3 varieties), *dabai* (6 varieties), *asam gelugur (Garcinia atroviridis)* (11 varieties), *durian* (5 varieties), *isu* (5 varieties), *nyekak* (4 varieties) and *sukang* (3 varieties). The moisture content of the fruits ranged from 0.24% to 56.68% with *asam gelugur Taiping* having the lowest and *ceri terengganu PK24* the highest. *Asam gelugur Kampung Layang-layang* also had the lowest ash content (1.36%) while *ceri terengganu PK42* had the highest (4.44%). The lowest fat content was in *bambangan ovoid fruit* (0.2%) while the highest was in *durian 1-89 variety* (40.14%). The highest protein content was also found in *durian 1-89 variety* (8.81%) while *asam gelugur Kampung Biong fruit* had the lowest (1.06%). The carbohydrate content ranged from 37.86% (*ceri terengganu PK4*) to 95.26% (*asam gelugur Bota Kanan*). The energy content of the fruits ranged from 166.85 Kcal (*ceri terengganu PK4*) to 567.12 Kcal [*dabai niah (soaked)*]. The proximate compositions of these fruits are useful for developing a Malaysian underutilised food composition database.

**G22** **Chemical compositions and antioxidative and antidiabetic properties of underutilized vegetable palm hearts from *Plectocomiopsis geminiflora* and *Eugeissona insignis***

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Journal of Agricultural and Food Chemistry, Vol.62 (9), 2014, 2077-2084

Underutilized vegetables are currently studied not only for their nutrient values but also for their health-promoting components for protection against chronic diseases. The present study was performed to evaluate chemical compositions and antioxidant properties of underutilized vegetable palm hearts, namely, lalis (*Plectocomiopsis geminiflora*) and pantu (*Eugeissona insignis*). Additionally, the vegetable extracts were evaluated for their activities in the inhibition of digestive enzymes and effects on insulin secretion using BRIN BD11 pancreatic cell lines. Both vegetables contain valuable sources of dietary fiber, potassium, and zinc. For the first time, the phenolic compounds of the vegetables were identified and quantified using HPLC-DAD and LC-ESI-MS. Appreciable amounts of chlorogenic acid were found in the studied vegetables. The sample extracts exhibited potential antioxidant capacities through chemical and biological in vitro assays. High inhibition of  $\alpha$ -amylase activity (>50%) was found from the extracts. Thus, it was suggested the vegetable consumption could fulfill the nutrient requirements among local communities.







**H**

**Clinical Nutrition/  
Intervention**

## H1 Delivery of enteral nutrition for critically ill children

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Nutrition and Dietetics, Vol. 70 (2), 2013, 120-125

**Aim:** Optimal nutrition support is important in the care of critically ill children as they are at higher risk of malnutrition and have a higher incidence of complications and mortality. The aim of this study was to review the delivery of enteral feeding to critically ill paediatric patients in the Paediatric Intensive Care Unit in a tertiary hospital in Malaysia. **Methods:** This cross-sectional study was conducted in 53 subjects (30 males and 23 females) who were recruited on the day of admission and remained in the study until they were discharged, deceased or for a maximum of 14 days of Paediatric Intensive Care Unit stay. The median age of subjects was 10.2 (interquartile range 5.1-50.5) months old. **Results:** Enteral nutrition was initiated within 21.0 (interquartile range 5.3-33.8) hours after admission and was interrupted in 66% of patients during the study, with a median duration of 11.5 (interquartile range 6.1-28.3) hours for each patient. The overall duration of enteral feeding interruptions was 20% of the total feeding time. The main reasons for interruptions were medical procedures (55%) and non-gastrointestinal complications (27%). Twenty-two (43.2%) of the patients were malnourished when admitted to the Paediatric Intensive Care Unit. The feeding initiation time, referral to the dietitian, and the frequency and duration of feeding interruptions were all positively associated with cumulative energy and protein deficits. **Conclusions:** Malnutrition among critically ill children in the Paediatric Intensive Care Unit was prevalent; energy and protein deficits were substantial. Strategies to improve the delivery of nutritional support to this group of patients should be planned and implemented by multidisciplinary clinical teams.

## H2 Fish oil supplementation is beneficial on caloric intake, appetite and mid upper arm muscle circumference in children with leukaemia

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Asian Pacific Journal of Clinical Nutrition, Vol. 21(4), 2012, 502-510

A randomised trial was carried out to determine the effect of supplementation of fish oil among 51 children with leukaemia aged 4 to 12 years on appetite level, caloric intake, body weight and lean body mass. They were randomly allocated into the trial group (TG) and the control group (CG). At baseline, 30.8% of TG subjects and 44.0% of CG subjects were malnourished and 7.7% of subject from TG and 28.0% from CG were classified as stunted. The majority of subjects from TG and CG were in the mild malnutrition category for mid upper arm muscle circumference (MUAMC)-for-age. The TG group showed significant increment in MUAMC (0.13 cm vs -0.09 cm) compared with CG at 8 weeks ( $p < 0.001$ ). There was a significant higher increase for appetite level ( $0.12 \pm 0.33$ ) ( $p < 0.05$ ) and an increasing trend on energy and protein intake in the TG group ( $213 \pm 554$  kcal;  $3.64 \pm 26.8$  g) than in the CG group. In conclusion, supplementation of fish oil has a positive effect on appetite level, caloric intake and MUAMC among children with leukaemia.

### Perceptions of Malaysian colorectal cancer patients regarding dietary intake: A qualitative exploration

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Asian Pacific Journal of Cancer Prevention, Vol. 14(2), 2013, 1151-1154

**Background:** Changes in dietary practices are known to be associated with changes in the health and disease pattern of a population. This study aimed to qualitatively explore the perception of colorectal cancer patients regarding causes of colorectal cancer and the influence of diet.

**Materials and Methods:** Twelve respondents from three major ethnicities in Malaysia were selected from the quantitative study on dietary pattern and colorectal cancer carried out earlier in this study. In-depth interviews (IDI), conducted from April until June 2012, were mainly in the Malay language with additional use of English and continued until the saturation point was reached. All interviews were autorecorded so that verbatim transcriptions could be created.

**Results:** Causes of colorectal cancer were categorized into internal and external factors. The majority of respondents agreed that there is an association between Western foods and colorectal cancer. Malaysian traditional diet was not related to colorectal cancer as less preservative agents were used. Malaysian diet preparation consisting of taste of cooking (spicy, salty and sour foods) plus type of cooking (fry, grilled and smoked) were considered causes of colorectal cancer. All respondents changed their dietary pattern to healthy food after being diagnosed with colorectal cancer. Advice from doctors regarding suitable food for colorectal cancer was useful in this regard.

**Conclusions:** Eating outside, use of food flavoring ingredients and preservative agents were considered to be the main factors causing colorectal cancer. All respondents admitted that they changed to a healthy diet after being diagnosed with colorectal cancer.

### Does vitamin A supplementation protect schoolchildren from acquiring soil-transmitted helminthiasis? A randomized controlled trial

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Parasites & Vectors, Vol. 7, 2014, 367

**Background:** Despite the intensive global efforts to control intestinal parasitic infections, the prevalence of soil-transmitted helminth (STH) infections is still very high in many developing countries particularly among children in rural areas. **Methods:** A randomized, double-blind,

placebo-controlled trial was conducted on 250 Aboriginal schoolchildren in Malaysia to investigate the effects of a single high-dose of vitamin A supplementation (200 000 IU) on STH reinfection. The effect of the supplement was assessed at 3 and 6 months after receiving interventions; after a complete 3-day deworming course of 400 mg/daily of albendazole tablets. Results: Almost all children (98.6%) were infected with at least one STH species. The overall prevalence of ascariasis, trichuriasis and hookworm infection was 67.8%, 95.5% and 13.4%, respectively. Reinfection rates of *Ascaris*, *Trichuris* and hookworm were high; at 6 months, assessment reached 80% of the prevalence reported before treatment. There were no significant differences in the reinfection rates and intensities of STH between vitamin A supplemented-children and those who received placebo at 3 and 6 months ( $p>0.05$ ). Conclusions: Vitamin A supplementation showed no protective effect against STH reinfection and this could be due to the high endemicity of STH in this community. Long-term interventions to reduce poverty will help significantly in reducing this continuing problem and there is no doubt that reducing intestinal parasitic infection would have a positive impact on the health, nutrition and education of these children.

## H5 Effects of vitamin a supplementation on iron status indices and iron deficiency anaemia: A randomized controlled trial

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Nutrients, Vol. 6, 2014, 190-206

Iron deficiency anaemia (IDA) is the most common nutritional deficiency in the world including developed and developing countries. Despite intensive efforts to improve the quality of life of rural and aboriginal communities in Malaysia, anaemia and IDA are still major public health problems in these communities particularly among children. A randomized, double-blind, placebo-controlled trial was conducted on 250 Orang Asli (aboriginal) schoolchildren in Malaysia to investigate the effects of a single high-dose of vitamin A supplementation (200,000 IU) on iron status indices, anaemia and IDA status. The effect of the supplement was assessed after 3 months of receiving the supplements; after a complete 3-day deworming course of 400 mg/day of albendazole tablets. The prevalence of anaemia was found to be high: 48.5% (95% CI = 42.3, 54.8). Moreover, 34% (95% CI = 28.3, 40.2) of the children had IDA, which accounted for 70.1% of the anaemic cases. The findings showed that the reduction in serum ferritin level and the increments in haemoglobin, serum iron and transferrin saturation were found to be significant among children allocated to the vitamin A group compared to those allocated to the placebo group ( $p<0.01$ ). Moreover, a significant reduction in the prevalence of IDA by almost 22% than prevalence at baseline was reported among children in the vitamin A group compared with only 2.3% reduction among children in the placebo group. In conclusion, vitamin A supplementation showed a significant impact on iron status indices and IDA among Orang Asli children. Hence, providing vitamin A supplementation and imparting the knowledge related to nutritious food should be considered in the efforts to improve the nutritional and health status of these children as a part of efforts to improve the quality of life in rural and aboriginal communities.

H6

## Randomised-controlled trial of a web-based dietary intervention for patients with type 2 diabetes mellitus: Study protocol of *myDIDeA*

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BMC Public Health, Vol.11, 2011, 359

**Background:** The potential of web-based interventions in dietary behaviour modification of the diabetics has not been fully explored. We describe the protocol of a 12-month match-design randomised controlled trial of a web based dietary intervention for type 2 diabetic patients with primary aim to evaluate the effect of the intervention on their dietary knowledge, attitude and behaviour (KAB). The secondary objective of this study is to improve the participants' dietary practices, physical measurements and biomarkers. **Methods/Design:** A minimum total sample of 82 Type 2 diabetics will be randomised, either to the control group, who will receive the standard diabetes care or the e-intervention group, who will participate in a 6-month web based dietary intervention in addition to the standard care. The dietary recommendations are based on existing guidelines, but personalised according to the patients' Stages of Change (SOC). The participants will be followed up for 6 months post-intervention with data collection scheduled at baseline, 6-month and 12-month. **Discussion:** We are aiming for a net improvement in the KAB score in participants of the e-intervention group, besides investigating the impact of the e-intervention on the dietary practices, physical measurements and blood biomarkers of those patients. The successful outcome of this study can be a precursor for policy makers to initiate more rigorous promotion of such web-based programmes in the country.

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H7

## A workplace email-linked website intervention for modifying cancer-related dietary and lifestyle risk factors: Rationale, design and baseline findings

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Malaysian Journal of Nutrition, Vol. 19 (1), 2013, 37-51

The use of email and website as channels for workplace health information delivery is not fully explored. This study aims to describe the rationale, design, and baseline findings of an email-linked website intervention to improve modifiable cancer risk factors. Employees of a Malaysian public university were recruited by systematic random sampling and randomised into an intervention (n=174) or control group (n=165). A website was developed for the intervention and educational modules were uploaded onto the website. The intervention group received ten consecutive weekly emails with hypertext links to the website for downloading the modules and two individual phone calls as motivational support whilst the control group received none. Diet, lifestyle, anthropometric measurements, psychosocial factors and stages of change related to dietary fat, fruit and vegetable intake, and physical activity were assessed. Participants were predominantly female and in non-academic positions. Obesity was prevalent in 15% and 37% were at risk of co-morbidities. Mean intake of fats was 31%, fruit was ~1 serving/day and vegetable was <1 serving/day. Less than 20% smoked and drank alcohol and about 40% were

physically inactive. The majority of the participants fell into the Preparation stage for decreasing fat intake, eating more fruit and vegetables, and increasing physical activity. Self-efficacy and perceived benefits were lowest among participants in the Precontemplation/Contemplation stage compared to the Preparation and Action/Maintenance stages. Baseline data show that dietary and lifestyle practices among the employees did not meet the international guidelines for cancer prevention. Hence the findings warrant the intervention planned.

## H8 Effect of Talbinah food consumption on depressive symptoms among elderly individuals in long term care facilities, randomized clinical trial

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Clinical Interventions in Aging, Vol. 8, 2013, 279-285

Talbinah is a barley syrup cooked with milk and sweetened by honey. In his famous Hadith on Talbinah, the Prophet Mohammad (SAW) recommended it when sad events happen for its effect on soothing hearts and relieving sadness. This 3-week crossover designed, randomized clinical trial was conducted to determine the effect of Talbinah on mood and depression among institutionalized elderly people in Seremban. A sample of 30 depressed elderly subjects (21 men and 9 women) was selected from the long term care facility. Three different interview-based validated scales (Geriatric Depression Scale, Depression Anxiety Stress Scales, and Profile of Mood States) were used to determine mood, depression, stress, and anxiety at week 0, 3, 4, and 7. The nutritional value of Talbinah was examined using proximate food analysis, minerals content analysis, and differential amino acid analysis. The results indicated that Talbinah is a high carbohydrate food (86.4%) and has a high tryptophan: branch chain amino acids ratio (1:2). A Wilcoxon nonparametric test showed that there was a statistically significant decrease on depression, stress, and mood disturbances scores among the intervention group ( $P < 0.05$ ) for all parameters. In conclusion, Talbinah has the potential to reduce depression and enhance mood among the subjects. Ingestion of functional foods such as Talbinah may provide a mental health benefit to elderly people.

## H9 Medical nutrition therapy administered by a dietitian yields favourable diabetes outcomes in individual with type 2 diabetes mellitus

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Medical Journal of Malaysia, Vol. 6(1), 2013, 18-23

**Aim:** This prospective, single-group, pre-post design trial was conducted to evaluate the effect of individualised Medical Nutrition Therapy intervention administered by a dietitian in individuals with type 2 diabetes mellitus on glycaemic control, metabolic parameters and dietary intake.

**Methods:** Subjects ( $n=104$ ; age= $56.4 \pm 9.9$  years; 37% male; years of diagnosis =  $6.3 \pm 4.9$  years)

treated with diet and on a stable dose of oral anti-diabetic agents were given dietary advice by a dietitian for a 12 week period. Individualised dietary advice was based on Malaysian Medical Nutrition Therapy for adults with type 2 diabetes mellitus. The primary outcome measure was glycaemic control (fructosamine and HbA1c level) and the secondary outcome included measures of anthropometry, blood pressure, lipid profile, insulin levels dietary intake and knowledge on nutrition. **Results:** At week 12, 100 subjects completed the study with a dropout rate of 3.8%. The post-Medical Nutrition Therapy results showed a significant reduction of fructosamine (311.5+50 to 297+44  $\mu\text{mol/L}$ ;  $p<0.001$ ) and HbA1c (7.6+1.2 to 7.2+1.1%,  $p<0.001$ ) with pronounced reduction for subjects who had very high HbA1c levels of  $>9.3\%$  at baseline. Waist circumference (90.7+10.2 to 89.1+9.8 cm,  $p<0.05$ ), HDL-cholesterol (1.1+0.3 to 1.2+0.3 mmol/L,  $p<0.05$ ), dietary intake and nutrition knowledge score (42+19 vs. 75+17%;  $p<0.001$ ) were significantly improved from the baseline. **Conclusions:** Individualised Medical Nutrition Therapy administered by a dietitian resulted in favourable diabetes outcomes, which were more apparent for individuals with higher than optimal HbA1c levels at the start of the study.

## **H10 Effect of biscuits and muffins added with cornlettes powder on the glycemc responses of healthy individuals**

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Food and Nutrition Sciences, Vol. 5, 2014, 2195-2202

Dietary fibre content is a known factor that can affect the postprandial glycemc responses of a food and meal. Cornlettes vegetable which is rich in dietary fibre has been studied for its potential in lowering the peak glycemc responses of biscuits and muffins. Cornlettes was processed into powder and formulated into four formulations of selected bakery products. The glycemc responses produced by portions of the biscuits and muffins containing 25 g available carbohydrate were measured in 11 healthy volunteers. The incremental area under curve (AUC) of control biscuits was greater ( $81 \pm 11 \text{ mmol} \times \text{min/l}$ ) than cornlettes powder (CP) added biscuit ( $63 \pm 12 \text{ mmol} \times \text{min/l}$ ). Likewise, the AUC of control muffins was higher ( $88 \pm 13 \text{ mmol} \times \text{min/l}$ ) than CP-added muffins ( $74 \pm 12 \text{ mmol} \times \text{min/l}$ ). Control biscuits had an intermediate GI value of 61 while CP-added biscuits had a low GI value of 46. Both control and CP-added muffins recorded intermediate GI values (58 and 57, respectively). It is concluded that CP can be incorporated in selected bakery products as a potential ingredient to help lower the peak rise of postprandial glycemc responses.

## **H11 Rise of herbal and traditional medicine in erectile dysfunction management**

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Current Urology Reports, Vol. 12, 2011, 470-478

Herbal medicine long has been used in the management of sexual dysfunction, including erectile dysfunction. Many patients have attested to the efficacy of this treatment. However, is it evidence-based medicine? Studies have been done on animal models, mainly in the laboratory. However, randomized controlled trials on humans are scarce. The only herbal medications that have been studied for erectile dysfunction are Panax ginseng, Butea superba, Epimedium herbs (icariin), Tribulus terrestris, Securidaca longipedunculata, Piper guineense, and yohimbine. Of these, only Panax ginseng, B. superba, and yohimbine have published studies done on humans. Unfortunately, these published trials on humans were not robust. Many herbal therapies appear to have potential benefits, and similarly, the health risks of various phytotherapeutic compounds need to be elucidated. Properly designed human trials should be worked out and encouraged to determine the efficacy and safety of potential phytotherapies.

### H12 MTHFR C677T polymorphism, homocysteine and B-vitamins status in a sample of Chinese and Malay subjects in Universiti Putra Malaysia

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**Introduction:** Methylene tetrahydrofolate reductase (MTHFR) C677T is involved in folate and homocysteine metabolism. Disruption in the activity of this enzyme will alter their levels in the body. **Methodology:** This study assessed MTHFR C677T polymorphism and its relationship with serum homocysteine and B-vitamins levels in a sample of Chinese and Malays subjects in UPM, Serdang. One hundred subjects were randomly selected from among the university population. Folate, vitamin B12, B6, and homocysteine levels were determined using MBA, ECLIA, and HPLC, respectively. PCR coupled with HinfI digestion was used for detection of MTHFR C677T polymorphism. **Results:** The frequency of T allele was higher in the Chinese subjects (0.40) compared to the Malay (0.14). Folate, vitamin B12 and B6 levels were highest in the wild genotype in both ethnic groups. Subjects with heterozygous and homozygous genotype showed the highest homocysteine levels. The serum folate and homocysteine were mainly affected by homozygous genotype. **Conclusion:** MTHFR C677T polymorphism plays an important role in influencing the folate and homocysteine metabolism.

### H13 Mas Cotek (Ficus Deltoidea): A possible supplement for type II diabetes: (A pilot study)

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The aim of this research was to study the effect of the *Ficus deltoidea* (Mas Cotek) leaves on fasting blood sugar, renal and lipid profile of Type II diabetic patients. This study was carried out at Polyclinic Balok, located in Kuantan, Pahang, Malaysia. Twenty patients participated in the study and they were divided into two (2) groups of ten (10) patients each. The inclusion criteria were registered as diabetic patients in the health centre, diagnosed as type II diabetes mellitus for more than one (1) year, age 18 years and above, HbA1c more than 6.5% and have contactable telephone number. The patients in the intervention group has been given *F.deltoidea* 350 mg twice daily orally and monitored every 20 days for two (2) months. In conclusion, the effects on fasting blood sugar, HbA1C, renal and lipid profiles were not significant. The patients in the intervention group felt energetic and fresh compared to the control.

#### H14 **Supplementation with tocotrienol-rich fraction alters the plasma levels of Apolipoprotein A-I precursor, Apolipoprotein E precursor, and C-reactive protein precursor from young and old individuals**

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**Purpose:** Tocotrienol possess beneficial effects not exhibited by tocopherol. In vitro studies using animal models have suggested that these effects are caused via modulation of gene and protein expression. However, human supplementation studies using tocotrienol-rich isomers are limited. This study aims to identify plasma proteins that changed in expression following tocotrienol-rich fraction (TRF) supplementation within two different age groups. **Methods:** Subjects were divided into two age groups-32 ± 2 (young) and 52 ± 2 (old) years old. Four subjects from each group were assigned with TRF (78% tocotrienol and 22% tocopherol, 150 mg/day) or placebo capsules for 6 months. Fasting plasma were obtained at 0, 3, and 6 months. Plasma tocopherol and tocotrienol levels were determined. Plasma proteome was resolved by 2DE, and differentially expressed proteins identified by MS. The expressions of three proteins were validated by Western blotting. **Results:** Six months of TRF supplementation significantly increased plasma levels of tocopherols and tocotrienols. Proteins identified as being differentially expressed were related to cholesterol homeostasis, acute-phase response, protease inhibitor, and immune response. The expressions of Apolipoprotein A-I precursor, Apolipoprotein E precursor, and C-reactive protein precursor were validated. The old groups showed more proteins changing in expression. **Conclusions:** TRF appears to not only affect plasma levels of tocopherols and tocotrienols, but also the levels of plasma proteins. The identity of these proteins may provide insights into how TRF exerts its beneficial effects. They may also be potentially developed into biomarkers for the study of the effects and effectiveness of TRF supplementation.

## H15 Role of probiotics in modulating glucose homeostasis: Evidence from animal and human studies

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International Journal of Food Sciences and Nutrition, Vol. 64(6), 2013, 780-786

**Aim:** Evidences from several studies suggest that probiotics affect glucose homeostasis. This paper reviews the results of animal and human studies on the role of probiotics in modulating glucose homeostasis. **Method:** A systematic literature search using multiple databases was conducted without time limitation. Primary outcomes evaluated were parameters related to glucose homeostasis. Secondary outcomes were inflammatory markers, lipid profile, body weight, and energy intake. **Results:** A total of 17 animal studies and four human studies were identified. Among these, 16 animal studies and three human studies had documented significant improvements in at least one glucose homeostasis related parameter. Inflammatory markers and lipid profile were significantly improved in the animal model, while data from human studies were controversial. Changes in body weight and energy intake that could be due to probiotics supplementation were also inconclusive. **Conclusion:** Well-designed placebo-controlled clinical trials with validated outcome variables are needed to determine the effect of probiotics on glucose homeostasis.

## H16 The influence of fasting insulin level in post-gestational diabetes mellitus women receiving low-glycaemic-index diets

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Nutrition and Diabetes, Vol. 17(4), 2014, 107

Post-gestational diabetes mellitus (GDM) women are recommended weight loss to manage increased cardio-metabolic risks. We investigated the effects of lowering diet glycaemic index (GI) on fasting blood glucose (FBG), serum lipids, body weight and composition of post-GDM women with varying fasting insulin levels (INS). Seventy-seven Asian, non-diabetic women with previous GDM (aged 20-40 years, mean BMI: 26.4±4.6 kg m<sup>-2</sup>) were recruited. At baseline, 20 subjects with INS <2  $\mu$ U ml<sup>-1</sup> and 18 with INS  $\geq$ 2  $\mu$ U ml<sup>-1</sup> received conventional dietary recommendations (CHDR) only. CHDR emphasised energy and fat intake restriction and encouraged increase in dietary fibre intakes. Twenty-four subjects with INS <2  $\mu$ U ml<sup>-1</sup> and 15 with INS  $\geq$ 2  $\mu$ U ml<sup>-1</sup>, in addition to CHDR, received low-GI education (LGI). Changes in FBG,

serum lipids, body weight and body composition were evaluated. Subjects with  $INS < 2 \times IU \text{ ml}^{-1}$  had similar outcomes with both diets. After 1 year, subjects with  $INS \geq 2 \times IU \text{ ml}^{-1}$  who received LGI education had reductions in FBG and triglycerides. Subjects who received CHDR observed increase in both FBG and triglycerides ( $P < 0.05$ ). Among all subjects, diet GI was lower and dietary fibre intakes were higher in LGI compared with CHDR subjects (all  $P < 0.05$ ). Thus, in Asian post-GDM women with normal/higher INS, adding low-GI education to CHDR improved management of FBG and triglycerides.

## **H17 Effect of nenas honey supplementation on the oxidative status of undergraduate students**

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Acta Alimentaria, Vol. 43(1), 2014, 182-190

Honey is a dietary antioxidant as it contains phenolic compounds, such as flavonoids and phenolic acids. Antioxidants are non-nutritive, biologically active ingredients in food that reduce oxidative stress. The antioxidant content in each type of honey varies depending on its source. This study was aimed to determine the effect of Nenas honey supplementation on the oxidative status of a group of healthy medical students. They were divided into two groups; control ( $n=10$ ) and supplemented ( $n=13$ ), where 1 tablespoon of Nenas honey was given each day. Blood sampling was done at baseline, 1st and 2nd month of the study for determination of DNA damage and antioxidant enzyme activities, such as superoxide dismutase (SOD), glutathione peroxidase (GPx), and catalase (CAT). Results showed that Nenas honey increased the level of DNA damage at the 1st month but reduced it significantly at the 2nd month as compared to control. GPx and CAT activities also decreased significantly with honey supplementation throughout the study, though no changes were observed in SOD activity. Fasting glucose levels remained within the normal range with honey supplementation. In conclusion, Nenas honey decreases oxidative stress which leads to a reduction of antioxidant enzyme activities in the body.

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## **H18 Apparent bioavailability of isoflavones in urinary excretions of postmenopausal Malay women consuming tempeh compared with milk**

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International Journal of Food Science and Nutrition, Vol. 62(6), 2011, 642-650

Quantitation of isoflavones in humans is important to establish the benefits of these compounds to the populations. Urinary isoflavones are frequently used as a biomarker of isoflavone bioavailability from food or supplement since urine contains 100-fold higher concentrations of isoflavones. The objective of the present study was to determine and compare the urinary excretions of daidzein (DA), genistein (GE) and equol (EQ) in postmenopausal Malay women

following the consumption of tempeh and milk in a calcium absorption study and to test the hypothesis that the excretion of isoflavones following consumption of tempeh maybe higher compared with milk. The amounts of DA ( $47.06 \pm 4.18 \mu\text{mol/h}$ ), GE ( $33.27 \pm 3.71 \mu\text{mol/h}$ ) and EQ ( $24.35 \pm 4.34 \mu\text{mol/h}$ ) excreted in urine following tempeh consumption were significantly higher ( $P < 0.05$ ) compared with those in milk ( $3.51 \pm 0.62 \mu\text{mol/h}$  DA,  $2.79 \pm 0.35 \mu\text{mol/h}$  GE and  $0 \mu\text{mol/h}$  EQ). Almost all studied postmenopausal Malay women were able to excrete EQ following consumption of 240 g tempeh but only one subject can be classified as an equol producer. We concluded that most postmenopausal Malay women excreted DA, GE and EQ in their urine following tempeh consumption and the amount of the excreted isoflavones were higher compared with those in milk. However, further studies are needed to determine whether longer periods of time are required to capture EQ producers.

## H19 Effect of interaction between polymorphisms in insulin receptor substrate genes in Type 2 diabetes mellitus patients with severe/acute hyperglycemia

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Tropical Journal of Pharmaceutical Research, Vol. 13(6), 2014, 889-894

**Purpose:** To investigate whether there are interactions between insulin receptor substrate 1 (IRS1) and insulin receptor substrate 2 (IRS2) that are associated with increased insulin resistance during such episodes. **Methods:** Testing Haplotype EffectS in Association Studies (THESIAS) software was used to investigate allelic and haplotype interactions between the polymorphisms in 156 T2DM patients with severe or acute hyperglycemia. **Results:** Binary analysis showed there were significant differences in the haplotype frequencies for the IRS1 and IRS2 polymorphisms based on the insulin resistance status. Nevertheless, estimation of haplotype effects by equality analysis showed no significant interactions (likelihood ratio tests: all  $p > 0.05$ ) in increased insulin resistance in T2DM patients with severe/acute hyperglycemia. **Conclusion:** There are no interactions between IRS1 rs1801278 (p.Gly972Arg) and IRS2 rs1805097 (p.Gly1057Asp) polymorphisms that would affect insulin resistance in T2DM patients with severe/acute hyperglycemia.

## H20 A prospective cohort study on IRS gene polymorphisms in Type 2 diabetes mellitus patients during severe/acute hyperglycemia phase 1: Association with insulin resistance

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Tropical Journal of Pharmaceutical Research, Vol. 13(6), 2014, 895-901

**Purpose:** To investigate the genetic polymorphisms that may contribute to the worsening of insulin resistance in type 2 diabetes mellitus (T2DM) with severe or acute hyperglycemia.

**Methods:** This is a prospective cohort study involving 156 T2DM patients with severe or acute hyperglycemia from all medical wards of the National University of Malaysia Medical Centre (UKMMC) that were placed on insulin therapy. The polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) method was used to determine the genetic association of insulin receptor substrate (IRS) gene with insulin resistance. Insulin resistance status was determined using the homeostatic model assessment for insulin resistance (HOMA-IR) index.

**Results:** IRS1 polymorphisms were associated with increased insulin resistance ( $X^2 = 5.09$ ,  $p = 0.023$ ) in T2DM patients with severe/acute hyperglycemia. IRS2 polymorphisms were not associated with insulin resistance ( $X^2 = 0.69$ ,  $p = 0.406$ ) in this group of patients. **Conclusion:** IRS1 genetic factor alone may be a significant genetic determinant for insulin resistance in T2DM patients during severe/acute phase hyperglycemia.

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## H21 Ramadan fasting and cardiac biomarkers in patients with multiple cardiovascular disease risk factors

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Internet Journal of Cardiovascular Research, Vol. 7(2), 2011

**Objectives:** The study was aimed to evaluate the effect of fasting during Ramadan on cardiovascular bio-markers [high sensitive C-reactive protein (hs-CRP), plasminogen activator inhibitor type-1 (PAI- 1)] with other conventional cardiovascular risk factors like diabetes (DM), hypertension (HPT) and dyslipidaemia before, during and after Ramadan of the subjects under study. **Methodology:** It was a prospective cohort study with 76 subjects (41 males and 35 females) who were observed before during and after Ramadan. At each visit anthropometric parameters were measured including the body weight, body mass index (BMI) and blood pressure. Blood was analyzed for metabolic index [fasting blood glucose (FBG), glycosylated hemoglobin A1c (HbA1c) and fasting serum lipids], hs-CRP and PAI-1. More than 50% of the subjects under study had 4 risk factors such as DM, HPT, dyslipidaemia and either family history

of CAD or smoking. Results: A significant reduction of hs-CRP and PAI-1 was observed during Ramadan compared to pre-Ramadan ( $p < 0.001$  and  $0.031$ ). The reduction of PAI-1 levels was continued till post-Ramadan ( $p = 0.005$ ). A rebound in the levels of hs-CRP was observed in post-Ramadan compared to Ramadan ( $p < 0.001$ ). Significant ( $p < 0.001$ ) reduction of the body weight, BMI, systolic and diastolic blood pressure was observed during Ramadan compared to pre-Ramadan and post-Ramadan. LDL-C levels were reduced during and post-Ramadan, ( $p = 0.037$  and  $p = 0.030$ ), however, no significant effect on triglyceride and total cholesterol was found throughout the study. Conclusion: The practice of fasting during the month of Ramadan by the people with multiple CVD risks might be cardio-protective as it resulted in the lowering of both hs-CRP and PAI-1. However this benefit is short-lived as the hs-CRP rebound a month later. Ramadan fasting practice was found to give short-term benefit against cardiovascular diseases among the patients with multiple cardiovascular risks factors.

## H22 Glycemic control among pregnant diabetic women on insulin who fasted during Ramadan

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Iranian Journal of Medical Sciences, Vol. 36(4), 2011, 254-259

**Background:** Ramadan fasting for pregnant women with diabetes remains controversial and underreported. The objective of this study was to determine the glycemic control in pregnant diabetic women on insulin who fasted during Ramadan. **Methods:** This was a retrospective study carried out over a period of three years including pregnant diabetic women, who were on short-acting, intermediate-acting, or a combination of them, and opted to carry out Ramadan fasting. Glycemic control was assessed before, middle and after Ramadan fasting. **Results:** Thirty seven women opted to fast with 24 (64.9%) of them had type 2 diabetes mellitus and 83.8% of them required combined insulin (short- acting, intermediate-acting) therapy. The age of the participants was  $32.13 \pm 4.68$  years, and the age of their pregnancies was  $25.60 \pm 7.12$  weeks when the study was performed. The median number of days fasted was 25 days, and most of the women were able to fast for more than 15 days. There was no difference between glycemic control of type 2 diabetes mellitus and gestational diabetes mellitus women prior to fasting. In the middle of Ramadan, serum fructosamine decreased in both groups. However, only serum HbA1c reduced in gestational diabetes mellitus after Ramadan. **Conclusion:** The findings indicate that pregnant diabetic women on insulin were able to fast during Ramadan and that their glycemic control was improved during fasting period. They may also suggest that instead of absolute ban on fasting for pregnant diabetic women more practical approach and close consultation with health care providers might be more helpful.

## H23 Modulation of human postprandial lipemia by changing ratios of polyunsaturated to saturated (P/S) fatty acid content of blended dietary fats: A cross-over design with repeated measures

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Nutrition Journal, Vol.16 (12), 2013,122

**Background:** Postprandial lipemia (PL) contributes to coronary artery disease. The fatty acid composition of dietary fats is potentially a modifiable factor in modulating PL response. **Methods:** This human postprandial study evaluated 3 edible fat blends with differing polyunsaturated to saturated fatty acids (P/S) ratios (POL = 0.27, AHA = 1.00, PCAN = 1.32). A cross-over design included mildly hypercholesterolemic subjects (9 men and 6 women) preconditioned on test diets fats at 31% energy for 7 days prior to the postprandial challenge on the 8th day with 50 g test fat. Plasma lipids and lipoproteins were monitored at 0, 1.5, 3.5, 5.5 and 7 hr. **Results:** Plasma triacylglycerol (TAG) concentrations in response to POL, AHA or PCAN meals were not significant for time x test meal interactions ( $P > 0.05$ ) despite an observed trend (POL > AHA > PCAN). TAG area-under-the-curve (AUC) increased by 22.58% after POL and 7.63% after PCAN compared to AHA treatments ( $P > 0.05$ ). Plasma total cholesterol (TC) response was not significant between meals ( $P > 0.05$ ). Varying P/S ratios of test meals significantly altered prandial high density lipoprotein-cholesterol (HDL-C) concentrations ( $P < 0.001$ ) which increased with decreasing P/S ratio (POL > AHA > PCAN). Paired comparisons was significant between POL vs PCAN ( $P = 0.009$ ) but not with AHA or between AHA vs PCAN ( $P > 0.05$ ). A significantly higher HDL-C AUC for POL vs AHA ( $P = 0.015$ ) and PCAN ( $P = 0.001$ ) was observed. HDL-C AUC increased for POL by 25.38% and 16.0% compared to PCAN and AHA respectively. Plasma low density lipoprotein-cholesterol (LDL-C) concentrations was significant ( $P = 0.005$ ) between meals and significantly lowest after POL meal compared to PCAN ( $P = 0.004$ ) and AHA ( $P > 0.05$ ) but not between AHA vs PCAN ( $P > 0.05$ ). AUC for LDL-C was not significant between diets ( $P > 0.05$ ). Palmitic (C16:0), oleic (C18:1), linoleic (C18:2) and linolenic (C18:3) acids in TAGs and cholesteryl esters were significantly modulated by meal source ( $P < 0.05$ ). **Conclusions:** P/S ratio of dietary fats significantly affected prandial HDL-C levels without affecting lipemia.

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## H24 Routine hospital screening tool (NRS-2002) is adequate for identifying malnourished dialysis patients in Malaysia

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Kidney Research and Clinical Practice, Vol 31 (2), 2012, A44

Malnutrition is prevalent (>50%) in maintenance hemodialysis (HD) and continuous ambulatory peritoneal dialysis (CAPD) patients in Malaysia. The priority is to identify a suitable nutritional screening tool for use in dialysis units. We conducted a study between June to November 2011 testing simplified nutritional screening tools on 155 HD and 90 CAPD patients to validate their potential application. Routine nutritional screening tools commonly used for hospitalized patients (NRS-2002, MST, MUST) were compared against tools specific to dialysis such as the malnutrition-inflammation score (MIS), modified Subjective Global Assessment (mSGA) and

geriatric nutritional risk index (GNRI) with diagnostic values inclusive of anthropometry, biochemistry and dietary intake. The mSGA compared to MIS indicated greater specificity for BMI < 25 kg/m<sup>2</sup>, serum albumin < 40 g/dL, AMA ≤ 15th percentile, energy intake < 30 kcal/kg/day and protein intake < 1.2 g/kg/day with greater sensitivity scoring (99.3 vs 80.4%, 98.6 vs 72.9%, 99.3 vs 72.9%, 98.2 vs 67.3%, 98.3 vs 68.5% respectively). Comparing hospital screening tools against mSGA or MIS as reference standards for both PD and CAPD patients, the receiver operating characteristic (ROC) curve analysis indicated greater sensitivity in predicting malnutrition was associated with NRS (averaging at 58% against mSGA and 69% against MIS) whilst all other instruments were less predictive. GNRI, developed for Japanese dialysis patients was least sensitive to detect malnutrition. In conclusion, NRS-2002 can be utilized for identifying malnourished dialysis patients in Malaysia.

## H25 The chain length of dietary saturated fatty acids affects human postprandial lipemia

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Journal of The American College of Nutrition, Vol.30 (6), 2011, 511-521

**Objective:** Saturated fats increase total cholesterol (TC) and low density lipoprotein-cholesterol (LDL-C) and are linked to coronary artery disease risk. The effect of variance in chain length of saturated fatty acids (SFA) on coronary artery disease in human postprandial lipemia is not well elucidated. **Methods:** A total of 20 healthy volunteers were challenged with 3 test meals, similar in fat content (~31% en) but varying in saturated SFA content and polyunsaturated/saturated fatty acid ratios (P/S). The 3 meals were lauric + myristic acid-rich (LM), P/S 0.19; palmitic acid-rich (POL), P/S 0.31; and stearic acid-rich (STE), P/S 0.22. Blood was sampled at fasted baseline and 2, 4, 5, 6, and 8 hours. Plasma lipids (triacylglycerol [TAG]) and lipoproteins (TC, LDL-C, high density lipoprotein-cholesterol [HDL-C]) were evaluated. **Results:** Varying SFA in the test meal significantly impacted postprandial TAG response ( $p < 0.05$ ). Plasma TAG peaked at 5 hours for STE, 4 hours for POL, and 2 hours for LM test meals. Area-under-the-curve (AUC) for plasma TAG was increased significantly after STE treatment (STE > LM by 32.2%,  $p = 0.003$ ; STE > POL by 27.9%,  $p = 0.023$ ) but was not significantly different between POL and LM (POL > LM by 6.0%,  $p > 0.05$ ). At 2 hours, plasma HDL-C increased significantly after the LM and POL test meals compared with STE ( $p < 0.05$ ). In comparison to the STE test meal, HDL-C AUC was elevated 14.0% ( $p = 0.005$ ) and 7.6% ( $p = 0.023$ ) by the LM and POL test meals, respectively. The TC response was also increased significantly by LM compared with both POL and STE test meals ( $p < 0.05$ ). **Conclusions:** Chain length of saturates clearly mediated postmeal plasma TAG and HDL-C changes.



## H26 A transgressive brown rice mediates favourable glycaemic and insulin responses

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Journal of The Science of Food and Agriculture, Vol. 91(11), 2011, 1951-1956

**Background:** We evaluated glycaemic response of a brown rice variant (BR) developed by cross-breeding. Subjects (n = 9) consumed 50 g carbohydrate equivalents of BR, white rice (WR) and the polished brown rice (PR) in comparison to 50 g glucose reference (GLU) in a cross-over design. Plasma glucose and insulin at 0, 15, 45, 60, 90, 120 and 180 min were measured and incremental area under the curve (IAUC) and indices for glucose (GI) and insulin (II) calculated. **Results:** BR compared to PR or WR produced the lowest postprandial glycaemia (GI: 51 vs 79 vs 86) and insulinaemia (II: 39 vs 63 vs 68) irrespective of amylose content (19 vs 23 vs 26.5%). Only BR was significantly different from GLU for both plasma glucose (P = 0.012) and insulin (P = 0.013) as well as IAUC (glu) (P = 0.045) and IAUC (ins) (P = 0.031). Glycaemic and insulinaemic responses correlated positively (r = 0.550, P < 0.001). Linear trends for IAUC (glu) and IAUC (ins) indicated a greater secretion of insulin tied in with a greater glycaemic response for WR (r(2) = 0.848), moderate for PR (r(2) = 0.302) and weakest for BR (r(2) = 0.122). **Conclusion:** The brown rice variant had the lowest GI and II values but these advantages were lost with polishing.

## H27 The role of long chain omega-3 polyunsaturated fatty acids in reducing lipid peroxidation among elderly patients with mild cognitive impairment: A case-control study

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The Journal of Nutritional Biochemistry, Vol.24 (5), 2013, 803-808

The present work explores the effect of dietary omega-3 polyunsaturated fatty acids (PUFAs) intake on lipid peroxidation among mild cognitive impairment (MCI) patients. The plasma lipid hydroperoxide (LPO) levels in 67 MCI patients were compared to those of 134 healthy elderly controls. Omega-3 PUFA intake was assessed using an interviewer-administered food frequency questionnaire. Apolipoprotein E genotyping was performed using polymerase chain reaction and restriction enzyme digestion. The association between various confounders and lipid peroxidation was evaluated using regression analysis. The influence of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) intake on LPO level was investigated. The results revealed that LPO levels were significantly higher in the MCI group than in the control group. Inverse correlations were found between DHA and EPA intake and LPO level among the MCI group. LPO levels decreased significantly with increasing DHA and EPA intake. In summary, the findings revealed that DHA and EPA can play a role in alleviating oxidative stress and reducing the risk of neurodegenerative diseases.

## H28 Docosahexaenoic acid-concentrated fish oil supplementation in subjects with mild cognitive impairment (MCI): A 12-month randomised, double-blind, placebo-controlled trial

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Psychopharmacology, Vol. 225(3), 2013, 605-612

**Rationale:** Epidemiological studies have suggested a beneficial effect of fish oil supplementation in halting the initial progression of Alzheimer's disease. However, it remains unclear whether fish oil affects cognitive function in older people with mild cognitive impairment (MCI). **Objectives:** This study investigated the effects of fish oil supplementation on cognitive function in elderly person with MCI. **Methods:** This was a 12-month, randomised, double-blind, placebo-controlled study using fish oil supplementation with concentrated docosahexaenoic acid (DHA). Thirty six low-socioeconomic-status elderly subjects with MCI were randomly assigned to receive either concentrated DHA fish oil (n = 18) or placebo (n = 18) capsules. The changes of memory, psychomotor speed, executive function and attention, and visual-constructive skills were assessed using cognitive tests. Secondary outcomes were safety and tolerability of the DHA concentrate. **Results:** The fish oil group showed significant improvement in short-term and working memory (F = 9.890;  $\eta^2(2) = 0.254$ ;  $p < 0.0001$ ), immediate verbal memory (F = 3.715;  $\eta^2(2) = 0.114$ ;  $p < 0.05$ ) and delayed recall capability (F = 3.986;  $\eta^2(2) = 0.121$ ;  $p < 0.05$ ). The 12-month change in memory ( $p < 0.01$ ) was significantly better in the fish oil group. Fish oil consumption was well tolerated, and the side effects were minimal and self-limiting. **Conclusions:** This study suggested the potential role of fish oil to improve memory function in MCI subjects. Studies with larger sample sizes, longer intervention periods, different fish oil dosages and genetic determinations should be investigated before definite recommendations can be made.

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## H29 Community-based cardiovascular Risk Factors Intervention Strategies (CORFIS) in managing hypertension: A pragmatic non-randomised controlled trial

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The Medical Journal of Malaysia, Vol. 68 (2), 2013, 129-135

**Background:** Hypertension is the number one cardiovascular risk factor in Malaysia. This study aimed to evaluate the effectiveness of a Community-Based Cardiovascular Risk Factors Intervention Strategies (CORFIS) in the management of hypertension in primary care. **Methods:** This is a pragmatic, non-randomized controlled trial. Seventy general practitioners (GPs) were selected to provide either CORFIS (44 GPs) or conventional care (26 GPs) for 6 months. A total of 486 hypertensive patients were recruited; 309 were in the intervention and 177 in the control groups. Primary outcome was the proportion of hypertensive patients who achieved target blood pressure (BP) of <140/90mmHg (for those without diabetes mellitus) and <130/80mmHg (with diabetes mellitus). Secondary outcomes include change in the mean/median BP at 6-month as compared to baseline. **Results:** The proportion of hypertensive patients who achieved target BP

at 6-month was significantly higher in the CORFIS arm (69.6%) as compared to the control arm (57.6%),  $P=0.008$ . Amongst those who had uncontrolled BP at baseline, the proportion who achieved target BP at 6-month was also significantly higher in the CORFIS arm (56.6%) as compared to the control arm (34.1%),  $p<0.001$ . There was no difference in the patients who had already achieved BP control at baseline. There were significant reductions in SBP in the CORFIS arm (median -9.0mmHg; -60 to 50) versus control (median -2mmHg; -50 to 48),  $p=0.003$ ; as well as in DBP (CORFIS arm: median -6.0mmHg; ranged from -53 to 30 versus control arm: median 0.0mmHg; ranged from -42 to 30),  $p<0.001$ . **Conclusions:** Patients who received CORFIS care demonstrated significant improvements in achieving target BP.

### **H30 Modulation of interferon gamma response through orally administered bovine colostrum in active adolescent boys**

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Biomedical Research, Vol. 22 (1), 2011, 18-22

Bovine colostrum (BC) is a rich source of bioactive components reported to have health promoting effects. The purpose of the present study was to determine the effects of six-week supplementation of BC on the production of gamma-interferon (IFN- $\gamma$ ) by mitogen-stimulated peripheral blood leucocytes (PBL) in active adolescent male. Subjects were recruited from the students who were undergoing regular athletics training. The subjects were randomly assigned into control and experimental groups. The control group ( $n=18$ ) received daily supplementation of skim milk while the experimental group ( $n=18$ ) received bovine colostrum (20 g/day). Fasting venous blood samples were collected on day-0 and day-42 for measurement of IFN- $\gamma$  produced by concanavalin A (Con A)-stimulated PBL. Interferon- $\gamma$  levels were quantified using ELISA. Changes in IFN- $\gamma$  levels from baseline to endpoints for both groups were compared and presented as mean ( $\pm$  SD). Although baseline levels of cytokine concentrations were similar in both groups, there was a decreasing trend in IFN- $\gamma$  production by the mitogen-stimulated PBL from subjects who received the bovine colostrum supplement compared to controls. The findings of the present study suggest that oral supplementation of bovine colostrum for a period of 6 weeks may modulate in vitro IFN- $\gamma$  concentration.

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### **H31 Nutritional management of enterocutaneous fistula: A retrospective study at a Malaysian University Medical Center**

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Journal of Multidisciplinary of Healthcare, Vol. 4(7), 2014, 365-370

Enterocutaneous fistula is a challenging clinical condition with serious complications and considerable morbidity and mortality. Early nutritional support has been found to decrease these complications and to improve the clinical outcome. Location of the fistula and physiological status affect the nutrition management plan in terms of feeding route, calories, and protein requirements. This study investigated the nutritional management procedures at the Universiti Kebangsaan Malaysia Medical Center, and attempted to determine factors that affect the clinical outcome. Nutritional management was evaluated retrospectively in 22 patients with enterocutaneous fistula seen over a 5-year period. Medical records were reviewed to obtain data on nutritional status, biochemical indices, and route and tolerance of feeding. Calories and protein requirements are reported and categorized. The results show that surgery was the predominant etiology and low output fistula was the major physiological category; anatomically, the majority were ileocutaneous. The spontaneous healing rate was 14%, the total healing rate was 45%, and the mortality rate was 22%, with 14% due to fistula-associated complications. There was a significant relationship between body mass index/serum albumin levels and fistula healing; these parameters also had a significant relationship with mortality. Glutamine was used in 50% of cases; however, there was no significant relationship with fistula healing or mortality rate. The nutritional status of the patient has an important impact on the clinical outcome. Conservative management that includes nutrition support is very important in order to improve nutritional status before surgical repair of the fistula.

### H32 Effects of a probiotic fermented milk on functional constipation: A randomized, double-blind, placebo-controlled study

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Journal of Gastroenterology and Hepatology, Vol. 28(9), 2013, 1584

**Background and Aim:** Evidence suggests that probiotics reduce certain constipation-related symptoms. *Lactobacillus casei strain Shirota* has never been tested as treatment for functional constipation in otherwise-healthy subjects. To evaluate the efficacy of this probiotic among adults with functional constipation was aimed. **Methods:** Subjects with functional constipation (Rome II-defined) were randomized to intake *L. casei strain Shirota* fermented milk or placebo once daily for 4 weeks under double-blind condition. Primary outcomes were constipation severity and stool frequency; secondary outcomes were stool consistency and quantity. **Results:** In intent-to-treat population, compared with baseline, constipation severity and stool frequency improved in both probiotic (n = 47) and control groups (n = 43), but improvements were comparable in both groups at week 4 ( $\alpha = 5\%$  level). In probiotic group, stool consistency and quantity at week 4 improved significantly versus baseline but not versus control. Considering that the study agent is non-pharmaceutical and the purpose of supplementation is for long-term effect, re-evaluation at  $\alpha = 10\%$  was conducted, which showed significant improvement in constipation severity at week 4 (P = 0.058). Magnitude of the probiotic effect on stool consistency was small but grew over time, d = 0.19, 95% confidence interval 0.00-0.35 (Week 4), d = 0.29, 95% confidence interval 0.11-0.52 (postintervention). Post-hoc exploratory analysis suggests incomplete evacuation may decrease with probiotic intake. **Conclusions:** Four-week administration of *L. casei strain Shirota* did not alleviate constipation severity or stool frequency, consistency, and quantity when compared with control. With re-evaluation at  $\alpha = 10\%$  level, improvement in constipation severity was significant at week 4. To obtain conclusive results, further studies with longer intervention are warranted.

### H33 Short term nasogastric versus oral feeding in hospitalised patients with advanced cirrhosis: A randomised trial

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European Society for Clinical Nutrition and Metabolism, Vol. 6, 2011, 242-247

**Background & aims:** The benefit of short term nasogastric (NG) feeding over oral supplementation in advanced cirrhosis remains uncertain. A randomized controlled trial (RCT) was designed to ascertain this information. **Methods:** A randomized trial of NG versus oral feeding was conducted in patients with decompensated liver cirrhosis. Nutritional parameters and Child-Pugh score changes at 2 weeks, with follow up measurements in 6 weeks, were assessed. **Results:** 52 patients (mean age 58.9 years  $\pm$  12.2 years, 38.5% females) with similar baseline parameters were randomized to NG (n=28) or oral feeding (n=24) between August 2007 and May 2010. At 2 weeks, there was a higher caloric intake in the NG group (1721  $\pm$  599 kCal vs 1346  $\pm$  448 kCal, p=0.015), but no significant improvement in anthropometry (MAMC mean difference 0.35  $\pm$  1.82 NG vs -0.60  $\pm$  1.88 oral), biochemistry (serum transferrin mean difference 0.81  $\pm$  3.55 NG vs 0.04  $\pm$  0.30 oral) or CP scores (mean difference -0.68  $\pm$  1.14 NG vs -0.43  $\pm$  1.29 oral), and this was maintained at 6 weeks' follow up. 12/28 (42.9%) patients had poor tolerance (VAS score <50) to the NG tube placement. Nine patients (four NG, five oral) suffered mortality prior to the 6 weeks follow up. **Conclusion:** Short term NG feeding is poorly tolerated and confers little benefit over oral feeding in hospitalized patients with advanced cirrhosis.

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### H34 The use of traditional treatment modalities with special mention of Piper Sarmentosum in treatment of bone fracture

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Journal of Medicinal Plants Research, Vol. 5(33), 2011, 7132-7139

Osteoporosis is a socio-public health issue which led to a rise in risk of fractures with subsequent delay in fracture healing. Fracture healing is a complex physiological process which involves four overlapping phases that is, haematoma formation, inflammation, repair and remodelling phases. It involves a series of biological cascades which resemble tissues differentiation that occur during foetal skeletal development. Several studies have been carried out to investigate the different traditional medicines using plants known for their fracture healing properties. Piper sarmentosum (Daun Kaduk) is widely distributed in South East Asia and used traditionally to treat many diseases such as diabetes mellitus, fungoid dermatitis and joint ache. The high costs and adverse effects of conventional treatment modalities may favor the wide usage of traditional herbal medicines. The current review focused on the usage of traditional herbal medicine to treat fractures healing in osteoporotic state.

### H35 The effects of Tualang honey on bone metabolism of postmenopausal women

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Evidence-Based Complementary and Alternative Medicine, Vol.2012, Article ID 938574

Osteoporosis which is characterized by low bone mass and microarchitectural deterioration with a consequent increase in bone fragility can be associated with various stimuli such as oxidative stress and inflammation. Postmenopausal women are more prone to osteoporosis due to reduction in estrogen which may further lead to elevation of oxidative stress and lipid accumulation which will promote osteoblasts apoptosis. Proinflammatory cytokines are elevated following estrogen deficiency. These cytokines are important determinants of osteoclasts differentiation and its bone resorption activity. The main treatment for postmenopausal osteoporosis is estrogen replacement therapy (ERT). Despite its effectiveness, ERT, however, can cause many adverse effects. Therefore, alternative treatment that is rich in antioxidant and can exert an anti-inflammatory effect can be given to replace the conventional ERT. Tualang honey is one of the best options available as it contains antioxidant as well as exerting anti-inflammatory effect which can act as a free radical scavenger, reducing the oxidative stress level as well as inhibiting proinflammatory cytokine. This will result in survival of osteoblasts, reduced osteoclastogenic activity, and consequently, reduce bone loss. Hence, Tualang honey can be used as an alternative treatment of postmenopausal osteoporosis with minimal side effects.

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### H36 The effects of the Ramadan month of fasting on disease activity in patients with rheumatoid arthritis

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Turkish Journal of Rheumatology, Vol. 28(3), 2013, 189-194

**Objectives:** This study aims to investigate possible effects of Ramadan month of fasting on disease activity in rheumatoid arthritis (RA) patients. **Patients and methods:** Between January 2010 and December 2011, 71 patients with RA who were scheduled for follow-up visit before Ramadan month and at two months after Ramadan month were retrospectively analyzed. The fasting cohort (n=39) and non-fasting cohort (n=32) were compared using the Disease Activity score 28 (DAS 28) and the patients' dietary habits both before and during Ramadan month. **Results:** In the fasting group, the mean DAS 28 score before Ramadan month was higher than for afterwards, however, this was not statistically significant ( $p>0.05$ ). Clinical symptoms of morning stiffness and fatigue were found in fewer patients after Ramadan month, however, it was not statistically significant ( $p>0.05$ ). There was a statistically significant reduction in morning stiffness ( $p=0.001$ ) and functional class ( $p=0.011$ ) after Ramadan in the fasting group. The intake of high-calorie foods was not statistically significant ( $p=0.022$ ) in this group. **Conclusion:** Fasting lowers the mean DAS 28 in RA patients. Furthermore, dietary changes do not significantly affect RA disease activity in fasting patients.

### **H37 Weighing the evidence of low glycemic index dietary intervention for the management of gestational diabetes mellitus: An Asian perspective**

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International Journal of Food Sciences and Nutrition, Vol. 65(2), 2014, 144-150

This review aims to evaluate the effectiveness of low glycemic index (GI) dietary intervention for the treatment of gestational diabetes mellitus (GDM), specifically from the Asian perspective. A systematic review of the literature using multiple databases without time restriction was conducted. Three studies were retrieved based upon a priori inclusion criteria. While there was a trend towards improvement, no significant differences were observed in overall glycemic control and pregnancy outcomes in GDM women. However, a tendency for lower birth weight and birth centile if the intervention began earlier was noted. Low GI diets were well accepted and had identical macro-micronutrient compositions as the control diets. However, due to genetic, environment and especially food pattern discrepancies between Western countries and Asians, these results may not be contributed to Asian context. Clearly, there are limited studies focusing on the effect of low GI dietary intervention in women with GDM, particularly in Asia.

### **H38 Effects of Mangifera pajang Kostermans juice on plasma antioxidant status and liver and kidney function in normocholesterolemic subjects**

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Journal of Functional Foods, Vol.5 (4), 2013, 1900-1908

The effects of a bambangan juice powder (BJP) drink on plasma vitamin and antioxidant enzyme levels and liver and kidney function were investigated. Thirty-two healthy subjects (12 male and 20 female) ages 24-28 years were recruited from the Faculty of Medicine and Health Sciences of University Putra Malaysia, Malaysia. Compared with consuming the placebo, consumption of the BJP drink daily for 9 weeks significantly increased the concentration of plasma  $\beta$ -carotene and ascorbic acid. Plasma total antioxidant status was increased, but liver and kidney functions were unaffected after consumption of the BJP drink. The consumption of a BJP drink resulted in a significant improvement in certain cardiovascular biochemical parameters and thus reduced the risk of cardiovascular disease.

### H39 Effect of acute stevia consumption on blood glucose response in healthy Malay young adults

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Sains Malaysiana, Vol.43 (5), 2014, 649-654

Previously, researchers had initiated investigation to find an alternative drug that can treat diabetes mellitus without dragging patients into more complicated health problems. After many studies, they found a new and high potential plant-based drug named stevia that is able to reduce diabetic patients' blood glucose. This study aimed to determine the effect of stevia on blood glucose of healthy subjects. The study was carried out by comparing the glycemic response between sucrose and stevia (500 and 1000 mg) among 32 subjects aged between 18 and 23 years old. Subjects were required to fast 8 to 10 h prior to each test which was done on different days. Finger prick test were done on 0, 30, 60, 90 and 120 min to construct a blood sugar response curve for 2 h period. There is a significant difference between the glycemic response of sucrose and stevia 500 mg. Sucrose significantly increased the post prandial blood glucose while stevia 500 mg reduced blood glucose after 30 min of consumption. Sucrose also produced higher glycemic response at min-30 when compared with stevia 1000 mg. There is no significant difference between the glycemic response of stevia of different dose, 500 and 1000 mg. No dose-dependent effect was observed in this study. In conclusion, stevia does not raise blood glucose significantly when consumed in short period. Stevia is effective to be used by healthy people to maintain blood glucose even when consumed in short length of time.

### H40 Health-related quality of life profile in relation to chemotherapy-induced nausea and vomiting among breast cancer patients

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ASEAN Journal of Psychiatry, Vol. 13(1), 2012, 3-12

**Objective:** Despite the availability of modern anti-emetics, chemotherapy-induced nausea and vomiting (CINV) symptoms remain distressing to a high number of cancer patients. This study intended to (1) describe the incidence of CINV and anti-emetic usage; (2) assess the health-related quality of life (HRQoL) and correlate its components with Global Health Status; (3) evaluate HRQoL status in relation to CINV among breast cancer patients receiving chemotherapy. **Methods:** A cross sectional study was conducted in two government hospitals located in the East Coast of Peninsular Malaysia (Terengganu, Kelantan). The Morrow Assessment of Nausea and Emesis Follow-up (MANE-FU) and European Organization for Research and Treatment of Cancer Quality



of Life Questionnaire (EORTC QLQ-C30) were administered. Descriptive statistics and non-parametric tests were employed (SPSS 16). **Results:** Respondents included 41 female patients (age = 49 ± 9.6 years; Malay = 92.7%; no family history of breast cancer = 68.3% and on moderately emetogenic chemotherapy = 97.6%). Majority of patients experienced nausea during or after chemotherapy (90.2%) and rated it as 'severe'. Most patients had taken anti-emetic (87.8%) and considered it 'somewhat useful'. The median score for Global Health Status was 50 (IqR= 16.7). Emotional Functioning, Fatigue and Pain correlated fairly with HRQoL (rs= +0.435; -0.417; -0.387 respectively). Patients with 'a lot' and 'moderate' nausea displayed significantly more fatigue compared to those with little nausea (p=0.029). Those who experienced vomiting reported worse HRQoL profile compared to those who did not (p=0.011). **Conclusion:** These findings generally ascertained that CINV remains poorly controlled and significantly interferes with HRQoL, providing rooms for improvements in therapeutic intervention.

#### **H41 Diets high in palmitic acid (16:0), lauric and myristic acids (12:0 + 14:0), or oleic acid (18:1) do not alter postprandial or fasting plasma homocysteine and inflammatory markers in healthy Malaysian adults**

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The American Journal of Clinical Nutrition, Vol.94, 2011, 1451-1457

**Background:** Dietary fat type is known to modulate the plasma lipid profile, but its effects on plasma homocysteine and inflammatory markers are unclear. **Objective:** We investigated the effects of high-protein Malaysian diets prepared with palm olein, coconut oil (CO), or virgin olive oil on plasma homocysteine and selected markers of inflammation and cardiovascular disease (CVD) in healthy adults. **Design:** A randomized-crossover intervention with 3 dietary sequences of 5 wk each was conducted in 45 healthy subjects. The 3 test fats, namely palmitic acid (16:0)-rich palm olein (PO), lauric and myristic acid (12:0 + 14:0)-rich CO, and oleic acid (18:1)-rich virgin olive oil (OO), were incorporated at two-thirds of 30% fat calories into high-protein Malaysian diets. Results: No significant differences were observed in the effects of the 3 diets on plasma total homocysteine (tHcy) and the inflammatory markers TNF- $\alpha$ , IL-1 $\beta$ , IL-6, and IL-8, high-sensitivity C-reactive protein, and interferon- $\gamma$ . Diets prepared with PO and OO had comparable nonhypercholesterolemic effects; the postprandial total cholesterol for both diets and all fasting lipid indexes for the OO diet were significantly lower (P < 0.05) than for the CO diet. Unlike the PO and OO diets, the CO diet was shown to decrease postprandial lipoprotein (a). **Conclusion:** Diets that were rich in saturated fatty acids prepared with either PO or CO, and an OO diet that was high in oleic acid, did not alter postprandial or fasting plasma concentrations of tHcy and selected inflammatory markers. This trial was registered at clinicaltrials.gov as NCT00941837.

## H42 What are the antioxidant status predictors' factors among male chronic obstructive pulmonary disease (COPD) patients?

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Global Journal of Health Science, Vol. 5(1), 2012, 70-78

Imbalance between antioxidant and oxidative stress is a major risk factor for pathogenesis of some chronic diseases such as chronic obstructive pulmonary disease (COPD). This study aimed to determine antioxidant and oxidative stress status, and also their association with respiratory function of male COPD patients to find the antioxidant predictors' factors. A total of 149 subjects were involved in a cross-sectional study. The study was conducted at two medical centers in Kuala Lumpur, Malaysia. Results of the study showed that plasma vitamin C was low in most of the subjects (86.6%). Total antioxidant capacity was the lowest in COPD stage IV compare to other stages ( $p < 0.05$ ). Level of plasma vitamin A ( $p = 0.012$ ) and vitamin C ( $p = 0.007$ ) were low in malnourished subjects. The predictors for total antioxidant capacity were forced vital capacity (FVC) % predicted and intake of  $\beta$ -carotene ( $R^2 = 0.104$ ,  $p = 0.002$ ). Number of cigarette (pack/ year) and smoking index (number/ year) were not associated with total antioxidant capacity of this COPD population. Plasma oxidative stress as assessed plasma lipid peroxidation (LPO) was only positively correlated with plasma glutathione ( $p = 0.002$ ). It might be a need to evaluate antioxidant status especially in older COPD patients to treat antioxidant deficiency which is leading to prevent COPD progression.

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## H43 Elderly diabetic patients' perception on family support and glucose control

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International Journal of Public Health Research, Vol. 1(1), 2011, 7-12

**Introduction:** Elderly are often associated with multiple social and health problems. Family members are important in helping them doing their daily activities. For elderly diabetics, family support has a role in diabetes management and glucose control. The aim of this study is to explore the perceptions of elderly diabetics regarding the role of family support on their glucose control.

**Methods:** This qualitative technique was a part of the study on glucose control and its associated factors among elderly diabetics. It was conducted from February until May 2009 in Kulim. Ten respondents were purposively sampled based on their glucose control. HbA1c 6.5% or less was considered as good glucose control. In depth interview, using semi-structured interview guide was used in this study. The conversation had been taped, transcribed to verbatim and analyzed manually using thematic analysis. **Results:** All ten respondents perceived that family support did not play a role on their glucose control. They believed that self-awareness and self-determination were important to control the glucose level. Those with good glucose control practiced healthy diet, and not affected by food prepared by their family members compared to those with poor glucose control. However, both groups claimed that, they did not receive much advice from their family members and no special food was prepared for them. **Conclusions:** Elderly diabetics should be motivated on self-determination and focusing on good glucose control. Health education

should be given to patients and their family members to increase their diabetes knowledge especially on useful advice and proper food preparation. It could motivate the elderly diabetics to control their glucose level.

#### **H44 The clinical significance of vitamin D in systematic lupus erythematosus: A systematic review**

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PLoS ONE, Vol. 8(1), 2013, 55275

**Background:** Vitamin D deficiency is more prevalent among SLE patients than the general population. Over the past decade, many studies across the globe have been carried out to investigate the role of vitamin D in SLE from various clinical angles. Therefore, the aim of this systematic review is to summarise and evaluate the evidence from the published literature; focusing on the clinical significance of vitamin D in SLE. **Methods:** The following databases were searched: MEDLINE, Scopus, Web of Knowledge and CINAHL, using the terms "lupus", "systemic lupus erythematosus", "SLE and "vitamin D". We included only adult human studies published in the English language between 2000 and 2012. The reference lists of included studies were thoroughly reviewed in search for other relevant studies. **Results:** A total of 22 studies met the selection criteria. The majority of the studies were observational (95.5%) and cross sectional (90.9%). Out of the 15 studies which looked into the association between vitamin D and SLE disease activity, 10 studies (including the 3 largest studies in this series) revealed a statistically significant inverse relationship. For disease damage, on the other hand, 5 out of 6 studies failed to demonstrate any association with vitamin D levels. Cardiovascular risk factors such as insulin resistance, hypertension and hypercholesterolaemia were related to vitamin D deficiency, according to 3 of the studies. **Conclusion:** There is convincing evidence to support the association between vitamin D levels and SLE disease activity. There is paucity of data in other clinical aspects to make firm conclusions.

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#### **H45 A web-based dietary intervention for people with type 2 diabetes: Development, implementation, and evaluation**

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International Journal of Behavioral Medicine, Vol. 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 (myDIDeA) 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 myDIDeA 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 myDIDeA 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.

#### H46 Web-based interventions for the management of type 2 diabetes mellitus: A systematic review of recent evidence

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International Journal of Medical Informatics, Vol. 80(6), 2011, 389-405

**Introduction:** The Internet has emerged as a potentially effective medium for information exchange. The Internet's potential has been recognised and web-based education programmes have been steadily adopted in recent years in preventing and managing chronic diseases such as diabetes mellitus. This review provides a descriptive discussion of web-based behavioural interventions for the management of type 2 diabetes mellitus. **Method:** Systematic literature searches were performed using MEDLINE, EMBASE, PUBMED, PsycINFO, Web of Science and Cochrane Library to retrieve articles published between 2000 and June 2010 which fulfilled all inclusion criteria. Methodological quality assessment and data synthesis were then performed. **Results:** Twenty articles representing 13 different studies were reviewed. None of the studies were ranked as low in the methodological quality. Goal-setting, personalised coaching, interactive feedback and online peer support groups were some of the successful approaches which were applied in e-interventions to manage type 2 diabetes mellitus. Strong theoretical background, use of other technologies and longer duration of intervention were proven to be successful strategies as well. **Conclusion:** The web-based interventions have demonstrated some level of favourable outcomes, provided they are further enhanced with proper e-research strategies.

#### H47 The contribution of reproductive factors and family history towards premenopausal breast cancer risk in Kuala Lumpur, Malaysia

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The Medical Journal of Malaysia, Vol. 66(3), 2011, 220-226

Breast cancer is the most common cancer among Malaysian women. This study aimed to determine the reproductive for premenopausal breast cancer risk in Kuala Lumpur, Malaysia. A case-control study was conducted in 216 histopathologically confirmed cases of premenopausal breast cancer and 216 community-based controls that were matched by age within a 5-year period and ethnicity. The results of this study showed that premenopausal breast cancer risks were strongly related to parity, number of live births and family history of breast cancer. Premenopausal women with these known reproductive and family history risk factors should take extra measures to undergo appropriate screening method for early detection of breast cancer.

#### H48 Serum vitamin D levels in patients with chronic kidney disease

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EXCLI Journal, Vol. 12, 2013, 511-520

**Introduction:** Hypovitaminosis D is reported to be associated with several medical complications. Recent studies have reported a high worldwide prevalence of Vitamin D deficiency in the general population (up to 80%). This is even higher in patients with chronic kidney disease (CKD) and increases with advancing stages of CKD. **Objectives:** To determine the difference in serum Vitamin D [25-hydroxyvitamin D, 25(OH) D] levels between CKD patients and normal healthy population. **Materials and Methods:** A prospective cross-sectional study involving 50 normal volunteers (control) and 50 patients with CKD stages 2-4. Their demographic profiles were recorded and blood samples taken for serum 25(OH) D, intact parathyroid hormone (iPTH) and other routine blood tests. **Results:** All subjects regardless of renal status had hypovitaminosis D (< 30ng/mL). The mean serum 25(OH) D were comparable in the control and CKD groups (15.3 ± 4.2 ng/mL vs 16.1 ± 6.2 ng/mL, p = NS). However, within the Vitamin D deficient group, the CKD group had lower levels of serum 25(OH) D [12.6(3.7) ng/mL vs 11.2(6.5) ng/mL, p = 0.039]. Female gender [OR 22.553; CI 95 % (2.16-235.48); p = 0.009] and diabetic status [OR 6.456; CI 95 % (1.144-36.433); p = 0.035] were independent predictors for 25(OH) D deficiency. **Conclusions:** Vitamin D insufficiency and vitamin D deficiency are indeed prevalent and under-recognized. Although the vitamin D levels among the study subjects and their control are equally low, the CKD group had severe degree of vitamin D deficiency. Diabetic status and female gender were independent predictors of low serum 25(OH) D.

## H49 The effect of calcium with or without calcitriol supplementation on renal function in patients with hypovitaminosis D and chronic kidney disease

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Nephro-Urology Monthly, Vol. 6(1), 2014, 1-8

**Background:** Hypovitaminosis D (serum 25-OHD <30 ng/mL) is common in patients with chronic kidney disease (CKD). Vitamin D is believed to involve in the regulation of renin-angiotensin system and may be renoprotective. **Objectives:** To compare the effects of calcium with or without calcitriol on renal function in patients with CKD. **Patients and Methods:** A prospective randomized trial was performed involving patients with stages 2-4 CKD and hypovitaminosis D. Baseline demographics data were taken at baseline. Patients were randomized equally into oral calcitriol plus calcium carbonate (calcitriol group) or calcium carbonate alone (non-calcitriol group). Serum levels of 25-hydroxyvitamin D (25-OHD), 1, 25-dihydroxyvitamin D<sub>3</sub> (1, 25-(OH) 2D), creatinine, calcium and urine protein creatinine index (uPCI) were measured at 6 and 12 weeks. **Results:** Fifty (21 Female: 29 Male) patients with CKD with a median age of 53 (22-65) years were recruited. Their median MDRD eGFR (modification of diet in renal disease, estimation of glomerular filtration rate) was 36.0 (15-89) mL/min/1.73 m<sup>2</sup> with the CKD stage 2 (n=8, 16%), stage 3 (n=29, 58%), and stage 4 (n=13, 26%) respectively. In both study groups serum 25-OHD levels were increased at 12 weeks (P=0.001), in contrast to serum 1, 25-(OH) 2D levels which remained unchanged (P>0.05), serum creatinine and uPCI were also remained unchanged until the end of study (P>0.05 each). Patients with diabetes had higher serum creatinine (P=0.01) and lower serum 1, 25-(OH) 2D (P=0.02) at baseline. Regardless of the diabetics status, the serum 25-OHD was increased, and 1, 25-(OH) 2D remained unchanged at 12 weeks in both study groups. At 12 weeks, serum creatinine was decreased in patients with diabetes in the noncalcitriol group (P=0.03) compared to stabilization of creatinine in the calcitriol group (P>0.05). Serum calcium was increased, though it was still within the normal range in the calcitriol group (P<0.001); whereas, in the noncalcitriol group, there was an initial reduction but increased back to baseline (P=0.007). Urine PCI remained unchanged in both groups. **Conclusions:** We have demonstrated that calcitriol supplementation did not offer any additional benefit to reduce 25-OHD and 1, 25-(OH) 2D levels over calcium carbonate alone in patients with CKD in this short term study. Overall renal function remained unchanged. However, we found that calcitriol at 0.5 mg daily plus calcium carbonate 500 mg daily could be reno-protective in diabetic nephropathy regardless of their serum 25-OHD levels.

## **H50 Use of complementary and alternative medicine among breast cancer survivors**

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Asian Pacific Journal of Cancer Prevention, Vol. 13(8), 2012, 4081-4086

Complementary and alternative medicine (CAM) use is prevalent among individuals with cancer, especially breast cancer survivors. This study was conducted among 394 breast cancer survivors in selected regions of Peninsular Malaysia to identify the pattern and factors associated with CAM use. About 51% of the respondents reported CAM use as complementary treatment. Vitamins (47.2%), spiritual activities (33.2%) and other dietary supplements (30.7%) were the most commonly used CAM therapies. Common reasons for CAM use were to increase the body's ability to perform daily activities (70.9%), enhance immune function (58.3%) and improve emotional well-being (31.7%). Users obtained CAM information mainly from friends and family members (62.5%), physicians (25.0%) and mass media (13.9%). Ethnicity and years of education were significantly associated with CAM use. Although no adverse effects of CAM were reported, breast cancer survivors should discuss their CAM use with health professionals to prevent potential adverse effects of these therapies.

## **H51 Effects of dietary vitamin C and E supplementations on hepatic and renal function on young weightlifters**

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Journal of Physical Activity, Sports & Exercise, Vol. 2(2), 2014, 24-29

Dietary supplements vitamin C and E have shown to reduce oxidative stress and muscle damage markers following the exercise. Therefore, it has been hypothesized that markers of oxidative stress and muscle damage induced weightlifting training could be decreased by supplementing subjects with vitamin C and E. Thirty two trained weightlifters recruited and randomly assigned into two groups: Supplement group were given 500 mg of vitamin C and 400 IU of vitamin E per day, while placebo group given maltodextrine, zero calorie per day for 6 weeks. Serum creatine kinase (CK), lactate dehydrogenase (LDH), aspartate aminotransferase (AST), alanine transaminase (ALT), creatinine and urea. Urinary TBARS and circumferences of mid arm, mid-thigh and calf were measured before and after supplementation. All data were expressed as median and interquartile range. All the statistical significance was accepted at  $p < 0.05$ . There was no significant effect ( $p > 0.05$ ) of vitamin supplementation on LDH, CK and urinary TBARS between two groups. There was no significant effect of vitamin C and E supplements on hepatic enzymes AST and ALT; there was statistically significant difference ( $p < 0.05$ ) in renal enzymes, creatinine and urea, but no effect happened and the values were within the normal reference value. These data indicate that vitamin C and E were not effective in ameliorating markers of muscle damage and oxidative stress induced weightlifting training in trained individuals. Moreover, intake of vitamin C and E for 6 weeks showed no toxic effects on hepatic and renal function.

## H52 Effectiveness of exercise and protein supplementation intervention on body composition, functional fitness, and oxidative stress among elderly Malays with sarcopenia

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Clinical Interventions in Aging, Vol. 8, 2013, 1365-1375

Sarcopenia, characterized as muscle loss that occurs with aging, is a major health problem in an aging population, due to its implications on mobility, quality of life, and fall risk. Protein supplementation could improve the physical fitness by increasing protein anabolism, and exercise has a documented evidence of positive effect on functional status among the elderly. However, the combined effect of both protein supplementation and exercise has not been investigated among sarcopenic elderly in the Asian population. Thus, this study aimed to determine the effectiveness of exercise intervention and protein supplementation either alone or in combination for 12 weeks, on body composition, functional fitness, and oxidative stress among elderly Malays with sarcopenia. Sixty five sarcopenic elderly Malays aged 60-74 years were assigned to the control group, exercise group (ExG), protein supplementation group (PrG), or the combination of exercise and protein supplementation group. A significant interaction effect between body weight and body mass index (BMI) was observed, with the PrG (-2.1% body weight, -1.8% BMI) showing the highest reductions. Further, there was a decrease in % body fat (-4.5%) and an increase in fat-free mass (kg) (+5.7%) in the ExG after 12 weeks ( $P < 0.05$ ). The highest increments in lower and upper body strength were observed in the PrG (73.2%) and ExG (47.6%), respectively. In addition, the ExG showed a reduction in superoxide dismutase (SOD) levels, and both interventions did not alter either lipid or protein oxidation. In conclusion, the exercise program was found to improve muscle strength and body composition, while protein supplementation reduced body weight and increased upper body strength, among sarcopenic elderly in Malaysia.

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## H53 Dietary changes among breast cancer patients in Malaysia

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Cancer Nursing, Vol. 36(2), 2013, 131-138

**Background:** Breast cancer patients often show an interest in making dietary changes after diagnosis of breast cancer to improve their health condition and prevent cancer recurrence. **Objective:** The objective of the study was to determine changes in dietary intake 2 years after diagnosis among breast cancer patients. **Methods:** One hundred sixteen subjects were asked to complete a semiquantitative food frequency questionnaire, diet recalls, and dietary changes questionnaire to assess dietary intake before and after diagnosis. The information on sociodemographic background, cancer treatment history, and anthropometric indices was also collected. **Results:** Seventy-two subjects considered diet as a contributing factor to breast cancer,



and 67 subjects changed their dietary habits after breast cancer diagnosis. The reasons for changes in diet were physician and dietitian advice and desire to cure cancer. The sources of information were derived from their physician, mass media, and family members. Total energy, protein, total fat, fatty acids, and vitamin E intake were significantly decreased after diagnosis. Meanwhile, the intake of  $\beta$ -carotene and vitamin C increased significantly after diagnosis. The changes included reduction in red meat, seafood, noodles, and poultry intake. An increased consumption of fruits, vegetables, fish, low-fat milk, and soy products was observed. The subjects tended to lower high-fat foods intake and started to eat more fruits and vegetables. **Conclusion:** Breast cancer patients had changed to a healthier diet after breast cancer diagnosis, although the changes made were small. Implications for practice: This will be helpful to dietitians in providing a better understanding of good eating habits that will maintain patients' health after breast cancer diagnosis.

#### **H54 Vitamin E in Sarcopenia: Current evidences on its role in prevention and treatment**

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Oxidative Medicine and Cellular Longevity, 2014, Article ID 914853

Sarcopenia is a geriatric syndrome that is characterized by gradual loss of muscle mass and strength with increasing age. Although the underlying mechanism is still unknown, the contribution of increased oxidative stress in advanced age has been recognized as one of the risk factors of sarcopenia. Thus, eliminating reactive oxygen species (ROS) can be a strategy to combat sarcopenia. In this review, we discuss the potential role of vitamin E in the prevention and treatment of sarcopenia. Vitamin E is a lipid soluble vitamin, with potent antioxidant properties and current evidence suggesting a role in the modulation of signaling pathways. Previous studies have shown its possible beneficial effects on aging and age-related diseases. Although there are evidences suggesting an association between vitamin E and muscle health, they are still inconclusive compared to other more extensively studied chronic diseases such as neurodegenerative diseases and cardiovascular diseases. Therefore, we reviewed the role of vitamin E and its potential protective mechanisms on muscle health based on previous and current in vitro and in vivo studies.

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#### **H55 Low glycaemic index diets improve glucose tolerance and body weight in women with previous history of gestational diabetes: A six months randomized trial**

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Nutrition Journal, Vol. 12(68), 2013, 1-12

**Background:** Gestational Diabetes Mellitus (GDM) increases risks for type 2 diabetes and weight management is recommended to reduce the risk. Conventional dietary recommendations (energy-restricted, low fat) have limited success in women with previous GDM. The effect of lowering Glycaemic Index (GI) in managing glycaemic variables and body weight in women post-GDM is unknown. **Objective:** To evaluate the effects of conventional dietary recommendations administered with and without additional low-GI education, in the management of glucose tolerance and body weight in Asian women with previous GDM. **Method:** Seventy seven Asian, non-diabetic women with previous GDM, between 20-40 y were randomised into Conventional healthy dietary recommendation (CHDR) and low GI (LGI) groups. CHDR received conventional dietary recommendations only (energy restricted, low in fat and refined sugars, high-fibre). LGI group received advice on lowering GI in addition. Fasting and 2h post-load blood glucose after 75 g oral glucose tolerance test (2HPP) were measured at baseline and 6 months after intervention. Anthropometry and dietary intake were assessed at baseline, three and six months after intervention. The study is registered at the Malaysian National Medical Research Register (NMRR) with Research ID: 5183. **Results:** After 6 months, significant reductions in body weight, BMI and waist-to-hip ratio were observed only in LGI group ( $P < 0.05$ ). Mean BMI changes were significantly different between groups (LGI vs. CHDR:  $-0.6$  vs.  $0$  kg/m<sup>2</sup>,  $P = 0.03$ ). More subjects achieved weight loss = 5% in LGI compared to CHDR group (33% vs. 8%,  $P = 0.01$ ). Changes in 2HPP were significantly different between groups (LGI vs. CHDR: median (IQR):  $-0.2(2.8)$  vs.  $+0.8(2.0)$  mmol/L,  $P = 0.025$ ). Subjects with baseline fasting insulin =  $2$  IU/ml had greater 2HPP reductions in LGI group compared to those in the CHDR group ( $-1.9 \pm 0.42$  vs.  $+1.31 \pm 1.4$  mmol/L,  $P < 0.001$ ). After 6 months, LGI group diets showed significantly lower GI ( $57 \pm 5$  vs.  $64 \pm 6$ ,  $P < 0.001$ ), GL ( $122 \pm 33$  vs.  $142 \pm 35$ ,  $P = 0.04$ ) and higher fibre content ( $17 \pm 4$  vs.  $13 \pm 4$  g,  $P < 0.001$ ). Caloric intakes were comparable between groups. **Conclusion:** In women post-GDM, lowering GI of healthy diets resulted in significant improvements in glucose tolerance and body weight reduction as compared to conventional low-fat diets with similar energy prescription.

## H56 Tocotrienol rich fraction supplementation improved lipid profile and oxidative status in healthy older adults: A randomized controlled study

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Nutrition & Metabolism, Vol. 8(42), 2011, 2-14

**Background:** Vitamin E supplements containing tocotrienols are now being recommended for optimum health but its effects are scarcely known. The objective was to determine the effects of Tocotrienol Rich Fraction (TRF) supplementation on lipid profile and oxidative status in healthy older individuals at a dose of 160 mg/day for 6 months. **Methods:** Sixty-two subjects were recruited from two age groups: 35-49 years ( $n = 31$ ) and above 50 years ( $n = 31$ ), and randomly assigned to receive either TRF or placebo capsules for six months. Blood samples were obtained

at 0, 3rd and 6th months. Results: HDL-cholesterol in the TRF-supplemented group was elevated after 6 months ( $p<0.01$ ). Protein carbonyl contents were markedly decreased ( $p<0.001$ ), whereas AGE levels were lowered in the >50 year-old group ( $p<0.05$ ). Plasma levels of total vitamin E particularly tocopherols were significantly increased in the TRF-supplemented group after 3 months ( $p<0.01$ ). Plasma total tocotrienols were only increased in the >50 year-old group after receiving 6 months of TRF supplementation. Changes in enzyme activities were only observed in the >50 year-old group. SOD activity was decreased after 3 ( $p<0.05$ ) and 6 ( $p<0.05$ ) months of TRF supplementation whereas CAT activity was decreased after 3 ( $p<0.01$ ) and 6 ( $p<0.05$ ) months in the placebo group. GPx activity was increased at 6 months for both treatment and placebo groups ( $p<0.05$ ). **Conclusion:** The observed improvement of plasma cholesterol, AGE and antioxidant vitamin levels as well as the reduced protein damage may indicate a restoration of redox balance after TRF supplementation, particularly in individuals over 50 years of age.

### **H57 Nutritional status and quality of life (QOL) studies among leukemic children at pediatric institute, Hospital Kuala Lumpur, Malaysia**

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Asian Journal of Clinical Nutrition, Vol.3 (2), 2011, 62-70

This study attempts to determine interrelationship between nutritional status and quality of life among leukemic children. Cross sectional study involved 34 children aged 5-15 years old. Anthropometric measurements and biochemical data were obtained. A Multiple Pass 24-h Diet Recall for nutritional assessment was attained. Quality of Life (QoL) is measured using Cancer Module PedsQL. The findings revealed that leukemic children have normal development like healthy children of the same age. Majority of them had normal percentiles of height-for-age and weight-for-age with 91.2 and 97.1%, respectively and only 5.9% were stunted. Indicators of protein-energy malnutrition showed that triceps skinfold 64.7%, MUAC 73.5% and arm muscle area 73.5% were in normal percentiles. Where else, for biochemical assessment, most of them have normal albumin and total protein level, 91.8 and 79.4%, respectively but 55.9% have low hemoglobin level. There were significant difference between QoL with socioeconomic status and time of diagnose. QoL was positively correlated with weight and body mass index but negatively correlated with total protein and albumin. In conclusion, it is learned that weight, BMI, total protein and albumin were not a predictor of QoL among leukemic children.

## H58 Physical activity of pediatric patients with acute leukemia undergoing induction or consolidation chemotherapy

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Leukemia Research, Vol.37 (1), 2013, 14-20

This study aimed to assess the physical activity levels of pediatric patients with acute leukemia undergoing chemotherapy. Thirty-eight pediatric patients and matched controls, aged 3-12 years old, were measured for weight, height, and other anthropometric parameters. Physical activity was assessed using actical accelerometer and activity log book. Patients recorded significantly lower mean total activity counts ( $26.2 \pm 30.2$  cpm vs.  $192.2 \pm 68.8$  cpm;  $p < 0.01$ ) and spent more time in sedentary activities ( $1301 \pm 121$  min vs.  $1020 \pm 101$  min;  $p < 0.001$ ) compared to controls. They also achieved fewer 1-5-min bouts of moderate-vigorous physical activity (MVPA) compared to controls ( $1.50 \pm 5.95$  vs.  $37.38 \pm 40.36$ ;  $p < 0.001$ ). In conclusion, patients had lower physical activity level and intensity; and simple exercise intervention programs may be needed to minimize the detrimental effects of prolonged sedentary behaviors.

## H59 Improvement of metabolic parameters in healthy older adult men following a fasting calorie restriction intervention

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The Official Journal of the International Society for the Study of the Aging Male, Vol. 16(4), 2013, 177-183

**Objective:** Calorie restriction and intermittent fasting are two dietary interventions that can improve aging. Religious fasting also suggested having similar benefit; however, such studies are still scarce. Thus, this study aimed to determine the effect of fasting calorie restriction (FCR) on metabolic parameters and DNA damage among healthy older adult men. **Methods:** A randomized controlled study was done on men, aged 50-70 years in Klang Valley, Malaysia. Subjects were divided into two groups; FCR (reduction of 300-500 kcal/d combined with 2 days/week of Muslim Sunnah Fasting) and control. Assessment was ascertained at three time point; baseline, weeks 6 and 12. Blood samples were analyzed for lipid profile, DNA damage and malondialdehyde (MDA). **Results:** The FCR group reduced their energy intake for approximately 18% upon completion of the study. A significant interaction effect was found in body weight, body mass index, fat percentage, fat mass, blood pressure, total cholesterol, low-density lipoprotein cholesterol and the ratio of total cholesterol/high-density lipoprotein cholesterol ( $p < 0.05$ ). A significant improvement ( $p < 0.001$ ) in total DNA rejoining cells and MDA ( $p < 0.05$ ) was also observed in the FCR group. **Conclusion:** FCR improved metabolic parameters and DNA damage in healthy older adult men. Therefore, there is a need to further examine the mechanism of FCR.

## H60 Vitamin E: A potential therapy for gastric mucosal injury

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Pharmaceutical Biology, Vol. 52(12), 2014, 1591-1597

**Context:** Many scientific reports have shown the involvement of oxidative stress and inflammation as well as diminished gastroprotective substances in the pathogenesis of gastric lesions using various models. Therefore, treatment with antioxidants like tocopherol and tocotrienol may afford beneficial effects in attenuating the formation of the gastric lesions. **Objective:** The aim of this work was to summarize documented reports on the effects of vitamin E on various models of gastric lesion. **Methods:** A literature search was performed from databases in Medline (PubMed), Web of Science, ScienceDirect, and GoogleScholar from June to December 2013. **Results and conclusion:** The potential roles of tocopherol and tocotrienol in modifying the effects of ulcerogenic agents are discussed in this review. The protective effects of the vitamin E might involve ameliorating oxidative stress and inflammation as well as restoration of endogenous gastroprotective substances. This vitamin has the potential to be used as a therapy for gastric mucosal injury.





# **Food Science and Technology**

**(Food Safety and Quality)**

## Effect of rice bran and carboxymethyl cellulose addition on the physicochemical quality of chicken sausage formulated with red palm mid fraction

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World Applied Sciences Journal 17 (Towards the Traceability of Halal and Thoyyiban Application), 2012, 57-61

The objective of this study is to determine the effects of dietary fiber on the sensory properties of cooked chicken sausages by partial substitution of chicken fat (CF) with red palm mid fraction (RPMF). Four sausage formulations with the fat level of 5% were blended with rice bran 1.5% (RB) and carboxymethyl cellulose (CL). Instrumental analysis of water activity ( $a_w$ ), cook loss, pH value and texture (hardness) were performed to measure physicochemical properties. Sensory properties were estimated using a hedonic test. Statistical analysis was performed by using SPSS. The results showed that this fiber is compatible when used with red palm mid fraction (RPMF) fat in chicken sausages. The panelists indicated that all the formulations except the treatment with RPMF+CL were not significantly different to the control in terms of acceptability. In conclusion, the lipid content, when substituting CF with RPMF, with rice bran carboxymethyl cellulose, yielded acceptable chicken nuggets. This indicates the RPMF and rice bran formulations were equally comparable or better than the CF formulation. It is recommended that multiple analyses with different analytical instrumentation (GC, FTIR and UV-Vis) may explain better the antioxidants behaviour and oxidative stability of the products.

## Physicochemical and sensorial evaluation of biscuit and muffin incorporated with young corn powder

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Sains Malaysiana, Vol. 43(1), 2014, 45-52

Various types of natural fibre-rich ingredients are added into bakery-based products to improve their fibre content for health promotional purposes. However, most of these products are frequently added with imported dietary fibre ingredients. The aim of this study was to develop bakery products incorporated with young corn powder (YCP) and to evaluate the effects on physicochemical properties and sensory acceptabilities. Dried young corn was used to substitute wheat flour in biscuit and muffin formulations at different levels (0, 10, 20 and 30%). The effects of YCP incorporation on proximate compositions, physical characteristics, texture profile and sensory evaluation of both bakery products were investigated. The present results showed that YCP had significantly increased protein and total dietary fibre contents of both biscuit and muffin. Hardness attribute of both products increased in line with the level of YCP addition. Interestingly, biscuit and muffin containing 10% YCP received better score than the control and other formulations for most of the sensorial attributes judged. In conclusion, YCP can be potentially be



used as an alternative functional ingredient for partial replacement of wheat flour in formulating biscuit and muffin because of its ability to improve the nutritional quality without jeopardizing sensorial palatability.

### **13 Physiochemical properties and sensory attributes of medium-and long-chain triacylglycerols (MLCT)-enriched baking shortening**

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Food and Bioprocess Technology, Vol.4, 2011, 587-596

Six binary formulations of medium-and longchain triacylglycerols (MLCT) fat and palm stearin and four ternary formulations of MLCT fat, palm stearin, and palm olein were produced. MLCT fat and palm stearin were mixed in ranges of 40-90% with 10% increments (w/w), while for the ternary formulations, 10% and 20% palm olein were substituted to palm stearin in MS 46 and MS 55 formulations. The solid fat content (SFC) by pulsed nuclear magnetic resonance and heating profiles using differential scanning calorimeter of these formulations were determined. Results obtained from SFC and heating profiles found that all the formulations melted completely at 55°C. The high complete melting temperature is due to the stearic acid content in MLCT fat. Generally, increasing % MLCT fat (40-90%) in the formulations lowers the SFC curves at the measured temperatures (0-60°C). The binary samples of MS 73, MS 82, and MS 91 showed SFC between 15% and 25% at room temperature (25°C), which indicated that these formulations were suitable for shortening production. As the production cost of MLCT fat is high (approximately USD 3/kg), an attempt to reduce the proportion of MLCT fat in the shortening formulations was done by developing the ternary formulations. Shortenings formulated with 40:40:20 (MSO 442), 50:40:10 (MSO 541), and 50:30:20 (MSO 532) of MLCT fat/ palm stearin/ palm olein formulations had similar SFC% at 25°C, and they were subsequently chosen to produce shortening. Using multivariate analysis, taste attribute showed positively and highly correlated to the melting temperature and SFC at 25°C of the MLCT-enriched shortenings. In acceptance test, high correlation ( $R^2=0.98$ ) was only found on cakes made from MSO 442 and MSO 541 shortenings. Both untrained and trained panelists rated the Madeira cakes made from MSO 532 shortening the highest for overall acceptability.

### **14 Antibacterial activity of Lactobacillus acidophilus strains isolated from honey marketed in Malaysia against selected multiple antibiotic resistant (MAR) Gram-positive bacteria**

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Journal of Food Science, Vol.77 (7), 2012, 364-371

A total of 32 lactic acid bacteria (LAB) were isolated from 13 honey samples commercially marketed in Malaysia, 6 strains identified as Lactobacillus acidophilus by API CHL50. The isolates

had antibacterial activities against multiple antibiotic resistant's *Staphylococcus aureus* (25 to 32 mm), *Staphylococcus epidermis* (14 to 22 mm) and *Bacillus subtilis* (12 to 19 mm) in the agar overlay method after 24 h incubation at 30 °C. The crude supernatant was heat stable at 90 °C and 121 °C for 1 h. Treatment with proteinase K and RNase II maintained the antimicrobial activity of all the supernatants except sample H006-A and H010-G. All the supernatants showed antimicrobial activities against target bacteria at pH 3 and pH 5 but not at pH 6 within 72 h incubation at 30 °C. *S. aureus* was not inhibited by sample H006-A isolated from Libyan honey and sample H008-D isolated from Malaysian honey at pH 5, compared to supernatants from other *L. acidophilus* isolates. The presence of different strains of *L. acidophilus* in honey obtained from different sources may contribute to the differences in the antimicrobial properties of honey.

## 15 Evaluation on Antibacterial Activity of *Lactobacillus Acidophilus* Strains Isolated from honey

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American Journal of Applied Sciences, Vol.9 (6), 2012, 807-817

**Problem statement:** This study reports the isolation of lactic acid bacteria from 13 honey samples produced in Malaysia, Libya and Saudi Arabia and their antibacterial activity against three Gram negative pathogenic bacteria. **Approach:** A modified MRS agar with 0.8% CaCO<sub>3</sub> and MRS with 1% glucose was found to facilitate isolation of LAB compared to MRS, tomato juice agar and modified tomato juice agar. 32 isolates were confirmed LAB by catalase test and Gram staining. Six isolates were screened for antibacterial activity and identified as strains of *Lactobacillus acidophilus* 1 by API CH50. **Results:** All the isolates showed very good inhibitory activity against target Gram negative bacteria as indicated by the diameter of inhibition zone: *Salmonella Typhimurium* (23-30 mm), *Escherichia coli* (7-18 mm) and *Enterobacter aerogenes* (10-18 mm) after 24 h incubation at 30°C. Supernatants of *L. acidophilus* 1 strains showed good antibacterial activity against all target bacteria. Heating the supernatants at 90 and 121°C for 1 h enhanced the antibacterial activity against all target bacteria except supernatants H006-A and H010-G against *S. Typhimurium*. Antibacterial activity of supernatants were maintained after pH adjustment to 3, but at pH5 supernatants H006-A, H008-D and H010-G lost the activity against *S. Typhimurium* and *E. coli* within 48 h of incubation while at pH 6 all supernatants lost activity except against *E. aerogenes*. Enzymes treatments of supernatants with RNase II and Proteinase K for 1 h inhibited all target bacteria except supernatants H008-D, H008-E and H006-A which were relatively sensitive to both enzymes against *S. Typhimurium* and *E. coli*. **Conclusion/ Recommendations:** In conclusion, honey from different sources contains strains of *L. acidophilus* 1 that produced compounds with good antibacterial activity which may be responsible for the antibacterial properties of honey.

## Physicochemical characterization of starch extracted from Malaysian wild yam (*Dioscorea Hispida Dennst*)

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Emirates Journal of Food and Agriculture, Vol.26 (8), 2014, 652-658

Using a sedimentation method, the extracted starch from *Dioscorea hispida* tuber was characterized for their morphological, thermal and other physicochemical properties such as total starch content, moisture content, pH, water binding capacity (WBC), solubility and swelling power. The starch content extracted from the tuber was 11.46% with the WBC and moisture content were 107% and 249% respectively. Results showed the starch solubility and swelling power gradually increased with the increasing of temperature ranging from 65°C to 95°C. Under a scanning electron microscope (SEM), it was observed the starch granules have polyhedral shapes and their size between 1.3  $\mu\text{m}$  to 4.3  $\mu\text{m}$ . The results obtained from differential scanning calorimeter (DSC) showed the starch transition temperature ( $T_0$ ,  $T_p$  and  $T_c$ ) were 74.54°C, 79.35°C and 83.36°C whereas, enthalpy of gelatinization ( $\Delta H_{\text{gel}}$ ) was 4.12 Jg<sup>-1</sup>. This research identify that starch from *D.hispida* has unique properties which can be used as a new starch source for various applications.

## Determination of Antimicrobial Activities of Kacangma Herb *Leonurus Sibiricus*

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Sains Malaysiana, Vol. 40(8), 2011, 879-885

Evaluation of antimicrobial effectiveness of kacangma extract was carried out using disc diffusion test and direct inhibition test. Result showed that ethanol extracts at concentration of 50 and 100 mg/mL inhibited *Staphylococcus aureus*. Water extracts at concentration 10, 25, 50 and 100 mg/mL inhibited *Aspergillus Niger*, 25, 50 and 100 mg/mL inhibited *Saccharomyces Cerevisae* and at concentration 100 mg/mL inhibited *Staphylococcus Aureus*. Heat treatments during direct inhibition test with incorporation of extracts did not show any differences of inhibitory effects against all microorganisms tested.

## Effects of oil palm (*Elais guineensis*) fruit extracts on glucose uptake activity of muscle, adipose and liver cells

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ASEAN Journal on Science and Technology for Development, Vol.31 (2), 2014, 83-89

The effect of oil palm (*Elais guineensis*) fruit aqueous extract (OPF) on glucose uptake activity of three different cell lines was investigated. The cell lines were incubated with different concentrations of OPF to evaluate the stimulatory effect of OPF towards glucose uptake activity of L6 myotubes, 3T3F442A adipocytes and Chang liver cell line. The glucose uptake activities of all tested cells were enhanced in the presence of OPF extract (basal condition). Nevertheless in combination of OPF extract and 100 nM insulin, the glucose uptake activity was only significantly enhanced in L6 myotubes and 3T3F442A adipocytes cell lines. The extracts enhanced the glucose uptake into cells through either insulin-mimetic or insulin-sensitizing property or combination of these two properties. It can be suggested that the OPF extract exerts its antihyperglycemic action partly by mediated glucose uptake into the glucose-responsive disposal cells, muscle, adipose and liver.

## Bioactive compounds determination in fermented liquid dragon fruit (*Hylocereus polyrhizus*)

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Borneo Science, Vol. 31, 2012, 31-48

Bioactive compounds have been intensively studied due to their beneficial effects on high cholesterol, cardiovascular disease and cancer. This study focused on the bioactive compounds (fatty acids, phytosterols, betacyanins and acetic acid) and other aspects (physical, microbiological, chemical and nutritional properties) of fermented liquid dragon fruit (*Hylocereus polyrhizus*) without pasteurization sample A (SA) and with pasteurization sample B (SB). Overall, SB exhibited significantly higher concentrations ( $p < 0.05$ ) of phytosterols, betacyanins, acetic acids, total phenolic content (TPC), total flavonoid content (TFC) and total flavanol assay (TFA) as compared to SA, except fatty acids; this suggested that heat treatment (75°C for 15 s) may have exerted a favourable effect on the concentration of these bioactive compounds. Also, SB showed greater ( $p < 0.05$ ) radical scavenging capacity in 2,2'-azino-bis-3-ethylbenzthiazoline-6-sulphonic acid (ABTS) assay than SA. No microorganisms were detected in SA or SB which was possibly due to restricting internal factor such as low pH (3.94-4.00), high ethanol concentration (7.31-8.92%) and the presence of organic acids. In conclusion, the overall results suggested both SA and SB were microbiologically safe for consumption however heat pasteurization may exert a beneficial effect on concentrations of bioactive compounds.

## Effects of probiotic on the intestinal morphology with special reference to the growth of broilers

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Journal of The Chemical Society of Pakistan, Vol. 33(1), 2011, 129

The probiotic (Protexin)® increases the growth rate in broilers. It must interfere with the intestinal cell morphology and absorption. The intestinal epithelium is one of the most rapidly renewed tissues in the body and is renewed by a process of continuous cell division. This study was carried out with an aim to establish a link between the use of probiotic doses, growth rate, and intestinal cell proliferation by measuring the length and weight of the intestine and intestinal crypt cell proliferation (CCP) of broiler chicks. The results revealed significant increase in intestinal CCP but no effect was observed on the intestinal weight and length. The increase in CCP has also no significant influence towards growth factor. The increased weight gain in this study is associated with more feed consumption which is observed with Protexin(r) dose 1.0 g / 10 kg of feed. Furthermore, feed consumption reduced beyond this dose may lead to reduced weight gain.

## Effects of physicochemical soil properties on the heavy metal concentrations of *Diplaziumesculentum* (medicinal plant) from the UKM and Tasik Chini, Malaysia

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International Journal of Chemical Technology Research, Vol.6 (14), 2014, 5519-5527

*Diplaziumesculentum* is widely used as an edible plant and a medicinal plant in Malaysia and other regions worldwide. This study aimed to identify the soil properties (pH, EC, CEC, percentage clay content, and organic matter) that affect the heavy metal uptake in medicinal plant. The heavy metal concentrations (lead, iron, manganese, zinc, copper, and chromium) in the parts of *D.esculentum* (roots, rhizomes, young leaves, mature leaves, and fiddleheads) and soil where the plants grow were analyzed. The study was carried out in UKM fern garden and Tasik Chini forest in Malaysia. The heavy metal concentrations were extracted using wet digestion method and determined by inductively coupled plasma spectroscopy ICP-MS. The heavy metals in the soil of Tasik Chini showed different values compared with those in the UKM fern garden. Correlation analysis showed that the properties of soil affected the concentrations of heavy metals in the soil and plant parts. Furthermore, many significant correlation were observed.

## **I12 Quality characteristics of spent duck sausages containing surimi like material substitution during refrigerated storage**

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International Journal of Poultry Science, Vol.13, 2014, 228-239

The quality characteristics of duck sausages prepared using different treatment were evaluated. Physicochemical, sensory and microbial properties of sausages containing duck surimi-like material substitution with cryoprotectant added (CPP) and without cryoprotectant added (NPP), antioxidant added (BHA) and, duck mince (as the control, CON) were compared. CPP and NPP sample had significantly higher ( $p < 0.05$ ) moisture content and lower protein and fat content compared with CON sample. The thiobarbituric acid-reactive substances (TBARS) value of all sample increased as the storage time increased up to day 30, but thereafter it decreased in all of the samples. CPP sample had significantly lower TBARS value ( $p < 0.05$ ) and this value remained lower than those of the other samples throughout the refrigerated storage time. Addition of duck surimi-like material to the sausages had significant effects ( $p < 0.05$ ) on hardness, gumminess and chewiness values of CPP and NPP sample. Treatment had no significant effect on sensory attributes of sausages prepared from duck meat. CPP sample had lower microbial activity during 40 days of refrigerated storage. However, BHA sample had no significant difference in microbial activity compared with CON sample. The results indicate that duck surimi-like material substitution with cryoprotectant added improves quality characteristics of duck sausages during refrigerated storage than the other treatments.

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## **I13 Comparison of physical, chemical and functional properties of broken rice and breadfruit starch against cassava starch**

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Journal of Tropical Agriculture and Food Science, Vol.40 (2), 2012, 211-219

The physical, chemical and functional properties of starch differ with different starch sources. In general, breadfruit starch was closer to cassava starch characteristics compared to broken rice starch. Among the starch sources, cassava starch showed the highest paste clarity at all pH values. The broken rice starch had poor paste clarity even though it has the smallest starch granules. Compared to both broken rice and cassava starches, breadfruit starch was found to have the highest swelling power, water binding capability, water absorption index, bulk density, dispersibility capability and required the highest enthalpy energy during the gelatinization process.

## The harmful effects of consumption of repeatedly heated edible oils: A short review

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*La Clinica Terapeutica*, Vol. 165(4), 2014, 217-221

It has been a regular practice to repeatedly heat the cooking oil and consume it without knowing the harmful effects of such. The procedure to use repeatedly heated cooking oil is aimed to curb the cost of expenses. Heating results in the formation of free reactive oxygen species (ROS) which is responsible for the oxidative stress and damage to various organs in the body. The present review article discusses the harmful events occurring due to consumption of repeated heating of edible oil. A strong message is aimed to generate public awareness of the deleterious effects of consumption of heated edible oil which may help in curbing hypertension and atherosclerosis.

## Nutritional composition and lipid oxidation stability of beef patties packed with biodegradable and non-biodegradable material

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*Sains Malaysiana*, Vol. 43(8), 2014, 1197-1203

Long term environmental problems of non-biodegradable plastic, the need to conserve finite fossil fuels and the impact of globalization of food supply are some of the driving forces in looking towards biodegradable plastics as an alternative to the existing petrochemical-based polymers for food packaging application. The stability of nutritional composition, lipid oxidation, physical traits of beef patties packed with different types of plastics and the surface morphology of plastics after 3 months of frozen storage (-18°C) were studied. Beef patties were packed with either non-biodegradable high density polyethylene (PE), hydro-biodegradable low density polyethylene/thermoplastic sago starch plastic (PES), hydro-biodegradable polylactic acid plastic (PLA) or oxo-biodegradable plastic (OXO). There were no differences in most of the nutrients analyzed and lipid oxidation values of beef patties packed with either biodegradable or non-biodegradable plastics after storage. There were significant ( $p < 0.05$ ) decreases in fat for cooked patties and moisture for both raw and cooked patties. Lipid oxidation indices of beef patties increased after storage but they were not significant ( $p > 0.05$ ). Beef patties packed with biodegradable packaging materials were able to retain moisture without jeopardizing the diameter reduction during storage. In summary, the application of biodegradable plastics for packing beef patties was considered acceptable and can be suggested as an alternative packaging item to replace conventional polyethylene plastic packaging.

## **I16 Acceptability and consumption of soy products among consumers in Peninsular Malaysia**

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Sains Malaysiana, Vol. 43(7), 2014, 977-985

Soybean-based foods are popular among Asian for thousands of years and it is not only recognized as a traditional food but have the potential for health purposes. This survey was conducted to determine consumers' acceptance, preference and consumption of soy products. A total of 330 respondents were involved in this study. They were university students and general public aged 18 years and above. Each respondent was asked to fill the questionnaire under researcher's supervision. The results of the study showed that 56% of the respondents preferred soymilk compared with other soy products such as tofufa (16%), soy sauce (9%), tempeh (8%), egg tofu (7%) and soy tofu (4%). Majority of the respondents (>50%) believed that soy products could reduce the risk of cancer and osteoporosis. As much as 89.4% of the respondents ate soy tofu, while 63.9% of the respondents ate egg tofu and 42.2% liked fried egg tofu. More than 80% of the respondents preferred the color, aroma, taste and texture of the egg tofu.

## **I17 Frying quality of virgin coconut oil as affected by Zea mays extract**

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Sains Malaysiana, Vol. 43(9), 2014, 1311-1315

The effect of corn silk or Zea mays extract on the physicochemical changes of virgin coconut oil was studied during three consecutive days of deep frying. There were three types of oil blend systems used: virgin coconut oil without antioxidant as control system; virgin coconut oil with butylated hydroxytoluene (BHT) as synthetic antioxidant and virgin coconut oil with Zea mays extract as natural antioxidant. The oil quality was assessed by measuring the colour, viscosity, peroxide, p-anisidine, free fatty acids, totox and iodine value. The results show that Zea mays extract delayed the oil deterioration. The Zea mays extract significantly ( $p < 0.05$ ) lowered the rate of oxidation in virgin coconut oil compared to control oil and was comparable to BHT. Zea mays extract did not change the sensory profiles of French fries which was shown by insignificant difference ( $p < 0.05$ ) between Zea mays and control fries for all sensory attributes (colour, taste, aroma, crispiness, oiliness and overall quality). In general, the Zea may extract was capable of extending the stability and quality of virgin coconut oil and therefore has potential as new source of natural antioxidant for use in deep frying.



## Potency of honey as antibacterial agent against multiple antibiotic resistant pathogens evaluated by different methods

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American Journal of Applied Sciences, Vol. 11 (10), 2014, 1773-1783

Honey is rich with complex natural components which could be useful as antibacterial agents or as preservative. Honey contains high concentration of sugars, low amount of water, high osmolality and often dark colour which influence its antibacterial activity. Disc diffusion, well method, micro dilution assay are methods commonly used to determine the antibacterial activity of honey. In this study, microtiter and microbial plate count were included to ascertain the potency of honey as antibacterial agent against multiple antibiotic resistant pathogenic bacteria (*Staphylococcus aureus*, *Salmonella Typhimurium*, *Escherichia coli*, *Bacillus subtilis* and *Pseudomonas aeruginosa*) with concentration of 0.2 g mL<sup>-1</sup>. Results found that well diffusion method tends to give higher inhibitory zone than disc diffusion method but there was no correlation among the bacteria was observed except for *S. Typhimurium*, *E. coli* (R = 0.310, 0.505 and 0.316, respectively). Nan photometer assay and microtiter plates assay showed comparable results with moderately strong correlation (R<sup>2</sup> = 0.681 and 0.767, respectively) for *S. aureus* and *S. typhimurium*, but poor correlation was found for *E. coli*, *B. subtilis* and *P. aeruginosa* (R<sup>2</sup> = 0.441, 0.308 and 0.383, respectively). Determining the number of survivors by plating on agar after nanophotometer assay or microtiter plate assay had confirmed the effectiveness of honey as antimicrobial agent against target bacteria; which confirmed that honey has the potency to inhibit pathogens even at low concentration.

## Osteoporotic fracture healing: Potential use of medicinal plants from the tropics

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Current Drug Targets, Vol. 14(14), 2013, 1651-1658

With improvements in living standards and healthcare, life expectancy has been increasing dramatically in most parts of the world. These situations lead to the increase in the reported cases of geriatrics-related diseases such as hypogonadal osteoporosis with skeletal fracture being the ultimate outcome, which eventually causes significant morbidity and mortality. The deficient gonadal hormones, which are the main cause of hypogonadal osteoporosis, could be substituted with hormone replacement therapy to hinder bone loss. However, the artificial hormonal therapy has been linked to grievous conditions such as breast and prostate cancers. In view of the various adverse effects associated with conventional treatment, many researchers are now focusing on finding alternative remedies from nature. This article explores the possibilities of certain medicinal plants native to Malaysia that possess androgenic and antioxidant properties to potentially be used in the treatment of fracture due to osteoporosis in ageing people.

## 120 **A new approach for reduction of chemical compounds causing undesirable odour in *Morinda Citrifolia* fruit juice**

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Journal of Tropical Agriculture and Food Science, Vol.41 (2), 2013, 257 - 264

A specific selective technique for reduction of chemical compounds that caused undesirable odour from fresh *Morinda citrifolia* fruit juice has been developed. A polysaccharide derivative known as Sephadex LH-20 has been used as the stationary phase to separate the chemical compounds that caused undesirable odour from the juice. Eight common chemical compounds responsible for the undesirable odour have been reduced and some have been successfully removed from the *M. citrifolia* juice. Based on analysis using GCMS (Gas Chromatography Mass Spectrometer), the eight major compounds and groups of compounds that contributed to undesirable odour were identified as hexanoic acid, octanoic acid, trimethylsilyl ester, tridecane, methyl ester, 4-octanol, undecane and methyl arachate.

## 121 **Evaluation on chemical analysis and microbiological quality of partially cooked-frozen of Malaysian heritage food ('Satar')**

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The International Journal of Engineering and Science (IJES), Vol. 3(9), 2014, 71-77

'Satar' is a Malaysian heritage food that made of a blend of boneless fish marinated in spices, wrapped in banana leaves and grilled over flaming charcoal. It is a very popular ready-to-eat food sold in the East Coast of Peninsular Malaysia. Left over 'Satar' is frequently subjected to frozen and re-grilling. Storing the 'Satar' under freezing condition has been a common practice by the owners, but how this practice may affect the quality of this product is yet to be understood. This product may undergo undesirable changes during storage and such deterioration may affect the quality of 'Satar'. The objective of this study was to determine the chemical and microbiological changes of partially cooked-frozen 'Satar' during storage. Initially, 'Satar' was prepared under controlled environment by mixing fish together with onion, shallot, spices, sugar, salt and shredded coconut. The chemical analyses were conducted every two weeks storage at -18°C in a blast freezer for 2 months period of study. The moisture, carbohydrate, protein, lipid and ash contents of the 'Satar' were 66.89%, 5.39%, 11.71%, 14.06% and 1.87%, respectively. The peroxide value of 'Satar' was significantly increased from 9.23 to 12.75 mEq/kg fat during frozen storage. In terms of microbiological quality of this product, Aerobic Plate Count (APC), Enterobacteriaceae count and Yeast and Mold count were gradually increased throughout 8-weeks of frozen storage, where after 6-weeks of storage showed substantial increase of microbial populations to unacceptable level. In conclusion, storage of partially cooked frozen 'Satar' was acceptable within 4 weeks of storage at -18°C. After four weeks of storage at -18°C, lipid oxidation

was significantly higher and APC almost reached  $1.0 \times 10^6$ CFU/g which indicate the physicochemical properties and microbiological quality of the product became unacceptable.

## **I22 Microbiological quality of food contact surfaces at selected food premises of Malaysian heritage food ('Satar') in Terengganu, Malaysia**

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The International Journal of Engineering and Science (IJES), Vol. 3 (9), 2014, 66-70

Satar' is a blend of succulent boneless fish marinated in spices, wrapped in banana leaves and grilled over flaming charcoal. It is a very popular ready-to-eat food sold in the East Coast of Peninsular Malaysia. The vehicle and routes of 'Satar' contamination could come from raw materials and food contact surfaces during preparation and handling of 'Satar'. However, this study only focused on the possibility of contaminations which came from food contact surfaces. This study was carried out to determine the Aerobic Plate Count (APC), Enterobacteriaceae count, Staphylococcus aureus count, Pseudomonas count and the presence of Salmonella sp. in swab samples from ten selected food contact surfaces in two popular 'Satar' premises in Terengganu. Results showed that all food contact surfaces used in the Premise A which were cutting board, knife, table of preparation, mixer, food handler's hand, container, spoon, banana leaves, skewer and surface of griller were highly contaminated with indicator microorganisms (aerobic mesophilic organisms, Enterobacteriaceae and Pseudomonas) compared to food contact surfaces of premise B. This findings highlight the possibility of microbial contamination in 'Satar' that could come from contaminated food contact surfaces. Further study should be carried out in improving the hygienic status of 'Satar' premises and local RTE foods.

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## **I23 Effects on morphology and motility of *Listeria Monocytogenes* cells subjected to sublethal stress of temperatures**

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International Journal of Scientific and Research Publications, Vol.4 (10), 2014, 1-5

Survival and growth of *Listeria monocytogenes*L56 (IMR isolate) was studied in trypticase soy broth (TSB) grown at 37°C before being subjected to three selected sublethal stress temperatures (55°C, 28°C and 4°C). The morphological changes and motility as affected by temperature stresses were determined using Scanning Electron Microscopy (SEM) and motility media, respectively. For this purpose, 10 ml broth containing *L. monocytogenes* previously grown in 300 ml of TSB at 37°C at log phase (12 hour) and stationary phase (19 hour) to 55°C, 28°C and 4°C were taken every 2 h intervals for measurement of morphological changes and motility. A total of 180 cells

were measured lengthwise at 9,500x Scanning Electron Microscopy (SEM) magnification using SEMafore for each temperature treatments. The study demonstrated cells of both log and stationary phase of stressed temperature of *L. monocytogenes* showed a significant variation in morphology. Cells of log phase become elongated at 55°C but not at 28°C and 4°C, whereas cells of stationary phase were shorter and more coccoidal rather than elongated as in log phase cells at the three temperatures studied. Loss of motility was observed in cells stressed at stationary phase cells but not at log phase; suggesting that motility plays a role in survival of the organism under temperature stress.

## 124 Anti-bacterial and anti-fungal activity of coleus leaves consumed as breast-milk stimulant

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Nutrition and Food Science, Vol. 43 (6), 2013, 582-590

The aim of this study was to assess the anti-bacterial and anti-fungal activity of six coleus plants based on their traditional uses (as breast-milk stimulants in some parts of the Asia) from two Asian countries (Malaysia and Indonesia). Plants leaves of coleus species were collected from Kuantan (Malaysia) and Jakarta (Indonesia). From Kuantan, *Coleus aromaticus*- Malaysia (CATM), *Pogostemon cablin*- Malaysia (PCM), *Coleus blumei*-purple leaves-Malaysia (CBPM), *Coleus blumei* -red leaves- Malaysia (CBRM), *Coleus amboinicus*-Malaysia (CALM) and from Jakarta *Coleus amboinicus*-Indonesia (CALI) were collected freeze dried and extracted with aqueous methanol. The antimicrobial activity of the extract was determined by making use of macro dilution and disc diffusion methods. The selected bacterias and fungus used were namely *Bacillus subtilis* & *Staphylococcus aureus* (gram positive) and *Escherichia coli* & *Pseudomonas aeruginosa* (gram negative) and *Candida albicans*(a fungi). All leaf extracts showed activity at least against one strain of bacteria. The results shows that there were significant differences ( $p < 0.05$ ) between the activities on microorganism. The minimum inhibitory concentration (MIC) of all leaves extracts ranged from 1.0-2.0 mg/ml in inhibiting the growth of *S. aureus*, *E. coli*, *P. aeruginosa* and *B. subtilis*. This study shows that the coleus plants leaves can be used as anti-bacterial anti-fungal agent apart from the breast milk stimulation properties.

## 125 Torbangun (*Coleus Amboinicus* Lour) extracts affect microbial and fungus activities

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Journal of Nutritional Therapeutics, Vol. 2 (4), 2013, 194-200

Coleus also known as Torbangun or Ati Ati plants leaves i.e. Coleus amboinicus Lour from Indonesia (CAL-I) and Coleus aromaticus (CAT-M), Pogostemon cablin (PC-M), Coleus blumei-red leaves (CBR-M), Coleus amboinicus- (CAL-M) Coleus blumei -purple leaves (CBP-M) from Malaysia were collected, freeze dried and extracted with aqueous methanol. The effect of the extract was assessed on microbial and fungal activities in relation to their phytochemicals and antioxidants concentrations. The total phenolic content was determined according to the Folin-Ciocalteu method whilst antioxidant activity was assessed using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) method. The anti-microbial and anti-fungal activities were assessed by minimum inhibitory concentrations (MIC) and disc diffusion methods. The result indicates that the extracts are rich sources of phytochemicals and antioxidants from the listed plants. When the effect of the extracts was assessed on microbial and fungal activities it was observed that the effect was more pronounced on the gram-positive bacteria compared to gram-negative bacteria. Furthermore, there was strong association between phytochemicals and antioxidants concentration and with the microbial and fungal activities. However, it was not consistent for all types of strains. This study shows that Torbangun plants extracts are rich in phenolic contents therefore; it can be used as free radical scavengers and antimicrobial agent apart from other traditional uses.

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### **Antifungal activity of Lactobacillus fermentum Te007, Pediococcus pentosaceus Te010, Lactobacillus pentosus G004, and L. paracasi D5 on selected foods**

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Journal of Food Science, Vol. 76(7), 2011, 493-499

In the search for new preservatives from natural resources to replace or to reduce the use of chemical preservatives 4 strains of lactic acid bacteria (LAB) were selected to be evaluated for their antifungal activity on selected foods. The supernatants of the selected strains delayed the growth of fungi for 23 to 40 d at 4 °C and 5 to 6 d at 20 and 30 °C in tomato puree, 19 to 29 d at 4 °C and 6 to 12 d at 20 and 30 °C in processed cheese, and 27 to 30 d at 4 °C and 12 to 24 d at 20 and 30 °C in commercial bread. The shelf life of bread with added LAB cells or their supernatants were longer than normal bread. This study demonstrates that Lactobacillus fermentum Te007, Pediococcus pentosaceus Te010, L. pentosus G004, and L. paracasi D5 either the cells or their supernatants could be used as biopreservative in bakery products and other processed foods. **Practical application:** The heat stability nature of the antifungal compounds produced by the LAB isolates offers a promising application of L. fermentum Te007, P. pentosaceus Te010, L. pentosus G004, and L. paracasi D5 as biopreservative in bakery products or other processed foods to replace or reduce the use of chemical preservatives.

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## 127 **Eurycoma Longifolia: Medicinal plant in the prevention and treatment of male osteoporosis due to androgen deficiency**

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Evidence-based Complementary and Alternative Medicine, Vol. 2012, Article ID 125761

Osteoporosis in elderly men is now becoming an alarming health issue due to its relation with a higher mortality rate compared to osteoporosis in women. Androgen deficiency (hypogonadism) is one of the major factors of male osteoporosis and it can be treated with testosterone replacement therapy (TRT). However, one medicinal plant, *Eurycoma longifolia* Jack (EL), can be used as an alternative treatment to prevent and treat male osteoporosis without causing the side effects associated with TRT. EL exerts proandrogenic effects that enhance testosterone level, as well as stimulate osteoblast proliferation and osteoclast apoptosis. This will maintain bone remodelling activity and reduce bone loss. Phytochemical components of EL may also prevent osteoporosis via its antioxidative property. Hence, EL has the potential as a complementary treatment for male osteoporosis.

## 128 **Effects of aging on physico-chemical properties, nutritional compositions and cooking characteristics of Bario rice**

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Journal of Tropical Agriculture and Food Science, Vol. 41(2), 2013, 239-248

Bario rice varieties, *Adan Halus*, *Bario Tuan*, *Bario Merah Sederhana* and *Bario Celum* undergo some changes in physico-chemical properties, nutritional composition and cooking characteristics during storage. The study showed that moisture content in aged *Adan Halus*, *Bario Tuan* and *Bario Celum* were significantly decreased. Aging significantly increased the amylose content of all Bario rice samples and the rice was harder and less sticky. The calcium and iron contents also increased significantly. However, aging does not affect the protein, ash, carbohydrate, fat, crude fibre and sodium contents of Bario rice. The protein content ranged from 5.4 to 8.9% which can be considered as a good source of protein. Significant increase in phosphorus and decrease in potassium in *Bario Merah Sederhana* and *Bario Celum* depend on the concentration of minerals in the bran of the coloured Bario varieties. All fresh Bario rice are high in thiamine (>0.42 mg/100 g) but aging significantly decreased the thiamine content. Aged Bario rice required longer cooking time compared to fresh samples. It was also observed that Bario rice varieties were not elongated (ratio less than 2) during cooking. Water uptake ratio significantly increased in aged *Bario Tuan*, while solid loss was significantly reduced in *Bario Tuan*, *Bario Merah Sederhana* and *Bario Celum*.

## Physicochemical characteristics of Belimbing Dayak (*Baccaurea Angulata*) juice beverages

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European International Journal of Science and Technology, Vol. 2 (2), 2013

This study was conducted to evaluate some physicochemical parameters of underutilized tropical fruit namely belimbing dayak (*Baccaurea angulata*). Several parameters were identified including pH, total soluble solid (TSS), titratable acidity (TA), sugar-acid-ratio (TSS:TA), ash and calcium composition at different concentrations and conditions of belimbing dayak juice. The conditions are juices without addition of sugar and juices added with sugar. These juices were prepared at concentrations of low (LC), medium (MC) and high (HC). The highest pH was observed in LC added with sugar (3.43) while the lowest pH can be detected at HC with sugar (3.03). The TSS value vary widely where the highest TSS value for juices without sugar was 1.05°Brix while for the juices with sugar the highest TSS value was 7.95°Brix. TA readings pattern was observed to be increase as the concentration increasing for both conditions. From the analysis of ash, the content for both conditions are the same where the reading for LC and MC was 0.02g/100ml of juice and for HC the value was 0.05g/100ml of juice. Most of the parameters interested showed statistically difference ( $p < 0.05$ ). The calcium content was ranging from 4.88 to 10.96mg/L. The results contribute to the important information on physicochemical properties of belimbing dayak.

## Microbiological quality of Malaysian heritage food ('Satar') sold in Marang and Kemaman, Terengganu, Malaysia

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The International Journal of Engineering and Science (IJES), Vol. 3(11), 2014, 27-32

Satar' is a Malaysian heritage ready-to-eat (RTE) food, especially in Terengganu and Kelantan. Due to lack of standard hygiene of 'Satar' preparation, microbial load of 'Satar' prior to grilling is considerably high. Therefore, in this study, microbiological methods were used to determine the microbiological quality in raw and cooked 'Satar' at four different stalls in Kemaman and Marang, Terengganu. The samples were analysed for Aerobic plate count (APC), Enterobacteriaceae count, Staphylococcus aureus count, Yeasts and Molds count (YM) and psychrotrophic count. There were significant difference ( $P < 0.05$ ) between the microbiological analyses conducted between raw and cooked 'Satar' at four different stalls in Marang and Kemaman. The results showed that grilling had significantly decreased the microbial loads in 'Satar' up to 8-log<sub>10</sub> reduction. This study also indicated that the mean of microbial quality of selected 'Satar' premises in Marang and Kemaman were not significantly different ( $P > 0.05$ ). This study has provided some scientific evidences on the microbiological quality that reflects the current hygienic practice of 'Satar'

premises in Terengganu. The implementation of Good Hygiene Practice (GHP) and Hazard Analysis and Critical Control Point (HACCP) in 'Satar' production may improve the hygienic status and quality of 'Satar' production.

### **131 Fibre from pumpkin (*Cucurbita Pepo* L.) seeds and rinds: Physico-chemical properties, antioxidant capacity and application as bakery product ingredients**

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Malaysian Journal of Nutrition, Vol. 19 (1), 2013, 99-109

The aims of this study were to determine the proximate composition, functional properties and antioxidant activity of pumpkin seeds and rind. Besides, the effects of dietary fibre in pumpkin seeds and rinds on bread qualities and properties were evaluated. Formulations for bread substituted with 0%, 5% and 10% pumpkin seed and rind, respectively were produced. Sensory evaluation of the prepared bread samples for such attributes as appearance, aroma, flavour, texture and overall acceptability was undertaken. The physical properties of the bread samples, including dough expansion, loaf volume, crumb colour and bread texture, were determined. Proximate analysis and determination of antioxidant activity of the bread samples were also conducted. Crude fibre of the pumpkin seeds and pumpkin rinds was high at 31.48% and 14.83%, respectively. The total phenolic compound (TPC) and DPPH radical scavenging activity for the pumpkin rinds were 38.60 mg GAE/100 g dry weight and 69.38%, respectively, which were higher than those of pumpkin seeds. A 5% level of pumpkin rind bread gave the best overall acceptability and sensory attributes, followed by 5% pumpkin seed bread. Total dietary fibre, total phenolic compound and DPPH radical scavenging activity in breads substituted with 5% pumpkin seed and 5% pumpkin rind flour were higher than the values in control bread. Pumpkin seeds and rinds can be used as dietary fibre sources in bakery.

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### **132 Sensory preference and mineral contents of cereal bars made from glutinous rice flakes and sunnah foods**

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IOSR Journal of Environmental Science, Toxicology and Food Technology, Vol.8 (12), 2014, 26-31

Cereal bars were formulated using dry raw materials (glutinous rice, black Cummins, etc.) and binding agents (honey and glucose syrup). The dried fruits were mixed with the dry ingredients and binding ingredients at different percentages. The cereal bars were assessed for mineral element contents using microwave -assisted digestion method. The consumer acceptability of the cereal bars were carried out using 9-hedonic scale. The cereal bar samples had sodium, 70.54-



235.86mg/kg; calcium, 186.54-482.89mg/kg; iron, 33.64-41.52mg/kg; zinc, 29.76-50.95mg/kg; manganese, 12.52-17.05mg/kg; copper, 11.86-13.73mg/kg; magnesium, 88.00-160.14mg/kg. In the sensory analysis, it was found that the sample CB-C (honey-19.76%, glucose syrup-13.18% and 9.50% fruits) had the highest acceptability. All the qualities evaluated did not significantly ( $p \leq 0.05$ ) affect the acceptability and preference of the samples, except texture which shows a significant difference ( $p \leq 0.05$ ) among the samples. Hence, it was concluded that incorporation of halal/sunnah fruits into the production of cereal bars will still make it to retain much of the nutritional and sensory properties.

### **I33 Nutritional properties and organoleptic acceptability of traditional cakes made from MR 220 rice flour**

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Journal of Tropical Agriculture and Food Science, Vol.41 (1), 2013, 41-52

MR 220 rice flour which was prepared by dry milling using air-isolating cyclone was used in this study. The moisture content of the rice flour ranged from 6.5 - 8.9% and the water and oil absorption capacity were between 0.8 and 1.2 g/g and 0.5 and 0.8 g/g respectively. The MR 220 rice flour had lower bulk density and a soft gel compared to the commercial rice flour. The particle size distributions of MR 220 rice flour showed that a higher percentage of the particles were retained on the larger meshes. A total of 15 traditional cakes were prepared from MR 220 and a commercial rice flour. Organoleptic evaluation was carried out to compare the sensory attributes of traditional cakes produced from both flours. The assessment was made based on taste, aroma, texture, colour and overall acceptability. Generally, all attributes had higher scores given to the traditional cakes made from MR 220 rice flour. Results showed that the carbohydrate content and energy values ranged from 17 - 78% and 80.42 - 609.38 Kcal/100 g samples respectively.

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### **I34 Honey: Food or Medicine?**

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Medicine & Health, Vol. 8(1), 2013, 3-18

Honey is a natural substance produced by honeybees, *Apis mellifera*, from the nectar of blossomed flowers or exudates of trees and plants producing nectar honeys or honeydews, respectively. It is a supersaturated solution of sugars, enriched with proteins, minerals, vitamins, organic acids and polyphenols. Honey possesses numerous nutritional, healing and prophylactic properties attributed by the rich components found in honey. Some of the health beneficial properties include wound healing, antimicrobial, antioxidant and anti-inflammatory potential. This review relates the nutritional composition, antioxidant and therapeutical effects of honey with emphasis on Malaysian honeys.

### 135 Survival of commercial probiotic strains to pH and bile

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International Food Research Journal, Vol. 18(4), 2011, 1515-1522

This study was performed to enumerate the total viable cell count of probiotic in five brands (A to E) of commercially cultured milk drinks that are available in the Malaysian market as well as to test their tolerance to various pH and bile concentrations by simulating the human gastrointestinal pH and bile concentration. The acid tolerance test was studied under pH 1.5 and 3.0 with 7.2 as control. The cell count for the acid tolerance test was obtained at an interval of 0, 1.5 and 3 hours respectively and was plated onto duplicate MRS agars to be incubated at 37°C for 48 hours. All cells recovered after 3 hours of pH treatment were selected for bile tolerance test in MRS broth containing bile concentrations of 0% (control), 0.3% and 2.0% and cell counts were recorded after 24 hours of incubation. The probiotic strains in products A, B, C & D met the suggested initial count of 10<sup>6</sup> CFU/ml with brand C recording the highest at 9.19 ± 0.14 log CFU/ml. Strains in product A, B & C showed good tolerance to pH 3.0 and 7.2 recording a count of >10<sup>6</sup> CFU/ml after 3 hours with a range of 6.60 - 9.04 log CFU/ml. The higher bile concentrations resulted in lower growth of strains in all the brands. Upon pH 1.5 treatment, only brand C recorded growth in all bile concentrations. After pH 3.0 treatment, all brands except brand E met the requirement of survival at 0.3% bile concentration. Results showed probiotics in product A, B & C met the initial count requirement, and exhibited good acid and bile tolerance therefore being a potentially good source of probiotic.

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### 136 Antibiotic resistance and molecular typing among cockle (*Anadara granosa*) strains of *Vibrio parahaemolyticus* by polymerase chain reaction (PCR)-based analysis

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World Journal of Microbiology and Biotechnology, Vol. 30(2), 2014, 649-659

Genomic DNA of *Vibrio parahaemolyticus* were characterized by antibiotic resistance, enterobacterial repetitive intergenic consensus-polymerase chain reaction (ERIC-PCR) and random amplified polymorphic DNA-polymerase chain reaction (RAPD-PCR) analysis. These isolates originated from 3 distant locations of Selangor, Negeri Sembilan and Melaka (East coastal areas), Malaysia. A total of 44 (n = 44) of tentatively *V. parahaemolyticus* were also examined for the presence of *toxR*, *tdh* and *trh* gene. Of 44 isolates, 37 were positive towards *toxR* gene; while, none were positive to *tdh* and *trh* gene. Antibiotic resistance analysis showed the *V. parahaemolyticus* isolates were highly resistant to bacitracin (92%, 34/37) and penicillin (89%, 33/37) followed by resistance towards ampicillin (68%, 25/37), cefuroxime (38%, 14/37), amikacin (6%, 2/37) and ceftazidime (14%, 5/37). None of the *V. parahaemolyticus* isolates were resistant towards chloramphenicol, ciprofloxacin, ceftriaxone, enrofloxacin, norfloxacin, streptomycin and vancomycin. Antibiogram patterns exhibited, 9 patterns and phenotypically less heterogeneous when compared to PCR-based techniques using ERIC- and RAPD-PCR. The results

of the ERIC- and RAPD-PCR were analyzed using GelCompare software. ERIC-PCR with primers ERIC1R and ERIC2 discriminated the *V. parahaemolyticus* isolates into 6 clusters and 21 single isolates at a similarity level of 80%. While, RAPD-PCR with primer Gen8 discriminated the *V. parahaemolyticus* isolates into 11 clusters and 10 single isolates and Gen9 into 8 clusters and 16 single isolates at the same similarity level examined. Results in the present study demonstrated combination of phenotypically and genotypically methods show a wide heterogeneity among cockle isolates of *V. parahaemolyticus*.

### 137 Factors that affect the adhesion of probiotics bacteria to resist rice starch

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Journal of Biology & Life Science (JBLS), Vol. 4 (1), 2013, 122

Prebiotics such as resistant starch can be included with probiotics to increase their survival during processing. In this study lactic acid bacteria (LAB) isolated from several sources (yoghurt, banana, and human breast milk) were screened for their probiotic properties. Ten species of bacteria overcame the stress to pH 3 and 0.3% bile. The adhesion properties of these LABs to resistant rice starch (RRS) were investigated. All 10 species of bacteria adhered to RRS within 60 min of exposure. Isolates Bn1 and HM2 were highly adhered to RRS with a total of 79% and 77% of the cells adhering, respectively. Moderate adherent was observed by isolates, YN (70%), CY(48%), FY(55%), HM1(61,5%), HM3(65%), and HM4(50,5%), while isolate YD and Bn2 were poorly adhered to RRS (< 40%adherent). Bacteria adhesion to RRS was positively correlated to time but not to concentration. 37 °C was the ideal temperature for adhesion and Living cells are important for the adhesion.

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### 138 The in-vitro effects of sea cucumber (*Stichopus sp1*) extract on human osteoblast cell line

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Malaysian Orthopaedic Journal, Vol. 7(1), 2013, 41-48

Despite its claimed therapeutic effects, the action of sea cucumber (known as Gamat in the Malay language) on human osteoblast cells is still unknown. We performed in vitro studies utilising extract of *Stichopus sp1* (Gamat) to elucidate its effects on cell viability and functional activity. We found an inverse relationship between Gamat concentration and its effect on osteoblast cell viability ( $p < 0.001$ ). Only Gamat concentration at 1 mg/ml significantly promoted cell viability at day 3 of incubation. There was a trend towards increased osteoblast cell function in the presence of Gamat at 5 mg/ml and 10 mg/ml but this observation was not consistent at different incubation periods.

### 139 Paper review of factors, surveillance and burden of food borne disease outbreak in Malaysia

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Malaysian Journal of Public Health Medicine, Vol. 13(2), 2013, 98-105

Food borne diseases like cholera, typhoid fever, hepatitis A, dysentery and food poisoning occur as the results of ingestion of food stuffs contaminated with microorganisms or chemical. The true incidence of food borne disease in Malaysia is unknown, however the incidence is low ranging from 1.56 to 0.14 cases per 100,000 population and the food poisoning cases is on the rise as the evident by the incident rate of 62.47 cases per 100,000 population in 2008 and 36.17 in 2009. The rapid population growth and demographic shift toward ageing population, changing eating habit such as consumption of raw or lightly cooked food, long storage of such food, lack of education on basic rules of hygienic food preparation and food trading without appropriate microbiological safety procedure become contributing factors for food borne diseases. Food borne disease in Malaysia is in the rise and the direct and indirect cost management of FBD will become one of the most common issues to face by the government. The world is spending millions and millions in cost of treatment due to food borne diseases. The information on this paper was collected via findings of previous journals, data and statistics from the MOH of Malaysia and WHO websites. As a result, authors found that the prevention and management of the food borne disease outbreak needs to be addressed seriously.

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### 140 Does cooking affect the phytate content in local soy based dishes?

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International Food Research Journal, Vol. 20(5), 2013, 2873-2880

This study aimed to determine the effect of cooking on phytate content and the inhibitory effects of phytate on the bioavailability of minerals in eight Malaysian soy based dishes. Phytate was analyzed by using anion-exchange chromatography while minerals were analyzed by using Atomic Absorption Spectrophotometer. Molar ratios were obtained by dividing the mole of phytate to minerals. Phytate content was reduced in cooked dishes compared to the raw ones but it was not significantly different ( $P > 0.05$ ). Raw, cooked and whole dish soy products contained 257.14-900.00, 182.14-803.57 and 289.29-910.71 mg/100 g phytate, respectively. Boiling and steaming have reduced most phytate content in the food samples. Molar ratios for phytate/minerals in these samples (phytate/Ca  $> 0.17$ ; phytate/Fe  $> 1$ ) indicated that phytate content inhibited the absorption of calcium and iron. However, the ratio for Ca x phytate/Zn in all samples was less than 200 which showed that phytate did not affect the bioavailability of zinc.

**141 Efficacy of commercial sanitizers on the native microflora of mung bean sprouts (*Vignaradiata*) and its microbiological analysis**

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Journal of Food Technology, Vol. 11(4-6), 2013, 75-81

The effect of five commercial sanitizers (labelled as A, B, C, D and E) available at local markets in reducing the native microflora of mung bean sprouts was evaluated. The microflora populating the sprouts was enumerated using the Plate Count Agar (PCA) for total bacterial count, Potato Dextrose Agar (PDA) for yeast and mould and E. coli/Coliform Agar (ECA) for E.coli and coliforms. All the sanitizer solutions at minimum concentration recommended by the manufacturer did not show significant differences in reducing the native microflora on the sprouts. Identification of microorganisms on the sprouts was done by using API 20E kits for Enterobacteriaceae and other non-fastidious Gram-negative bacteria and API Candida kits for yeasts. The Gram negative bacteria found on the sprouts were identified as *Rahnella aquatilis* and *Mannheimia haemolytica* (*Pasteurella haemolytica*). As for yeast, *Trichosporon mucoides* was the species found on the sprout.

**142 Reduction of saltiness and acrylamide levels in palm sugar-like flavouring through buffer modification and the addition of calcium chloride**

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Molecules, Vol. 18(6), 2013, 6792-6803

Palm sugar-like flavouring (PSLF) is a type of flavour product that is formed by heating amino acids and sugar under specific heating conditions. Unfortunately, PSLF has a salty taste and contains high amounts of acrylamide. Hence, the objective of this research was to reduce saltiness and acrylamide without negatively affecting the aroma properties of PSLF. A decrease in the sodium phosphate ( $\text{NaHPO}_4$ ) buffer concentration from 0.20 to 0.02 M was found to reduce sodium to approximately 15% of the level found in original PSLF. A further decrease (~25%) in the sodium content was achieved by removing monobasic sodium phosphate ( $\text{NaH}_2\text{PO}_4$ ) from the buffer system. Meanwhile, the addition of  $\text{CaCl}_2$  at 20-40 mg/L reduced the acrylamide content in PSLF by as much as 58%. A  $\text{CaCl}_2$  concentration of 20 mg/mL was most favourable as it most efficiently suppressed acrylamide formation while providing an acceptably high flavour yield in PSLF. In view of the high acrylamide content in PSLF, additional work is necessary to further reduce the amount of acrylamide by controlling the asparagine concentration in the precursor mixture.

### **Incidence and antibiogram of *Vibrio parahaemolyticus* in processed and frozen bivalve mollusks in Kuala Terengganu, Malaysia**

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International Food Research Journal, Vol. 21 (4), 2014, 1349

This study aimed to investigate the prevalence and antibiogram of *Vibrio parahaemolyticus* in processed bivalve molluscs in Kuala Terengganu. A total of 80 seafood samples, namely mussels (n=20), carpet clams (n=20), cockles (n=20) and scallops (n=20), were subjected to PCR and conventional plating method for the detection of *V. parahaemolyticus*. *V. parahaemolyticus* was found in green mussels (55%), carpet clam (80%), cockles (40%) and scallops (55%). Fifty-five *V. parahaemolyticus* isolates were subjected to 9 types antibiotic sensitivity test using discs diffusion method. All isolates were susceptible to Tetracycline and Gentamycin. Isolates showed high resistance towards Vancomycin (52.73%), Penicillin (45.45%) and Ampicillin (32.73%). Resistance towards Amikacin, Ciprofloxacin and Norfloxacin were found to be 1.82%. It can be concluded that local bivalve molluscs were contaminated with *V. parahaemolyticus* and isolates showed resistance towards certain antibiotics. Therefore, consumption of raw or semi-cooked bivalve molluscs is not advisable.

### **Biosafety of *Vibrio parahaemolyticus* from vegetables based on antimicrobial sensitivity and RAPD profiling**

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International Food Research Journal, Vol.19 (2), 2012, 467-474

This study was undertaken to characterize the antibiotic resistance and randomly amplified polymorphic DNA (RAPD) profiles of *Vibrio parahaemolyticus* isolates from raw vegetable samples. A total of 46 isolates of *V. parahaemolyticus* recovered from raw vegetables samples and were confirmed by PCR were analyzed in this study. Most of the isolates were resistant to nalidixic acid (93.48%) and were the least resistant towards imipinem (4.35%). The MAR index results also demonstrated high individual and multiple resistances to antibiotics among the isolates. From the RAPD analysis, the size for RAPD fragments generated ranged from 250 bp to 1,500 bp, with most of the strains contained three major gene fragments of 350, 1,000 and 1,350 bp. The RAPD profiles revealed a high level of DNA sequence diversity within the isolates. Antibiotic resistance and RAPD proved to be effective tools in characterizing and differentiating the *V. parahaemolyticus* strains.

## 145 The antibacterial or antifungal effects of *Eurycoma Longifolia* root extract

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The Internet Journal of Herbal and Plant Medicine, Vol. 2(1), 2011

**Background:** *Eurycoma longifolia* Jack (*E. long*) has anticancer and antimalarial properties. Even though there are various claims of the ability of *E. long* to treat infections, there was only one study reported on its antibacterial effects, while there was no study on its antifungal effects. Therefore, we have conducted a study on the antibacterial and antifungal effects of using the current and most relevant clinical strains of bacteria and fungi. **Methods:** A macrobroth dilution method was used in this study. Three types of fungi (*Candida albicans*, *Candida glabrata* and *Candida krusei*) were tested against an aqueous extract of *E. long* root at concentrations of 10, 5, 2.5, 1.25 and 0.625 mg/mL. Six types of bacteria (methicillin-resistant *Staphylococcus aureus*, *Enterococcus faecium*, extended-spectrum beta lactamase-producing *Klebsiella pneumoniae*, group-1 beta lactamase-producing *Pseudomonas aeruginosa*, multidrug-resistant *Acinetobacter baumannii* and *Salmonella typhi*) were tested against an aqueous extract of *E. long* root at concentrations of 50, 25, 12.5, 6.25 dan 3.125 mg/mL. The minimum inhibitory concentrations were determined by looking at the clarity of the final solutions. **Results:** There was no reduction in turbidity in all test tubes containing various concentrations of *E. long* root extract. **Conclusion:** *E. long* root extract did not show any antibacterial or antifungal effect at concentrations of equal to or less than 50 mg/mL and 10 mg/mL, respectively.

## 146 Nutritional composition and sensory properties of oyster mushroom-based patties packed with biodegradable packaging

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Sains Malaysiana, Vol. 43(1), 2014, 65-71

The increase use of synthetic packaging films in food products has led to serious environmental problems due to their total non-biodegradability property. Nutrient composition and sensory acceptability of chicken patties formulated with various levels of *Pleurotus sajor-caju* popularly known as grey oyster mushroom (OM) and wrapped with degradable plastic were studied. The chicken patties were formulated with either 0, 25 or 50% of fresh OM. The results showed that chicken patty formulated with 25% PSC has protein content of 17.46% lower than the control patty which had 18.13% but it was not significant ( $p > 0.05$ ). After storage, cooked chicken patty formulated with 25% OM had protein content of 21.53% lower than the control patty (23.90%) but it was not significant ( $p > 0.05$ ). However, incorporation of OM in chicken patties resulted in decreasing of fat content significantly ( $p \leq 0.05$ ) from 15.58 (control) to 13.33% after storage. On the other nutrient, the concentration of  $\beta$ -glucan were detected at values ranged between 0.70 and 0.76 (g/100 g) after 6 month. Other results showed that patty formulated with 25% OM received the highest scores for all attributes except for aroma. Meanwhile, patty prepared with 50% OM received the highest score of aroma attribute after 6 month of storage. However, the score values for all attributes of all OM-based patties were not statistically different with control patty ( $p >$

0.05). In conclusion, the addition of OM at 25% can be recommended for the purpose of lowering fat content while keeping protein and  $\beta$ -glucan unchanged without jeopardizing sensorial properties. This investigation therefore, suggested that biodegradable plastic can be used in packing any type of processed meat-based products.

## 147 Botany, uses, phytochemistry and pharmacology of *Vallaris*: A short review

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Pharmacognosy Journal, Vol. 5(5), 2013, 242-246

The World Checklist of Selected Plant Families has listed a global list of 28 species for *Vallaris* under the family Apocynaceae of which only *Vallaris glabra*, *Vallaris solanacea* and *Vallaris indecora* are accepted names. In this short review, the current knowledge of the botany, uses, phytochemistry and pharmacology of *V. glabra* and *V. solanacea* is reviewed as there is no information on the chemical constituents and bioactivities of *V. indecora*. *V. glabra* (L.) Kuntze or bread flower is a woody climber with broadly elliptic leaves. Flowers are cup-like and white with a unique fragrance of leaves of pandan or newly cooked fragrant rice. The species is a popular ornamental plant in gardens of Southeast Asia. No uses of *V. glabra* in traditional medicine have been reported. From the leaves of *V. glabra*, cardiac glycosides, phenolic acids, fatty acids and triterpenes have been isolated. Essential oils extracted from flowers have been identified. The antiproliferative, antiplasmodial and antioxidant properties of *V. glabra* are reviewed. *V. solanacea* (Roth) Kuntze is a twining shrub up to 10 m tall. Leaves are elliptic and densely pubescent on both surfaces. Flowers are white or creamy, fragrant and borne in clusters. The species occurs naturally in forests of South and Southeast Asia. Traditionally, the milky latex of *V. solanacea* can be applied to treat ringworm and other skin infections, including sores, cuts and wounds. From leaves and seeds of *V. solanacea*, cardiac glycosides, fatty acids and triterpenes have been isolated. From the root bark, essential oils have been identified. Leaves and barks of *V. solanacea* have been reported to possess anticancer, antimicrobial, analgesic, anti-inflammatory, anti-diarrhoeal and cardiotoxic properties, and display toxicity to brine shrimp but not to rats. *V. indecora* (Baill.) Tsiang & P.T. Li is a trailing shrub with elliptic or obovate leaves and pale yellow flowers. Occurring in China, the plant is used to treat worm diseases.

## 148 Botany, uses, phytochemistry and pharmacology of selected Etlingera Gingers: A review

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Pharmacognosy Communications, Vol. 3 (4), 2013, 3-12

Etlingera species are large ginger plants which grow in clumps. Their rhizomes are subterranean, creeping and aromatic. Crushed leaves of each species emit a distinctive scent. Inflorescences are borne on erect stalks protruding from the ground (Phaeomeria group) or are found at the soil level (Achasma group). The colourful flowers and leaves of Etlingera make them very attractive plants.



The World Checklist of Selected Plant Families has documented 100 accepted names of *Etlingera* species. In Peninsular Malaysia, 15 *Etlingera* species have been recorded. In Java, Indonesia, nine species are known, and Borneo has 42 species of which 16 were until recently unknown. Three species are reported in China. The various species of the genus are used as foods, spices, condiments, medicines and ornaments. *Etlingera elatior* (torch ginger) is the best known and most studied species. In this review, the current knowledge on the botany, uses, phytochemistry and pharmacology of leaves, inflorescences and rhizomes of five selected *Etlingera* species is reviewed. The species included *Etlingera elatior*, *Etlingera fulgens* and *Etlingera maingayi* of the *Phaeomeria* group, and *Etlingera littoralis* and *Etlingera rubrostriata* of the *Achasma* group.

#### 149 **Fatty acids composition of microalgae *Chlorella vulgaris* can be modulated by varying carbon dioxide concentration in outdoor culture**

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African Journal of Biotechnology Vol. 10(62), 2011, 13536-13542

Varying culture methods of *Chlorella vulgaris* (CV) has been associated with different nutrient composition. The aim of this study was to investigate the fatty acid contents and other nutrients of CV subjected to various culturing conditions. We found that CV cultured under 24 h light and 10% CO<sub>2</sub> showed the best growth rates and contained higher lipid, protein and moisture contents compared to other culture conditions. Interestingly, the content of fatty acids of CV was dependent on the amount of CO<sub>2</sub>. Fatty acid analysis of CV by gas chromatography-mass spectrometry (GC-MS) showed the presence of cis-10-pentadecanoic acid (C15:1), palmitic acid (C16:0), palmitoleic acid (C16:1), heptadecanoic acid (C17:0), stearic acid (C18:0), oleic acid (C18:1n9c), linoleic acid (C18:2n6c), linolenic acids (C18:3n3) and arachidic acid (C20:0). Remarkably, polyunsaturated fatty acids (linoleic and linolenic acids) are found in abundance compared to other fatty acids in CV. The concentrations of palmitic, oleic, linoleic and linolenic acids increased when the amount of carbon dioxide was raised from 1 to 10% under both culture conditions (12 and 24 h light). This study shows the possibility of modifying lipid contents in freshwater microalgae by varying the amount of carbon dioxide and light.

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#### 150 **A comparative study of the physicochemical properties of a virgin coconut oil emulsion and commercial food supplement emulsions**

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Molecules, Vol.19, 2014, 9187-9202

Food manufacturers are interested in developing emulsion-based products into nutritional foods by using beneficial oils, such as fish oil and virgin coconut oil (VCO). In this study, the

physicochemical properties of a VCO oil-in-water emulsion was investigated and compared to other commercial oil-in-water emulsion products (C1, C2, C3, and C4). C3 exhibited the smallest droplet size of 3.25  $\mu\text{m}$ . The pH for the emulsion samples ranged from 2.52 to 4.38 and thus were categorised as acidic. In a texture analysis, C2 was described as the most firm, very adhesive and cohesive, as well as having high compressibility properties. From a rheological viewpoint, all the emulsion samples exhibited non-Newtonian behaviour, which manifested as a shear-thinning property. The  $G'G''$  crossover illustrated by the VCO emulsion in the amplitude sweep graph but not the other commercial samples illustrated that the VCO emulsion had a better mouthfeel. In this context, the VCO emulsion yielded the highest zeta potential (64.86 mV), which was attributed to its strong repulsive forces, leading to a good dispersion system. C2 comprised the highest percentage of fat among all emulsion samples, followed by the VCO emulsion, with 18.44% and 6.59%, respectively.

## 151 The prevalence of microbiological contamination in ready- to- eat food and factors affecting it in Melaka

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Jurnal Kesihatan Masyarakat, Vol.17 (1), 2011, 64-73

**Background:** A cross sectional study was carried out to determine the prevalence of microbiological contamination in ready- to-eat food and factors affecting it in Melaka from February 2008 till May 2008 in collaboration with the Food Safety and Quality Unit and District Health Offices in Melaka Tengah, Alor Gajah and Jasin. **Methods:** A purposive sampling of 101 food premises was carried out and 202 ready- to-eat food samples were collected and analysed microbiologically using standard methods. A total of 202 food handlers were randomly selected for questionnaire interview while rectal and nasal swabs were taken from them to determine their healthy carrier status of pathogenic food bacteria. **Results:** Results showed that the overall prevalence of microbiological contamination in ready- to-eat food was 35.1%, while prevalence by type of food was 42.0% for main dishes and 9.8% for staple food. The majority of the contaminations were due to coliforms (14.9%), total plate counts (12.4%) and *Staphylococcus aureus* (3.5%). The mean score for food premise inspection was  $77.21 \pm 10.32$  and the prevalence of healthy carrier status of pathogenic food bacteria among the food handlers was 15.8%. The level of food handling practices among food handlers was influenced by sex ( $p=0.012$ ) and formal training on food handling courses ( $p=0.009$ ). There was a significant negative correlation between age and level of food handling practices among the food handlers ( $r = -0.163$ ;  $p = 0.02$ ). Poor food handling practices ( $p=0.02$ ) and poor hygiene status among the food handlers ( $p<0.01$ ) were factors that influenced microbiological contamination of food samples. A logistic regression analysis showed that poor food handling practices (Odds ratio=3.50; 95% CI=1.35-9.06) and poor hygiene status among food handlers (Odds ratio=13.16; CI=3.65-47.44) were significantly associated with healthy carrier status of pathogenic food bacteria. **Conclusion:** Poor food handling practices and poor hygiene status among food handlers were factors that influenced microbiological contamination of ready-to-eat food as well as healthy carrier status of pathogenic food bacteria.



# **Food Science and Technology**

**(Food Methodology  
and Analysis)**

## Detection of blood transglutaminase enzyme in fish surimi based product by using polymerase chain reaction (PCR) method

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Middle-East Journal of Scientific Research 13(Approaches of Halal and Thoyyib for Society, Wellness and Health), 2013, 29-35

Blood plasma contain transglutaminase (TGase) enzyme - catalyst the reaction of cross-linking between proteins which has a significant impact on properties of protein gel capacity, thermal stability, water holding capacity thereby protein characteristics elasticity, mouth feel, flavour, texture, binding force. The objectives of this study are to design and analyze the specificity of oligonucleotide primers of blood plasma transglutaminase from chicken, bovine and porcine blood and to detect the presence of blood plasma transglutaminase in eight samples of fish surimi based products using PCR method. In this study, Polymerase Chain Reaction (PCR) method has been used in detecting the existence of blood transglutaminase enzyme DNA in surimi based products. Specific primers for chicken (*Gallus gallus*), cow (*Bos taurus*) and pig (*Sus scrofa*) blood transglutaminase enzyme were designed for positive detection. Two of the six primers designed for the chicken blood transglutaminase, G3 and G5 have shown 99 % significant identity to the sequence of *G. gallus* similar to XP-C repair complementing (transglutaminase) and the latter to the hypothetical LOC428804 (transglutaminase) sequence. However, there was no positive result using the six primers designed for *Bos Taurus* transglutaminase and the six primers designed for *S. scrofa* transglutaminase. PCR amplification with G3 and G5 primers in surimi based products also showed negative results. Based on this study, G3 primer sequence for chicken showed 99 % of *G. gallus* similar XP-C repair complementing (transglutaminase) followed by G5 primer which also obtained 99 % *G. gallus* hypothetical LOC428804 (transglutaminase) of significant identity. However, for primer of cow and pig, there were no positive results. On the contrary, PCR amplification on surimi based products had not showed positive bands of chicken blood transglutaminase, G3 and G5 in the samples. Further research should be done to verify the consistency of this result and to redesign the primers for cow and pig's blood transglutaminase enzymes in order to increase its specificity which is vital in assuring the reliability of the detection method in food products in accordance to the Halal food guidelines and regulations.

## Comparison between solvent extraction using gas chromatography mass spectrometry triple quadrupole (GCMS-QQQ) of cholesterol and cholesterol oxidation derivatives

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Cholesterol Oxidation Products (COPS) are well known for their negative biological effects. Till now, there is no study reported on solvent extraction used for COPS. In this study, two solvent extraction techniques, namely chloroform/methanol (2:1, v/v) or Folch method and n-hexane/2-propanol (3:2, v/v) or Hara-Radin method of cholesterol and COPS in beef tallow and lard were compared. Cholesterol and COPS (5-cholestane, 7-ketocholesterol and 25-hydroxycholesterol) contents in both fats also analyzed. The analysis passed through four major steps; extraction of lipids, saponification, enrichment of COPS and quantification by gas chromatography mass spectrometry triple quadrupole. All standards showed good linearity with correlation coefficient (r) of 0.9998 (5-cholestane), 0.9999 (cholesterol), 0.9873 (25-hydroxycholesterol) and 0.9693 (7-ketocholesterol). Data obtained by this method was analyzed based on precision and recovery criteria. Precision measured as standard deviation (SD) was between 0.0040 and 2.2460; and no significant different ( $P>0.05$ ) for the recovery testing using 5-cholestane in both method. Recovery by Hara Radin method in lard (27.23%) and beef tallow (8.73%) was higher than the Folch method, 14.25% and 2.97% respectively. This study implies that Hara-Radin method can be an alternative method to avoid the use of harmful solvent such as chloroform in Folch method.

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#### **Detection of blood thrombin enzyme in surimi-based products by using polymerase chain reaction (PCR) method**

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World Applied Sciences Journal 17 (Towards the Traceability of Halal and Thoyyiban Application), 2012, 34-38

The detection of blood thrombin enzyme presented in eight samples of surimi based products was investigated by using Polymerase Chain Reaction (PCR) method. Specific primers for chicken (*Gallus gallus*), cow (*Bos taurus*) and pig (*Sus sucrofa*) blood thrombin enzyme were designed for positive detection. Two primers for chicken blood which are Gal2 and Gal3 showed 98% and 99% in significant identity of *G.gallus* coagulation factor II (thrombin) while two primers from cow which are Bos4 and Bos6 showed 100% significant identity of *B. Taurus* coagulation factor II (thrombin). On the contrary, there were no positive results on pig primers with *S. sucrofa* coagulation factor II (thrombin). PCR amplification with Gal2 and Bos4 primers in surimi based products showed several positive results while Sus5 primer showed none. Further research should be done to verify the consistency of this result and redesign a specific primer for pig's blood thrombin enzymes is vital in order to guarantee the quality of food products to comply with Halal food guidelines and regulations.

**155** **Detection of non-halal plasma transglutaminase in selected surimi-based products by using sandwich Elisa method**

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World Applied Sciences Journal 17 (Towards the Traceability of Halal and Thoyyiban Application), 2012, 39-44

The usage of non-halal plasma transglutaminase to improve the gelling properties of surimi is prohibited for Muslim consumers. The objective of this study is to detect non-halal plasma transglutaminase in surimi products. A total of 12 samples were tested using DEAE, Unosphere Q and BioScale Macroprep High Q columns and further confirmed by Sandwich ELISA method. Three different monoclonal antibody (MAbs) species which were bovine, chicken and porcine were used to observe the reaction against the samples. The reactivity of the antibody against the antigen was defined in a certain range of cutoff value that is very strong, strong, moderate, weak and negative. By using the MAbs of the different species, the result showed S1, S2 and S3 did not contain transglutaminase from bovine while the other samples did. Six samples which were S1, S2, S3, S8, S11 and S12 selected in the ELISA procedure had a very strong reaction with transglutaminase from porcine species. For MAbs of chicken species, S12 has a weak reactivity while other samples showed very strong and strong reaction of transglutaminase. The sandwich ELISA can be a useful method to detect the presence of transglutaminase in surimi-based products, which is derived from blood of different species of mammalian animals. Further study should be done to optimize the specificity of antibody used in the confirmation of TGase in surimi.

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**156** **Detection of cholesterol oxidation products (COPS) in raw and chilled storage of chicken sausages formulated with chicken fat and red palm mid fraction**

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World Applied Sciences Journal 17 (Towards the Traceability of Halal and Thoyyiban Application), 2012, 51-56

The purpose of this paper is to determine the effect of different lipid sources (animal and plant) during chilled storage on the formation of cholesterol and cholesterol oxidation products in sausages formulated with chicken fat and red palm mid fraction. The commercial sample, as represented by the chicken sausage and the mechanical deboned meat sausage was analyzed as a comparison. The sausages were produced in a plant scale for two batches, vacuum packed and stored at -4°C or chilled condition. At time intervals of week 0, 1, 2 and 3, the sausages were analyzed using gas chromatography with flame ionization detector for determining cholesterol and cholesterol oxidations products, which were 25-hydroxycholesterol, -epoxycholesterol, -epoxycholesterol and 7-ketocholesterol. This study showed the variable amount of compounds analyzed throughout the period of analysis, 25-hydroxycholesterol detected in PMF at week 3 (0.77 ppm). The significantly high amount of cholesterol was detected in MDM (239.99 ppm) at

week 3. The different type of sausages formulated with chicken fat and palm mid fraction which were animal and plant fats, respectively did not show any significant changes towards the formation of cholesterol and COPs throughout the storage period in chilled condition. It is recommended for future works to prolong the period of storage to obtain concrete result at the end of analysis, analyze the compounds using gas chromatography with mass spectrometry to improve the detection limit and to expand the reference standard of cholesterol oxidation products to be used as the compounds may varies.

## **157 Market surveillance on non-halal additives incorporated in surimi based products using polymerase chain reaction (PCR)-southern hybridization analysis**

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International Food Research Journal, Vol. 21(6), 2014, 2095- 2099

In Malaysia, halal certification status for some surimi-based product is still suspicious due to the incorporation of non-halal plasma protein additives as part of the food ingredient. This study was conducted to determine the presence of plasma protein additives that have been incorporated into surimi-based product using Polymerase Chain Reaction (PCR)-Southern Hybridization method which able to differentiate 7 type (beef, chicken, duck, goat, buffalo, lamb and pork) of species on a single chip. A random of 17 (n = 17\*3) different brands of surimi-based product was purchased from Selangor local market in January 2013. Of 17 brands, 3 (n = 3\*3) brands were positive for chicken DNA and 1 (n = 1\*3) brand was positive for goat DNA, while remainder 13 brands (n = 13\*3) has no DNA species detected. In presence study, it is evidence that PCR-Southern Hybridization analysis offered a reliable result due to its highly specific and sensitive properties in detecting plasma protein incorporation in surimi-based product.

## **158 A novel on-package sticker sensor based on Methyl Red for real-time monitoring of broiler chicken cut freshness**

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Packaging Technology and Science, Vol. 27(1), 2013, 69-81

A novel sticker sensor has been fabricated based on methyl red, and tests have been conducted to detect the freshness of broiler chicken cuts. Methyl red was immobilized onto a bacterial cellulose membrane via absorption method. The methyl red/cellulose membrane as a freshness sensor worked based on pH increase as the basic spoilage volatile amines produced gradually in the package headspace, and subsequently, the colour of the sensor will change from red to yellow for spoilage indication, which is easily visible to the naked eye. The results show that the sticker sensor could be used to determine the degree of chicken cut freshness, as the relationship between the colour change of methyl red as a sensor response and the chicken cut freshness

follows a similar trend. Therefore, the spoilage of the chicken cut could be detected visually. A sticker sensor indicates the chicken cut freshness by its colour change in real time. Thus, the sticker sensor can be used as an effective tool for monitoring the microbial quality of packaged fresh poultry meat. Finally, the methyl red/cellulose membrane was successfully used as a sticker sensor for the real-time monitoring of chicken cut freshness in ambient and chiller conditions.

## 159 Real-time monitoring of shrimp spoilage using on-package sticker sensor based on natural dye of curcumin

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Food Analytical Methods, Vol. 5(4), 2012, 881-889

The development of a curcumin-based sensor for the detection of volatile amines (specifically known as total volatile basic nitrogen, TVBN) is described. Curcumin [(1E, 6E)-1, 7-bis (4-hydroxy-3-methoxyphenyl) hepta-1, 6-diene-3,5dione] is the major yellow pigment extracted from turmeric, a commonly used spice, derived from the rhizome of the plant *Curcuma longa*. Curcumin was immobilized onto bacterial cellulose membrane via the absorption method. Thus, the sensing materials are edible and suitable for food applications. The curcumin/bacterial cellulose membrane as the TVBN sensor worked based on pH increase as the basic spoilage volatile amines produced gradually in the package headspace, and subsequently, the color of the sensor will change from yellow to orange, then to reddish orange for spoilage indication, which is easily visible to the naked eye. The curcumin membrane is a highly sensitive material toward acid-base reactions. Color changes, as a result of its interactions with increasing pH (as a result of increasing TVBN), were monitored directly with visual inspection and the color quantitatively measured with color analysis via Photoshop software. Furthermore, the membrane response was found to correlate with bacterial growth patterns in shrimp samples. Finally, the curcumin/bacterial cellulose membrane was successfully used as a sticker sensor for real-time monitoring of shrimp spoilage in ambient and chiller conditions.

## 160 A study of fatty acid composition and tocopherol content of lipid extracted from marine microalgae, *Nannochloropsis Oculata* and *Tetraselmis Suecica*, using solvent extraction and supercritical fluid extraction

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International Food Research Journal, Vol. 20(2), 2013, 721-729

This study was conducted to investigate and compare the fatty acids and tocopherols of lipid extracted from marine microalgae, *Nannochloropsis oculata* (NO) and *Tetraselmis suecica* (TS) using solvent extraction and supercritical fluid extraction (SFE). Fatty acids and tocopherols were determined in the extracted lipid as functions of the temperature (40, 80°C) and pressure (3000,



5000, 7000, 9000psi). Dichloromethane/methanol and hexane were the chosen conventional solvent for fatty acids and tocopherols extraction respectively. The results obtained showed that there were differences in the fatty acid composition of various lipid extracts of NO and TS. Extracts of NO were high in myristic acid (C14:0) (17-35%), palmitic acid (C16:0) (14-47%) and palmitoleic acid (C16:1) (11-42%) whereas extracts of TS were high in C14:0 (21-34%) and C16:0 (29-49%). Eicosapentaenoic acid (EPA) was detected only under certain SFE conditions in NO but was not detected in TS.  $\alpha$ -,  $\beta$ - and  $\gamma$ -tocopherol were detected in various SFE extracts of NO but only  $\alpha$ - and  $\beta$ -tocopherol were detected in TS. Hexane extraction of both NO and TS resulted in the detection of only  $\alpha$ -tocopherol. In conclusion, the use of different extraction methods resulted in different compositions and concentrations of fatty acids and tocopherols in the microalgae studied.

## 161 Analysis and evaluation of sensory properties and consumer acceptability of *Thunbergia Laurifolia* teas

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International Journal for the Advancement of Science and Arts, Vol. 2 (2), 2011, 16-26

Sensory properties and consumer acceptability of herbal teas of *Thunbergia laurifolia* produced from four different drying methods were evaluated using quantitative descriptive analysis (QDA) and hedonic survey, respectively. Comparisons were made with the commercial *T. laurifolia* or Rang Chuet (RC) tea from Thailand. Teas from microwave-dried (MD), freeze-dried (FD), oven-dried (OD) and freeze-withered (FW) leaves of *T. laurifolia* were extracted with boiling water and infusions were allowed to steep to mimic tea brewing. The QDA evaluated sensory attributes of fermented flavour, unfermented flavour, bitterness, astringency, grassiness and sourness. The MD and FD teas can be categorised as green tea while the FW, RC and OD teas are characteristic of black teas. Results of the hedonic survey, which scored attributes of appearance, aroma, flavour, overall acceptability and preference ranking, showed that the MD tea was the most preferred, being the least bitter and has a sweet after-taste. The OD tea had the lowest scores for aroma, flavour and overall acceptability. Preference ranking of the *T. laurifolia* teas was MD > FD ~ FW > RC > OD. In terms of purchase intent, 34% of the respondents would definitely or probably buy the tea products. Bitterness of *T. laurifolia* teas was a crucial factor in determining consumer acceptance or rejection.

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## 162 A fourier transform infrared spectroscopy method for analysis of palm oil adulterated with lard in pre-fried french fries

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Fourier transform infrared spectroscopy with attenuated total reflectance accessory was used to detect the presence of lard in French fries pre-fried in palm oil adulterated with lard. A Fourier transform infrared calibration model was obtained using partial least squares for prediction of lard in a blend mixture of lard and palm oil. The coefficient of determination ( $R^2$ ) of 0.9791 was obtained with 0.5% of detection limit. The error in calibration expressed with root mean square error of calibration was 0.979%. In addition, the error obtained during cross validation was 2.45%. A discriminant analysis test was able to distinguish between fries samples adulterated with lard and samples, which were pre-fried with palm oils. Fourier transform infrared spectroscopy is a fast and powerful technique for quantification of lard present in French fries.

### 163 Effect of ethanol concentration, extraction time and extraction temperature on the recovery of phenolic compounds and antioxidant capacity of *Centella Asiatica* extracts

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International Food Research Journal, Vol. 18, 2011, 571-578

The present study was to optimize the phenolic recovery from *Centella asiatica* by investigating the effects of ethanol concentration (0-100%, v/v), extraction time (60-300 min) and extraction temperature (25-65°C) on phenolic extraction using single-factor experiments. Total phenolic content (TPC), total flavonoid content (TFC) and condensed tannin content (CTC) were used for determination of phenolic content while 2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) radical-scavenging capacity and 2,2'-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging capacity were used for measuring the antioxidant capacity of *C. asiatica* extract. All extraction conditions had significant effect ( $p < 0.05$ ) on the phenolic contents and antioxidant capacities of *C. asiatica* extract. The optimal conditions for phenolic recovery were 40% ethanol for 60 min at 65°C, with values of 1203.49 mg GAE/ 100 g DW for TPC, 561.92 mg CE/ 100 g DW for TFC, 181.25 mg CE/ 100 g DW for CTC, 730.37  $\mu\text{mol TEAC/ 100 g DW}$  for ABTS and 1948.30  $\mu\text{mol TEAC/ 100 g DW}$  for DPPH. TFC was found to be positive correlated significantly (0.902,  $p < 0.05$ ) with DPPH under influence of ethanol concentration. However, all antioxidant compound assays (TPC, TFC and CTC) were negatively correlated significantly with ABTS under the effect of extraction temperature.

### 164 Research advancements in palm oil nutrition

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European Journal of Lipid Science and Technology, Vol. 116 (10), 2014, 1301-1315

Palm oil is the major oil produced, with annual world production in excess of 50 million tonnes.

About 85% of global palm oil produced is used in food applications. Over the past three decades, research on nutritional benefits of palm oil have demonstrated the nutritional adequacy of palm oil and its products, and have resulted in transitions in the understanding these attributes. Numerous studies have demonstrated that palm oil was similar to unsaturated oils with regards to effects on blood lipids. Palm oil provides a healthy alternative to trans fatty acid containing hydrogenated fats that have been demonstrated to have serious deleterious effects on health. The similar effects of palm oil on blood lipids, comparable to other vegetable oils could very well be due to the structure of the major triglycerides in palm oil, which has an unsaturated fatty acid in the stereospecific number (sn)-2 position of the glycerol backbone. In addition, palm oil is well endowed with a bouquet of phytonutrients beneficial to health, such as tocotrienols, carotenoids, and phytosterols. This review will provide an overview of studies that have established palm oil as a balanced and nutritious oil.

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### **Effects of young corn ear addition on nutritional composition and acceptability of conventional cake**

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Malaysian Journal of Nutrition, Vol. 20 (1), 2014, 93-99

Scientific evidence indicates that higher dietary fibre consumption protects against various chronic diseases and leads to recovery enhancement. Young corn ear is very rich in total dietary fibre (TDF). The study objective was to evaluate the effects of young corn ear addition on the nutritional composition, textural properties and sensory attributes of conventional cake. Wheat flour used in the preparation of conventional cake was substituted with different percentages (0%, 5%, 10% and 15%) of young corn ear powder (YCP). Moisture, total ash, fat, protein and TDF content of conventional cake samples were investigated. Textural properties including firmness, cohesiveness, springiness, gumminess and chewiness were examined. The aroma, colour, chewiness, tenderness, flavour and overall acceptance of conventional cake were evaluated via sensory evaluation. The conventional cake with addition of 15% YCP recorded the highest moisture content. There was no predictable trend observed in the ash and fat content following the incorporation of YCP. Addition of 15% of YCP increased the protein content significantly while TDF content of conventional cake increased proportionally (1.42%-2.88%) with the level of YCP added. The incorporation of YCP did not produce any trend on all the textural properties of conventional cake. Conventional cake with 10% of YCP was the most preferred manifested by the highest scores in chewiness, tenderness and flavour attributes. In conclusion, 10% of YCP could be recommended as the ideal formulation in order to produce a healthier conventional cake without jeopardising acceptability.

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## 166 Multivariate statistical analysis treatment of DSC thermal properties for animal fat adulteration

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Food Chemistry, Vol.158, 2014, 1132-1138

The adulteration of edible fats is a kind of fraud that impairs the physical and chemical features of the original lipid materials. It has been detected in various food, pharmaceutical and cosmeceutical products. Differential scanning calorimetry (DSC) is the robust thermo-analytical machine that permits to fingerprint the primary crystallisation of triacylglycerols (TAGs) molecules and their transition behaviours. The aims of this study was to assess the cross-contamination caused by lard concentration of 0.5-5% in the mixture systems containing beef tallow (BT) and chicken fat (CF) separately. TAGs species of pure and adulterated lipids in relation to their crystallisation and melting parameters were studied using principal components analysis (PCA). The results showed that by using the heating profiles the discrimination of LD from BT and CF was very clear even at low dose of less than 1%. Same observation was depicted from the crystallisation profiles of BT adulterated by LD doses ranging from 0.1% to 1% and from 2% to 5%, respectively. Furthermore, CF adulterated with LD did not exhibit clear changes on its crystallisation profiles. Consequently, DSC coupled with PCA is one of the techniques that might use to monitor and differentiate the minimum adulteration levels caused by LD in different animal fats.

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## 167 Qualitative HPLC analysis of gallic acid in *Benincasa Hispida* prepared with different extraction techniques

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Sains Malaysiana, Vol. 43(8), 2014, 1181-1187

Ash gourd (*Benincasa hispida*, Bh) is traditionally claimed useful in treating asthma, cough, diabetes, haemoptysis and hemorrhages from internal organs, epilepsy, fever and balancing of the body heat. One of the major phenolic acids presented in *Benincasa hispida* is gallic acid, a phenolic compound which is linked with its ability in reducing Type II diabetes. The aim of the present study was to investigate the effect of different extraction techniques on the concentration of gallic acid in Bh. The Bh extracts were prepared with three different techniques namely; fresh extract (FE), low heating (LH) and drying and heating (DH). The gallic acid has been detected and quantified using high performance liquid chromatography (HPLC) coupled with UV-Vis detector. The amount of gallic acid detected in FE, LH and DH were 0.036, 0.050 and 0.272mg/100g, respectively. The limits of detection was 0.75\_g/mL while the limit of quantification and recovery were 2.50\_g/mL and 95.53%, respectively. In summary, HPLC technique coupled with UV

detector systems able to quantify gallic acid in Bh extracts. The gallic acid were present at higher concentration in Bh extracted using drying and heating, followed by low heating and fresh extract methods.

## 168 Propolis as a potential quorum sensing inhibitor in *Chromobacterium Violaceum*

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International Journal of Antimicrobial Agents, Vol. 42 (2), 2013, 108

In opportunistic bacterial pathogens, especially in Gram-negative bacteria, inhibition of the quorum sensing system is an interesting strategy to overcome infection and resistance against antibiotics through suppressing bacterial virulence. The objective of this study was to elucidate the potential compound(s) in bee products (bee pollen, honey and propolis) that exhibits significant quorum sensing inhibitory (QSI) properties on *Chromobacterium violaceum* ATCC 12472 at the phenotypic and molecular levels. Preliminary screening on *C. violaceum* lawn agar revealed that manuka propolis had the strongest QSI activity, bee pollen had no detectable QSI activity and honey had bactericidal activity, likely due to a high sugar content. Thus, manuka propolis was fractionated using column chromatography and pooled via thin-layer chromatography (TLC). The pooled fractions were rescreened for the highest QSI effects in dose-dependent and time-dependent manners on *C. violaceum* lawn agars. One pooled fraction, PF5, showed the largest violacein inhibition zone ( $24.5 \pm 2.5$  mm) at 1 mg per disc. For *vioA* (a QS-regulated gene involved in violacein biosynthesis) expression assays, RNA were isolated from bacterial cultures after 24 hours of incubation with 300-500 µg/ml of PF5 and subjected to reverse-transcription real-time PCR. Interestingly, *vioA* was significantly down-regulated with incubation with at least 450 µg/ml of PF5. Phytochemical content analysis of manuka propolis, together with high performance liquid chromatography (HPLC) and liquid chromatography-mass spectrometry (LC-MS) of PF5 revealed a major composition of hydroxycinnamic acid-derivatives, where a compound with [M-H] of 247 was identified as isoprenyl caffeate. This compound is hypothesized as a competitive inhibitor of acyl homoserine lactone, therefore prevent the activation of QS mechanism in *C. violaceum*, and also possibly other Gram-negative bacteria. This is the first study to elucidate an active QSI compound in manuka propolis (isoprenyl caffeate), as well as to correlate phenotypical QSI observations in *C. violaceum* with the molecular involvement of the main QS pathway of this bacterium. Further investigations on PF5 are recommended towards the development of potential propolis-based anti-pathogenic drugs.

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## 169 Comparison of microwave assisted acid digestion methods for ICP-MS determination of total arsenic in fish tissue

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Sains Malaysiana, Vol. 4(12), 2012, 1557-1564

Fish is one of the most important sources of arsenic exposure in human diet and the Food Safety and Quality Division, Ministry of Health since 2007 has required routine monitoring of total arsenic in seafoods such as fish. This study describes an improved extraction method of total arsenic in fish using microwave assisted acid digestion procedure before being analysed by inductively coupled plasma mass spectrometry (ICP-MS). The parameters studied were pre-treatment of sample, digestion temperature, time programme and the chemicals (HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>) used. Arsenic contents in fish samples under these conditions were compared using the standards additions technique. Microwave assisted acid digestion method with a combination of ultrapure concentrated nitric acid (HNO<sub>3</sub>) to concentrated hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) at a ratio of 7 mL: 1 mL, run time of 25 min and digestion temperature of 200°C with no pre-treatment was found to have recovery of 100.7% as compared with other digestion procedure where the recovery were 115.5, 111.6 and 101.8%. Validation using certified reference material (CRM) of fish tissue (DORM-3) showed a recovery of 101.4 ± 2.5% for total arsenic from the CRM.

### 170 Optimization of extraction conditions for phenolic compounds from neem (*Azadirachta Indica*) leaves

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International Food Research Journal, Vol. 18 (3), 2011, 931-939

The objective of this study was to optimise the extraction conditions for phenolic compounds from neem (*Azadirachta indica*) leaves using response surface methodology (RSM). A central composite rotatable design (CCRD) was applied to determine the effects of acetone concentration (%), extraction time (mins), and extraction temperature (oC) on total phenolic content (TPC) from neem (*Azadirachta indica*) leaves. The independent variables were coded at five levels and their actual values were selected based on the results of single factor experiments. Results showed that acetone concentration and extraction time were the most significant ( $p < 0.001$ ) factor affecting the TPC. The optimum extraction conditions were found to be acetone concentration of 48.49%, extraction time of 59.25 mins, and extraction temperature of 40.88oC. Under the optimised conditions, the experimental value for TPC was 4661.17 mg GAE/100 g DW, which reasonably close to the predicted value (4649.16 mg GAE/100 g DW).

### 171 Evaluation of the performance of a micromethod for measuring urinary iodine by using six sigma quality metrics

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Annals of Laboratory Medicine, Vol. 33(5), 2013, 319-325

**Background:** The urinary iodine micromethod (UIMM) is a modification of the conventional method and its performance needs evaluation. **Methods:** UIMM performance was evaluated using the method validation and 2008 Iodine Deficiency Disorders survey data obtained from four

urinary iodine (UI) laboratories. Method acceptability tests and Sigma quality metrics were determined using total allowable errors (TEAs) set by two external quality assurance (EQA) providers. **Results:** UIMM obeyed various method acceptability test criteria with some discrepancies at low concentrations. Method validation data calculated against the UI Quality Program (TUIQP) TEAs showed that the Sigma metrics were at 2.75, 1.80, and 3.80 for  $51 \pm 15.50$   $\mu\text{g/L}$ ,  $108 \pm 32.40$   $\mu\text{g/L}$ , and  $149 \pm 38.60$   $\mu\text{g/L}$  UI, respectively. External quality control (EQC) data showed that the performance of the laboratories was within Sigma metrics of 0.85-1.12, 1.57-4.36, and 1.46-4.98 at  $46.91 \pm 7.05$   $\mu\text{g/L}$ ,  $135.14 \pm 13.53$   $\mu\text{g/L}$ , and  $238.58 \pm 17.90$   $\mu\text{g/L}$ , respectively. No laboratory showed a calculated total error ( $\text{TE}_{\text{calc}} < \text{TE}_a$ ) for the low concentration level; all laboratories showed an acceptable performance for the medium-high level, and two laboratories showed an acceptable performance for the high level. When calculated against the Ensuring the Quality of UI Procedures (EQUIP) TEAs, the performance of all laboratories was  $\leq 2.49$  Sigma metrics at all concentrations. Only one laboratory had  $\text{TE}_{\text{calc}} < \text{TE}_a$  for the medium-high and high concentrations. **Conclusions:** UIMM showed unacceptable performance for the iodine deficiency levels and variable performance at other concentrations according to different TEAs.

## 172 Screening method for detection of immediate amino acid decarboxylases—producing bacteria implicated in food poisoning

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Tropical Biomedicine, Vol.28 (2), 2011, 351-361

Assessment of amino acid decarboxylase activity can be conducted using tubed broth or plated agar. In this study, the test was carried out in microtitre plates containing lysine, ornithine, arginine, tyrosine, tryptophan, phenylalanine or histidine as biogenic amine precursors. Møller decarboxylase base broth (MDB) with or without 1% of a known amino acid were added to wells of a 96 well-microtitre plate. The wells were inoculated with *Escherichia coli*, *Klebsiella pneumoniae*, *Acinetobacter anitratus* or *Staphylococcus aureus* to the final concentration of  $6.0 \times 10^7$  cfu/ml and incubated at 35°C. The absorbance of the culture broth was read at 570 nm at 0, 1.0, 2.0, 3.0, 4.0, 5.5, 6.5 and 7.5 hour. Comparison of means of  $A'(570)$  between 0 hour and a specified incubation time was determined statistically. Positive decarboxylase activities were detected in the media inoculated with *E. coli* and *K. pneumoniae* in less than 6 hours. The current method is suitable for immediate producers of amino acid decarboxylase enzymes. It costs less as it uses less amino acid and it has the potential to be used for screening aliquots of food materials for amino acid decarboxylase activities.

## 173 The effect of extraction methods on fatty acid and carotenoid compositions of marine microalgae *Nannochloropsis Oculata* and *Chaetoceros Gracilis*

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Pertanika Journal of Tropical Agricultural Science, Vol.36 (2), 2013, 145-160

This study was conducted to assess three extraction methods for the determination of fatty acid compositions and carotenoids (lutein, zeaxanthin,  $\beta$ -carotene, and  $\alpha$ -carotene) from marine microalgae, *Nannochloropsis oculata* (NO) and *Chaetoceros gracilis* (CG). For this purpose, three different extraction methods for the determination of fatty acids (dichloromethane: methanol, water: propan-2-ol: hexane and direct saponification-ethanol KOH) and carotenoids (hexane: ethanol: acetone: toluene, methanol: chloroform and methanol: tetrahydrofuran) were used. Two derivatization methods using different types of catalyst (acetyl chloride and boron trifluoride) were also used for the transmethylation of the fatty acids into corresponding methyl esters. The results of the fatty acid compositions showed that NO had a higher amount of n-3 and n-6 polyunsaturated fatty acid (PUFA), particularly eicosapentaenoic acid (EPA) (C20:5). CG was predominantly high in palmitic acid (C16:0) and palmitoleic acid (C16:1). The extraction method 1 (dichloromethane: methanol) and extraction method 2 (water: propan-2-ol: hexane) with acetyl chloride-catalyzed transmethylation were found to be the best methods for the determination of fatty acid compositions in NO and CG, respectively. A significantly higher ( $P < 0.05$ ) amount of carotenoids was found in NO as compared to CG using different extraction methods. Extraction method 1 (involving saponification procedure) yielded the best result for NO while extraction method 3 (methanol: tetrahydrofuran with no saponification procedure) generated higher amounts of carotenoids in CG. Overall, this study has shown that significantly high amounts of fatty acids and carotenoids could be obtained from these microalgae using these methods.

#### 174 Extraction of starch and enzymatic production of high amylose starch from sweet potato (*Ipomea Batatas*) var. Telong

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Journal of Tropical Agriculture and Food Science, Vol. 40(2), 2012, 203-210

Starch from sweetpotato var. Telong was extracted at different ratios of sweetpotato and water. A 1:4 ratio (sweetpotato to water) was found to be optimum with 61% of the starch extracted. Further extraction (three times) of the residue at the same ratio of sweetpotato to water resulted in 98% of the total starch extracted. A high amylose starch was produced by debranching the amylopectin of the sweetpotato starch using 0.5% (v/dry weight) pullulanase (Promozyme D2) at 60 °C for 24 h. The effects of pH, temperature, substrate concentration and reaction time on the production of high amylose starch were studied. The optimum conditions for the production of high amylose starch were at pH 5.0, 5.0% (w/v) starch concentration and incubated at 60 °C for 8 h. The amylose content increased from 21 - 84% after 8 h of incubation. The surface morphology of the starch granules observed with a scanning electron microscope (SEM) showed shrinkage on the surface of the starch granules.

#### 175 Use of rapid microbial kits for regular monitoring of food-contact surfaces towards hygiene practices

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Food business operators should promote safe and healthy food, utilizing simple methods for microbe identification and verification. This study attempts to determine the practicability measurement of hygiene practices in two states of Malaysia. It used an inexpensive and user-friendly microbial kit to evaluate the cleanliness level of Food-Contact Surfaces (FCS). A total of 72 samples in triplicate detected 70% of all coliforms. The prevalent contaminations suggest that food service operators may need to improve the cleanliness of FCS. In conclusion, easy-to-use microbial kits are practical and self-check approach in hygiene and should be made mandatory or alternative for the operator.

### 176 **The kinetics of extraction of the medicinal ginger bioactive compounds using hot compressed water**

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Separation and Purification Technology, Vol. 124, 2014, 141-147

Zingiber officinale or ginger known for its high medicinal compounds is extracted using hot compressed water (HCW). The two most important bioactive compounds namely 6-gingerol and 6-shogaol in the ginger extracts are analyzed using HPLC. The effects of temperature and time of extraction on 6-gingerol and 6-shogaol are studied using HCW extraction. It is found that HCW extraction can extract these two bioactive compounds; 6-gingerol at 130°C and 30 mins whilst 6-shogaol at 170°C and 20 mins. This finding shows that HCW extraction is potentially used in selective extraction of bioactive compounds at different conditions of HCW. The kinetics of extraction for both bioactive compounds is studied from the optimum temperatures obtained. The overall mass transfer coefficient which represents the extraction efficiency is calculated using mass transfer model. The optimum values of the overall mass transfer coefficient (k) for 6-gingerol is  $8 \times 10^{-7}$  m/s at 130°C whilst for 6-shogaol, is  $18 \times 10^{-7}$  m/s at 170°C using HCW extraction. The relationship between the overall mass transfer coefficient and the dielectric constant of various solvents for 6-gingerol is identified. Similar relationship is identified for 6-shogaol using HCW as solvent. The dielectric constant does not contribute to the extraction efficiency of 6-gingerol and 6-shogaol.

### 177 **Coconut water vinegar: New alternative with improved processing technique**

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Journal of Engineering Science and Technology, Vol. 9(3), 2014, 293-302

Vinegar is a condiment made from various sugary and starchy materials by alcoholic and subsequent acetic fermentation. Vinegar can be produced via different methods and from various types of raw material. A new alternative substrate for vinegar production namely mature coconut water has been tested and was compared with 2 common substrates which were coconut sap and pineapple juice. Substrates such as sap and juices have been found to have high amount of total soluble solids which corresponding to high sugar content in the substrates which is more than 14°Brix. Therefore, both substrates could be directly used for vinegar production without requirement of other carbon sources. However, coconut water which showed low Brix value need to be adjusted to 14°Brix by adding sucrose prior to the fermentation process. Substrates fermented with *Saccharomyces cerevisiae* have yielded 7-8% of alcohol within 7-10 days aerobic incubation at room temperature. The alcoholic medium were then used as a seed broth for acetic fermentation with *Acetobacter aceti* as inoculums and fermented for approximately 2 months to obtain at least 4% of acetic acid. Investigation on the effect of inoculums size and implementation of back-slopping technique were performed to improve the processing method for coconut water vinegar production. The results show that 10% of inoculums size was the best for acetic acid fermentation and the back-slopping technique has helped to reduce the process time of coconut water vinegar production.

## 178 Effect of cinnamon powder addition on nutritional composition, physical properties and sensory acceptability of butter biscuit

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Malaysian Journal of Nutrition, Vol. 20(2), 2014, 245-253

Demand for dietary fibre-enriched and low sugar bakery products is rapidly increasing due to the current high incidence of Type 2 diabetes mellitus. Cinnamon, a spice which acts as a natural sweetener and insulin mimetic is believed to have health benefits. The objective of this study was to determine the properties of butter biscuits containing cinnamon powder (CP) that partially replaced sucrose at levels of 0 (control), 2, 4 or 6%. Nutritional composition, physical properties and sensory acceptability of the biscuits were analysed using AOAC methods, texture profile analyser and 7-point hedonic scaling method, respectively. Protein, ash and dietary fibre contents of the biscuits increased significantly ( $P < 0.05$ ) whereas the moisture and sucrose contents were reduced significantly, proportionately to the increasing levels of CP. In texture profile analyses, increment of firmness and reduction of crispiness of the biscuits were detected with increasing levels of CP, but not significantly. The sensory scores for control and 2% CP biscuits were not significantly different for all the sensory attributes. Biscuits with 4% CP received lower scores only for aroma and appearance whereas the scores for colour, crispiness and flavour showed no significant differences compared to the control and 2% CP biscuit. The addition of 4% CP in biscuit could be an effective way to produce nutritious butter biscuits without any apparent change to its desirable physical properties and sensory acceptability.

## Optimisation of digestion method for determination of arsenic in shrimp paste sample using atomic absorption spectrometry

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Food Chemistry, Vol. 134 (4), 2012, 2406-2410

The microwave digestion method was developed and verified for the determination of arsenic in shrimp paste samples. Experimental design for five factors (HNO<sub>3</sub> and H<sub>2</sub>O<sub>2</sub> volumes, sample weight, microwave power and digestion time) were used for the optimisation of sample digestion. For this purpose, two level half factorial design, which involves 16 experiments, was adopted. The concentration of arsenic was analysed by graphite furnace atomic absorption spectrometry. Design Expert(r) 7.0 software was used to interpret all data obtained. The combination of 2 mL HNO<sub>3</sub> and 1 mL H<sub>2</sub>O<sub>2</sub> volumes, 0.1g sample weight, 1400 W power and 5 min digestion time was found to be the optimum parameters required to digest the shrimp paste samples. Tests with spiked samples presented good recoveries with relative standard deviations between 0.32% and 5.35%.

## Optimization of optimum condition for phytic acid extraction from rice bran

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African Journal of Plant Science, Vol.5 (3), 2011, 168-176

Phytic acid is one of the bioactive compounds that are being intensively studied to evaluate their effects on health. This study was carried out to determine the optimum condition for phytic acid extraction from rice bran. Three main parameters were considered to optimize the condition for phytic acid extraction; different types of extracting solvent, length of extraction time and influence of different pH adjustment. Three acidic solutions were selected and were trichloroacetic acid (TCA), hydrochloric acid (HCl) and sulphuric acid (H<sub>2</sub>SO<sub>4</sub>). The results showed that 5% of H<sub>2</sub>SO<sub>4</sub> in pH 0.6 and after 30 min of extraction time gave the highest amount of phytic acid compared to 10% of TCA and 3% of HCl. The content of phytic acid in rice bran ranged from 0.22 to 2.22% for the different parameters optimized. Different methods produced different content of phytic acid from rice bran. Therefore, 5% of H<sub>2</sub>SO<sub>4</sub> in pH 0.6 and 30 min of extraction time was the best condition for the optimum production of phytic acid.

## 181 Study on anti-quorum sensing potential of selected local ulam in Malaysia

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World Journal of Pharmacy and Pharmaceutical Sciences, Vol. 3(3), 2014, 203-211

Bacterial intercellular communication, or quorum sensing (QS), controls the pathogenesis of many medically important organisms. Anti-QS compounds have the ability to attenuate bacterial pathogenicity. The current quest for new antimicrobials aimed at discovering non-toxic inhibitors of QS from natural sources which can be used for the treatment of bacterial infections in human. The objective of this research is to study the anti-QS potential in some of local ulam commonly found in Malaysia. In this study, seven types of local *ulam* namely; *Parkia speciosa*, *Cosmos cardatus*, *Centellaasiatica*, *Manihot esculenta* leaf sprigs, *Psophocarpus tetragonolobus*, *Polygonum minus* and *Oenanthe javanica* were tested on the anti-QS potentials in fresh (edible or macerated) forms and methanol extracts via biomonitor strain *Chromobacterium violaceum* ATCC 12472. This biomonitor strain has an ability to produce a purple pigment (violacein) under QS-control. The results exhibited the wide variation in the anti-QS activities on selected local *ulam* in fresh and methanol extract forms. The highest anti-QS activity was recorded by *P. minus* and *C. asiatica* extracts as the lowest of minimum QS inhibition concentration value (7.81 mg/ml) was indicated by both extracts respectively. This study introduces not only a new mode of action and possible validation for traditional plant use, but also a potentially new therapeutic direction for the treatment of bacterial infections.

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## 182 Differentiation of lard from other edible fats by gas chromatography-flame ionisation detector (GC-FID) and chemometrics

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Journal of Food and Pharmaceutical Sciences, Vol.2 (1), 2014, 27-31

The presence of lard or its derivatives in any food products is a serious religious issue among Muslim and Judaism. Thus, the objective of this study was to investigate the use of gas chromatography with flame ionisation detector (GC-FID) coupled with chemometrics techniques such as Principle Components Analysis (PCA) and K-mean cluster analysis to differentiate lard adulteration at very low concentrations in beef and chicken fats. The measurements were made from the pure lard, beef tallow, pure chicken fat; and beef tallow (BT), chicken fat (CF) adulterated with different concentrations of lard (0.5%-10% in BT and CF). The data were first scaled into standardisation before PCA is performed to each of the scaled data using Unscrambler software. The Scores plots and loadings plots of each scaled data were compared and studied. The results showed that lard contains higher fatty acid (FA) of C18: 2cis and low C16:0 FA, but oppositely for beef tallow and chicken fat. The amount of C4:0, C14:0, and C18:0 FAs are approximately similar for all fats. Others FAs are small in amount and nearly similar for both. Additionally, PCA was able to significantly identify lard, beef fat, chicken fat and the mixtures of lard and beef tallow, lard and chicken fat, even at lower concentration level (0.5 % lard-99.5% beef tallow / chicken fat (w/w). K-mean cluster only able to classify the pure lard (LD), pure chicken fat (CF) and pure beef tallow (BT).

## Rapid detection and E-test antimicrobial susceptibility testing of *Vibrio Parahaemolyticus* isolated from seafood and environmental sources in Malaysia

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Saudi Medical Journal, Vol. 32(4), 2011, 400-406

**Objectives:** To find out the prevalence and antimicrobial susceptibility of *Vibrio parahaemolyticus* in seafoods and environmental sources. **Methods:** The study was carried out at the Center of Excellence for Food Safety Research, University Putra Malaysia; Universiti Kebangsaan Malaysia; Medical Molecular Biology Institute; and University Kebangsaan Malaysia Hospital, Malaysia between January 2006 and August 2008. One hundred and forty-four isolates from 400 samples of seafood (122 isolates) and seawater sources (22 isolates) were investigated for the presence of thermostable direct hemolysin (tdh+) and TDH-related hemolysin (trh+) genes using the standard methods. The E-test method was used to test the antimicrobial susceptibility. **Results:** The study indicates low occurrence of tdh+ (0.69%) and trh+ isolates (8.3%). None of the isolates tested possess both virulence genes. High sensitivity was observed against tetracycline (98%). The mean minimum inhibitory concentration (MIC) of the isolates toward ampicillin increased from 4 µg/ml in 2004 to 24 µg/ml in 2007. **Conclusions:** The current study demonstrates a low occurrence of pathogenic *Vibrio parahaemolyticus* in the marine environment and seafood. Nonetheless, the potential risk of vibrio infection due to consumption of *Vibrio parahaemolyticus* contaminated seafood in Malaysia should not be neglected.

## The effect of extraction conditions on total phenolic content and free radical scavenging capacity of selected tropical fruits' peel

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Health and the Environment Journal, Vol. 4 (2), 2013, 80-102

The present study aimed to investigate the effects of ethanol concentration (0-100%, v/v), extraction time (60-300 min), and extraction temperature (25-60°C) on total phenolic content (TPC) and free radical-scavenging capacity of rambutan (*Nephelium lappaceum*), mangosteen (*Garcinia mangostana*), and langsung (*Lansium domesticum*) peels using single-factor experiments. Folin-Ciocalteu's method was used for the determination of TPC, while the antioxidant capacity was determined by 2, 2'-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging assay. All the extraction conditions showed significant effect ( $p < 0.05$ ) on TPC and DPPH radical-scavenging capacity. The best extraction conditions determined for rambutan peel were 80% ethanol concentration for 120 min at 50°C; for mangosteen peel were 60% ethanol concentration for 60 min at 25°C; and 80% ethanol concentration for 120 min at 25°C were the best extractions for langsung peel. Extracts were then subjected to various antioxidant assays such as DPPH assay, TPC, nitric oxide scavenging activity (NO) and β-carotene bleaching (BCB) assay. Based on these

optimized extraction conditions, high antioxidant capacity was obtained with EC50 value of 8.87  $\mu$ g/mL (DPPH radical scavenging activity), 64.88% for NO activity, and 98.19% for BCB activity; as well as 53.94 mg GAE/g (TPC) for rambutan peel. While mangosteen peel showed a EC50 value of 19.75  $\mu$ g/mL (DPPH), 54.66% (NO), 79.94% (BCB), and TPC value of 42.25 mg GAE/g; and langsung peel with EC50 value of 85.28  $\mu$ g/mL (DPPH), 50.42% (NO), 23.95% (BCB) and TPC value of 22.04 mg GAE/g. With these extraction conditions, maximum antioxidant capacity could be obtained for future studies of all the selected fruits peel and it will be useful for nutraceutical development.

## 185 Cholesterol oxidation products analysis in meat and poultry

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Middle-East Journal of Scientific Research 13(Approaches of Halal and Thoyyib for Society, Wellness and Health), 2013, 67-78

The purpose of this research is to assess the formation and determination of cholesterol oxidation products (COPs) in meat and poultry products and its effects on human health. Cholesterol is a molecule with an unsaturated or double bond which is prone towards oxidation and formation of COPs. The impact of COPs towards human health depend on the type of COPs formed. Extraction, purification and detection methods in quantifying COPs play an important role in the analysis as COPs occur mostly at low levels. Direct cold saponification was the most suggested method due to high efficiency, good method precision, minimal artifact formation and ease of handling to recover COPs. High performance liquid chromatography (HPLC) and gas chromatography (GC) couple with mass spectrometry (MS) detector have become more important in providing better quantitative information in COPs analysis. Determination of cholesterol using gas chromatography usually need to go through derivatisation process to improve volatility and thermo stability, to optimize peak shape, to decrease retention time and to increase sensitivity. However, it makes no difference between GC analysis of free cholesterol and those of trimethylsilyl (TMS) or acetate derivatives. The gas chromatography mass spectrometry (GCMS) is the most commonly used method to determine COPs for many food samples including meats and poultry.

## 186 Effects of extraction solvent system, time and temperature on total phenolic content of henna (*Lawsonia Inermis*) stems

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International Food Research Journal, Vol. 20 (6), 2013, 3117-3123

Henna plant (*Lawsonia inermis*) is an Indian medicinal plant used in traditional medicine for the treatment of various diseases, besides its popularity as a natural dye to colour hand and hair. Research in the recent past has accumulated enormous evidence revealing henna plant to be an excellent source of antioxidants such as total phenolics. In this study, the extraction of total phenolics from henna stems was evaluated using the Folin-Ciocalteu assay. A set of single factor experiments was carried out for identifying the optimum condition of each independent variable affecting total phenolic content (TPC) extraction efficiency of henna stems, namely the solvent type, solvent concentration (v/v, %), extraction time (min) and extraction temperature (°C). Generally, high extraction yield was obtained using aqueous acetone (about 40%) as solvent and the extraction yield could further be increased using a prolonged time of 270 min and a higher incubation temperature of 55°C. Under these optimized conditions, the experimental maximum yield of TPC of  $5554.15 \pm 73.04$  mg GAE/100 g DW was obtained.

## 187 Optimal binary solvent extraction system for phenolic antioxidants from Mengkudu (*Morinda Citrifolia*) fruit

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Molecules, Vol. 18 (6), 2013, 7004-7022

Antioxidants have been widely used in the food industry to enhance product quality by preventing oxidation of susceptible substances. This work was carried out to maximise the recovery of total phenolic content (TPC), total flavonoid content (TFC), 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) radical-scavenging capacity and 2,2'-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging capacity from *Morinda citrifolia* fruit via modification of the ethanol concentration, extraction time and extraction temperature at minimal processing cost. The optimised conditions yielded values of  $881.57 \pm 17.74$  mg GAE/100 g DW for TPC,  $552.53 \pm 34.16$  mg CE/100 g DW for TFC,  $799.20 \pm 2.97$  µmol TEAC/100 g DW for ABTS and  $2,317.01 \pm 18.13$  µmol TEAC/100 g DW for DPPH were 75% ethanol, 40 min of time and 57 °C. The four responses did not differ significantly ( $p > 0.05$ ) from predicted values, indicating that models obtained are suitable to the optimisation of extraction conditions for phenolics from *M. citrifolia*. The relative amounts of flavonoids were  $0.784 \pm 0.01$  mg quercetin/g of extract and  $1.021 \pm 0.04$  mg rutin/g of extract. On the basis of the results obtained, *M. citrifolia* extract can be used as a valuable bioactive source of natural antioxidants.

## A binary solvent extraction system for phenolic antioxidants and its application to the estimation of antioxidant capacity in *Andrographis Paniculata* extracts

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International Food Research Journal, Vol. 20 (3), 2013, 1103-1111

The effects of ethanol concentration (0-100%, v/v), extraction time (60-300 min) and extraction temperature (25-65°C) on the extraction of phenolic antioxidants from *Andrographis paniculata* was evaluated using single-factor experiments. The following complementary assays were used to screen the antioxidant properties of the crude extracts: total phenolic content (TPC), total flavonoid content (TFC), condensed tannin content (CTC), 2, 2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) radical-scavenging capacity and 2, 2'-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging capacity. The extraction conditions chosen had significant effects ( $p < 0.05$ ) on the extraction of phenolic compounds and antioxidant capacity. The optimal conditions were 60% ethanol for 60 min at 65°C for phenolic compounds and at 25°C for antioxidant capacity. Strong negative significant ( $p < 0.05$ ) correlations were observed between the phenolic compounds (TPC, TFC and CTC) and antioxidant capacity comprising ABTS (-0.924, -0.909, -0.887, respectively) and DPPH radical-scavenging capacities (-0.992, -0.938, -0.928, respectively) were determined under the influence of extraction temperature.

## Modeling, simulation and control of pink guava puree pasteurization process with fouling as disturbance

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Journal of Food Process Engineering, Vol. 36 (6), 2013, 834-845

Fouling is an unwanted deposit on a heat exchanger surface which may cause inefficiency to the heat exchanger's performance in maintaining the outlet product temperature during pasteurization. In order to deal with this problem, fouling must be handled by an efficient control strategy. In this study, an empirical model of fouling was successfully developed and used in a control system. The obtained model is represented by first order plus time delay model with  $R^2 = 0.90$ . Several proportional-integral-derivative (PID) controllers were then simulated on this model to determine the best control system. Simulation results showed that an ideal PID controller tuned by minimization of integral absolute error (IAE) method exhibited good performance in disturbance rejection of fouling with settling time reduced and robustness improved. This result provides insights to properly design a control strategy dealing with fouling during pasteurization.



## Simulation and control of pasteurization process with inlet product temperature as disturbance

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Journal of Food, Agriculture and Environment (JFAE), Vol.10 (3&4), 2012, 124-128

Effective operation of pasteurization process involves optimum control of pasteurized product temperature. However, the presence of disturbance directly change the pasteurized product temperature and consequently, the product may not be pasteurized properly and contains unwanted microorganisms. In this study, several proportional-integral-derivative (PID) tuned by different tuning methods were applied on the obtained disturbance model (inlet product temperature) and simulated using SIMULINK in order to determine the best control system. The empirical model of process used in simulation work was also developed. The model obtained can be represented by the first-order plus time delay (FOPTD) form with R2 more than 0.918. Simulation results revealed that the minimization of integral absolute error (IAE) tuning method is satisfactorily adaptable for disturbance rejection with faster settling time and good robustness, whereas, ideal PID outperforms the other PID structures with lower settling time (less than 2 min). Thus, this controller tuned by minimization of IAE tuning method was good control scheme in controlling pasteurization process. In conclusion, the results obtained are recommended as a suitable control strategy for the pasteurization process of pink guava puree in the industry.

## Effects of young corn ear addition on nutritional composition and acceptability of Malaysian star cake (Baulu Cermai)

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Sains Malaysiana, Vol. 43(10), 2014, 1503-1508

Sufficient intakes of functional foods containing significant amount of dietary fibre in daily diet are beneficial to human health especially in preventing the prevalence of non-communicable diseases (NCDs). In this study, young corn powder (YCP) was added into Malaysian star cake (Baulu Cermai) to replace wheat flour (WF) partially at the formulations of 5, 10 and 15%. Baulu Cermai with 100% WF and 0% YCP was used as the control. The aim of the present study was to evaluate the effects of YCP addition on the nutritional composition, textural properties and sensory attributes of Baulu Cermai. The results showed that the mean values of moisture, ash, fat and protein content of Baulu Cermai increased in line with the levels of YCP incorporation. In addition, the total dietary fibre (TDF) content was increased proportionally with the increasing levels of YCP added into Baulu Cermai. Addition of YCP did not show any predictable trend in all the textural properties of Baulu Cermai. Meanwhile, the aroma, chewiness and tenderness increased in parallel with the increasing percentages of YCP added in the formulated products. Baulu Cermai added with 10% of YCP showed the highest score of overall acceptance. Addition of YCP at 10% into Baulu Cermai increases moisture, ash, fat, protein and total dietary fibre content without significantly affecting the textural properties and the sensory attributes of Baulu Cermai. Addition of YCP at 5% to replace WF partially in Baulu Cermai resulted in slight improvement of TDF and fat but does not affected moisture, ash, protein content and acceptability of the consumers.

## 192 Young corn ear addition improves some nutrients and lowering glycemic index of chiffon cake

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Food and Nutrition Sciences, Vol. 5, 2014, 1545-1553

The effects of partial replacement of wheat flour with young corn ear (YCE) on sensory properties and glycemic index (GI) of chiffon cake were investigated. Dried YCE was processed into powdered form and added in chiffon cake formulations to replace wheat flour partially at concentrations of 0 (control), 10%, 20% and 30%. Protein, ash and dietary fibre contents of chiffon cake added with YCE powder were increased in line with the levels of YCE used. Even though protein content of YCE-based cakes increased in line (13.3% to 15.7%) with the levels of YCE (10% to 30%), but there was no significant difference compared to control. Sensory evaluation results indicate that partial replacement of wheat flour with up to 10% is satisfactory as compared to other levels of wheat flour replacement. Interestingly, addition of YCE at 10% to partially replace wheat flour resulted in reduction of postprandial blood glucose response. The GI value for chiffon cake added with YCE was 49 lower than control cake which recorded GI value at 60. In conclusion, novel food ingredient of YCE can be incorporated in selected bakery products to enhance nutritional composition while at the same time help in reducing the GI value. Further investigation on the addition of YCE into other bakery products in relation to nutrition and glycemic response effects can also be explored.

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## 193 Effect of solid-to-solvent ratio on phenolic content and antioxidant capacities of “Dukung Anak” (*Phyllanthus niruri*)

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International Food Research Journal, Vol. 20 (1), 2013, 325-330

The objective of this study was to evaluate the effects of solid-to-solvent ratio (1:5, 1:10, 1:15 and 1:20) on the extraction of phenolic compounds (TPC and TFC) and antioxidant capacity (ABTS and DPPH radical scavenging capacity) of *P. niruri*. Solid-to-solvent ratio showed a significant effect for both phenolic compounds (TPC and TFC) and antioxidant capacity (ABTS and DPPH radical scavenging capacity) with 1:20 was the condition for extracting the highest of phenolic compounds (TPC and TFC) with a value of 5788.7 mg GAE/100 g DW and 1906.5 mg CE/100 g DW, respectively and exhibited high antioxidant capacities (ABTS and DPPH radical scavenging capacities) with a value of 0.820 mM and 1.598 mM, respectively among the four levels studied. TPC was positively and significantly correlated with ABTS and DPPH ( $r=0.999$  and  $r=0.999$ ) under the effects of solid-to-solvent ratio as compared to TFC, positively and strongly correlated ( $r=0.865$  and  $r=0.868$ ) with ABTS and DPPH.

## Flavour generation during commercial barley and malt roasting operations: A time course study

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Food Chemistry, Vol.145, 2014, 378-387

The roasting of barley and malt products generates colour and flavour, controlled principally by the time course of product temperature and moisture content. Samples were taken throughout the industrial manufacture of three classes of roasted product (roasted barley, crystal malt and black malt) and analysed for moisture content, colour and flavour volatiles. Despite having distinct flavour characteristics, the three products contained many compounds in common. The product concentrations through manufacture of 15 flavour compounds are used to consider the mechanisms (Maillard reaction, caramelisation, pyrolysis) by which they were formed. The use of water sprays resulted in transient increases in formation of certain compounds (e.g., 2-cyclopentene-1, 4-dione) and a decrease in others (e.g., pyrrole). The study highlights rapid changes in colour and particularly flavour which occur at the end of roasting and onwards to the cooling floor. This highlights the need for commercial maltsters to ensure consistency of procedures from batch to batch.

## Optimization of extraction time and temperature on antioxidant activity of *Schizophyllum Commune* aqueous extract using response surface methodology

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Journal of Food Science and Technology India, Vol. 50 (2), 2013, 275-283

Central composite design of response surface methodology (RSM) was employed to optimize the extraction time ( $X^1$ : 99.5-290.5 min) and temperature ( $X^2$ : 30.1-54.9 °C) of *Schizophyllum commune* aqueous extract with high antioxidant activities and total phenolic content (TPC). Results indicated that the data were adequately fitted into four second-order polynomial models. The extraction time and temperature were found to have significant linear, quadratic and interaction effects on antioxidant activities and TPC. The optimal extraction time and temperature were: 290.5 min and 35.7°C (DPPH<sup>•</sup> scavenging ability); 180.7 min and 41.7°C (ABTS<sup>•+</sup> inhibition ability); 185.2 min and 42.4 °C (ferric reducing antioxidant power, FRAP); 290.5 min and 40.3 °C (TPC). These optimum conditions yielded 85.10%; 94.31%; 0.74 mM Fe<sup>2+</sup> equivalent/100 g; 635.76 mg gallic acid equivalent/100 g, respectively. The yields of antioxidant activities and TPC obtained experimentally were close to its predicted values. The establishment of such model provides a good experimental basis employing RSM for optimizing the extraction time and temperature on antioxidants from *S. commune* aqueous extract.

**196 Optimization of extraction time and temperature for antioxidant activity of edible wild mushroom, *Pleurotus Porrigens***

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Food and Bioproducts Processing, Vol. 90, 2012, 235-242

The extraction time and temperature of *Pleurotus porrigens* were optimized for the maximization of 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging and 2,2'-azino-bis(3-ethylbenzthiazoline-6-sulfonate) (ABTS) radical cation inhibition activities, ferric reducing/antioxidant power (FRAP) and total phenolic content (TPC) using response surface methodology (RSM). A rotatable central composite design consisting of 14 experimental runs with three replicates at the central points was applied and second-order polynomial models were used to describe the experimental data regarding the responses. The experimental results adequately fitted into the second-order polynomial models with significant linear, quadratic and interaction effects of the independent variables. The optimized conditions were 372.8min/32.0°C (DPPH); 340.9min/36.8°C (ABTS); 240.0min/38.1°C (FRAP); and 310.1min/43.6°C (TPC) with corresponding yields of 32.66%; 91.21%; 7.91mM Fe<sup>2+</sup> equivalent/100g; and 494mg gallic acid equivalent/100g, respectively. The experimental values were close with those predicted values, indicating suitability of the model employing RSM for optimizing the extraction time and temperature on antioxidant activity from *P. porrigens*.

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**197 Laboratory experiment on bioaccumulation of 109Cd and 134Cs in white seabass**

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Jurnal Sains Nuklear Malaysia, Vol. 24 (2), 2012, 71-78

Laboratory radiotracer experiment was performed to study the bioaccumulation of 109Cd and 134Cs in the Malaysian common fish White seabass (*Lates calcarifer*). The aim of this study was to compare the biokinetics of uptake these two contrasting radionuclides by White seabass in laboratory condition scale. Experiments were designed to determine the processes controlling uptake of both radionuclides following exposure via seawater. In this study, the curve shapes of the uptake kinetic of 109Cd and 134Cs in White seabass were slightly linear and gradually increased with increasing of exposure time but were not reach equilibrium in the period of the study of 21 days. This phenomenon can be concluded that radioelement concentrations of 109Cd and 134Cs; and exposure duration of this experiment may not adequately to reach steady-state condition for uptake kinetic of those radioelements in White seabass. Furthermore, this was indicated that the uptake rate of 109Cd was 1.79 times faster than 134Cs due to some factors may probably influenced the output of this experiment such as different element accumulation strategies, physiological, behavior of radioelements, etc.



# **Food Science and Technology**

**(Food Processing and  
Preservation)**

## 198 Effect of grilling and roasting on the fatty acids profile of chicken and mutton

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World Applied Sciences Journal, Vol. 17, 2012, 29-33

The effect of grilling and roasting using a microwave oven on fatty acid profile of chicken and Mutton meat was investigated. The lipid content (gravimetric method) and fatty acids composition (gas chromatography) were analyzed in three different treatments and applied on these meats in four replicates and two batches. Cooking losses, internal temperature reached by meat and, consequently, total lipids, increased directly with the cooking time and temperature used. Cooked chicken meat had a lower proportion of monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA) and saturated fatty acids (SFA) than cooked mutton meat. PUFA/SFA ratio decreased in chicken meat and increased in mutton meat by heating. Chicken meat presents more favorable fatty acids profile than in mutton meat. This study implies the great choice for consumer to choose the healthier meat in a better way of cooking. It is recommended that other researchers should study on the nutritional value of chicken and mutton with other different cooking methods to obtain a better comparison data.

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## 199 Effect of grilling and roasting on formation of Cholesterol Oxidation Products (COPs) in chicken and mutton

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World Applied Sciences Journal, Vol. 17, 2012, 21-24

The objective of this paper is to determine the effect of grilling and roasting on cholesterol oxidation products (COPs) in mutton and chicken. Four steps of analysis have been conducted: saponification, extraction, derivatisation and quantification by GCMS-QQQ. The temperature and time used for grilling was 230°C (20 minutes) while roasting was 190°C (25 minutes) using microwave. This study showed that there was no significant difference between raw mutton and raw chicken in the amount of cholesterol. Raw mutton have higher amount of cholesterol than raw chicken due to the high content of SFA and cholesterol. In both of the cooking treatments, there was no significant difference in the amount for most of COPs, but for the grilling process, in  $\alpha$ -epoxide were significantly higher. In conclusion, the roasting treatment is better to be applied in meat compared to grilling in term of COPs. It is suggested in the future works that the drip loss during the cooking being analyzed as the cholesterol and COPs might be lost during heat treatment and more reference standards of COPs need to be used.

## **I100 Effect of grilling and roasting on fatty acids methyl esthers (FAME) in beef and pork**

**Alina AR<sup>1</sup>, Nurulhuda MS<sup>2</sup>, Siti Mashitoh A<sup>1</sup>, Shazamawati ZH<sup>2</sup>, Nurul Mawaddah AH<sup>2</sup>, Umami Syuhada HS<sup>2</sup>, Nurul Farah SA<sup>2</sup>, Nurul Aqilah AS<sup>2</sup>, Syamsul KMW<sup>1</sup> and Nur Nadiah Syuhada AS<sup>2</sup>**

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World Applied Sciences Journal, Vol. 17, 2012, 25-28

The process of cooking may affect the fatty acids methyl esthers (FAME) content in food. The objective of this study is to determine the effect of grilling and roasting on FAME in beef and pork. Lipids were extracted using the Soxtherm fat extraction instrument. The fats were then methylated by sodium methoxide and being examined by using a gas chromatography. Data was analyzed using a one-way ANOVA. The amount of fatty acids in pork is significantly higher than in beef. The treatments within beef, showed significantly different values between the treatments. However, raw and grilled pork treatments were not significantly different except for the roast treatment ( $p < 0.05$ ). Ratio of polyunsaturated to saturated fatty acids (PUFA:SFA) in raw, grilled and roasted beef treatment are 0.03, 0.04 and 0.01. While in pork, raw, grilled and roasted treatments gives ratios 0.37, 0.33 and 0.30. This showed that pork has more PUFA content compared to beef. Further research can be done by changing the method of extraction to see any difference between the methods.

## **I101 Effect of storage on fatty acid methyl ester (fame) and cholesterol oxidation products (COPS) in different type of sausages**

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World Applied Sciences Journal, Vol. 17, 2012, 45-50

Cholesterol oxidation products (COPs) have been shown potentially atherogenic, mutagenic and carcinogenic effects towards human. Storage of food will increase the production of COPs. The objective of this research is to investigate the effect of cold storage (chilled storage, 4°C and frozen storage, -20°C) on fatty acids content and formation of cholesterol oxides in three different lipid sources of sausage products containing chicken fat (CF), Super Olein (SO) and Red Palm Stearin (RPS). Three types of chicken sausages with different lipid sources: CF, SO and RPS were prepared and stored in chiller for zero, first, second and third weeks and stored frozen for zero, fourth and eight weeks. Fatty Acids and COPs in samples were extracted and analyzed using gas chromatography with flame ionization detector (FID). The reduction of unsaturated fatty acids, cholesterol content and formation of cholesterol oxides were found during throughout the storage life. The Red Palm Stearin (RPS) samples showed significant increment of the total saturated fatty acid compared to Super Olein (SO) and chicken fat (CF). It was concluded the saturated fatty acids (SFA) and monounsaturated fatty acids (MUFA) increased in comparison to

polyunsaturated fatty acids (PUFA) in all samples during chilled storage and the amount of COPs were in the following order; CF>SO>RPS. It implies that sausages formulated with SO and RPS are effective in reducing COPs formation. The recommendations are to wider the range of COPs reference standards.

## **I102 Effect of different cooking methods on formation of cholesterol oxidation products in pork and beef**

**Alina AR<sup>1</sup>, Umami Syuhada HS<sup>2</sup>, Syazamawati ZH<sup>2</sup>, Thema Juhana MJ<sup>2</sup>, Siti Mashitoh A<sup>1</sup>, Nurul Farah Sakinah A<sup>2</sup>, Nurul Mawaddah AH<sup>2</sup> and Nurulhuda MS<sup>2</sup>**

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World Applied Sciences Journal, Vol. 17, 2012, 17-20

Cooking process can lead to the formation of cholesterol oxidation products (COPs) which can give negative biological effects to human. The objective of this work was to study the effect of different cooking methods (grilled and roasted) on formation of COPs in beef and pork. The analysis involved four major steps; saponification, extraction, derivatisation and quantification by GC/MS-QQQ. Five common COPs (5 $\alpha$ -cholestane, 7-ketocholesterol,  $\alpha$ -epoxycholesterol,  $\beta$ -epoxycholesterol and 25-hydroxycholesterol) that are generally reported in foods were analyzed to study the differences of their content between raw, grilled and roasted meat. Besides cholesterol, the most abundant compound in both types of samples that can be detected was  $\alpha$ -epoxycholesterol. Grilling process for both samples was observed to contain the highest cholesterol and total COPs level. Beef samples contain higher total cholesterol and COPs compared to pork. It implies that consume beef regularly gives bad effect to health. It is recommended to do analysis on the collected drip loss during the cooking methods as the cholesterol and COPs might be lost during heat treatment and more reference standards of COPs need to be used in this study.

## **I103 Effect of drying and cooking methods on antioxidant properties of bitter gourd (*Momordica Charantia*)**

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Journal of Tropical Agriculture and Food Science, Vol.41 (2), 2013, 249 - 256

The effect of various cooking methods (stir frying, deep frying, boiling, steaming and) and oven-drying at three different temperatures (40, 50 and 60 °C) on antioxidant properties of bitter gourd were evaluated. Total phenolic content (TPC) was measured using Folin-Ciocalteu method while the antioxidant activity was evaluated using methanol solution of DPPH and ferric reducing potential assay using FRAP reagents. All analyses were conducted using the microplate reader spectrophotometer. The results indicated that deep frying had the highest TPC at 98.18 mg/100 g GAE, followed by microwave cooking (25.63 mg/100 g GAE). The TPC for deep-fried samples was significantly different ( $p < 0.05$ ) from the other cooking methods. However, microwave cooked



samples have significantly ( $p < 0.05$ ) higher percentage of DPPH radical scavenging activity (88.54%) and FRAP (65.85  $\mu\text{mol/g FE}$ ) compared to oven-dried, boiling or deep frying. For oven-drying, bitter melon dried at 40 °C retained the highest antioxidant activities compared to samples dried at 50 or 60 °C. Thus, the best drying temperature to retain antioxidant properties in bitter melon is at 40 °C while the best cooking method is either microwave or deep fried.

## 1104 Smart packaging: Sensors for monitoring of food quality and safety

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Sensing and Instrumentation for Food Quality and Safety, Vol.5 (3-4), 2011, 137-146

The development of chemical sensors and biosensors over several decades has been investigated resulting in novel and very interesting sensor devices with great promise for many areas of applications including food technology. The incorporation of such sensors into the food packaging technology has resulted what we call smart or intelligent packaging. These are truly integrated and interdisciplinary systems that invoke expertise from the fields of chemistry, biochemistry, physics and electronics as well as food science and technology. Smart packaging utilises chemical sensor or biosensor to monitor the quality & safety of food from the producers to the costumers. This technology can result in a variety of sensor designs that are suitable for monitoring of food quality and safety, such as freshness, pathogens, leakage, carbon dioxide, oxygen, pH, time or temperature. Thus, this technology is needed as on-line quality control and safety in term of consumers, authorities and food producers, and has great potential in the development of new sensing systems integrated in the food packaging, which are beyond the existing conventional technologies, like control of weight, volume, colour and appearance.

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## 1105 Effects of drying method and particle size on the antioxidant properties of leaves and teas of *Morus Alba*, *Lagerstroemia Speciosa* and *Thunbergia Laurifolia*

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Chemical Industry & Chemical Engineering Quarterly, Vol. 18 (3), 2012, 465-472

Antioxidant properties (AOP) of leaves and teas of *Morus alba* L., *Lagerstroemia speciosa* (L.) Pers. and *Thunbergia laurifolia* Lindl. as affected by microwave, oven and freeze drying were assessed. Total phenolic content (TPC), radical scavenging ability expressed as ascorbic acid equivalent capacity (AEAC) and ferric reducing power (FRP) were screened using the Folin-Ciocalteu, 2,2-diphenyl-1-picrylhydrazyl (DPPH) and potassium ferricyanide assays, respectively. The effects of particle size were also investigated. Microwave drying resulted in enhanced AOP in *M. alba* and *T. laurifolia*. Oven drying resulted in declined AOP in *T. laurifolia*, with *M. alba* and *L. speciosa* relatively unchanged. Significant increase in AOP was observed in freeze-dried leaves of *M. alba* with *L. speciosa* and *T. laurifolia* showing no change or slight increase. TPC, AEAC and FRP of ground microwave-, oven- and freeze-dried leaves of *M. alba* extracted with 50% methanol

were significantly higher than shredded leaves. For tea infusions extracted with hot water, three categories were recognised, i.e., species with shredded leaves yielding stronger AOP (*M. alba*), species with ground leaves yielding stronger AOP (*L. speciosa*), and species with ground and shredded leaves yielding comparable AOP (*T. laurifolia*).

## I106 Formulation optimization of canned chicken in Kacangma herbal soup using response surface methodology

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Journal of Tropical Agriculture and Food Science, Vol. 39(1), 2011, 19-27

Formulation of chicken in kacangma herbal soup, a traditional delicacy of Sarawak was developed. Processing parameters for the canned product was established. The product was canned and retorted at 121(C in an overpressure retort to achieve commercial sterility. A three-component constrained mixture according to a symmetrical-simplex interior design was used to determine the optimum formulation. Result showed that a mixture with 82% blended ginger, 17% dried kacangma and 1% cornstarch would give a mean sensory score of more than 6.6 for taste, colour, texture, consistency and overall acceptability. Meanwhile, a score above 5.5 was given for aroma. The study showed that the thermal process applied with Fo value of 8.36 is sufficient to produce commercially sterile products.

## I107 Does gamma irradiation affect physicochemical properties of honey?

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Clinica Terapeutica, Vol. 165(2), 2014, 125-133

**Background and aims:** Honey is a supersaturated solution of sugars, enriched with proteins, minerals, vitamins, organic acids and polyphenols. Gamma irradiation is a physical technique of food preservation which protects the honey from insects' and microbial contamination during storage. We investigated the effect of gamma irradiation on physicochemical properties in two types of Malaysian honey, Gelam and Nenas. **Materials and methods:** Both honeys were irradiated at the dose 25 kGy in a cobalt-60 irradiator. The physicochemical properties pH, moisture, acidity, color, and sugar content as well as vitamins C and E, hydroxymethylfurfural (HMF) and mineral contents, for the irradiated and non-irradiated honeys were assessed. **Results:** The results revealed that pH, acidity, minerals and sugar contents in both types of honey were not affected significantly by gamma irradiation, while moisture, vitamin E contents and HMF level decreased significantly with gamma irradiation. However, significant increased in color intensity and vitamin C were observed after gamma irradiation for both types of honey. **Discussion:** In summary,

gamma irradiation treatment of honey (in the dose mentioned above) did not cause significant changes in the physicochemical and mineral contents, except for significant alterations in color intensity, moisture, vitamins (C and E), and HMF contents.

## **I108 Deep frying performance of enzymatically-synthesized palm-based MLCT blends**

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Food and Bioprocess Technology, Vol.4, 2011, 124-135

The main aim of this work was to assess the frying strength of the enzymatically synthesized palm-based medium- and long-chain triacylglycerols (MLCT) oil with the aid of different antioxidants under deep-frying conditions. Palm-based MLCT oil in the presence of synthetic or natural antioxidants showed significantly better ( $P < 0.05$ ) thermal resistance and oxidative strength than refined, bleached, and deodorized (RBD) palm olein throughout the five consecutive days of frying. Rancimat induction period, free fatty acid content, anisidine value, E1%1cm at 232 and 268 nm, color, percentage of oil uptake, and viscosity measurement can be used as oil quality parameters to indicate the degree of oil deterioration under continuous stressed frying conditions. No significant changes ( $P > 0.05$ ) in the saturated/unsaturated fatty acids ratio across frying periods indicated good oxidative stability of the palm-based MLCT oil. Due to the polarity of medium- and long-chain triacylglycerols in palm-based MLCT oil, total polar compounds determination may not be suitable oil quality measures. Sensory evaluation of fried chips showed no significant differences ( $P > 0.05$ ) between chips fried in RBD palm olein and palm-based MLCT oil over the 3-month storage period.

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## **I109 The use of enzymatically synthesized medium- and long-chain triacylglycerols (MLCT) oil blends in food applications**

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International Food Research Journal, Vol.18, 2011, 355-366

The potential use of medium- and long-chain triacylglycerols (MLCT) oil blends in food applications such as frying oil and salad dressings were investigated. The frying strength of palm-based MLCT oil with different antioxidants under deep frying conditions was assessed. Palm-based MLCT oil showed better thermal resistant oxidative strength than refined, bleached and deodorized (RBD) palm olein throughout the five consecutive days of frying. Sensory evaluation and rancidity assessment on fried chips showed no significant differences ( $P > 0.05$ ) between chips fried in RBD palm olein and palm-based MLCT oil. MLCT-based salad dressings treated with different antioxidants showed similar rheological behaviors as compared to soybean based salad dressings. The overall quality of the physical appearance and organoleptic acceptability based on quantitative descriptive analysis showed no significant differences ( $P > 0.05$ ) in all salad dressings. These findings indicated that MLCT-based oil blends can be used as healthy functional oil for daily consumption.

### **I110 Effects of modified atmosphere packaging on shelf life of roasted spicy chicken (Ayam Percik)**

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Journal of Tropical Agriculture and Food Science, Vol. 39(2), 2011, 141-147

The effects of various gas compositions on roasted spicy chicken (ayam percik) during chill storage under modified atmosphere conditions were studied. Oriented nylon laminated with low density polyethylene (ONy/LLDPE) with 8  $\mu\text{m}$  thickness was used as packaging materials for the ayam percik. To create the modified atmosphere conditions the packages were flushed with normal air (control, T1), 30% CO<sub>2</sub> + 70% N<sub>2</sub> (T2) and 40% CO<sub>2</sub> + 60% N<sub>2</sub> (T3). Evaluations were conducted at weekly intervals for microbiological and chemical analysis during chill storage at  $2 \pm 2$  °C. Ayam percik packed in normal air spoiled after 4 weeks as indicated by high microbial counts. When the level of CO<sub>2</sub> was increased to 30% and 40% in the headspace of the packages, the shelf life of ayam percik was extended to 7 weeks.

### **I111 Combined effects of $\gamma$ -irradiation and ascorbic acid on the physico-chemical properties, microbial stability and aroma profile of onion puree during storage**

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The onion was first pureed and then added with 0.5% ascorbic acid before it was  $\gamma$ -irradiated at 2 kGy. The puree was then stored at 4, 10, and 27°C for up to 28 days. Changes monitored included pH, titratable acidity, total soluble solids, colour, total bacteria and yeast counts, organic acids and sensory property of the puree. Results show that the combined treatments reduced the contamination levels of the total bacteria and yeasts, and it helped to stabilize the colour, and other physico-chemical properties such as pH, acidity, and organic acid composition and contents of cold stored onion puree. This study has shown that onion puree kept the initial colour of fresh onion puree after 2kGy  $\gamma$ -irradiation if it contained 0.5% ascorbic acid and storage at 4 °C for 28 days.

### **I112 Effect of accelerated storage on microencapsulated Kenaf seed oil**

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Journal of the American Oil Chemists' Society, Vol. 90 (7), 2013, 1023-1029

In order to improve the quality and protect against degradation, kenaf (*Hibiscus cannabinus L.*) seed oil was microencapsulated by using spray drying. The microencapsulated kenaf seed oil (MKSO) was then stored at 65 °C for 24 days, the changes of fatty acids and bioactive compounds were examined every six days. Bulk (unencapsulated) kenaf seed oil was used as a control and was compared to the MKSO. The fatty acids and phytosterols compositions were determined by using gas chromatography, while tocopherols and phenolic acids of microencapsulated kenaf seed oil were determined by using high performance liquid chromatography. The results showed that there was a significant decrease ( $p < 0.05$ ) in bioactive compounds in kenaf seed oil while the bioactive compounds in MKSO were maintained in a stable condition upon accelerated storage. Microencapsulation was shown to protect kenaf seed oil against oxidation, as well as preventing the degradation and/or loss of bioactive compounds in kenaf seed oil.

### 1113 Influence of the inlet air temperature on the microencapsulation of kenaf (*Hibiscus Cannabinus L.*) seed oil

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European Journal of Lipid Science and Technology, Vol. 115, 2013, 1309-1318

The aim of this study was to evaluate the influence of different inlet air temperatures on the physicochemical properties and oxidative stability of microencapsulated kenaf seed oil (MKSO). Kenaf seed oil was homogenised with the wall materials at a total solid content of 30% and was spray-dried at 160, 180 or 200°C inlet air temperature. The microstructure and morphology of the microencapsulated kenaf seed oil were observed using a scanning electron microscope. The physicochemical properties, such as moisture content, water activity and particle size, of MKSO produced at different inlet air temperatures showed a significant difference ( $p < 0.05$ ). MKSO produced with an inlet air temperature of 160°C exhibited the highest microencapsulation efficiency (MEE, 96.46%) compared to 180°C (78.42%) and the efficiency was lowest at 200°C (58.96%). Increasing the inlet air temperature also resulted in significantly increased ( $p < 0.05$ ) lipid oxidation of MKSO and decreased total intrinsic phenolic content upon accelerated storage. However, all MKSO had lower lipid oxidation and higher total phenolic content than bulk (unencapsulated) oil. This study indicates that increased inlet air temperature results in larger particle size, higher lipid oxidation and lower MEE. The process of microencapsulation could protect oil from the external environment that causes lipid oxidation.

## **I114 Functional foods innovation: High calorie liquid formulations and its acceptability among IUM Kuantan students**

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International Islamic University Malaysia, Malaysia.

Malaysian Journal of Science, Vol. 32(2), 2013, 15- 21

Nowadays, with the advancement of science and nutritional breakthrough, there are lots of methods can be applied to optimise energy and nutritional requirement. One of the approaches is through utilisation and modification of functional foods available. Some of these functional foods are high in calorie and nutrient dense. Therefore, the aim of the research was to develop simple formulations of healthy high calorie beverages derived from functional foods. Four formulations with different main ingredients were evaluated. The formulations were subjected to macronutrients analysis and sensory evaluation for measurement of the acceptability. The main sensory properties such as appearance, aroma, consistency, colour, after taste, and overall acceptance were evaluated using a nine point Hedonic scale. Nutritionist Pro(tm) software was used to compare the nutrient content. Based on the analysis performed, Enercal Plus(r) which was the control formulation shown the densest calorie for one serving (360 kcal/serving) followed by F2, F3, and F1 formulations. The results of hedonic rating proved that all formulations showed fair acceptability with the highest percentage and hedonic score goes to control formulation of Enercal Plus(r) followed by F3, F2, and F1 formulations. Their mean score ranged between 5- 6.6 in terms of general acceptability. From this research, it showed the development of high calorie beverage is possible through modification of functional foods.

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## **I115 Expectation and effectiveness of the halal slaughtering training towards employability among blue collar workers**

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Middle-East Journal of Scientific Research 13(Approaches of Halal and Thoyyib for Society, Wellness and Health), 2013, 11-16

Opportunities for Halal careers offer brighter prospect for blue collar workers, to become competent slaughterers towards fulfilling the mandatory Halal specifications. In Sarawak, Malaysia, competent meat slaughterers is seen as crucial to cater industrial demands for Halal meat. To what extent does the training fulfill the needs of the blue collar workers? What is their perception towards the Halal slaughter training? This paper aims at understanding the expectations of trainees towards the training; the effectiveness of module content and duration that took place in the training. This study employs both qualitative and quantitative approaches. Interviews are conducted to identify the expectation of trainees towards the training, Surveys conducted to measures the effectiveness level of content and duration of the programme among the 27 trainees. 95.5% of them agreed that the content of the module was effective and much needed in the context of meeting the industrial Halal needs. The duration of the programme was perceived as moderate (50%) while another 50% is at satisfactory level. The findings show that Halal slaughter training is required to overcome issues of workers shortage Halal meat

products. As education level influences the understanding level, the duration of the training is profoundly significant to ensure effectiveness among the blue collar workers. In conclusion, this module is effective towards bridging the theoretical and hands on skills of Halal Slaughterers for Malaysia Halal Meat Industry.

### **I116 Effects of mango (*Mangifera Indica* L.) and guava (*Psidium Guajava* L.) extract on frozen chicken meat balls' storage quality**

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Pakistan Journal of Nutrition, Vol.10 (9), 2011, 879-883

A study was carried out to determine the effect of mango and guava extract on frozen Chicken Meat Balls (CMB) storage quality. CMB were added with four different formulations; mango extract (400 ppm); guava extract (800 ppm); synthetic antioxidant (BHA) (200 ppm) and a control group. Antioxidant activities, Total Phenolic Compound (TPC), Ferum (III) Reducing Power (FRAP) and Ferric Thiocyanate (FTC) were also analyzed. Determination of Thiobarbituric Acid (TBA) test and Peroxide Value (PV) were done on CBM samples which had been stored in -18oC for 0, 1, 2 and 3 months and sensory evaluation for 0 and 2 months. TPC showed that mango had higher value at 548.77  $\mu$ g/100 g fresh weight compared to guava at 222.09  $\mu$ g/100 g fresh weight. FRAP value significantly ( $p < 0.05$ ) indicated that mango extract able to reduce ferric ions more effectively compared to guava extract. FTC test significantly ( $p < 0.05$ ) showed that both mango and guava extracts efficient slowed down the oxidation process compared to control group after seven days of incubation. PV control group was significantly high ( $p < 0.05$ ); 3.38 meq/kg as compared to other formulation groups. TBA analysis showed that mango and guava extract able to inhibit the oxidation process which similar to BHA. In conclusion, additional mango and guava extract did not affect on frozen CBM storage quality and consumers' acceptance.

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### **I117 Effects of drying on the physical characteristics of dehydrated watermelon rind candies**

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Journal of Tropical Agriculture and Food Science, Vol. 42(2), 2014, 115 -123

Dehydrated watermelon (*Citrullus lanatus*) rind candy was prepared using osmotic dehydrated process that involves slow impregnation of syrup before drying at 50 °C and 60 °C for 8, 14 and 20 h. It can be seen that the drying temperature and time significantly affected the moisture content and water activity of the dehydrated candy. The moisture content and water activity significantly decreased with increasing drying temperature and time. The hardness and stickiness

of the watermelon rind candy slightly increased with increasing drying time at 50 °C and 60 °C. For colour evaluation, the L\* values of dehydrated watermelon rind candy slightly decreased with increasing drying time while the a\* values slightly increased with increasing drying time. Watermelon rind candy that was dehydrated at 50 °C for 14 h was the most preferred sample by the panellists as it received the highest score for texture, taste and overall acceptability attributes.

## **I118 Functional properties of roselle (*Hibiscus Sabdariffa L.*) seed and its application as bakery product**

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Journal of Food Science and Technology, Vol. 51(12), 2014, 3830-3837

Roselle (*Hibiscus sabdariffa L.*) seed is a valuable food resource as it has an excellent source of dietary fibre. Therefore, this study examined the functional properties of roselle seeds. Replacement of cookie flour with roselle seed powder at levels of 0-30 % was investigated for its effect on functional and nutritional properties of cookies. Among the four formulations cookies, the most preferred by panelists was 20 % roselle seed powder cookie (F3), followed by 10 % roselle seed powder cookie (F2) and 30 % roselle seed powder cookie (F4). The least preferred formulation among all was control cookie (F1). Cookie with 20 % roselle seed powder added showed higher content of total dietary fibre (5.6 g/100 g) as compared with control cookie (0.90 g/100 g). Besides that, cookies incorporated with roselle seed powder exhibited improved antioxidant properties. Thus, roselle seed powder can be used as a dietary fibre source and developed as a functional ingredient in food products.

## **I119 Quality changes and antioxidant properties of Microencapsulated Kenaf (*Hibiscus Cannabinus L.*) seed oil during accelerated storage**

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Journal of the American Oil Chemists' Society, Vol. 90 (12), 2013, 1859-1867

Quality changes and antioxidant properties of microencapsulated kenaf (*Hibiscus cannabinus L.*) seed oil (MKSO) were investigated at 6-day intervals during 24 days of storage at 65°C. DPPH, ABTS, FRAP and BCB assays were used to determine the antioxidant activity (AOA) and their correlations were reported. Total flavonoids content (TFC) and oxidative stability in terms of evolution of thiobarbituric acid reactive substances (TBARS) were also studied. The results showed that there was a significant ( $p < 0.05$ ) effect of microencapsulation whereby AOA of MKSO showed only a 23.28 % decrease as compared to a 61.51 % decrease in the control bulk oil (KSO) when assessed by FRAP. MKSO showed significantly ( $p < 0.05$ ) lower reduction of its initial TFC



as compared to KSO and total increase in TBARS of MKSO was reported to be significantly ( $p < 0.05$ ) lower than that of KSO. AOA determined by all assays were well correlated with TFC and also among themselves. Microencapsulation of kenaf seed oil was found to be effective in the stabilisation of natural antioxidants and prolonging the shelf-life.

## **I120 Nutritional composition and sensory properties of *Kuih Baulu* incorporated with stabilized rice bran**

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Journal of Tropical. Agricultural and Food Science, Vol.39 (1), 2011

Rice bran is a valuable by-product from the rice processing industry. Stabilised rice bran (SRB) was used to complement rice flour (MR 220) to add value to Malaysian traditional sponge cake known as kuih baulu. Four levels of stabilised rice bran (10, 20, 30 and 40%) were used in the formulations. Chemical analysis and sensory evaluation were carried out. The protein, fat and ash contents increased with increasing proportions of the rice bran. All SRB-incorporated kuih baulu had higher values for mineral and vitamin contents as compared to the control. Products with 20-40% levels of rice bran were significantly different from the control sample in terms of colour, texture, taste, flavour and overall acceptability. For texture, tenderness was found to increase with increasing SRB content. Panellists indicated that the addition of SRB resulted in darker kuih baulu. SRB could replace about 30% rice flour without diminishing acceptability. Sensory evaluation showed that all SRB-incorporated kuih baulu were acceptable.

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## **I121 Drying of Stevia leaves using laboratory and pilot scale dryers**

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Journal of Tropical Agriculture and Food Science, Vol. 41(1), 2013, 137-147

Drying at temperatures of 50 - 60 °C was an effective method in removing moisture content of *Stevia* plants. At this temperature, the quality of dried leaves produced in terms of colour, sweetness and nutrient content was better compared with drying at 70 °C. The drying process took 5 to 6 h using a laboratory dryer and more than 7 h using a pilot scale dryer to reduce the moisture content from 80% to 3 - 5%. A total of 72 - 74% dried leaves were obtained after threshing the final dried samples. The dried leaves had a brighter ( $L^*$ ), greener ( $a^*$ ) and slightly yellow ( $b^*$ ) colour with values of 54, - 3.0 and 9 respectively, when dried at 50 °C compared to samples dried at 60 - 70 °C. Dried *Stevia* leaves contained stevioside and various types of nutrients and minerals. In every 100 g of dried leaves, there were 16 g protein, 65 g carbohydrate, 2,805 mg potassium, 620 mg calcium, 268 mg phosphorous and 16 mg vitamin C. Dried *Stevia* leaves also contained soluble sugars at 5 - 7% brix with pH around 6.

## I122 Effect of pre-slaughter stunning on the death of the poultry and myofiber apoptosis

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International Food Research Journal, Vol. 21(6), 2014, 2279-2284

The effectiveness of poultry stunning in producing swift slaughtering was analysed in response to the time needed for the chickens to become insensible upon neck cutting (Td) and the induction of myofiber apoptosis. In total, 49 chicken broilers (BW of  $2.17 \pm .24$  kg) were sacrificed with pre-slaughter stunning, using a constant voltage stunner where the electric current varied between 7.2 to 124.3 mA, and without stunning. The electric current applied during stunning was found to have no effect on Td. Number of apoptotic myonuclei did not vary among stunned and unstunned meat. Apoptosis inducing factor (AIF) and caspase 3 expressions were also not detected in the meat samples of both stunned and unstunned groups at 1 d postmortem. Since the slaughtering process and stunning are associated with stress, the expression of 70 kDa-heat shock protein (Hsp70) was investigated. Moreover Hsp70 is also an inhibitor of apoptosis, by preventing the activation of AIF and apoptosome which stimulates caspase 3 activation. However, expression of Hsp70 was not induced in both stunned groups and unstunned groups. Together, this study found that poultry stunning does not affect Td and myofiber apoptosis.

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## I123 Optimization of soaking conditions for the production of seaweed (*Kappaphycus Alverazii*) paste using response surface methodology

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International Food Research Journal, Vol.21 (1), 2014, 471-477

The effects of soaking conditions on the quality characteristics of seaweed paste of *Kappaphycus alverazii* species were studied. Response Surface Methodology (RSM) with a 2-factor, 5-level central composite design (CCD) was conducted to determine the optimum soaking conditions. The interactive effect of dry seaweed: soaking water ratio (X1= 1: 15-50) and soaking duration (X2= 30-120 min) on the gel strength (g), whiteness, expansion (%), moisture content (%) and protein content (g/100 g) of the paste were determined. Results showed that the experimental data could be adequately fitted into a second-order polynomial model with multiple regression coefficients (R<sup>2</sup>) of 0.8141, 0.9245, 0.9118, 0.9113 and 0.9271 for the gel strength, whiteness, expansion, moisture content and protein content, respectively. The gel strength, whiteness, expansion, moisture content and protein content of seaweed paste were dependent on the ratio of dry seaweed to soaking water and also soaking duration. The proposed optimum soaking conditions for the production of seaweed paste is at a ratio of 1:15 (dry seaweed: soaking water) and soaking duration of 117.06 min. Based on the result obtained, the RSM demonstrated a suitable approach for the processing optimization of *Kappaphycus alverazii* paste.

## **I124 Effect of different packaging materials on the shelf life of modified atmosphere packaged red tilapia (*Oreochromis Mossambica*) fillets**

**Siah WM and Mohd Tahir S.**

Food Technology Research Centre, MARDI Headquarters, Serdang, Kuala Lumpur, Malaysia.

International Food Research Journal, Vol. 18(3), 2011, 1091-1095

The effect of four different packaging films: (1) linear low density polyethylene/ethylene vinyl alcohol/linear low density polyethylene (LLDPE/EVOH/LLDPE, 60  $\mu\text{m}$ ); (2) oriented nylon/polyethylene (ONy/PE, 70  $\mu\text{m}$ ); (3) oriented polypropylene/polypropylene (OPP/PP, 60  $\mu\text{m}$ ); and (4) high density polyethylene (HDPE, 50  $\mu\text{m}$ ) on the shelf life of modified atmosphere packaged Red Tilapia (*Oreochromis mossambica*) fillets were studied. pH, K-value, microbial growth, as well as sensory alterations during storage under modified atmosphere of 80% CO<sub>2</sub> : 20% N<sub>2</sub> at 2  $\pm$  2oC were monitored. Fillets packaged in LLDPE/EVOH/LLDPE and ONy/PE showed a further inhibition of biochemical, microbiological and sensory deterioration compared with OPP/PP and HDPE-packaged fillets. pH, K-value, and total plate counts of LLDPE/EVOH/LLDPE and ONy/PE-packaged fillets were significantly lower ( $p < 0.05$ ) than OPP/PP and HDPE-packaged fillets throughout the storage periods. The shelf life of tilapia fillets packaged in LLDPE/EVOH/LLDPE and ONy/PE were 14 days, whereas fillet in OPP/PP was 9 days, and 6 days when packaged in HDPE.

## **I125 Effects of packaging materials and storage on total phenolic content and antioxidant activity of Centella Asiatica drinks**

**Siah WM<sup>1</sup>, FaridahH<sup>1</sup>, Rahimah MZ<sup>1</sup>, Mohd Tahir S<sup>1</sup> and Mohd Zain D<sup>1</sup>**

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Journal of Tropical Agriculture and Food Science, Vol. 39(1), 2011, 29-35

The effects of packaging materials and storage time on total phenolic content and antioxidant activity of Centella asiatica drinks were studied. The total phenolic content and antioxidant activity were determined using Folin-Ciocalteu method and 2, 2-diphenyl-1-picrylhydrazyl (DPPH) assay respectively. All analyses were carried out monthly for a period of one year for drinks packaged in high density polyethylene (HDPE) bottles, polypropylene (PP) bottles, standing pouches and cans, which were stored at ambient temperature (27  $\pm$  5  $^{\circ}\text{C}$ , RH = 75-85%). The total phenolic content and antioxidant activity remained stable for the first month of storage regardless of the types of packaging materials used. Significant decrease ( $p < 0.05$ ) was noticed after 2 months storage. Drinks in cans had the greatest decrease, followed by drinks in PP bottles and HDPE bottles, while drinks in standing pouches gave the highest reading throughout the storage period.

## I126 Nutritive qualities of patties prepared with mixture of meat and oyster mushroom

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International Food Research Journal, Vol. 21(5), 2014, 2001-2006

Nutritive qualities of patties prepared from chicken, beef and oyster mushroom were determined. Three groups of rats were fed with patty diets prepared with either a combination of 75% chicken + 25% oyster mushroom (CMP) or 75% beef + 25% oyster mushroom (BMP) or 100% chicken patty + 0% oyster mushroom (CP). There was no significant difference ( $P < 0.05$ ) in total tryglyceride (0.3-0.5 mmol/L), total cholesterol (1.7-1.9 mmol/L) LDL-cholesterol (0.3- 0.4 mmol/L) and HDL-cholesterol (1.2-1.4 mmol/L) for all groups except for protein free. Protein efficiency ratio (PER) values of CMP and BMP groups were significantly lower than casein group but significantly higher than chicken patty (CP) group. Both CMP and BMP fed groups recorded PER values at 1.73 and 1.69 while CP had PER value at 1.52. The AD of rats fed with CMP, BMP and CP diets were closely ranged from 98.3-98.9% but not significant as compared to casein diet group (98.5%). The close AD values between CMP, BMP and CP indicated that the mixture of patty protein from either chicken or beef with protein of oyster mushroom did not affect digestibility aspect. In summary, addition of oyster mushroom into either chicken or beef patties did not changed AD but improved PER value, thus proving that oyster mushroom could be used as an alternative ingredient to replace meat partially in the making of patties.

A large, bold, red letter 'I' is centered in the upper half of the page. The background consists of a pattern of overlapping, semi-transparent triangles in various shades of red and pink, creating a geometric, crystalline effect.

# **Food Science And Technology**

**(Food Antioxidant)**

## I127 Tocotrienols: molecular aspects beyond its antioxidant activity

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Journal of Medical Research and Practice, Vol. 2(9), 2013, 246-250

Tocotrienols are the lesser-known components of the vitamin E family. Vitamin E family represent eight different isomers that belong to two classes:  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\zeta$  tocopherols and  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\zeta$  tocotrienols. Numerous studies have been done to compare the properties of tocotrienols with those of tocopherols and it was found that some biological activities were demonstrated to be unique for tocotrienols. Tocotrienols are the active components of many plants including annatto, rice bran, and palm. Research has been mostly focused on examining the antioxidant properties and cell signaling activities of tocopherols and tocotrienols. Although the antioxidative capability of tocotrienols is higher than that of tocopherols, tocotrienols show a lower bioavailability after oral administration. In this review, recent developments in the understanding of the molecular targets of the tocotrienols beyond their antioxidant activity are elaborated.

## I128 Oxidative stability of smoked chicken sausage substituted with red palm mid fraction during chilled storage

Alina AR<sup>1</sup>, Siti Mashitoh A<sup>2</sup>, Babji AS<sup>3</sup>, Maznah I<sup>4</sup>, Syamsul KMW<sup>1</sup> and Muhyiddin Y<sup>1</sup>.

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World Applied Sciences Journal, Vol. 17, 2012, 62-66

The effects of rice bran and carboxymethyl cellulose (CMC) on the oxidative stability of smoked chicken sausages were determined. Lipid oxidation was analyzed at several different days of chilled storage ( $n=3$ , for all measurements). Thiobarbituric acid (TBA) values and peroxide value (PV) of smoked chicken sausages increased throughout the nine days of storage ( $4^{\circ}\text{C}$ ). Chicken sausage formulated with Red Palm Mid Fraction (RPMF) showed significantly lower TBA value compared to the samples prepared with chicken fat ( $p<0.05$ ). However, -carotene content showed the highest significant value ( $p<0.05$ ) in sausage incorporated with RPMF. It was concluded that the utilization of RPMF significantly reduced the oxidation of lipid, which was indicated, by the TBA values. This study also showed that the small amount of dietary fiber (rice bran) also improve the oxidative stability of smoked chicken sausages. It can be suggest that the time for oxidation study need longer storage duration to see the good result plot and changes that occur can be determined clearly.

## 1129 Antioxidant properties of herbs with enhancement effects of drying treatments: A synopsis

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Free Radicals and Antioxidants, Vol. 3, 2013, 2-6

Our recent work on the antioxidant properties (AOP) of herbs showed that three species (*Etligeria elatior*, *Morus alba*, and *Thunbergia laurifolia*) displayed enhancement effects of microwave-, oven-, and freeze-drying. AOP analysed were total phenolic content (TPC), ascorbic acid equivalent antioxidant capacity (AEAC), ferric reducing power (FRP), and chelating efficiency concentration (CEC50). Microwave- and oven-drying led to drastic decline in AOP but freeze-drying resulted in significantly increase for leaves of *E. elatior*. Leaves of *M. alba* responded positively to all three drying treatments. TPC and FRP following oven-drying remained unchanged but AEAC and CEC50 increased by 27% and 22%, respectively. Freeze-drying resulted in increase in TPC (16%), AEAC (26%), FRP (20%), and CEC50 (44%). Microwave-drying increased TPC, AEAC, and FRP by 24%, 91%, and 30%, respectively. Microwave-drying enhanced AOP of *T. laurifolia* leaves. TPC and AEAC increased by 34% and 67%, respectively. Results indicated that different drying treatments have variable effects on AOP of herbs. Effects include little or no change, significant losses or enhancement in phenolic content and antioxidant activity. Decline in AOP following drying treatments has been attributed to thermal degradation of phytochemicals, enzymatic degradation of phenolic compounds and loss of antioxidant enzyme activities. Reasons for the increase in AOP following drying treatments include the release of bound phenolic compounds by the breakdown of cellular constituents and the formation of new compounds with enhanced antioxidant properties.

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## 1130 Antioxidant and sensory properties of Thai herbal teas with emphasis on *Thunbergia Laurifolia* lindl

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Chiang Mai Journal of Science, Vol. 39 (4), 2012, 599-609

Antioxidant properties (AOP) of 12 types of Thai herbal teas and five types of *Thunbergia laurifolia* teas were investigated. Total phenolic content (TPC), caffeoylquinic acid content, ascorbic acid equivalent antioxidant capacity (AEAC), ferric reducing power (FRP) and ferrous ion chelating (FIC) ability were assessed using the Folin-Ciocalteu, molybdate, 2,2-diphenyl-1-picrylhydrazyl, potassium ferricyanide and ferrozine assays, respectively. The Thai herbal teas comprised leaves, flowers and rhizomes of herbs, shrubs and trees. In general, there was positive correlation between TPC and primary antioxidant activities of AEAC and FRP. However, teas with potent primary antioxidant activities may not necessary have strong secondary antioxidant activity of FIC. Most herbal teas had lower antioxidant values than teas of *Camellia sinensis*, based on data from an earlier study. The most outstanding exception was *Lagerstroemia speciosa* (banaba) tea with AOP comparable or superior to those of green teas. Another exception was *Stevia rebaudiana* (stevia) tea with AOP comparable to oolong and/or black teas. *Morus alba* (mulberry) tea had stronger FIC ability than teas of *C. sinensis*. Teas of *T. laurifolia* produced from microwave drying

(MD), freeze drying (FD), oven drying (OD) and freeze withering (FW) were evaluated for their AOP and sensory properties, with comparisons to the commercial *T. laurifolia* or Rang Chuet (RC) tea. Values of *T. laurifolia* teas were significantly stronger than the RC tea, with the exception of the FW tea which had comparable properties. Ranking of AOP of teas was FD > MD > OD > RC~ FW. Results suggested that AOP of *T. laurifolia* teas were dependent on the degree of fermentation, i.e. fermented (FW, RC and OD) teas had lower antioxidant values than unfermented (MD and FD) teas. Results showed that the MD tea had the highest scores for aroma, flavour and overall acceptability.

## **I131 Antioxidant and antibacterial properties of some fresh and dried Labiatae herbs**

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Journal of Free Radicals and Antioxidants, Vol. 2 (3), 2012, 20-27

Although the antioxidant and antibacterial properties of Labiatae herbs are well known, the effects of different drying methods are yet to be determined. In this study, the antioxidant and antibacterial properties of fresh and oven-dried herbs of oregano, marjoram, rosemary, sage, basil, thyme, peppermint, and spearmint were investigated, in comparison with commercial brands of dried herbs. Antioxidant properties of total phenolic content, total flavonoid content, caffeoylquinic acid content, free radical scavenging activity, and ferric reducing power were assessed using the Folin-Ciocalteu, aluminium chloride, molybdate, DPPH radical scavenging, and potassium ferricyanide assays, respectively. Antibacterial properties were assessed using the disc-diffusion assay based on minimum inhibitory dose (MID). Bacteria tested were Gram-negative *Escherichia coli*, *Pseudomonas aeruginosa*, and *Salmonella typhi*, and Gram-positive *Bacillus cereus*, *Micrococcus luteus*, and *Staphylococcus aureus*. The three drying treatments were oven drying at 50°C (OD50), oven drying at 80°C (OD80), and oven drying at 50°C with microwave pre-treatment (MOD50). Fresh and commercial rosemary, and oven-dried oregano had the strongest antioxidant properties. Generally, MOD50 herbs had the strongest antioxidant properties followed by OD50 and OD80 herbs. Oven-dried rosemary had lower phenolic content and antioxidant activity than commercial rosemary, while oven-dried oregano, spearmint, thyme, peppermint, and basil had higher values. All herbs showed no antibacterial activity against Gram-negative *E. coli*, *P. aeruginosa*, and *S. typhi*. Rosemary, sage, peppermint, and spearmint inhibited the growth of Gram-positive *B. cereus*, *M. luteus*, and *S. aureus*. Compared to green and black teas of *Camellia sinensis*, rosemary and sage have stronger antibacterial properties. Labiatae herbs can have enhanced antioxidant and antibacterial effects when used in combination. Further research is needed to study the synergistic behaviour of these herbs.

## **I132 Rosemary and Sage outperformed six other culinary herbs in antioxidant and antibacterial properties**

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International Journal for the Advancement of Science and Arts, Vol. 1, 2012, 142-151



The antioxidant and antibacterial properties of Labiatae culinary herbs are well documented but the effects of different drying methods are poorly studied. In this study, the antioxidant and antibacterial properties of fresh and oven-dried herbs of oregano, marjoram, rosemary, sage, basil, thyme, peppermint and spearmint were compared with available commercial herbs. Antioxidant properties of total phenolic content, total flavonoid content, caffeoylquinic acid content, free radical scavenging activity, ferric reducing power and ferrous ion chelating ability were assessed using the Folin-Ciocalteu, aluminium chloride, molybdate, DPPH radical scavenging, potassium ferricyanide and ferrozine assays, respectively. Antibacterial properties were assessed using the disc diffusion assay based on mean diameter of inhibitory zone and minimum inhibitory dose. The two drying treatments were oven drying at 50°C (OD) and microwave pretreatment followed by oven drying at 50°C (MOD). Fresh rosemary and oven-dried oregano had the strongest antioxidant properties. For most herbs, oven drying resulted in loss of antioxidant values compared to fresh herbs with the exception of oregano. Values of oven-dried oregano, spearmint, thyme, peppermint and basil were higher than commercial samples, while those of oven-dried rosemary were lower. Of the six commercial herbs, rosemary had the highest values, followed by oregano, spearmint, thyme, peppermint and basil. All herbs showed no antibacterial activity against Gram-negative *Escherichia coli*, *Pseudomonas aeruginosa* and *Salmonella typhi*. Rosemary, sage, peppermint and spearmint inhibited the growth of Gram-positive *Bacillus cereus*, *Micrococcus luteus* and *Staphylococcus aureus*. Rosemary and sage had stronger antibacterial properties than green and black teas of *Camellia sinensis*. When used in combination, rosemary and sage can have enhanced antioxidant and antibacterial effects, which are desirable in developing nutraceutical products, and in controlling rancidity and bacterial growth in food.

### 1133 Antioxidant and antibacterial properties of *Alpinia Galanga*, *Curcuma Longa*, and *Etlingera Elatior* (Zingiberaceae)

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Pharmacognosy Journal, Vol. 3 (22), 2011, 54-61

Antioxidant and antibacterial properties of methanolic extracts, non-polymeric phenolic fractions, and polymeric tannin fractions of leaves and rhizomes of *Alpinia galanga* and *Curcuma longa*, and leaves and inflorescences of *Etlingera elatior* were investigated. Antioxidant properties based on total phenolic content (TPC) and ascorbic acid equivalent capacity (AEAC) were screened using the Folin-Ciocalteu and 2,2-diphenyl-1-picrylhydrazyl (DPPH) assays, respectively. Antibacterial activity based on minimum inhibitory dose (MID) was tested against Gram-positive *Staphylococcus aureus*, *Micrococcus luteus*, and *Bacillus cereus* using the disc-diffusion method. The effect of ethylenediamine tetraacetic acid (EDTA) on the antibacterial properties of extracts and fractions was also studied. Extraction yields ranged from 4.1-6.0%. Yields of non-polymeric phenolic (NP) fractions (66-92%) were much higher than that of polymeric tannin (PT) fractions (0.5-10%), suggesting that the former were the major compounds. Highest TPC and AEAC were observed in the PT fraction of *A. galanga* rhizomes, in the crude extract and NP fraction of *C. longa* rhizomes, and in the PT fraction of *E. elatior* leaves. Leaf extracts and fractions of *A. galanga* and *C. longa* did not show any antibacterial activity against *S. aureus*, *M. luteus*, and *B. cereus*. Rhizome extracts and fractions of *A. galanga* and *C. longa* had no inhibitory effect on *M. luteus* and *S. aureus*, respectively. PT fractions of *E. elatior* leaves and inflorescences displayed no antibacterial activity. With the addition of 0.01 mg/ml of EDTA, extracts and fractions of *A. galanga*,

*C. longa*, and *E. elatior* showed moderate, weak, and strong responses, respectively. Strongest antibacterial activity was observed in the PT fraction of *A. galanga* rhizomes with MID of 0.06 mg/disc against all three bacterial species. PT fractions of *E. elatior* leaves and inflorescences displayed antibacterial activity with MID of 0.13 mg/disc, which showed no activity prior to the addition of EDTA. The effect of EDTA on the antibacterial activity of extracts and fractions of these three ginger species warrants further investigation.

### **I134 Antioxidant and antibacterial properties of green, black, and herbal teas of *Camellia Sinensis***

**Chan EWC, Soh EY, Tie PP and Law YP**

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Pharmacognosy Research, Vol. 3 (4), 2011, 266-272

The role of non-polymeric phenolic (NP) and polymeric tannin (PT) constituents in the antioxidant and antibacterial properties of six brands of green, black, and herbal teas of *Camellia sinensis* were investigated. Total phenolic content (TPC) and ascorbic acid equivalent antioxidant capacity (AEAC) were assessed using the Folin-Ciocalteu and 2,2-diphenyl-1-picrylhydrazyl (DPPH) assays, respectively. Minimum inhibitory dose (MID) against Gram-positive *Micrococcus luteus*, *Staphylococcus aureus*, and *Bacillus cereus*, and Gram-negative *Escherichia coli*, *Salmonella typhi*, and *Pseudomonas aeruginosa* was assessed using the disc-diffusion method. Teas were extracted with hot water successively three times for one hour each time. The extracts were fractionated using Sephadex LH-20 column chromatography to obtain the NP and PT constituents. Extraction yields ranged from 12 to 23%. Yields of NP fractions (70\_81%) were much higher than those of PT fractions (1-11%), suggesting that the former are the major tea components. Ranking of antioxidant properties of extracts was green tea>black tea>herbal tea. For all six teas, antioxidant properties of PT fractions were significantly higher than extracts and NP fractions. Extracts and fractions of all six teas showed no activity against the three Gram-negative bacteria. Green teas inhibited all three Gram-positive bacteria with *S. aureus* being the least susceptible. Black and herbal teas inhibited the growth of *M. luteus* and *B. cereus*, but not *S. aureus*. The most potent were the PT fractions of Boh Cameron Highlands and Ho Yan Hor with MID of 0.01 and 0.03 mg/disc against *M. luteus*. Results suggested that NP constituents are major contributors to the antioxidant and antibacterial properties of teas of *C. sinensis*. Although PT constituents have stronger antioxidant and antibacterial properties, they constitute only a minor component of the teas.

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### **I135 Analysis and evaluation of antioxidant properties of Thai herbal teas**

**Chan EWC, Lye PY and Tan LN**

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International Journal for the Advancement of Science and Arts, Vol. 2 (2), 2011, 8-15

Antioxidant properties of 12 types of herbal teas were investigated. Findings from this study were compared with the antioxidant properties of other herbal teas including green, oolong and black

teas of *Camellia sinensis*. Total phenolic content (TPC), ascorbic acid equivalent capacity (AEAC), ferric reducing power (FRP) and ferrous ion chelating efficiency concentration (CEC50) were assessed using Folin-Ciocalteu, 2,2-diphenyl-1-picrylhydrazyl (DPPH), potassium ferricyanide and ferrozine assays, respectively. Herbal teas comprised leaves, flowers and rhizomes of trees, shrubs and herbs. In general, there was positive correlation between TPC, AEAC and FRP i.e. plants with higher phenolic content had stronger primary antioxidant activities. However, plants with potent primary antioxidant activities may not necessarily have strong secondary antioxidant activities. Compared to teas of *C. sinensis*, herbal teas generally had lower antioxidant values. The most outstanding exception was banaba (*Lagerstroemia speciosa*) tea with antioxidant properties comparable or superior to those of green teas. In terms of CEC50, teas of banaba and mulberry (*Morus alba*) surpassed all *C. sinensis* teas. Another exception was tea of stevia (*Stevia rebaudiana*) with antioxidant properties comparable to oolong and/or black teas. Its CEC50 value was superior to most teas of *C. sinensis*.

### 1136 Standardised herbal extract of chlorogenic acid from leaves of *Etilingera elatior* (Zingiberaceae)

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Pharmacognosy Research, Vol. 3 (3), 2011, 178-184

Chlorogenic acid (CGA) or 5-caffeoylquinic acid, was found to be the dominant phenolic compound in leaves of *Etilingera elatior* (Zingiberaceae). The CGA content of *E. elatior* leaves was significantly higher than flowers of *Lonicera japonica* (honeysuckle), the commercial source. In this study, a protocol to produce a standardised herbal CGA extract from leaves of *E. elatior* using column chromatography was developed. Freeze-dried leaves of *E. elatior* were extracted with 30% ethanol, and sequentially fractionated using Diaion HP-20 and Sephadex LH-20. The CGA fractions, which yielded extracts of 10% and 40% w/w purity, possessed antioxidant, tyrosinase inhibition, and antibacterial properties. The entire fractionation process took only 6.5 hours, using gravity flow. From 50 g of leaves, the final yield of CGA extract was 0.2 g (0.4%). The CGA content of the standardised herbal extract from leaves of *E. elatior* (40%) is 1.6 times that of commercial extracts from honeysuckle flowers (25%). With high CGA content, the standardised herbal extract has a great potential to be developed into functional food and other health products. Leaves of *E. elatior*, which currently have no economic value, could serve as an alternative source of CGA. Leaves are large, available in abundance, and harvesting is non-destructive to the plants.

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### 1137 Effect of ethanol concentration, extraction time and extraction temperature on the recovery of phenolic compounds and antioxidant capacity of *Orthosiphon stamineus* extracts

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International Food Research Journal, Vol. 18 (4), 2011, 1427-143

Optimization of phenolic extraction from *Orthosiphon stamineus* was carried out in present study by investigating the effects of ethanol concentration (0-100%, v/v), extraction time (60-300 min) and extraction temperature (25-65oC) on the phenolic recovery using single factor experiment. Total phenolic content (TPC), total flavonoid content (TFC) and condensed tannins content (CTC) were used for determination of phenolic compounds while 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) radical-scavenging capacity and 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging capacity were used for evaluating the antioxidant capacities of crude extract. Experimental results showed that all extraction parameters had significant ( $p < 0.05$ ) effect on phenolic contents (TPC, TFC and ABTS) and antioxidant capacities (ABTS and DPPH) of crude extract. The optimized conditions for phenolic extraction were 40% ethanol for 120 min at 65oC with values of 2003.4 mg GAE/100 g DW for TPC, 1611.9 mg CE/100 g DW for TFC, 202.4 mg CE/100 g DW for CTC, 765.4  $\mu$ mol TEAC/100 g DW for ABTS and 2180.9  $\mu$ mol TEAC/100 g DW for DPPH. DPPH was found to be positively significantly correlated with TPC but negatively significantly correlated with CTC under the influence of ethanol concentration. As a function of extraction temperature, all antioxidant compounds assays (TPC, TFC and CTC) were negatively correlated with antioxidant capacities (ABTS and DPPH).

### **I138 Phenolic and flavonoid contents and antioxidant activities of selected Dabai (*Canarium Odontophyllum*) genotypes**

**Chua HP, Nicholas D and Suzalyna M**

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Journal of Tropical Agriculture and Food Science, Vol. 42(2), 2014, 1-10

Dabai (*Canarium odontophyllum*) or commonly known as 'Sarawak olive', is one of the potential seasonal fruits that has been given priority for development in Sarawak. In an attempt to make systematic comparisons and to identify the best genotype for further utilisation, the total phenolic and flavonoid contents and antioxidant activities of six different dabai fruit genotypes commonly available in the local markets were determined. Three edible fractions of the dabai fruit, namely the skin, pulp and kernel were also studied. Dabai skin fraction extract was found to exhibit the highest values in all four parameters studied i.e. total phenolic content (18.88 - 26.62 mg GAE/g), total flavonoid content (15.62 - 46.70 mg QE/g), DPPH free radical scavenging activity (19.90 - 30.15%) and  $\beta$ -carotene bleaching activity (41.75 - 61.55%). Positive correlations were observed in all four parameters studied. A negative correlation was also detected in total phenolic content and DPPH free radical scavenging activities of dabai fruit skin fraction.

### **I139 Determination of antioxidant activities of dried kacangma herb (*Leonurus Sibiricus*) extract in three bioassay systems**

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Journal of Tropical Agriculture and Food Science, Vol. 41(2), 2013, 221-229

Kacangma (*Leonurus sibiricus* L.) is a potential medicinal dan culinary herb of Sarawak which biological activities have not been fully studied. Antioxidant activities of ethanolic and aqueous extract of dried kacangma were studied under three bioassay systems namely, auto-oxidation of

linoleic acid lipid system (LP), xanthine oxidase superoxide scavenging activity (XOD) and 1,2-diphenyl-2-picrylhydrazyl radical scavenging activity (DPPH). Based on the antioxidant activity range, antioxidant activity of ethanolic extract was high in LP system (71.6%), moderate in XOD system (69.7%) and low in DPPH system (48.8%). On the other hand, antioxidant activity of aqueous extract was found high in all three bioassays with mean percentages of 72.7%, 76.3% and 78.2%, respectively. Thus, the result indicated that extraction using water was more efficient than ethanol in extracting antioxidant compounds from dried kacangma.

## 1140 Physicochemical and antioxidant characteristics of *Baccaurea Angulata* fruit juice extract

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African Journal of Biotechnology, Vol. 12 (34), 2013, 5333-5338

The purpose of this study was to explore the physicochemical and antioxidant characteristics of *Baccaurea angulata* fruit juice extract. Freeze-dried whole fruit (FDWF), freeze-dried berry (FDB), and freeze-dried skin (FDS) of *B. angulata* were analyzed for total phenolic, total flavonoid, total anthocyanin, and antioxidant activities. FDS recorded the highest moisture and ash content, protein, total fat, and water activity, compared to FDWF and FDB. FDS also contained the highest total phenolic, total flavonoid, and total anthocyanin, while FDWF recorded the highest in scavenging xanthine oxidase (35.9%) and ferric reducing activity (44.9 μM TE/g). FDS, however, showed the highest DPPH (102.66 mg AA/100 g) and TEAC (847.46 mg TE/100 g) values. DPPH, TEAC and FRAP were strongly correlated with total phenol ( $r = 0.979; 0.948; 0.997$ ) and total flavonoid ( $r = 0.987; 0.960; 0.992$ ). Total anthocyanin had no correlation with DPPH and TEAC, but moderately with FRAP ( $r = 0.734$ ). Physicochemical and antioxidant characteristics of *B. angulata* may indicate that this fruit may impart health benefits when consumed and can be suggested as a good source for nutraceutical beverages.

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## 1141 Antioxidant properties of ginger leaves: An overview

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Free Radicals and Antioxidants, Vol. 1 (1), 2011, 6-16

Past studies on the antioxidant properties (AOP) of ginger species were confined to rhizomes. Although leaves of ginger species have been used for food flavouring and in traditional medicine, little research has been done on their AOP until recent years. This overview is on recent work done on the AOP of ginger leaves. Emphasis is on variation between species, comparison with

rhizomes and flowers, altitudinal variation, effects of thermal and non-thermal drying methods, herbal teas, and commercial potentials. Of 26 ginger species, belonging to nine genera and three tribes, AOP of leaves were strongest in *Etilingera* followed by *Alpinia* and *Hedychium*. Eleven out of 14 species (78%) had significantly higher values in leaves than in rhizomes. Similar trends were also observed in other species of *Zingiber*, *Boesenbergia* and *Elettariopsis*. Leaves of highland populations of *Etilingera* had higher values than their lowland counterparts. Thermal drying of leaves of four species led to drastic declines in AOP but freeze drying led to significantly increase for leaves of *Etilingera elatior* and *Alpinia zerumbet*. AOP of hot-water extracts of the freeze-dried tea of *A. zerumbet* were found to be significantly higher than the commercial tea. A protocol to produce a standardised herbal extract of chlorogenic acid (CGA) from *E. elatior* leaves (40% purity) has been developed. With high CGA content of 1.6 times that of commercial extracts from honeysuckle flowers (25% purity), the standardised extract has great potential to be developed into functional foods and other health products.

### 1142 In vitro antioxidant properties of underutilized *Baccaurea Angulate* fruit

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International Journal of Advances in Agricultural & Environmental Engineering, Vol. 1(1), 2014, 144-150

Six different crude extracts were obtained from the skin, pulp and whole fruit freeze-dried samples of *Baccaurea angulata*, an underutilized tropical fruit from Borneo Island of Malaysia. The effect of solvents on; total phenolic contents, total flavonoid contents, total carotene contents, free radical scavenging activities, phosphatidylcholine peroxidation inhibition activities and qualitative-quantitative compositions of ascorbic acid, carnosic, catechin, cinnamic and myricetin using ultra high performance liquid chromatography were determined using their respective assays. The results indicated that methanol extracts contain higher TPC, TFC and TCC than PBS extracts for the various fruits' parts. Methanol extracts also showed remarkable antiradical activity. A strong correlation was also found between pulp and whole fruit. Overall, the variations in the UHPLC results among the various extracts were consistent with the results obtained for TPC, TFC, TCC, DPPH radical scavenging activity and lipid peroxidation inhibition activities of the various crude extracts, especially, methanol extracts.

### 1143 Antioxidant activity of pink-flesh guava (*Psidium Guajava L.*): Effect of extraction techniques and solvents

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Food Analysis Method, Vol.4, 2011, 100-107

The effect of commonly used techniques and solvents in the antioxidant activities of pink-flesh guava fruit were studied. The extraction techniques compared were homogenization, shaking,

sonication, magnetic stirring, and maceration for 1, 2, and 3 days. The solvent systems used were methanol, ethanol, and acetone at three different concentrations (50%, 70%, and 100%) and with 100% distilled water. The antioxidant activity of the fruit was evaluated using Folin-Ciocalteu index, ferric-reducing antioxidant power assay, and 1,1-diphenyl-2-picrylhydrazyl free radical-scavenging capacity. Ultrasonic and homogenization were the best techniques to extract the antioxidant from guava fruit. Homogenization technique was found to be the most convenient exhaustive and time-saving extraction technique. Results showed that the extracting solvent significantly ( $P < 0.05$ ) altered the antioxidant property estimations of pink-flesh guava fruit. Pure solvents were inefficient extraction media for antioxidant. Enhanced extraction yields were obtained from solvent containing higher water concentrations and 50% acetone is a recommended solvent for extracting antioxidants compounds from pink-flesh guava fruit. High correlations between phenolic compositions and antioxidant activities of pink-flesh guava extracts were observed. High levels of antioxidant activities were detected in pink-flesh guava, indicating that the fruit may serve as an excellent dietary source of natural antioxidants.

## 1144 Antioxidative and cardioprotective properties of anthocyanins from defatted Dabai extracts

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Evidence-Based Complementary and Alternative Medicine, Vol. 2013, Article ID 434057

This study aimed to determine anthocyanins and their antioxidative and cardioprotective properties in defatted dabai parts. Anthocyanins in crude extracts and extract fractions of defatted dabai peel and pericarp were quantified using UHPLC, while their antioxidant capacity and oxidative stress inhibition ability were evaluated by using DPPH and CUPRAC assays as well as linoleic acid oxidation system, hemoglobin oxidation, and PARP-1 inhibition ELISA. Cardioprotective effect of the defatted dabai peel extract was evaluated using hypercholesterolemic-induced New Zealand white rabbits. Six anthocyanins were detected in the defatted dabai peel, with the highest antioxidant capacities and oxidative stress inhibition effect compared to the other part. The defatted dabai peel extract has also inhibited lipid peroxidation (plasma MDA) and elevated cellular antioxidant enzymes (SOD and GPx) in the tested animal model. Major anthocyanin (cyanidin-3-glucoside) and other anthocyanins (pelargonidin-3-glucoside, malvidin-3-glucoside, cyanidin-3-galactoside, cyanidin-3-arabinoside, and peonidin-3-glucoside) detected in the defatted dabai peel are potential future nutraceuticals with promising medicinal properties.

## **I145 Oxidative stability study of virgin coconut oil during deep frying**

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Journal of Tropical Agriculture and Food Science, Vol. 40(1), 2012, 35-44

Comparative deep frying study of refined, bleached and deodorized (RBD) palm olein, RBD coconut oil and virgin coconut oil (VCO) from Malaysia and Indonesia for frying of potato chips was undertaken at 170°C for 5 consecutive days. Several oil quality parameters were evaluated, i.e. free fatty acids content, iodine value, peroxide value, color index, viscosity, percentage of total polar materials (TPM) and other products of oxidation (E1% at 233 and 269 nm). VCO from Malaysian Agricultural Research and Development Institute (MARDI) was found to be the least susceptible to oxidative deterioration. The oxidative stability of the different oils studied was in the order: VCO (Indonesia) < RBD palm olein < RBD coconut oil < VCO (MARDI). It was concluded that percentage of TPM and smoke point measures were not suitable as quality parameters to assess the frying performance of virgin coconut oil due to their polarity structure of medium-chain triglyceride.

## **I146 A review of the use of Piper betel in oxidative stress disorders**

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Clinica Terapeutica, Vol. 165(5), 2014, 199-201

Increase in prevalence of disease related oxidative stress disorders have been on the rise in the entire world since the past decades. Significant positive effects with few antioxidant properties in the modern drugs pave for the alternative medicines in managing the disease. Piper betel (*P. betel*), a herb, is known to possess high anti-oxidant, anti-diabetic, anti-atherosclerosis, anti-hyperlipidemic, anti-cancer and neuroprotective property. This review focused on the effect of *P. betel* on diabetes mellitus, atherosclerosis and chronic kidney disease, Alzheimer's disease and breast cancer. *P. betel* proved to show positive effects with specific outcomes towards these diseases. Moreover, the promising effect of *P. betel* in vitro studies was also highlighted in the present review. It is believed that the findings obtained in this review will draw the attention of the medical professionals and general public towards *P. betel* and it will open the door for further detailed research.



**1147 Total phenolic content and antioxidant activity of kesum (*Polygonum minus*), ginger (*Zingiberofficinale*) and turmeric (*Curcuma longa*) extract**

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International Food Research Journal, Vol. 18, 2011, 529-534

Herb and spices namely kesum, ginger and turmeric were extracted by using juice extractor without the additional of solvent. These herb and spices were determined for moisture content and the extracts were analyzed for total phenolic content (TPC) and antioxidant activity (DPPH radical scavenging assay and FRAP ferric-reducing antioxidant power assay). The yield of kesum, ginger and turmeric extraction was 23.6%, 58.6% and 66.4%, respectively. The results showed that, there was significant difference ( $P < 0.05$ ) in total phenolic content and antioxidant activity for kesum, ginger and turmeric extracts. Kesum extract had the highest total phenolic content followed by ginger and turmeric extract. A significant and positive high Pearson's correlations between TPC and DPPH assay ( $r = 0.86$ ) and between TPC and FRAP assay ( $r = 0.91$ ) respectively was observed for all plants extracts. This indicated that phenolic compounds were the main contributor of antioxidant activity in plants. However, there was no synergistic effect observed for all plants extract mixture.

**1148 Antioxidant and hepatoprotective effect of aqueous extract of germinated and fermented mung bean on ethanol-mediated liver damage**

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Malaysian Agricultural Research & Development Institute (MARDI), Kuala Lumpur, Malaysia.

Biomedicine Research International, Vol.13, 2013

Mung bean is a hepatoprotective agent in dietary supplements. Fermentation and germination processes are well recognized to enhance the nutritional values especially the concentration of active compounds such as amino acids and GABA of various foods. In this study, antioxidant and hepatoprotective effects of freeze-dried mung bean and amino-acid-and GABA-enriched germinated and fermented mung bean aqueous extracts were compared. Liver superoxide dismutase (SOD), malondialdehyde (MDA), ferric reducing antioxidant power (FRAP), nitric oxide (NO) levels, and serum biochemical profile such as aspartate transaminase (AST), alanine transaminase (ALT), triglycerides (TG), and cholesterol and histopathological changes were examined for the antioxidant and hepatoprotective effects of these treatments. Germinated and fermented mung bean have recorded an increase of 27.9 and 7.3 times of GABA and 8.7 and 13.2 times of amino acid improvement, respectively, as compared to normal mung bean. Besides, improvement of antioxidant levels, serum markers, and NO level associated with better histopathological evaluation indicated that these extracts could promote effective recovery from hepatocyte damage. These results suggested that freeze-dried, germinated, and fermented mung bean aqueous extracts enriched with amino acids and GABA possessed better hepatoprotective effect as compared to normal mung bean.

**I149 Free radical scavenging activity and phenolic content of *Ficus Deltoidea* accessions MFD4 and MFD6 leaves**

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Journal of Tropical Agriculture and Food Science, Vol. 39(1), 2011, 85-92

Methanol extracts of leaves from *Ficus Deltoidea* accessions, MFD4 & MFD6, were examined for phenolic constituents and free radical scavenging activity, to determine their potential as a source of natural antioxidants. Total phenolic and flavonoid contents were evaluated according to the Folin-Ciocalteu procedure and a colorimetric method respectively. The results showed that total phenolic compounds and flavonoid content were higher in MFD6 than MFD4. Antiradical activity determined in terms of per cent inhibition by the DPPH radical scavenging method was higher in MFD4 than MFD6.

**I150 Oxidative stability of sunflower oils supplemented with kenaf seeds extract, roselle seeds extract and roselle extract, respectively under accelerated storage**

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International Food Research Journal, Vol. 20 (2), 2013, 645-651

With the concern of adverse effects of lipid oxidation on food deterioration and human health, the antioxidant activities of kenaf seed extracts (KSE), roselle seed extracts (RSE) and roselle extracts (RE) were evaluated by comparing its oxidative stability in refined, bleached & deodorised (RBD) sunflower oils with that of in synthetic antioxidant, BHA. Established methods such as peroxide values (PV), p-anisidine values (AV), TOTOX values, free fatty acids (FFA), iodine values (IV), total phenolic contents (TPC), conjugated dienes (CD) and conjugated triene (CT) were employed to assess the extent of oil deterioration. During 24 days storage, consensus was accomplished based on the results assessed by PV, TOTOX, CD, CT, IV and TPC at which the antioxidant activities of KSE, RSE and RE were better than BHA. Surprisingly, the results obtained by AV and FFA assays showed the reversed. Among the extracts, RSE exhibited the best antioxidant activities. These suggest that KSE, RSE and RE may be used as potential source of natural antioxidants in the application of food industry to prevent lipid oxidation.

**I151 In vitro antioxidant activities of extract and oil from Roselle (*Hibiscus Sabdariffa* L.) seed against sunflower oil autoxidation**

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Malaysian Journal of Nutrition, Vol. 18 (2), 2012, 265-274

In order to overcome the stability problems of oils and fats, synthetic antioxidants such as butylated hydroxyanisole (BHA), butylatedhydroxytoluene (BHT) and tert-butyl hydroquinone (TBHQ) have wide spread use as food additives in many countries. Recent reports reveal that these compounds may be implicated in many health risks, including cancer and carcinogenesis. Hence, there is a move towards the use of natural antioxidants of plant origin to replace these synthetic antioxidants. Methods: In this study, roselle seed oil (RSO) and extract (RSE) were mixed with sunflower oil, respectively to monitor degradation rate and investigate antioxidant activity during accelerated storage. Results: The antioxidant activity was found to stabilise sunflower oil of various samples and in the order of RSE>RSO>tocopherol>sunflower oil. The total percentage increased after 5 days of storage period in free fatty acid (FFA), peroxide value (PV) and anisidine value (AV). Total oxidation value (TOx) of sunflower oil supplemented with 1500 ppm RSE was 33.3%, 47.7%, 14.5%, and 45.5%, respectively. While the total percentage increased under different analysis methods, sunflower oil supplemented with 5% RSO was 17.2%, 60.4%, 36.2% and 59.0% in the order of FFA, PV, AV and TOTOX. Both RSO and RSE were found to be more effective in stabilisation of sunflower oil compared to tocopherol. Total phenolic content of RSE was  $46.40 \pm 1.51$  mg GAE/100g of oil while RSO was  $12.51 \pm 0.15$  mg GAE/100g of oil. Conclusion: The data indicates that roselle seed oil and seed extract are rich in phenolics and antioxidant activities and may be a potential source of natural antioxidants.

## 1152 Antioxidant capacities and total phenolic contents increase with gamma irradiation in two types of Malaysian honey

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Molecules, Vol. 16 (8), 2011, 6378-6395

Two types of monofloral Malaysian honey (Gelang and Nenas) were analyzed to determine their antioxidant activities and total phenolic and flavonoid contents, with and without gamma irradiation. Our results showed that both types of honey can scavenge free radicals and exhibit high antioxidant-reducing power; however, Gelang honey exhibited higher antioxidant activity ( $p < 0.05$ ) than Nenas honey, which is in good correlation ( $r = 0.9899$ ) with its phenolic contents. Interestingly, we also noted that both irradiated honeys have higher antioxidant activities and total phenolic and flavonoid contents compared to nonirradiated honeys by Folin-Ciocalteu and UV-spectrophotometry methods, respectively. However, HPLC analysis for phenolic compounds showed insignificant increase between irradiated and nonirradiated honeys. The phenolic compounds such as: caffeic acid, chlorogenic acid, ellagic acid, p-coumaric acid, quercetin and hesperetin as indicated by HPLC method were found to be higher in Gelang honey versus Nenas honey. In conclusion, irradiation of honey causes enhanced antioxidant activities and flavonoid compounds.

## 1153 Effect of different factors on goat milk antioxidant activity

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International Journal of ChemTech Research, Vol.6 (5), 2014, 3091-3196

Goat milk is an excellent source of antioxidants. This study aims to investigate the effect of different factors, such as milk pasteurization treatment, milk lactation stage, and geographic location, on the antioxidant activity of goat milk. Results showed that these factors significantly affected ( $P < 0.05$ ) the antioxidant capacity of goat milk. The first lactation and unpasteurized milk exhibited higher antioxidant activity in total phenol content (TPC), ferric reducing antioxidant power (FRAP), and 2,2-diphenyl-1-picryl hydrazyl (DPPH) assays than the middle and pasteurized milk. Among the geographic locations, Bander Baru Bangi possessed the highest antioxidant capacity, with 523.80 mg GA/100 g FW of TPC, 456.65 mg TE/100 g FW of FRAP, and 65.85% of DPPH. The effects of the three factors on the antioxidant activity of goat milk should be considered.

## 1154 The influence of growing environment on the total phenol content and antioxidant activity of *Ficus Hispida* leaves and fruits

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International Journal of ChemTech Research, Vol.6 (7), 2014, 3742-3747

Antioxidant activities in the leaves and fruits of *Ficus hispida* from different growing environment of Malaysia (Tasik Chini, Tasik Bera, Ayer Hitam and UKM Forest) were evaluated using the total phenol content (TPC), 1, 1-diphenyl-2-picrylhydrazyl free radical (DPPH) and ferric reducing/antioxidant power (FRAP) and oxygen radical absorbance capacity (ORAC). Variations in antioxidant activity and total phenolic content in fruit samples among growing locations were much greater than the variation observed between parts of plant (leaves and fruits), indicating that growing locations plays a more important role than parts of plant (leaves and fruits) in *Ficus hispida*. The data indicated that the fruits (Tasik Chini) had the highest total phenolic content (285.42 mg/ 100g DW) and antioxidant activity FRAP, DPPH and ORAC (231.02mg/100g DW, 84.03%, and 84.03<sub>mol</sub>/g TE) respectively, while leaves (UKM forest) had the lowest total phenolic content (138.59 mg/ 100g DW) and antioxidant activity FRAP, DPPH and ORAC (126.40 mg/100g DW, 70.87%, and 70.87<sub>mol</sub>/g TE) respectively. Correlation analyses indicated that there was a linear relationship between antioxidant activity and the total phenolic content in fruits and leaves. However, growing locations play an important role in the total phenol content and antioxidant activity of *Ficus hispida* leaves and fruits.

**I155 Effect of infusion conditions on the total phenolic content and antioxidant activity in pegaga (*Centella Asiatica*) tea infusion**

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Journal of Tropical Agriculture and Food Science, Vol. 39(2), 2011, 149-156

The effect of different infusion conditions (water temperature, steeping time and multiple infusions) on the total phenolic content (TPC) and antioxidant activity (AOA) of pegaga tea infusions were studied. Total phenolic content and antioxidant activity were determined spectrophotometrically using Folin-Ciocalteu method and 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay respectively. The extraction efficiency of these compounds strongly depends on the infusion conditions. The obtained results suggested that higher water temperature and shorter steeping time as well as lower water temperature and longer steeping time are the best combination for the extraction of bioactive compounds of pegaga tea. The highest TPC and AOA were detected in pegaga tea infused at 100 oC for 5 min and 80 oC for 10 min, while the lowest TPC and AOA was detected in infusions at 60 oC for 3 min. The study also showed that TPC and AOA were higher in the first infusion rather than second and third infusions. However, pegaga tea can be re-infused with the same leaves although the TPC and AOA decreased in the later infusions.

**I156 Antioxidant properties of three banana cultivars (*Musa Acuminata* 'Berangan', 'Mas' and 'Raja') extracts**

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Sains Malaysiana, Vol. 41(3), 2012, 319-324

The effect of solvent type in antioxidant compounds extraction from banana tissues was studied. The solvent system used was pure methanol, ethanol, acetone and their aqueous solution at 50% and 70% concentrations. Comparison among three common cultivars of banana in Malaysia (Berangan, Mas and Raja) had been done and their antioxidant activities were determined by 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging system, ferric reducing ability in plasma (FRAP) assays and total phenolic content (TPC) assays. Acetone 70% had the strongest antioxidant compounds extraction power as compared to other solvent. All banana samples were found to be low in primary antioxidant but powerful secondary antioxidant source of fruit. The ascending order of banana cultivars in term of their antioxidant activities in all antioxidant assays carried out were Berangan < Mas < Raja. FRAP-TPC assays were highly correlated ( $R^2 > 0.70$ ) than FRAP-DPPH and TPC-DPPH assays due to the same mechanism that occurred in the reaction of FRAP and TPC assays.

## **I157 Antioxidant properties: Effects of solid-to-solvent ratio on antioxidant compounds and capacities of Pegaga (*Centella asiatica*)**

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International Food Research Journal, Vol. 18, 2011, 557-562

The objective of this study was to evaluate the effects of solid-to-solvent ratio (1:5, 1:10, 1:15 and 1:20) on the extraction of phenolic compounds (TPC and TFC) and antioxidant capacity (ABTS and DPPH radical scavenging capacity) of *C. asiatica*. Solid-to-solvent ratio 1:15 was the optimum condition for extraction of phenolic compounds (TPC and TFC) with a value of 967.2 mg GAE/100 g DW and 908.3 mg CE/100 g DW, respectively and exhibited high antioxidant capacities (ABTS and DPPH radical scavenging capacities) with a value of 0.8133 mM and 2.0945 mM, respectively. TPC was positively and strongly correlated with ABTS and DPPH ( $r=0.808$  and  $r=0.859$ , respectively) under the effects of solid-to-solvent ratio as compared to TFC, positively and moderately correlated ( $r=0.590$ ,  $r=0.663$ ) with ABTS and DPPH.

## **I158 Treatment of dementia with herbs: A short review**

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La Clinica Terapeutica, Vol. 164(1), 2013, 43-46

Dementia is a common symptom observed in many psychiatric and neurodegenerative diseases. Alzheimer's disease is the most common form of senile dementia seen in the general population. Multiple factors like oxidative stress, apoptosis, mitochondrial dysfunction and inflammation may be related to the neurodegenerative states. Many drugs like cholinesterase have been used for treatment but the progression of the disease still poses a challenge to the clinician. During recent times, herbs have gained much popularity as supplements because of the cost effectiveness, easy availability and fewer side effects. Early diagnosis and proper treatment may help in the prevention of mortality and morbidity concerned with any neurodegenerative disease. Understanding the cellular and molecular biology of the mode of the action of herbal products may be beneficial for researchers and clinicians. The present review article attempts to look into the potential herbal extracts which may act as an antioxidant in combating dementia.

## 1159 Antioxidant synergism between ethanolic *Centella Asiatica* extracts and $\alpha$ -tocopherol in model systems

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Food Chemistry, Vol. 138 (2-3), 2013, 1215-1219

The synergistic antioxidant effects of ethanolic extracts of *Centella asiatica* (CE), and  $\alpha$ -tocopherol have been studied. The types of interactions exhibited by CE and  $\alpha$ -tocopherol combined at different ratios were measured using three assays: 2, 2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid) diammonium salt (ABTS) radical-scavenging capacity, the  $\beta$ -carotene bleaching system and liposome peroxidation assays. Fixed-fraction isobolographic analysis was used to detect any inducement of the antioxidant activity compared with the individual activities of CE and  $\alpha$ -tocopherol. Of all synergistic combinations of CE and  $\alpha$ -tocopherol, only fraction 2/3 showed the synergistic combination that fits well in three different assays and can be explained by the regeneration of  $\alpha$ -tocopherol by CE despite the interaction effect of  $\beta$ -carotene present in the analytical assay. This phenomenon involved complex interactions between CE and  $\alpha$ -tocopherol to exhibit different degrees of interactions that eventually increased antioxidant activity.

## 1160 Rose, a potential nutraceutical: An assessment of the total phenolic content and antioxidant activity

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Journal of Pharmacy and Nutrition Sciences, Vol. 3, 2013, 30-37

*Rosa hybrida* L. was reported to contain high total phenolic content and antioxidant activity. The scarce information on antioxidant properties of Malaysian cultivated *R. hybrida* L. had led to the present study, which aimed to determine the effect of different solvent extraction on the total phenolic content and antioxidant activity of roses of different colours. All the 23 *R. hybrida* L. cultivars' petals extracted with 70% ethanol had significantly higher 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity compared to the water extraction. The five cultivars (03, 203, 205, 402 and M203) that comprise the highest DPPH scavenging activity were subjected to various antioxidant assays. Cultivar M203 showed highest total phenolic content (TPC) at all concentration. Cultivar M203 and 402 gave higher DPPH radical scavenging ability (EC<sub>50</sub>=107.08  $\mu$ g/ml) and 2, 2'-azino-bis (3-ethylbenzo-thiazoline-6-sulfonic acid) (ABTS) radical cation scavenging ability (EC<sub>50</sub>=258.13  $\mu$ g/ml). In ferric reducing antioxidant power assay, cultivar M203 has the highest trolox equivalent value at 200, 300 and 500  $\mu$ g/ml concentrations while in  $\beta$ -carotene bleaching assay, cultivars 03, 205, and M203 (at the concentration of 500  $\mu$ g/ml) showed higher antioxidant activity than synthetic antioxidant (BHA). Strong positive correlations were found between TPC and antioxidant activities, hence, suggesting that the high antioxidant activity of selected *R. hybrida* L. petals might be mainly contributed by the phenolic compounds. In general, cultivar M203 showed the best antioxidant activity with nutraceutical potential.

## 1161 The effectiveness of Rambutan (*Nephelium Lappaceum L.*) extract in stabilization of sunflower oil under accelerated conditions

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Antioxidants, Vol. 3(2), 2014, 371-386

The oxidative properties of sunflower oil supplemented with rambutan extract, (crude extract and its fractionated fraction, SF II) in comparison with synthetic antioxidant were investigated. The supplemented sunflower oils were stored under accelerated conditions for 24 days at 60 °C. For every 6-day interval, the oxidative properties of the supplemented sunflower oil were evaluated based on the following tests, namely peroxide value, p-anisidine value, Thiobarbituric Acid Reactive Substances (TBARS) assay, iodine value and free fatty acids. The total oxidation (TOTOX) values were also calculated based on the peroxide values and p-anisidine values. Rambutan extract is a potential source of antioxidant. The oxidative activities of the extracts at all concentrations were significantly ( $p < 0.05$ ) higher than the control. Generally, the partially fractionated fraction was more effective than the crude extract. With a 2-year storage period at ambient temperature, the fractionated fraction of the extract, SF II at 300 ppm, was observed to work more effectively than the synthetic antioxidant, t-Tocopherol, and it possessed a protective effect comparable with butylatedhydroxyanisole (BHA). Therefore, rambutan extract could be used as a potential alternative source of antioxidant in the oil industry or other fat-based products to delay lipid oxidation.

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## 1162 Characterization of phenolic compounds, carotenoids, vitamins and antioxidant activities of selected Malaysian wild edible plants

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International Journal of Food Sciences and Nutrition, Vol.64 (5), 2013, 621-631

This study was carried out to characterize phenolic compounds, carotenoids, vitamins and the antioxidant activity of selected wild edible plants. Plant extracts were purified, and phenolic compounds comprising 11 phenolic acids (hydroxybenzoic acid and hydrocinnamic acid) and 33 flavonoids (including catechin, glycosides and aglycones) were analysed using High Performance Liquid Chromatography - Diode Array Detector (HPLC-DAD). Furthermore, the contents of ascorbic acid and tocopherol ( $\alpha$  and  $\gamma$  tocopherol) and carotenoids (lutein and  $\beta$ -carotene) were also determined. The major phenolics identified consisted of glycosides of flavones (apigenin and luteolin) and flavonols (kaempferol and quercetin). Among the phenolic acids identified after hydrolysis, coumaric acid was the predominant phenolic acid in all the extracts of wild plants. Ascorbic acid [53.8 mg/100 g fresh weight (FW)] and  $\beta$ -carotene (656.5 mg/100 g FW) showed the highest content in the leaf of *Heckeria umbellatum*. In conclusion, the leaves of *H. umbellatum*, *Aniseia martinicensis* and *Gonostegia hirta* have excellent potential in the future to emerge as functional ingredients.



## 1163 Effects of extraction conditions on antioxidant properties of sapodilla fruit (*Manilkara Zapota*)

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International Food Research Journal, Vol. 20 (5), 2013, 2065-2072

This study investigated the effects of different percentages of ethanol (0 - 100%), extraction times (1 - 5 h) and temperatures (25 - 60°C) on total phenolic content (TPC) and antioxidant activity (AA) of sapodilla pulp and peel. TPC was determined by Folin-Ciocalteu reagent method, while AA was evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay, 2,2-azino-bis-(3-ethyl-benzothiazoline-6-sulfonic acid) (ABTS) radical scavenging assay, ferric reducing antioxidant power (FRAP) assay and β-carotene bleaching (BCB) assay. Based on the optimal extraction conditions used, sapodilla pulp extract had TPC of 3.89 mg GAE/g, 63.20% of DPPH scavenging activity, 4.30% of ABTS scavenging activity, 19.17% of BCB activity, and FRAP value of 15.24 mg TE/g; while its peel extract had TPC of 9.23 mg GAE/g, 92.95% of DPPH scavenging activity, 5.36% of ABTS scavenging activity, 8.14% of BCB activity, and 27.85 mg TE/g (FRAP value). Using the optimal extraction conditions for sapodilla pulp (40% ethanol as extraction solvent that extracted at 60°C for 4 h) and sapodilla peel (80% ethanol and 2 h extraction time at 40°C), highest antioxidants can be extracted from the pulp and peel.

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## 1164 Antioxidant potential of *Pleurotus Porrhgens* extract and application in sunflower oil during accelerated storage

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Chiang Mai Journal of Science, Vol. 40 (1), 2013, 34 - 48

The oxidative stability of refined sunflower oil supplemented with edible wild mushroom, *Pleurotus porrhgens* crude extract, its n-butanol fraction (n-BUT, from liquid-liquid partitioning), and semi-purified sub-fraction (SF) III and SFIV, were tested under accelerated storage conditions compared with BHA and α-tocopherol, by measuring their peroxide value, *p-anisidine* value, thiobarbituric acid-reactive substance, and iodine value. The total phenolic content (TPC), 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging and ferric reducing/ antioxidant power (FRAP) were also evaluated. *P. porrhgens*' SFIII exhibited highest DPPH scavenging, while n-BUT showed highest FRAP; TPC was found highest in crude extract. Generally, BHA and α-tocopherol are more protective in stabilizing the sunflower oil. *P. porrhgens*' SFIII and SFIV had short-term protective effect in secondary oxidation for 1/2-year; whilst crude extract retarded secondary oxidation (TBARS value) and extend the shelf-life upon 11/2-year. *P. porrhgens* extracts did not show similar retardation of lipid oxidation in sunflower oil as compared to α-tocopherol and BHA at 200 ppm. However, the higher concentration of *P. porrhgens* extracts that provided the protective effect in stabilizing sunflower oil can be further studied.

**I165 Activity-guided fractionation and evaluation of potent antioxidants from extract of angel wings mushroom, *Pleurotus Porrigens* (higher Basidiomycetes)**

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International Journal of Medicinal Mushrooms, Vol. 15 (1), 2013, 9-19

*Pleurotus porrigens* is a well-known edible, wild mushroom enjoyed as a delicacy by aborigines in Sabah and as source of income for the aborigines who collect and sell them at tamu (local market). This study aimed to evaluate the antioxidant activity in vitro and identify potent antioxidative components of aqueous extracts of *P. porrigens*. The antioxidant activities were evaluated using DPPH radical scavenging ability, ABTS radical cation inhibition activity, ferric reducing/ antioxidant power, and total phenolic content. Activity-guided purifications based on DPPH radical scavenging ability resulted in 5 subfractions (SF). The highest DPPH radical scavenging ability was found in SF-III and SF-IV, but all were lower than butylated hydroxyanisole (BHA) and  $\alpha$ -tocopherol. Analysis with high-performance liquid chromatography-diode array detectors found presence of ascorbic acid and (+)-catechin in SFs of *P. porrigens*, as well as some unidentified components that may have contributed to the radical scavenging ability. In conclusion, aqueous extract of *P. porrigens* possesses promising antioxidant activities, although they are lesser in their partially purified SFs. Nonetheless, *P. porrigens* could be promoted as an antioxidant-rich food as part of a normal diet that provides antioxidative benefit.

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**I166 Oxidative stability of sunflower oil supplemented with medicinal split gill mushroom, *Schizophyllum Commune* Fr.:Fr. extract during accelerated storage**

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International Journal of Medicinal Mushrooms, Vol. 13 (4), 2011, 357-368

The oxidative stability of sunflower oil supplemented with medicinal split gill mushroom, *Schizophyllum commune*'s crude extract (CE), the formic acid (FA) fraction and semipurified subfractions (SF) II and IV were tested, compared to BHA and alpha-tocopherol, by measuring their peroxide value, iodine value, p-anisidine value, thiobarbituric acid-reactive substances, and free fatty acid content. Their total phenolic content (TPC), 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging, and ferric reducing/antioxidant power (FRAP) were also evaluated. FA and CE exhibited highest DPPH\* scavenging, while FA and SFIV showed the highest FRAP; TPC was found to be highest in CE, FA, and SFIV. BHA and alpha-tocopherol are more protective in stabilizing the sunflower oil; SFII and SFIV had short-term protective effect in secondary oxidation for 1 year, while CE and FA retarded secondary oxidation and extended the shelf life 1 1/2 years and 2 years, respectively. HPLC-DAD analysis found (+)-catechin in *Sch. commune*'s extracts. *Sch. commune*'s extracts did not show similar retardation of lipid oxidation in sunflower oil as compared to alpha-tocopherol and BHA at the 200 ppm level. However, the higher concentration of *Sch. commune*'s extract that provided the protective effect in stabilizing sunflower oil can be further studied.

## 1167 Comparative study of antioxidant activities and total phenolic content of selected edible wild mushrooms

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International Journal of Medicinal Mushrooms, Vol. 13 (3), 2011, 245-255

The present study aims to assess the antioxidant activities (AOA) and total phenolic content (TPC) of water extracts of selected edible wild mushrooms: *Pleurotus porrigens*, *Schizophyllum commune*, *Hygrocybe conica*, and *Lentinus ciliatus*. The AOA were evaluated against DPPH radical and ABTS radical cation scavenging ability, ferric-reducing antioxidant power (FRAP) and beta-carotene-linoleate bleaching (beta-CB) assays, and the Folin-Ciocalteu method for TPC. BHA was used as reference. *P. porrigens* showed significantly higher ( $p < 0.05$ ) DPPH radical scavenging ability (90.78 +/- 0.30%) and FRAP (6.37 +/- 0.22 mM FE/100g), while *Sch. commune* showed significantly higher ( $p < 0.05$ ) ABTS radical cation inhibition activity (94.96 +/- 0.70%) and beta-CB inhibition activity (94.18 +/- 0.17%), respectively. TPC was found in a descending order of *P. porrigens* > *L. ciliatus* = *Pleurotus ostreatus* (cultivated) > *H. conica* = *Sch. commune*. Positive correlation was observed between the AOA and TPC. When compared to BHA (2 mM), *P. porrigens* showed significantly higher ( $p < 0.05$ ) DPPH radical scavenging ability and reducing power, while *Sch. commune* showed comparable DPPH radical scavenging ability and ABTS radical cation inhibition activity. All the mushrooms have better ABTS radical cation inhibition activity than BHA (1 mM). The beta-CB inhibition activity of BHA was significantly higher than those of edible wild mushrooms. The water extracts of edible wild mushrooms showed potent antioxidant activities compared to BHA to a certain extent.

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## 1168 Deep-fried keropok lekors increase oxidative instability in cooking oils

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Malaysian Journal of Medical Sciences, Vol. 19(4), 2012, 58-63

Background: The study was performed to compare the oxidative quality of repeatedly heated palm and soybean oils which were used to fry keropok lekors and potato chips. Method: A kilogramme of keropok lekors or potato chips was fried in 2.5 L of palm or soybean oil at 180°C for 10 minutes. The frying process was repeated once and four times to obtain twice and five times heated oils. Peroxide value and fatty acid composition in the oils were measured. Results: Frequent heating significantly increased the peroxide values in both oils with the five times heated oils [palm: 14.26 ± 0.41 and 11.29 ± 0.58 meq/kg vs fresh (2.13 ± 0.00),  $F(3,12)=346.80$ ,  $P<0.001$ ; soybean: 16.95 ± 0.39 and 12.90 ± 0.21 meq/kg vs fresh (2.53 ± 0.00) oils,  $F(3,12)=1755$ ,  $P<0.001$ , when fried keropok lekors and potato chips respectively] had the highest peroxide values. Overall, both oils that fried keropok lekors had significantly higher peroxide values than the one that fried potato chips. Generally, heated soybean oil had significantly higher peroxide values than that of the palm oil. Fatty acid composition in the oils was generally unaltered by the heating frequency. Conclusion: Keropok lekors when used as the frying material increased the peroxide values in the palm and soybean oils. Fatty acid composition was not much affected by the frequency of frying.



**J**

**EXPERIMENTAL  
NUTRITION**

**(Antioxidants)**

## **Tocotrienol-adjuvanted dendritic cells inhibit tumor growth and metastasis: A murine model of breast cancer**

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PLoS One, Vol. 8(9), 2013, 74753

Tocotrienol-rich fraction (TRF) from palm oil is reported to possess anti-cancer and immune-enhancing effects. In this study, TRF supplementation was used as an adjuvant to enhance the anti-cancer effects of dendritic cells (DC)-based cancer vaccine in a syngeneic mouse model of breast cancer. Female BALB/c mice were inoculated with 4T1 cells in mammary pad to induce tumor. When the tumor was palpable, the mice in the experimental groups were injected subcutaneously with DC-pulsed with tumor lysate (TL) from 4T1 cells (DC+TL) once a week for three weeks and fed daily with 1 mg TRF or vehicle. Control mice received unpulsed DC and were fed with vehicle. The combined therapy of using DC+TL injections and TRF supplementation (DC+TL+TRF) inhibited ( $p < 0.05$ ) tumor growth and metastasis. Splenocytes from the DC+TL+TRF group cultured with mitomycin-C (MMC)-treated 4T1 cells produced higher ( $p < 0.05$ ) levels of IFN- $\gamma$  and IL-12. The cytotoxic T-lymphocyte (CTL) assay also showed enhanced tumor-specific killing ( $p < 0.05$ ) by CD8 (+) T-lymphocytes isolated from mice in the DC+TL+TRF group. This study shows that TRF has the potential to be used as an adjuvant to enhance effectiveness of DC-based vaccines.

## **Comparison of the effects of tocotrienol and estrogen on the bone markers and dynamic changes in postmenopausal osteoporosis rat model**

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Asian Journal of Animal and Veterinary Advances, Vol.7 (3), 2012, 225-234

The standard treatment for postmenopausal osteoporosis is Estrogen Replacement Therapy (ERT) but it was associated with serious adverse effects such as breast cancer and cardiovascular disease. There is a need to find other alternatives for the treatment of post-menopausal osteoporosis. Vitamin E especially tocotrienol was shown to have anti-osteoporosis effects in many animal osteoporotic models but it has never been compared to estrogen. This study aimed to compare the effects of tocotrienol-enriched fraction to estrogen on the bone biochemical markers and dynamic histomorphometric changes using ovariectomised rats as the postmenopausal osteoporosis model. Thirty-two female Sprague-Dawley rats were randomly divided into groups of sham-operated (SHAM), ovariectomised control (OVC), ovariectomised+60 mg kg<sup>-1</sup> tocotrienol-rich fraction (OV+T) and ovariectomised+64.5  $\mu$ g kg<sup>-1</sup> of premarin(r) (OV+ERT). The rats were treated for two months and the serum osteocalcin and serum C-telopeptide of type 1 collagen (CTX) were measured using ELISA technique, while the femoral dynamic changes were analysed histomorphometrically. The CTX levels were found to be lowered compared to the pre-treatment levels for all the groups. Only the osteocalcin level of OV+ERT

group was significantly reduced compared to its pre-treatment level. Dynamic histomorphometric analysis showed that both the OV+ERT and OV+T groups have lower single-labeled surface/bone surface (sLS) but higher double-labeled surface/bone surface (dLS), bone formation rate/bone surface (BFR) and mineral apposition rate (MAR) compared to the BC and OVC groups. The OV+T group showed better effects on most of the dynamic parameters compared to the OV+ERT group. Therefore, in postmenopausal osteoporosis model, tocotrienol-rich fraction has shown better bone protective effects than ERT.

### **J3 Tocotrienol-rich fraction, [6]-gingerol and epigallocatechin gallate inhibit proliferation and induce apoptosis of glioma cancer cells**

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Molecules, Vol. 19, 2014, 14528-14541

Plant bioactives [6]-gingerol (GING), epigallocatechin gallate (EGCG) and asiaticoside (AS) and vitamin E, such as tocotrienol-rich fraction (TRF), have been reported to possess anticancer activity. In this study, we investigated the apoptotic properties of these bioactive compounds alone or in combination on glioma cancer cells. TRF, GING, EGCG and AS were tested for cytotoxicity on glioma cell lines 1321N1 (Grade II), SW1783 (Grade III) and LN18 (Grade IV) in culture by the (3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxy-phenyl)-2-(4-sulfophenyl)-2H-tetrazolium, inner salt) (MTS) assay. With the exception of AS, combinations of two compounds were tested, and the interactions of each combination were evaluated by the combination index (CI) using an isobologram. Different grades of glioma cancer cells showed different cytotoxic responses to the compounds, where in 1321N1 and LN18 cells, the combination of EGCG + GING exhibited a synergistic effect with CI = 0.77 and CI = 0.55, respectively. In contrast, all combinations tested (TRF + GING, TRF + EGCG and EGCG + GING) were found to be antagonistic on SW1783 with CI values of 1.29, 1.39 and 1.39, respectively. Combined EGCG + GING induced apoptosis in both 1321N1 and LN18 cells, as evidenced by Annexin-V FITC/PI staining and increased active caspase-3. Our current data suggests that the combination of EGCG + GING synergistically induced apoptosis and inhibits the proliferation 1321N1 and LN18 cells, but not SW1783 cells, which may be due to their different genetic profiles.

### **J4 Gamma-tocotrienol and hydroxy-chavicol synergistically inhibits growth and induces apoptosis of human glioma cells**

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BMC Complementary and Alternative Medicine, Vol. 14, 2014, 213

**Background:** Gamma-tocotrienol (GTT), an isomer of vitamin E and hydroxy-chavicol (HC), a major bioactive compound in Piper betle, has been reported to possess anti-carcinogenic

properties by modulating different cellular signaling events. One possible strategy to overcome multi-drug resistance and high toxic doses of treatment is by applying combinational therapy especially using natural bioactives in cancer treatment. **Methods:** In this study, we investigated the interaction of GTT and HC and its mode of cell death on glioma cell lines. GTT or HC alone and in combination were tested for cytotoxicity on glioma cell lines 1321N1 (Grade II), SW1783 (Grade III) and LN18 (Grade IV) by [3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxy-phenyl)-2-(4-sulfophenyl)-2H-tetrazolium, inner salt] MTS assay. The interactions of each combination were evaluated by using the combination index (CI) obtained from an isobologram. **Results:** Individually, GTT or HC displayed mild growth inhibitory effects against glioma cancer cell lines at concentration values ranging from 42-100 µg/ml and 75-119 µg/ml respectively. However, the combination of sub-lethal doses of GTT + HC dramatically enhanced the inhibition of glioma cancer cell proliferation and exhibited a strong synergistic effect on 1321N1 with CI of 0.55, and CI = 0.54 for SW1783. While in LN18 cells, moderate synergistic interaction of GTT + HC was observed with CI value of 0.73. Exposure of grade II, III and IV cells to combined treatments for 24 hours led to increased apoptosis as determined by annexin-V FITC/PI staining and caspase-3 apoptosis assay, showing caspase-3 activation of 27%, 7.1% and 79% respectively. **Conclusion:** In conclusion, combined treatments with sub-effective doses of GTT and HC resulted in synergistic inhibition of cell proliferation through the induction of apoptosis of human glioma cells in vitro.

J5

### Tocotrienol rich fraction and *Piper Betle* extract enhanced the viability of human peripheral blood mononuclear cells

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International Medical Journal, Vol. 20(2), 2013, 163-166

**Objective:** Tocotrienols are isomers of vitamin E, reported to have immune boosting and antiproliferative functions while Piper betle (PB) was shown to possess anti-inflammatory and antioxidant properties. The effect of tocotrienol rich fraction 70% (TRF70) and PB on PHA non-stimulated human peripheral blood mononuclear cells (PBMC) cultures is less known. The current aim is to investigate the protective or cytotoxicity potentials TRF70 and PB and correlate it with the antioxidant capacity values. **Design:** Free radical scavenging activities of hot water extract (HWE) of PB and TRF70 were determined by using DPPH (1,1-diphenyl-2-picrylhydrazyl) radical trapping method. Cytotoxicity assay were performed by using 3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulfophenyl)-2H-tetrazolium (MTS) assay. **Results:** TRF70 has the highest radical scavenging activity followed by PB when compared to standard antioxidants such as butylated hydroxyl toluene (BHT) and L-Ascorbic Acid (vitamin C). Treatment with TRF70 significantly ( $p < 0.01$ ) increased PBMC cell viability in a dose-response manner of 5, 10, 15, 20, 25 µg/ml whereas PB showed a significant increase of cell viability at the concentration of 10, 20, 25, 50 µg/ml though this extract was cytotoxic at higher concentrations. **Conclusion:** Analysis revealed an increase of maximum cell viability at low concentrations of 20µg/ml and 50µg/ml for TRF70 and PB respectively, but at higher concentrations, a decrease of viable cells was seen.



## Annatto tocotrienol improves indices of bone static histomorphometry in osteoporosis due to testosterone deficiency in rats

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Nutrients, Vol. 6(11), 2014, 4974-4983

This study aimed to evaluate the effects of annatto tocotrienol on indices of bone static histomorphometry in orchidectomized rats. Forty male rats were randomized into baseline (BL), sham (SH), orchidectomized (ORX), annatto tocotrienol-treated (AnTT) and testosterone enanthate-treated (TE) groups. The BL group was sacrificed upon receipt. All rats except the SH group underwent bilateral orchidectomy. Annatto tocotrienol at 60 mg/kg body weight was administered orally daily to the AnTT group for eight weeks. Testosterone enanthate at 7 mg/kg body weight was administered intramuscularly once weekly for eight weeks to the TE group. The rat femurs were collected for static histomorphometric analysis upon necropsy. The results indicated that the ORX group had significantly higher osteoclast surface and eroded surface, and significantly lower osteoblast surface, osteoid surface and osteoid volume compared to the SH group ( $p < 0.05$ ). Annatto tocotrienol and testosterone enanthate intervention prevented all these changes ( $p < 0.05$ ). The efficacy of annatto tocotrienol was on par with testosterone enanthate. In conclusion, annatto tocotrienol at 60 mg/kg can prevent the imbalance in bone remodeling caused by increased osteoclast and bone resorption, and decreased osteoblast and bone formation. This serves as a basis for the application of annatto tocotrienol in hypogonadal men as an antiosteoporotic agent.

## Effects of annatto-derived tocotrienol supplementation on osteoporosis induced by testosterone deficiency in rats

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Clinical Interventions in Aging, Vol. 9, 2014, 1247-1259

**Background:** Previous animal models have demonstrated that tocotrienol is a potential treatment for postmenopausal osteoporosis. This study evaluated the antiosteoporotic effects of annatto-derived tocotrienol (AnTT) using a testosterone-deficient osteoporotic rat model. **Methods:** Forty rats were divided randomly into baseline, sham, orchidectomized, AnTT, and testosterone groups. The baseline group was euthanized without undergoing any surgical treatment or intervention. The remaining groups underwent orchidectomy, with the exception of the sham group. AnTT 60 mg/kg/day was given orally to the AnTT group, while the testosterone group received testosterone enanthate 7 mg/kg per week intramuscularly for 8 weeks. Structural changes in trabecular bone at the proximal tibia were examined using microcomputed tomography. Structural and dynamic changes at the distal femur were examined using histomorphometric methods. Serum osteocalcin and C-terminal of type 1 collagen crosslinks were measured. Bone-related gene expression in the distal femur was examined. **Results:** There were significant degenerative changes in structural indices in the orchidectomized group ( $P < 0.05$ ), but no significant changes in dynamic indices,

bone remodeling markers, or gene expression ( $P>0.05$ ) when compared with the sham group. The AnTT group showed significant improvement in structural indices at the femur ( $P<0.05$ ) and significantly increased expression of bone formation genes ( $P<0.05$ ). Testosterone was more effective than AnTT in preventing degeneration of bone structural indices in the femur and tibia ( $P<0.05$ ). **Conclusion:** AnTT supplementation improves bone health in testosterone-deficient rats by enhancing bone formation. Its potential should be evaluated further by varying the dosage and treatment duration.

### **J8 Proteomic analysis reveals that treatment with tocotrienols reverses the effect of H<sub>2</sub>O<sub>2</sub> exposure on peroxiredoxin expression in human lymphocytes from young and old individuals**

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The Journal of Nutritional Biochemistry, Vol. 23(7), 2012, 741-751

Vitamin E has been suggested to modulate age-associated changes by altering the redox balance resulting in altered gene and/or protein expression. Here we have utilized proteomics to determine whether such regulation in protein expression occurs in human lymphocytes from two different age groups stressed with H<sub>2</sub>O<sub>2</sub> and then treated with vitamin E in the form of tocotrienol-rich fraction (TRF). In this study, lymphocytes obtained from young (30-49 years old) and old (>50 years old) volunteers were first challenged with 1 mM H<sub>2</sub>O<sub>2</sub>. They were then treated by exposure to 50, 100 and 200 µg/ml TRF. Two-dimensional gel electrophoresis followed by MALDI-TOF/TOF (matrix-assisted laser desorption/ionization time-of-flight/time-of-flight) tandem mass spectrometry was then performed on whole-cell protein extracts to identify proteins that have changed in expression. A total of 24 proteins were found to be affected by H<sub>2</sub>O<sub>2</sub> and/or TRF treatment. These included proteins that were related to metabolism, antioxidants, structural proteins, protein degradation and signal transduction. Of particular interest was the regulation of a number of proteins involved in stress response—peroxiredoxin-2, peroxiredoxin-3 and peroxiredoxin-6—all of which were shown to be down-regulated with H<sub>2</sub>O<sub>2</sub> exposure. The effect was reversed following TRF treatment. The expression of peroxiredoxin-2 and peroxiredoxin-6 was confirmed by quantitative reverse transcriptase polymerase chain reaction. These results suggested that TRF directly influenced the expression dynamics of the peroxiredoxin-2, thus improving the cells ability to resist damage caused by oxidative stress.

### **J9 Tocotrienol rich fraction (TRF) increases viability of senescent fibroblast**

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Research Updates in Medical Sciences, Vol. 1(2), 2013, 3-6

The Hayflick limit is a theory that covers the definition of in vitro replicative senescence. It states that proliferating cells reach the limit of replicative potential after a series of sub-cultivations. Tocotrienol has been touted as it exhibits a higher significant radical scavenging activity as

compared to  $\alpha$ -tocopherols. In this study, we evaluated the effect of tocotrienol rich fraction (TRF) on the viability of young and senescent fibroblast and its possible modulation of oxidative stress. Cell viability study was performed using the MTS assay while determination of protein carbonyl, an oxidative stress biomarker was measured using OxiSelect(tm) Protein Carbonyl ELISA Kit. The concentrations of total vitamin E and its isomers:  $\alpha$ -tocopherol (ATF),  $\alpha$ -tocotrienol (ATT),  $\beta$ -tocotrienol (BTT),  $\alpha$ -tocotrienol (GTT) and  $\alpha$ -tocotrienol (DTT) in fibroblast were determined using reverse phase high performance liquid chromatography (HPLC). The percentage of viable young cells was significantly increased at 0.01mg/ml of TRF while the percentage of viable senescent cells was significantly increased from 0.01mg/ml to 0.05 mg/ml of TRF. TRF treatment significantly increased the levels of total vitamin E ( $0.24 \pm 0.06$  ug/ml), ATT ( $0.05 \pm 0.01$  ug/ml) and BTT ( $0.11 \pm 0.04$  ug/ml) in the young cells as well as the levels of total vitamin E ( $0.504 \pm 0.074$  ug/ml), ATF ( $0.08 \pm 0.009$  ug/ml), ATT ( $0.12 \pm 0.03$  ug/ml), BTT ( $0.16 \pm 0.03$  ug/ml) and GTT ( $0.14 \pm 0.009$  ug/ml) in senescent cells. However, no significant differences were found in the protein carbonyl level between the young and senescent fibroblast. In conclusion, TRF enhanced viability of senescent fibroblast cells in a concentration dependent manner.

### J10 The effects of prenatal and early postnatal tocotrienol-rich fraction supplementation on cognitive function development in male offspring rats

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BMC Neuroscience, Vol.14 (77), 2013

**Background:** Recent findings suggest that the intake of specific nutrients during the critical period in early life influence cognitive and behavioural development profoundly. Antioxidants such as vitamin E have been postulated to be pivotal in this process, as vitamin E is able to protect the growing brain from oxidative stress. Currently tocotrienols are gaining much attention due to their potent antioxidant and neuroprotective properties. It is thus compelling to look at the effects of prenatal and early postnatal tocotrienols supplementation, on cognition and behavioural development among offsprings of individual supplemented with tocotrienols. Therefore, this study is aimed to investigate potential prenatal and early postnatal influence of Tocotrienol-Rich Fraction (TRF) supplementation on cognitive function development in male offspring rats. Eight-week-old adult female Sprague Dawley (SD) rats were randomly assigned into five groups of two animals each. The animals were fed either with the base diet as control (CTRL), base diet plus vehicle (VHCL), base diet plus docosahexanoic acid (DHA), base diet plus Tocotrienol-Rich fraction (TRF), and base diet plus both docosahexanoic acid, and tocotrienol rich fraction (DTRF) diets for 2 weeks prior to mating. The females (F0 generation) were maintained on their respective treatment diets throughout the gestation and lactation periods. Pups (F1 generation) derived from these dams were raised with their dams from birth till four weeks post natal. The male pups were weaned at 8 weeks postnatal, after which they were grouped into five groups of 10 animals each, and fed with the same diets as their dams for another eight weeks. Learning and behavioural experiments were conducted only in male off-spring rats using the Morris water maze. Eight-week-old adult female Sprague Dawley (SD) rats were randomly assigned into five groups of two animals each. The animals were fed either with the base diet as control (CTRL), base diet plus vehicle (VHCL), base diet plus docosahexanoic acid (DHA), base diet plus Tocotrienol- Rich fraction (TRF), and base diet plus both docosahexanoic acid, and tocotrienol rich fraction (DTRF)

diets for 2 weeks prior to mating. The females (F0 generation) were maintained on their respective treatment diets throughout the gestation and lactation periods. Pups (F1 generation) derived from these dams were raised with their dams from birth till four weeks post natal. The male pups were weaned at 8 weeks postnatal, after which they were grouped into five groups of 10 animals each, and fed with the same diets as their dams for another eight weeks. Learning and behavioural experiments were conducted only in male off-spring rats using the Morris water maze. **Results:** Results showed that prenatal and postnatal TRF supplementation increased the brain (4-6 fold increase) and plasma  $\alpha$ -tocotrienol (0.8 fold increase) levels in male off-springs. There is also notably better cognitive performance based on the Morris water maze test among these male off-springs. **Conclusion:** Based on these results, it is concluded that prenatal and postnatal TRF supplementation improved cognitive function development in male progeny rats.

## J11 The effects of palm vitamin E on stress hormone levels and gastric lesions in stress-induced rats

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Archives of Medical Science, Vol.8 (1), 2012, 22-29

**Introduction:** This study examines the effects of palm vitamin E (PVE) or  $\alpha$ -tocopherol ( $\alpha$ -TF) supplementation on adrenocorticotropin hormone (ACTH), corticosterone and gastric lesions in rats exposed to water-immersion restraint stress (WIRS). **Material and methods:** Sixty male Sprague-Dawley rats (200-250 g) were divided into three groups. Group I: 20 rats as a control group were given a normal diet. Group II: 20 rats received oral supplementation of PVE at 60 mg/kg body weight. Group III: 20 rats received oral supplementation of  $\alpha$ -TF at 60 mg/kg body weight. After the treatment period of 28 days, each group was further subdivided into two groups: 10 rats not exposed to stress, and the other 10 rats subjected to WIRS for 3.5 h. Blood samples were taken to measure the ACTH and corticosterone levels. The rats were then sacrificed and the stomach excised and opened along the greater curvature and examined for lesions. Results: Rats exposed to WIRS had lesions in their stomach mucosa. Our findings showed that dietary supplementation of PVE or  $\alpha$ -TF was able to reduce gastric lesions significantly in comparison to the stressed controls. The WIRS increased plasma ACTH and corticosterone significantly. Palm vitamin E and  $\alpha$ -TF treatments reduced these parameters significantly compared to the stressed controls. **Conclusions:** Supplementation with either PVE or  $\alpha$ -TF reduces the formation of gastric lesions, probably by inhibiting the elevation of ACTH and corticosterone levels induced by stress.

## J12 Modulation of gastric motility and gastric lesion formation in stressed rats given enteral supplementation of palm vitamin E and $\alpha$ -tocopherol

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**Objective:** Stress is one of the major factors that cause various pathological changes in the gastrointestinal tract. The present study investigated the effects of palm vitamin E (PVE) and  $\alpha$ -tocopherol ( $\alpha$ -TF) on gastric motility using water-immersion restraint stress (WRS) model. **Design:** Sixty male Sprague-Dawley rats (200-250gm) were divided to three equal size groups; a control group was given a normal diet, second group administered 60 mg/kg/d of PVE or vehicle only for 28 days. Another group of rats receiving  $\alpha$ -TF was also included for comparison. At the end of the treatment period, half of the rats from each group were subjected to WRS for 3.5 hours. Blood was sampled to measure the level of acetylcholine (ACh) product after which the measurement of gastric motility by electrogastrogram was carried out. The rats were sacrificed and the stomachs were then examined for lesions. **Results:** WRS increased plasma Ach product levels, gastric motility and lesions. PVE or  $\alpha$ -TF was able to reduce ACh product levels, gastric motility and lesions. **Conclusion:** PVE and  $\alpha$ -TF were able to reduce the gastric lesions possibly by blocking the increase in the ACh level and gastric motility induced by stress.

### J13 Palm tocotrienol-rich fraction supplementation suppressed stress-induced gastric oxidative stress in rats

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Journal of Applied Pharmaceutical Science, Vol. 1(10), 2011, 118-122

Palm tocotrienol-rich fraction (TRF), an extract from palm oil containing both tocotrienol and tocopherol, is known for its antioxidant effect. The present study investigated the effect of palm TRF on the stomach using a water immersion restraint stress (WRS) model. Fortytwo male Sprague-Dawley rats were divided into three groups and were administered 60 mg/kg/d of palm TRF,  $\alpha$ -tocopherol or vehicle only for 28 days. At the end of the treatment period, half of the rats from each group were subjected to WRS for 3.5 hours, after which the rats were sacrificed. The stomachs were then examined for lesions and measured for thiobarbituric acid reactive substance content and xanthine oxidase activity. Rats exposed to WRS showed gastric mucosal lesions. Pretreatments of the palm TRF and  $\alpha$ -tocopherol reduced the occurrence of the lesions. WRS also increased gastric malondialdehyde content and xanthine oxidase activity significantly, but the increase in the oxidative stress parameters were significantly suppressed by both vitamin E pretreatments. However, the effects of palm TRF and  $\alpha$ -tocopherol on the parameters measured were not different. In conclusion, palm TRF has the ability to protect against gastric mucosal injury, likely via its ability to inhibit oxidative stress.

## **J14 Palm tocotrienol supplementation enhanced bone formation in oestrogen-deficient rats**

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International Journal of Endocrinology, Vol. 2012, Article ID 532862

Postmenopausal osteoporosis is the commonest cause of osteoporosis. It is associated with increased free radical activity induced by the oestrogen-deficient state. Therefore, supplementation with palm-oil-derived tocotrienols, a potent antioxidant, should be able to prevent this bone loss. Our earlier studies have shown that tocotrienol was able to prevent and even reverse osteoporosis due to various factors, including oestrogen deficiency. In this study we compared the effects of supplementation with palm tocotrienol mixture or calcium on bone biomarkers and bone formation rate in ovariectomised (oestrogen-deficient) female rats. Our results showed that palm tocotrienols significantly increased bone formation in oestrogen-deficient rats, seen by increased double-labeled surface (dLS/Bs), reduced single-labeled surface (sLS/BS), increased mineralizing surface (MS/BS), increased mineral apposition rate (MAR), and an overall increase in bone formation rate (BFR/BS). These effects were not seen in the group supplemented with calcium. However, no significant changes were seen in the serum levels of the bone biomarkers, osteocalcin, and cross-linked C-telopeptide of type I collagen, CTX. In conclusion, palm tocotrienol is more effective than calcium in preventing oestrogen-deficient bone loss. Further studies are needed to determine the potential of tocotrienol as an antiosteoporotic agent.

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## **J15 Subacute and subchronic toxicity studies of palm vitamin E in mice**

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Journal of Pharmacology and Toxicology, Vol.6 (2), 2011, 166-173

Palm oil is a rich source of vitamin E, especially the tocotrienols. It had been shown in previous studies to be effective in preventing and treating experimentally induced osteoporosis in laboratory rats. The objective of this study was to determine the subacute and subchronic toxic effects of palm vitamin E extract on mice. This was part of an ongoing effort to determine the potential for use of palm vitamin E as an anti-osteoporotic agent. The doses used in this study were 200, 500 and 1000 mg kg<sup>-1</sup>. Treatment period was 14 days for the Subacute Toxicity Study and 42 days for the Subchronic Toxicity Study. The parameters measured were Bleeding Time, Clotting Time, serum aspartate aminotransferase, serum creatinine as well as liver and kidney weights. The results showed that the Bleeding and Clotting Times were significantly prolonged in the 500 and 1000 mg kg<sup>-1</sup> groups in both the Subacute and Subchronic Toxicity Studies. Serum creatinine was raised in the 500 and 1000 mg kg<sup>-1</sup> group for the Subchronic Toxicity Study. Kidney weights were increased in the 200 and 500 mg kg<sup>-1</sup> groups for the Subacute Toxicity Study and in the 1000 mg kg<sup>-1</sup> group for the Subchronic Toxicity Study. No changes in serum aspartate aminotransferase levels or in liver weights were seen in both the Subacute and Subchronic Toxicity Studies. In conclusion, large doses of palm vitamin E in animals well above the effective dose used to prevent and treat osteoporosis may cause bleeding tendency and renal impairment but there was no liver toxicity.

## **J16** Thymoquinone prevents $\beta$ -amyloid neurotoxicity in primary cultured cerebellar granule neurons

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Cellular and Molecular Neurobiology, Vol. 233(8), 2013, 1159-1169

Thymoquinone (TQ), a bioactive constituent of *Nigella sativa* Linn (*N. sativa*) has demonstrated several neuropharmacological attributes. In the present study, the neuroprotective properties of TQ were investigated by studying its anti-apoptotic potential to diminish  $\beta$ -amyloid peptide 1-40 sequence (A $\beta$ 1-40)-induced neuronal cell death in primary cultured cerebellar granule neurons (CGNs). The effects of TQ against A $\beta$ 1-40-induced neurotoxicity, morphological damages, DNA condensation, the generation of reactive oxygen species, and caspase -3, -8, and -9 activation were investigated. Pretreatment of CGNs with TQ (0.1 and 1  $\mu$ M) and subsequent exposure to 10  $\mu$ M A $\beta$ 1-40 protected the CGNs against the neurotoxic effects of the latter. In addition, the CGNs were better preserved with intact cell bodies, extensive neurite networks, a loss of condensed chromatin and less free radical generation than those exposed to A $\beta$ 1-40 alone. TQ pretreatment inhibited A $\beta$ 1-40-induced apoptosis of CGNs via both extrinsic and intrinsic caspase pathways. Thus, the findings of this study suggest that TQ may prevent neurotoxicity and A $\beta$ 1-40-induced apoptosis. TQ is, therefore, worth studying further for its potential to reduce the risks of developing Alzheimer's disease.

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## **J17** Reversal of myoblast aging by tocotrienol rich fraction post treatment

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Oxidative Medicine and Cellular Longevity, Vol. 2013, Article ID 978101

Skeletal muscle satellite cells are heavily involved in the regeneration of skeletal muscle in response to the aging-related deterioration of the skeletal muscle mass, strength, and regenerative capacity, termed as sarcopenia. This study focused on the effect of tocotrienol rich fraction (TRF) on regenerative capacity of myoblasts in stress-induced premature senescence (SIPS). The myoblasts was grouped as young control, SIPS-induced, TRF control, TRF pretreatment, and TRF posttreatment. Optimum dose of TRF, morphological observation, activity of senescence-associated  $\beta$ -galactosidase (SA- $\beta$ -galactosidase), and cell proliferation were determined. 50  $\mu$ g/mL TRF treatment exhibited the highest cell proliferation capacity. SIPS-induced myoblasts exhibit large flattened cells and prominent intermediate filaments (senescent-like morphology). The activity of SA- $\beta$ -galactosidase was significantly increased, but the proliferation capacity was significantly reduced as compared to young control. The activity of SA- $\beta$ -galactosidase was

significantly reduced and cell proliferation was significantly increased in the posttreatment group whereas there was no significant difference in SA- $\beta$ -galactosidase activity and proliferation capacity of pretreatment group as compared to SIPS-induced myoblasts. Based on the data, we hypothesized that TRF may reverse the myoblasts aging through replenishing the regenerative capacity of the cells. However, further investigation on the mechanism of TRF in reversing the myoblast aging is needed.

## J18 Inhibitory effects of palm tocotrienol-rich fraction supplementation on bilirubin-metabolizing enzymes in hyperbilirubinemic adult rats

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PLoS One, Vol.9 (2), 2014, e89248

**Background:** Phenylhydrazine, a hemolytic agent, is widely used as a model of experimental hyperbilirubinemia. Palm tocotrienol-rich fraction (TRF) was shown to exert beneficial effects in hyperbilirubinemic rat neonates. **Aim:** To investigate the effects of palm TRF supplementation on hepatic bilirubin-metabolizing enzymes and oxidative stress status in rats administered phenylhydrazine. **Methods:** Twenty-four male Wistar rats were divided into two groups; one group was intraperitoneally injected with palm TRF at the dose of 30 mg/kg/day, while another group was only given vehicle (control) (vitamin E-free palm oil) for 14 days. Twenty-four hours after the last dose, each group was further subdivided into another two groups. One group was administered phenylhydrazine (100 mg/kg, intraperitoneally) and another group was administered normal saline. Twenty-four hours later, blood and liver were collected for biochemical parameter measurements. **Results:** Phenylhydrazine increased plasma total bilirubin level and oxidative stress in the erythrocytes as well as in the liver, which were reduced by the pretreatment of palm TRF. Palm TRF also prevented the increases in hepatic heme oxygenase, biliverdin reductase and UDP-glucuronyltransferase activities induced by phenylhydrazine. **Conclusion:** Palm tocotrienol-rich fraction was able to afford protection against phenylhydrazine-induced hyperbilirubinemia, possibly by reducing oxidative stress and inhibiting bilirubin-metabolizing enzymes in the liver.

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## J19 Gene expression changes in spleens and livers of tumour-bearing mice suggest delayed inflammation and attenuated cachexia in response to oil palm phenolics

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Journal of Nutrigenetics and Nutrigenomics, Vol.6 (6), 2013, 305-326

**Background/aim:** Plant phenolics can inhibit, retard or reverse carcinogenesis, and may thus help prevent or treat cancer. Oil palm phenolics (OPP) previously showed anti-tumour activities in vivo via a cytostatic mechanism at 1,500 ppm gallic acid equivalent. Here, we report other



possible molecular mechanisms by which this extract attenuates cancer, especially those concerning the immune response. **Methods:** We subcutaneously injected J558 myeloma cells in BALB/c mice and supplemented OPP orally at 1,500 ppm gallic acid equivalent. We observed the physiology parameters of these animals and harvested their spleens and livers after 18 h, 1 week and 4 weeks for microarray gene expression analysis using Illumina MouseRef-8 BeadChips. **Results:** Time course microarray analysis on spleens after injecting J558 myeloma cells in mice revealed that the immune response of tumour-bearing mice supplemented with OPP was lower compared to controls, thus suggesting delayed inflammation in response to OPP. In livers, cholesterol biosynthesis genes were upregulated while inflammatory genes were downregulated through time, further suggesting attenuation of systemic inflammation and cachexia. These effects correlated with the delayed in vivo development of syngeneic tumours in mice given OPP. **Conclusions:** This study suggests the possible utilisation of OPP as an anti-tumour and anti-cachexia agent

## J20 Differential and antagonistic effects of palm tocotrienols and other phytonutrients (carotenoids, squalene and coenzyme Q10) on breast cancer cells in vitro

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Journal of Oil Palm Research, Vol. 25 (2), 2013, 208- 215

Palm vitamin E, tocotrienols in particular, are known to exert great anti-cancer effects on a variety of cell types. In this study, the effects of palm vitamin E, carotenoids, squalene and coenzyme Q10 were studied on two human breast cancer cell lines. All compounds caused anti-proliferative effect in vitro but tocotrienols (compounds and isomers) were generally more potent. The results show that the anticancer effects of palm vitamin E were more pronounced when these were used on their own rather than in combination with other phytonutrients (carotenoids, squalene and coenzyme Q10). The palm phytonutrient complex, which contains all the tested phytonutrients did not appear to exert better antiproliferative effects compared to the individual compounds. Our results show that tocotrienols, as well as other phytonutrients (carotenoids, squalene and coenzyme Q10), have anti-proliferative effects on breast cancer cells but different and antagonistic mechanisms may be employed in combination.

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## J21 Tocotrienols promote apoptosis in human breast cancer cells by inducing poly (ADP-ribose) polymerase cleavage and inhibiting nuclear factor kappa-B activity

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Cell Proliferation, Vol.46 (2), 2013, 203-213

**Objectives:** Tocotrienols and tocopherols are members of the vitamin E family, with similar structures; however, only tocotrienols have been reported to achieve potent anti-cancer effects. The study described here has evaluated anti-cancer activity of vitamin E to elucidate mechanisms of cell death, using human breast cancer cells. **Materials and methods:** Anti-cancer activity of a

tocotrienol-rich fraction (TRF) and a tocotrienol-enriched fraction (TEF) isolated from palm oil, as well as pure vitamin E analogues ( $\alpha$ -tocopherol,  $\alpha$ -,  $\delta$ - and  $\gamma$ -tocotrienols) were studied using highly aggressive triple negative MDA-MB-231 cells and oestrogen-dependent MCF-7 cells, both of human breast cancer cell lines. Cell population growth was evaluated using a Coulter particle counter. Cell death mechanism, poly(ADP-ribose) polymerase cleavage and levels of NF- $\kappa$ B were determined using commercial ELISA kits. **Results:** Tocotrienols exerted potent anti-proliferative effects on both types of cell by inducing apoptosis, the underlying mechanism of cell death being ascertained using respective IC50 concentrations of all test compounds. There was marked induction of apoptosis in both cell lines by tocotrienols compared to treatment with Paclitaxel, which was used as positive control. This activity was found to be associated with cleavage of poly (ADP-ribose) polymerase (a DNA repair protein), demonstrating involvement of the apoptotic cell death signalling pathway. Tocotrienols also inhibited expression of nuclear factor kappa-B (NF- $\kappa$ B), which in turn can increase sensitivity of cancer cells to apoptosis. **Conclusion:** Tocotrienols induced anti-proliferative and apoptotic effects in association with DNA fragmentation, poly (ADP-ribose) polymerase cleavage and NF- $\kappa$ B inhibition in the two human breast cancer cell lines.

## J22 Modulation of collagen synthesis and its gene expression in human skin fibroblasts by tocotrienol-rich fraction

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Archive of Medical Science, Vol. 7(5), 2011, 889-895

**Introduction:** Skin aging may occur as a result of increased free radicals in the body. Vitamin E, the major chain-breaking antioxidant, prevents propagation of oxidative stress, especially in biological membranes. In this study, the molecular mechanism of tocotrienol-rich fraction (TRF) in preventing oxidative stress-induced skin aging was evaluated by determining the rate of total collagen synthesis and its gene expression in human skin fibroblasts. **Material and Methods:** Primary culture of human skin fibroblasts was derived from circumcision foreskin of 9 to 12 year-old boys. Fibroblast cells were divided into 5 different treatment groups: untreated control, hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>)-induced oxidative stress (20  $\mu$ M H<sub>2</sub>O<sub>2</sub>) exposure for 2 weeks, TRF treatment, and pre- and post-treatment of TRF to H<sub>2</sub>O<sub>2</sub>-induced oxidative stress. **Results:** Our results showed that H<sub>2</sub>O<sub>2</sub>-induced oxidative stress decreased the rate of total collagen synthesis and down-regulated COL I and COL III in skin fibroblasts. Pre-treatment of TRF protected against H<sub>2</sub>O<sub>2</sub>-induced oxidative stress as shown by increase in total collagen synthesis and up-regulation of COL I and COL III ( $p < 0.05$ ) genes. However, similar protective effects against H<sub>2</sub>O<sub>2</sub>-induced oxidative stress were not observed in the post-treated fibroblasts. **Conclusions:** Tocotrienol-rich fraction protects against H<sub>2</sub>O<sub>2</sub>-induced oxidative stress in human skin fibroblast culture by modulating the expression of COL I and COL III genes with concomitant increase in the rate of total collagen synthesis. These findings may indicate TRF protection against oxidative stress-induced skin aging.

**J23 Comparable down-regulation of TYR, TYRP1 and TYRP2 genes and inhibition of melanogenesis by tyrostat, tocotrienol-rich fraction and tocopherol in human skin melanocytes improves skin pigmentation**

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Clinica Terapeutica, Vol. 165(1), 2014, 39-45

**Background and Objective:** Antioxidant has been recognized to inhibit UV-induced melanogenesis. This study aimed to elucidate the molecular mechanism of tyrostat, tocopherol and tocotrienol-rich fraction in inhibiting melanogenesis in human skin melanocytes. **Materials and Methods:** Primary culture of melanocytes was exposed to repeated doses of 0.6 J/cm<sup>2</sup> UVA for 6 days and treated with tyrostat, tocotrienol-rich fraction or tocopherol alone or in combination. **Results:** UVA irradiation increased melanin content and tyrosinase activity and up-regulated TYR, TYRP1 and TYRP2 genes. Treatment with tyrostat, tocotrienol-rich fraction or tocopherol decreased melanin content and down-regulated TYR, TYRP1 and TYRP2 genes with decreased tyrosinase activity. Combined treatment exerted better effects as compared to treatment with single compound in decreasing the melanin content and down-regulating TYR, TYRP1 and TYRP2 genes. These findings indicated that tyrostat, tocotrienol-rich fraction and tocopherol inhibit melanogenesis by modulating the expression of genes involved in the regulation of melanin synthesis and inhibiting tyrosinase activity. **Conclusion:** Tyrostat, tocopherol and tocotrienol-rich fraction possessed anti-melanogenic properties and might be useful in improving skin pigmentation caused by UVA exposure.

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**J24 Does long term supplementation of vitamin E cause detrimental effects on the central nervous system? Morphological and histological study in experimental male Wistar rats**

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La Clinica Terapeutica, Vol.164 (2), 2013, 119-24

**Aim:** Aging is attributed to neuronal loss associated with increased oxidative stress. Vitamin E, and in particular, tocotrienol are potent antioxidants, which have been shown to be neuroprotective. The main aim of the present study was to observe the effect of long term intake of vitamin E in the form of tocotrienol rich fraction (TRF) and refined, bleached, deodorized palm olein (RBDPO) on the brain of experimental rats. **Materials and Methods:** Thirty male Wistar rats aged 3 months were either supplemented with TRF (dose of 200 mg/kg body weight), RBDPO (dose of 1 ml/kg body weight) or distilled water, continuously for 8 months. The animals were then examined in vivo for clinical magnetic resonance imaging (MRI) studies before being sacrificed. The brain was extracted, measured and studied for histological changes. **Results:** The magnetic resonance imaging (MRI) scan of the lateral ventricle, cortical thickness of cingulate gyrus and hippocampus size did not show any significant changes in all three groups. The brain weight,

length and width as well as histological sections of the brain showed no significant changes between the groups. **Conclusion:** It is thereby concluded that chronic consumption of vitamin E was not detrimental to the central nervous system.

## J25 Tocotrienol supplementation in postmenopausal osteoporosis: Evidence from a laboratory study

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Clinics, Vol. 68(10), 2013, 1338-1343

**Objective:** Accelerated bone loss that occurs in postmenopausal women has been linked to oxidative stress and increased free radicals. We propose the use of antioxidants to prevent and reverse postmenopausal osteoporosis. This study aimed to examine the effects of tocotrienol, a vitamin E analog, on bone loss due to estrogen deficiency. Our previous study showed that tocotrienol increased the trabecular bone volume and trabecular number in ovariectomized rats. In the current study, we investigated the effects of tocotrienol supplementation on various biochemical parameters in a postmenopausal osteoporosis rat model. **Materials and Methods:** A total of 32 female Wistar rats were randomly divided into four groups. The baseline group was sacrificed at the start of the study, and another group was sham operated. The remaining rats were ovariectomized and either given olive oil as a vehicle or treated with tocotrienol at a dose of 60 mg/kg body weight. After four weeks of treatment, blood was withdrawn for the measurement of interleukin-1 (IL1) and interleukin-6 (IL6) (bone resorbing cytokines), serum osteocalcin (a bone formation marker) and pyridinoline (a bone resorption marker). **Results:** Tocotrienol supplementation in ovariectomized rats significantly reduced the levels of osteocalcin, IL1 and IL6. However, it did not alter the serum pyridinoline level. **Conclusion:** Tocotrienol prevented osteoporotic bone loss by reducing the high bone turnover rate associated with estrogen deficiency. Therefore, tocotrienol has the potential to be used as an anti-osteoporotic agent in postmenopausal women.

## J26 Selective uptake of alpha-tocotrienol and improvement in oxidative status in rat brains following short- and long- term intake of tocotrienol rich fraction

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Malaysian Journal of Nutrition, 19(2), 2013, 251 - 259

Tocotrienol exerts neuroprotective effects resulting in an improved circulating oxidative status. However, accumulation of tocotrienol due to longterm intake may exert pro-oxidant effects. Thus the effects of short- and longterm supplementation of vitamin E tocotrienol rich fraction (TRF) on the parameters of oxidative status in rat brains were determined. Methods: Wistar rats aged 3

months were supplemented with TRF for 3 or 8 months. Control groups received equivolume of distilled water. Rats were sacrificed and brains harvested, weighed and homogenised. Supernatants were analysed for catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GSH-Px) activities, vitamin E and protein carbonyl. Results: A significant decline in the level of total vitamin E and its isomers with increasing age were found. TRF supplementation increased the level of total vitamin E with alpha-tocotrienol (ATT) being the major isomer raised. Glutathione peroxidase activity was also significantly increased in the long-term supplemented group compared to the short-term supplemented and control groups. The results also showed significantly higher superoxide dismutase activity ( $p < 0.05$ ) and heavier brain weights ( $p < 0.05$ ) in both supplemented groups but catalase activity remained unchanged. Conclusion: The study showed long-term TRF supplementation exerts positive effects on brain oxidative status.

## **J27 A review of antioxidant polyphenol curcumin and its role in detoxification**

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International Journal of PharmTech Research, Vol.6 (1), 2014, 280-289

Curcumin (diferuloylmethane), a yellow colouring agent present in the rhizome of *Curcuma longa* Linn (Zingiberaceae), has been reported to possess anti-inflammatory, antioxidant and anticarcinogenic activities. Despite such significant anti-tumor efficacies and bio-safety profiles of curcumin, its poor systemic bioavailability originating from sub-optimal absorption, rapid metabolism and fast systemic elimination, is turning out to be one of the major impeding factors retarding its clinical success. Curcumin exerts its chemoprotective and chemopreventive effects via multiple mechanisms. It has been reported to induce expression of the antioxidant enzymes in various cell lines. Curcumin significantly increased expression of Nrf2 as well as phase II detoxifying and antioxidant enzymes. The redox-sensitive transcription factor, nuclear factor erythroid 2 p45 (NF-E2)-related factor (Nrf2) plays a key role in regulating induction of phase II detoxifying or antioxidant enzymes. Thus, activation of Nrf2 is considered to be an important molecular target of many chemopreventive and chemoprotective agents. This review summarizes the molecular basis of chemoprevention and cytoprotection afforded by curcumin with emphasis on its ability to modulate Nrf2-mediated cellular events. In this review, we describe both antioxidant activity and effects of curcumin on biotransformation enzymes involved in carcinogen metabolism.

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## **J28 Dietary phytochemicals activate the redox-sensitive transcription factor Nrf2**

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International Journal of Pharmacy and Pharmaceutical Sciences, Vol. 6(5), 2014, 11-16

Nuclear transcription factor erythroid 2p45-related factor 2 (Nrf2) plays a crucial role in regulating phase-2 detoxifying/antioxidant gene induction. Under physiological conditions, NRF2 is mainly located in the cytoplasm. However, in response to oxidative stress, NRF2 translocates to the

nucleus and binds to specific DNA sites, termed “antioxidant response elements” or “electrophile response elements,” to initiate the transcription of numerous cytoprotective genes. Many structurally diverse antioxidants derived from various sources of dietary phytochemicals have been found to activate this particular redox-sensitive transcription factor, thereby potentiating the cellular detoxification action of Nrf2. This review focuses on known phytochemical inducers and the mechanism by which they regulate antioxidant responsive element (ARE)/Nrf2-dependent detoxification genes.

## **J29 The anti-inflammatory role of vitamin E in prevention of osteoporosis**

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Advances in Pharmacological Sciences, 2012, Article ID 142702

There is growing evidence that inflammation may be one of the causal factors of osteoporosis. Several cytokines such as IL-1, IL-6, RANKL, OPG, and M-CSF were implicated in the pathogenesis of osteoporosis. These cytokines are important determinants of osteoclast differentiation and its bone resorptive activity. Anticytokine therapy using cytokine antagonists such as IL-receptor antagonist and TNF-binding protein was able to suppress the activity of the respective cytokines and prevent bone loss. Several animal studies have shown that vitamin E in the forms of palm-derived tocotrienol and  $\alpha$ -tocopherol may prevent osteoporosis in rat models by suppressing IL-1 and IL-6. Free radicals are known to activate transcription factor NF $\kappa$ B which leads to the production of bone resorbing cytokines. Vitamin E, a potent antioxidant, may be able to neutralise free radicals before they could activate NF $\kappa$ B, therefore suppressing cytokine production and osteoporosis. Vitamin E has also been shown to inhibit COX-2, the enzyme involved in inflammatory reactions. Of the two types of vitamin E studied, tocotrienol seemed to be better than tocopherol in terms of its ability to suppress bone-resorbing cytokines.

## **J30 Tocotrienols as an anti-osteoporotic agent: The progress so far**

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International Journal of Osteoporosis and Metabolic Disorders, Vol.4, 2011, 1-14

Osteoporosis is a metabolic bone disease affecting both men and women especially postmenopausal women. Osteoporosis has been associated with oxidative stress and therefore the protective effects of antioxidants such as vitamin E were studied. Lately, there has been a growing interest in tocotrienol, a potent vitamin E with anti-cholesterol, anti-cancer and perhaps anti-osteoporotic properties. We have conducted studies on the effects of tocotrienol on various animal models of osteoporosis and discovered its ability to prevent osteoporosis. In most of the studies, tocotrienol mixtures as well as its isomers such as gamma-, alpha- or delta-tocotrienol were compared to alpha tocopherol, the most abundant and widely commercialized vitamin E. The techniques that were used included Enzyme-linked immunosorbent assay (ELISA), bone histomorphometry, Dual energy X-ray absorptiometry (DEXA) and biomechanical testing. Most of the results revealed that tocotrienols were more efficacious than alpha-tocopherol in protecting

the bone from various inducers of osteoporosis. These convincing results warrant further studies in pursuing the idea that in future, tocotrienol would be accepted as part of the treatment regime for osteoporosis. The role of tocotrienols in studies using various osteoporotic models was discussed in light of its potential as an anti-osteoporotic agent.

### **J31 Effects of phytosterol supplementation on lipid peroxidation induced by carbon tetrachloride in a rat model**

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Medicine & Health, Vol, 6(1), 2011, 25-32

Phytosterols are plant sterol with a chemical structure similar to cholesterol. It has anti-cholesterol, anti-cancer and anti-oxidant properties which are probably mediated by suppression of lipid peroxidation. However, there are limited studies on the effects of phytosterols on lipid peroxidation. The aim of this study is to determine the effects of phytosterols on plasma and tissue malondialdehyde (MDA) of rats exposed to carbon tetrachloride. The rats were divided into four group of normal control (NC), carbon tetrachloride (CCL4), phytosterol (P) and phytosterol+carbon tetrachloride (P+ CCL4). The P+CCI4 groups were pretreated with subcutaneous phytosterol at 140mg/kg once weekly for 5 weeks while the NC and CCL4 groups only receive olive oil (vehicle). A single oral dose of carbon tetrachloride was then given to rats in the CCL4 and P+CCI4 groups to induce lipid peroxidation. After 24 hours, all the rats were sacrificed and the plasma and tissue MDA were measured. Our results showed carbon tetrachloride had caused significant elevations of the plasma and hepatic MDA of the CCL4f group compared to the NC group. Phytosterol pretreatment (P+ CCL4) were able to prevent the MDA elevations. Phytosterols treatment in normal rats (P group) were found to reduce the hepatic MDA level. The conclusion of this study was that phytosterols are effective suppressor of plasma and hepatic lipid peroxidation. They have potential as supplements to further reduce lipid peroxidation in healthy individuals.

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### **J32 Tocotrienols and breast cancer: The evidence to date**

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Genes and Nutrition, Vol. 7(1), 2012, 3-9

Breast cancer is the second most frequent cancer affecting women worldwide after lung cancer. The toxicity factor associated with synthetic drugs has turned the attention toward natural compounds as the primary focus of interest as anticancer agents. Vitamin E derivatives consisting of the well-established tocopherols and their analogs namely tocotrienols have been extensively studied due to their remarkable biological properties. While tocopherols have failed to offer protection, tocotrienols, in particular,  $\alpha$ -,  $d$ -, and  $c$ -tocotrienols alone and in combination have

demonstrated anticancer properties. The discovery of the antiangiogenic, antiproliferative, and apoptotic effects of tocotrienols, as well as their role as an inducer of immunological functions, not only reveals a new horizon as a potent antitumor agent but also reinforces the notion that tocotrienols are indeed more than antioxidants. On the basis of a transcriptomic platform, we have recently demonstrated a novel mechanism for tocotrienol activity that involves estrogen receptor (ER) signaling. In silico simulations and in vitro binding analyses indicate a high affinity of specific forms of tocotrienols for ER $\beta$ , but not for ER $\alpha$ . Moreover, we have demonstrated that specific tocotrienols increase ER $\beta$  translocation into the nucleus which, in turn, activates the expression of estrogen-responsive genes (MIC-1, EGR-1 and Cathepsin D) in breast cancer cells only expressing ER $\beta$  cells (MDA-MB-231) and in cells expressing both ER isoforms (MCF-7). The binding of specific tocotrienol forms to ER $\beta$  is associated with the alteration of cell morphology, caspase-3 activation, DNA fragmentation, and apoptosis. Furthermore, a recently concluded clinical trial seems to suggest that tocotrienols in combination with tamoxifen may have the potential to extend breast cancer-specific survival.

### J33 Low dose of tocotrienols protects osteoblasts against oxidative stress

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Clinical Therapeutics, Vol. 162(6), 2011, 533-538

**Aims:** Vitamin E is an antioxidant that may protect bone against oxidative stress-induced osteoporosis. This in vitro study was conducted to determine the protective effects of  $\alpha$ -tocopherol and  $\gamma$ -tocotrienol on osteoblasts, the bone forming cells, against oxidative stress. **Materials and Methods:** Toxicity tests were carried out on hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>),  $\alpha$ -tocopherol and  $\gamma$ -tocotrienol and their inhibitory concentration 50 (IC<sub>50</sub>) on osteoblasts were determined if any. Osteoblast cultures were then pretreated with different concentrations of  $\alpha$ -tocopherol or  $\gamma$ -tocotrienol for 24 hours before incubated with the IC<sub>50</sub> of H<sub>2</sub>O<sub>2</sub> for 2 hours. Cell viability was determined by using MTS assay to compare the protective effects of both vitamin E on osteoblast exposed to H<sub>2</sub>O<sub>2</sub>. **Results:** The IC<sub>50</sub> after 2 hours and 24 hours incubation time for H<sub>2</sub>O<sub>2</sub> were 490  $\mu$ M and 280  $\mu$ M respectively.  $\gamma$ -Tocotrienol was found to be toxic to osteoblasts with the IC<sub>50</sub> of 290  $\mu$ M after 24 hours incubation time while  $\alpha$ -tocopherol was not toxic to osteoblasts at any doses. However,  $\gamma$ -tocotrienol was able to protect osteoblasts from H<sub>2</sub>O<sub>2</sub> toxicity at low concentration (1  $\mu$ M), whereas  $\alpha$ -tocopherol was not able to offer protection against H<sub>2</sub>O<sub>2</sub> toxicity. **Conclusions:**  $\gamma$ -tocotrienol was found to be toxic to osteoblasts at high concentrations but at much lower concentration, it has better antioxidant activity than  $\alpha$ -tocopherol to protect osteoblasts from oxidative stress.

### J34 Effect of vitamin E (Tri E(r)) on antioxidant enzymes and DNA damage in rats following eight weeks exercise

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**Background:** Exercise is beneficial to health, but during exercise the body generates reactive oxygen species (ROS) which are known to result in oxidative stress. The present study analysed the effects of vitamin E (Tri E®) on antioxidant enzymes; superoxide dismutase (SOD), glutathione peroxidase (GPx), catalase (Cat) activity and DNA damage in rats undergoing eight weeks exercise. **Methods:** Twenty four *Sprague-Dawley* rats (weighing 320-370 gm) were divided into four groups; a control group of sedentary rats which were given a normal diet, second group of sedentary rats with oral supplementation of 30 mg/kg/d of Tri E®, third group comprised of exercised rats on a normal diet, and the fourth group of exercised rats with oral supplementation of 30 mg/kg/d of Tri E®. The exercising rats were trained on a treadmill for 30 minutes per day for 8 weeks. Blood samples were taken before and after 8 weeks of the study to determine SOD, GPx, Cat activities and DNA damage. **Results:** SOD activity decreased significantly in all the groups compared to baseline, however both exercised groups showed significant reduction in SOD activity as compared to the sedentary groups. Sedentary control groups showed significantly higher GPx and Cat activity compared to baseline and exercised groups. The supplemented groups, both exercised and non exercised groups, showed significant decrease in Cat activity as compared to their control groups with normal diet. DNA damage was significantly higher in exercising rats as compared to sedentary control. However in exercising groups, the DNA damage in supplemented group is significantly lower as compared to the non-supplemented group. **Conclusions:** In conclusion, antioxidant enzymes activity were generally reduced in rats supplemented with Tri E(r) probably due to its synergistic anti-oxidative defence, as evidenced by the decrease in DNA damage in Tri E® supplemented exercise group.

**J35 Antioxidant enzyme activity and malondialdehyde levels can be modulated by *Piper Betle*, tocotrienol rich fraction and *Chlorella Vulgaris* in aging C57BL/6 mice**

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Clinics, Vol.67 (12), 2012, 1-8

**Objective:** The aim of this study was to determine the erythrocyte antioxidant enzyme activity and the superoxide dismutase, catalase, glutathione peroxidase, and plasma malondialdehyde levels in aging mice and to evaluate how these measures are modulated by potential antioxidants, including the tocotrienol-rich fraction, *Piper betle*, and *Chlorella vulgaris*. **Method:** One hundred and twenty male C57BL/6 inbred mice were divided into three age groups: young (6 months old), middle-aged (12 months old), and old (18 months old). Each age group consisted of two control groups (distilled water and olive oil) and three treatment groups: *Piper betle* (50 mg/kg body weight), tocotrienol-rich fraction (30 mg/kg), and *Chlorella vulgaris* (50 mg/kg). The duration of treatment for all three age groups was two months. Blood was withdrawn from the orbital sinus to determine the antioxidant enzyme activity and the malondialdehyde level. **Results:** *Piper betle* increased the activities of catalase, glutathione peroxidase, and superoxide dismutase in the young, middle, and old age groups, respectively, when compared to control. The tocotrienol-rich fraction decreased the superoxide dismutase activity in the middle and the old age groups but had no effect on catalase or glutathione peroxidase activity for all age groups. *Chlorella vulgaris* had no effect on superoxide dismutase activity for all age groups but increased glutathione peroxidase

and decreased catalase activity in the middle and the young age groups, respectively. *Chlorella vulgaris* reduced lipid peroxidation (malondialdehyde levels) in all age groups, but no significant changes were observed with the tocotrienol-rich fraction and the *Piper betle* treatments. **Conclusion:** We found equivocal age-related changes in erythrocyte antioxidant enzyme activity when mice were treated with *Piper betle*, the tocotrienol-rich fraction, and *Chlorella vulgaris*. However, *Piper betle* treatment showed increased antioxidant enzymes activity during aging.

### J36 The toxic effects of palm vitamin E on the reproductive system of female mice

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Journal of Toxicology Research, Vol.3 (2), 2013, 25-28

**Background:** Palm Vitamin E had been studied extensively for health and medicinal purposes. However, its toxic effects need to be elucidated. This Study was done to determine the toxic effects of palm vitamin E in various dosages on the reproductive system of mice by determining the body weight, amount and size of pups delivered and post-mortem examination of the dams.

**Methods:** This study was divided into two sub-studies i.e. giving palm vitamin E before and during pregnancy. A total of 56 mice were used in this study. The mice were divided into four groups; the control group, and groups supplemented with either palm vitamin E at 200mg/kg, 500mg/kg or 1000mg/kg. Supplementation of palm vitamin E before pregnancy involved giving palm vitamin E daily two weeks before pregnancy and no palm vitamin E given until birth. Supplementation of palm vitamin E during pregnancy involved giving palm vitamin E daily from the first day of pregnancy until birth, which was about 21 days. Body weights were recorded weekly. After delivery, the amount, weight and body length of pups were determined after which the dams were killed for post-mortem analysis of the uterus. **Results:** The results showed no significance difference ( $p>0.005$ ) in the weight, amount and size of pups delivered amongst the groups for both sub-studies. **Conclusion:** Palm vitamin E at the dosages of 200mg/kg, 500mg/kg and 1000mg/kg which was given before and during pregnancy did not cause any toxic effects on the reproductive system of mice.

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### J37 Antioxidant and cytotoxicity effect of rice bran phytic acid as an anticancer agent on ovarian, breast and liver cancer cell lines

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Malaysian Journal of Nutrition, Vol.17 (3), 2011, 367-375

**Introduction:** Phytic acid (PA) has been shown to have positive nutritional benefits. There are also claims that it is able to prevent cancer through its antioxidant capability. This study investigated antioxidant activity and cytotoxic effect of PA extracted from rice bran against selected cancer cell lines (i.e. ovarian, breast and liver cancer). **Methods:** Cytotoxicity activity of PA was

investigated using MTS [3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulfophenyl)]-2H-tetrazolium, inner salt] assay while the antioxidant activity of PA extract, commercial PA and butylated hydroxytoluene (BHT) was determined by using five different assays: ferric thiocyanate (FTC) and thiobarbituric acid (TBA) assay, beta-carotene bleaching method, DPPH radical scavenging assay and ferric reducing antioxidant power (FRAP) assay. **Results:** PA extracted from rice bran induced marked growth inhibition in ovary, breast and liver cancer cells with 50% growth inhibition concentration (IC50) values of 3.45, 3.78 and 1.66 mM, respectively but exhibited no sensitivity towards a normal cell line (3T3). The PA extract was also found to exert antioxidant activity when tested using the FTC, TBA, FRAP and beta-carotene bleaching methods but antioxidant activity could not be attributed to scavenging free radical species as measured by DPPH radical scavenging assay. **Conclusion:** The PA extract from rice bran displayed safe and promising anticancer properties in selected cancer cell lines and it is believed that its antioxidant capability is the likely contributor to the observed anticancer properties.

### **J38 Two different isomers of vitamin E prevent bone loss in postmenopausal osteoporosis rat model**

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Evidence-Based Complementary and Alternative Medicine, Vol. 2012, Article ID: 161527

Postmenopausal osteoporotic bone loss occurs mainly due to cessation of ovarian function, a condition associated with increased free radicals. Vitamin E, a lipid-soluble vitamin, is a potent antioxidant which can scavenge free radicals in the body. In this study, we investigated the effects of alpha-tocopherol and pure tocotrienol on bone microarchitecture and cellular parameters in ovariectomized rats. Three-month-old female Wistar rats were randomly divided into ovariectomized control, sham-operated, and ovariectomized rats treated with either alpha-tocopherol or tocotrienol. Their femurs were taken at the end of the four-week study period for bone histomorphometric analysis. Ovariectomy causes bone loss in the control group as shown by reduction in both trabecular volume (BV/TV) and trabecular number (Tb.N) and an increase in trabecular separation (Tb.S). The increase in osteoclast surface (Oc.S) and osteoblast surface (Ob.S) in ovariectomy indicates an increase in bone turnover rate. Treatment with either alpha-tocopherol or tocotrienol prevents the reduction in BV/TV and Tb.N as well as the increase in Tb.S, while reducing the Oc.S and increasing the Ob.S. In conclusion, the two forms of vitamin E were able to prevent bone loss due to ovariectomy. Both tocotrienol and alpha-tocopherol exert similar effects in preserving bone microarchitecture in estrogen-deficient rat model.

### **J39 Palm tocotrienol-rich fraction improves vascular proatherosclerotic changes in hyperhomocysteinemic rats**

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This study investigated the effects of palm tocotrienol-rich fraction (TRF) on aortic proatherosclerotic changes in rats fed with a high methionine diet. Forty-two male Wistar rats were divided into six groups. The first group was the control (fed with a basal diet). Another five groups were fed with 1% methionine diet for 10 weeks. From week 6 onward, folate (8 mg/kg diet) or palm TRF (30, 60, and 150 mg/kg diets) was added into the diet of the last four rat groups, respectively. The high methionine diet raised the plasma total homocysteine and aortic lipid peroxidation, which were reduced by the palm TRF and folate supplementations. Plasma nitric oxide was reduced in the high methionine group compared to the control (versus  $\mu\text{mol/L}$ ), which reduction was reversed by the palm TRF (60 and 150 mg/kg) and folate supplementations. The increased aortic vascular cell adhesion molecule-1 expression in the methionine group () was significantly reduced by the folate () and palm TRF at 150 mg/kg (). Palm TRF was comparable to folate in reducing high methionine diet-induced plasma hyperhomocysteinemia, aortic oxidative stress, and inflammatory changes in rats.

#### J40 Palm tocotrienol-rich fraction reduced plasma homocysteine and heart oxidative stress in rats fed with a high-methionine diet

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Journal of Physiology and Biochemistry, Vol.69 (3), 2013, 441-449

Oxidative stress contributes to cardiovascular diseases. We aimed to study the effects of palm tocotrienol-rich fraction (TRF) on plasma homocysteine and cardiac oxidative stress in rats fed with a high-methionine diet. Forty-two male Wistar rats were divided into six groups. The first group was the control. Groups 2-6 were fed 1% methionine diet for 10 weeks. From week 6 onward, folate (8 mg/kg diet) or palm TRF (30, 60 and 150 mg/kg diet) was added into the diet of groups 3, 4, 5 and 6. The rats were then killed. Palm TRF at 150 mg/kg and folate supplementation prevented the increase in plasma total homocysteine ( $4.14 \pm 0.33$  and  $4.30 \pm 0.26$  vs  $5.49 \pm 0.25$  mmol/L,  $p < 0.05$ ) induced by a high-methionine diet. The increased heart thiobarbituric acid reactive substance in rats fed with high-methionine diet was also prevented by the supplementations of palm TRF (60 and 150 mg/kg) and folate. The high-methionine group had a lower glutathione peroxidase activity ( $49 \pm 3$  vs  $69 \pm 4$  pmol/mg protein/min) than the control group. This reduction was reversed by palm TRF at 60 and 150 mg/kg diet ( $p < 0.05$ ), but not by folate. Catalase and superoxide dismutase activities were unaffected by both methionine and vitamin supplementations. In conclusion, palm TRF was comparable to folate in reducing high-methionine diet-induced hyperhomocysteinemia and oxidative stress in the rats' hearts. However, palm TRF was more effective than folate in preserving the heart glutathione peroxidase enzyme activity.

## J41 Tocotrienol attenuates stress-induced gastric lesions via activation of prostaglandin and upregulation of COX-1 mRNA

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Evidence-Based Complementary and Alternative Medicine, 2013, Article ID 804796

The present study aims to distinguish the effect of tocotrienol on an important gastric protective factor, prostaglandin E2 (PGE2), in stress-induced gastric injury. Twenty-eight Wistar rats were divided into four groups of seven rats each. Two control groups were fed commercial rat diet, and two treatment groups were fed the same diet but with additional dose of omeprazole (20 mg/kg) or tocotrienol (60 mg/kg). After 28 days, rats from one control group and both treated groups were subjected to water-immersion restraint stress for 3.5 hours once. The rats were then sacrificed, their stomach isolated and gastric juice collected, lesions examined, and gastric PGE2 content and cyclooxygenase (COX) mRNA expression were determined. Both the regimes significantly attenuated the total lesion area in the stomach compared to the control. Gastric acidity, which was increased in stress, was significantly reduced in rats supplemented with omeprazole and tocotrienol. The PGE2 content was also significantly higher in the rats given tocotrienol supplementation compared to the control followed by an increase in COX-1 mRNA expression. We conclude that tocotrienol supplementation protected rat gastric mucosa against stress-induced lesions possibly by reducing gastric acidity and preserving gastric PGE2 by increasing COX-1 mRNA.

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## J42 Palm vitamin E reduces catecholamines, xanthine oxidase activity and gastric lesions in rats exposed to water-immersion restraint stress

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BMC Gastroenterology, Vol. 12 (54), 2012

**Background:** This study examined the effects of Palm vitamin E (PVE) and  $\alpha$ -tocopherol ( $\alpha$ -TF) supplementations on adrenalin, noradrenalin, xanthine oxidase plus dehydrogenase (XO + XD) activities and gastric lesions in rats exposed to water-immersion restraint stress (WIRS). **Methods:** Sixty male *Sprague-Dawley* rats (200-250 g) were randomly divided into three equal sized groups. The control group was given a normal diet, while the treated groups received the same diet with oral supplementation of PVE or -TF at 60 mg/kg body weight. After the treatment period of 28 days, each group was further subdivided into two groups with 10 rats without exposing them to stress and the other 10 rats were subjected to WIRS for 3.5 hours. Blood samples were taken to measure the adrenalin and noradrenalin levels. The rats were then sacrificed following which the stomach was excised and opened along the greater curvature and examined for lesions and XO + XD activities. **Results:** The rats exposed to WIRS had lesions in their stomach mucosa. Our findings showed that dietary supplementations of PVE and  $\alpha$ -TF were able to reduce gastric lesions significantly in comparison to the stressed control group. WIRS

increased plasma adrenalin and noradrenalin significantly. PVE and  $\alpha$ -TF treatments reduced these parameters significantly compared to the stressed control. **Conclusions:** Supplementations with either PVE or  $\alpha$ -TF reduce the formation of gastric lesions. Their protective effect was related to their abilities to inhibit stress induced elevation of adrenalin and noradrenalin levels as well as through reduction in xanthine oxidase and dehydrogenase activities.

#### **J43 Effects of tocotrienol and tocopherol supplementation on liver oxidative status and antioxidant enzymes activity in stress-induced rats**

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Sains Malaysiana, 40 (5), 2011, 481-487

This study was designed to investigate the effects of tocotrienol (TT) and tocopherol (TF) supplementation on oxidative status and antioxidant enzymes activity in stress-induced rats. Twenty-four male Sprague-Dawley rats were randomly assigned into four groups, consisted of two control groups (C and CS) which were fed with a commercially prepared normal rat diet while two treatment groups (TTS and TFS) were given tocotrienol or tocopherol orally in the dose of 60 mg/kg body weight. After 28 days of treatment, the CS, TTS and TFS rats were subjected to restraint stress, two hours daily for four consecutive days. The rats were killed and their blood was taken to determine the antioxidant enzymes activity; superoxide dismutase (SOD) and glutathione peroxidase (GPx). The liver was taken to determine malondialdehyde (MDA) and glutathione levels. The findings showed that CS rats after being stressed had significantly higher levels of MDA and lower levels of glutathione in the liver. Tocotrienol and tocopherol were proved to significantly reduce the MDA and increased the glutathione content in tissues after exposure to stress compared to control groups. The findings also showed that the activity of GPx in plasma increased significantly in the CS group. However, rats fed with tocotrienol showed reduced GPx activity compared to the CS group. In conclusion, tocotrienol and tocopherol are capable of reducing the oxidative stress by reducing MDA tissue level, increasing glutathione tissue level and reducing GPx plasma activity in stress-induced rats.

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#### **J44 Bone proteome study in ovariectomised rats supplemented with palm vitamin E**

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World Academy of Science, Engineering and Technology, Vol. 6, 2012, 12-26

Supplementation of palm vitamin E has been reported to prevent loss of bone density in ovariectomised female rats. The mechanism by which palm vitamin E exerts these effects is still unknown. We hypothesized that palm vitamin E may act by preventing the protein expression changes. Two dimensional poly acrylamide gel electrophoresis (2-D PAGE) and PD Quest software genomic solutions Investigator (proteomics) was used to analyze the differential protein expression profile in femoral and humeri bones harvested from three groups of rats; sham-

operated rats (SO), ovariectomised rats (Ovx) and ovariectomised rats supplemented for 2 months with palm vitamin E. The results showed that there were over 300 valued spot on each of the groups PVE and OVX as compared to about 200 in SO. Comparison between the differential protein expression between OVX and PVE groups showed that ten spots were down-regulated in OVX but up-regulated in PVE. The ten differential spots were separately named P1-P10. The identification and understanding of the pathway of the differential protein expression among the groups is ongoing and may account for the molecular mechanism through which palm vitamin E exert its anti-osteoporotic effect.

#### **J45 Pure tocotrienol concentrate protected rat gastric mucosa from acute stress-induced injury by a non-antioxidant mechanism**

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Polish Journal of Pathology, Vol. 64(1), 2013, 52-58

Stress has been implicated as a risk factor of various major health problems, such as stress-induced gastric mucosal injury. This study was performed to investigate the action of a pure preparation of tocotrienol (T3) concentrate, made up of 90%  $\gamma$ -tocotrienol and 10%  $\delta$ -tocotrienol, on gastric injury of rats induced by water-immersion restraint stress (WIRS). Fourteen male Sprague-Dawley rats (200-250 g) were divided into two equal groups: a control group and a treated group. The treatment group received T3 concentrate at 60 mg/kg body weight daily for 28 days. The body weights of rats were recorded daily before the treatment was given. At the end of the treatment period, all rats were subjected to WIRS for 3.5 hours, following which the rats were euthanized. The stomachs were isolated and opened along the greater curvature for the examination of lesions and measurements of gastric malondialdehyde (MDA) and prostaglandin E<sub>2</sub> (PGE<sub>2</sub>) contents. The mean gastric mucosal lesion index in the treated rats was significantly lower than that in the control rats. This suggests that the T3 concentrate has the ability to confer protection to the gastric mucosa against gastric injury induced by acute stress. No significant difference was observed for changes in body weight before and after the treatment. The gastric PGE<sub>2</sub> content in both groups was comparable. However, the gastric MDA content was significantly higher in the treated group compared to the control group, indicating that the T3 supplementation was not able to reduce the lipid peroxidation process. This study concludes that the T3 concentrate has the ability to protect the gastric mucosa from stress-induced injury by a non-antioxidant mechanism.

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#### **J46 Effects of palm vitamin E on bone-formation-related gene expression in nicotine-treated rats**

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The study determines the effects of palm vitamin E on the gene expression of bone-formation-related genes in nicotine-treated rats. Male rats were divided into three groups: normal saline olive oil (NSO), nicotine olive oil (NO), and nicotine palm vitamin E (NE). The treatment was carried out in 2 phases. During the first 2 months, the NSO group received normal saline while the NO and NE groups received nicotine 7\_mg/kg, 6 days a week, intraperitoneally. The following 2 months, normal saline and nicotine administration was stopped and was replaced with oral supplementation of olive oil for the NSO and NO groups and oral supplementation of palm vitamin E (60\_mg/kg) for the NE group. Both femurs were harvested to determine the gene expression of bone morphogenetic protein-2 (BMP-2), Osterix (OSX), and Runt-related transcription factor 2 (RUNX2). Nicotine significantly downregulated the gene expression. This effect was reversed by palm vitamin E treatment. In conclusion, palm vitamin E may play a role in osteoblast differentiation and can be considered as an anabolic agent to treat nicotine-induced osteoporosis.

#### **J47 Effects of vitamin E on bone oxidative parameters during fracture healing of postmenopausal osteoporosis rat model**

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Research Updates in Medical Sciences, Vol.2 (1), 2014, 39-43

Osteoporosis increases the risk of bone fracture and may interfere fracture healing. Studies have proven that vitamin E promoted fracture healing of osteoporotic bone. The objective of this study is to determine whether the antioxidative actions of tocopherol and tocotrienol promotes the late-phase fracture healing of ovariectomised rats. Thirty-two female Sprague-Dawley (200g - 250g) rats were divided among four groups: Sham (SO), Ovariectomised-control (OVXC), Ovariectomised + 60mg/kg alpha-tocopherol (ATF), and ovariectomised + 60mg/kg tocotrienol enrich fraction (TEF). The right femora of the rats were fractured eight weeks after ovariectomy and vitamin E supplementations were given two days post-fracture, by oral gavage, six days per week, for eight weeks. The rats were euthanised and the right femora were harvested for bone oxidative status determination (TBARS, SOD, GPX, and catalase). Result from the study showed no significant changes for all oxidative parameters measured (MDA, SOD, GPX and Catalase). Supplementation of  $\alpha$ -tocopherol and tocotrienol had no effects on the bone oxidative status during late phase fracture healing of postmenopausal osteoporosis rat model. These anti-oxidative actions of vitamin E may be important only during the early-phase of fracture healing.

#### **J48 The effects of alpha-tocopherol supplementation on fracture healing in a postmenopausal osteoporotic rat model**

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Clinics, Vol.67 (9), 2012, 1077-1085

**Objective:** Osteoporosis increases the risk of bone fractures and may impair fracture healing. The aim of this study was to investigate whether alpha-tocopherol can improve the late-phase fracture healing of osteoporotic bones in ovariectomized rats. **Method:** In total, 24 female Sprague-Dawley rats were divided into three groups. The first group was sham-operated, and the other two groups were ovariectomized. After two months, the right femora of the rats were fractured under anesthesia and internally repaired with K-wires. The sham-operated and ovariectomized control rat groups were administered olive oil (a vehicle), whereas 60 mg/kg of alpha-tocopherol was administered via oral gavage to the alpha-tocopherol group for six days per week over the course of 8 weeks. The rats were sacrificed, and the femora were dissected out. Computed tomography scans and X-rays were performed to assess fracture healing and callus staging, followed by the assessment of callus strengths through the biomechanical testing of the bones. **Results:** Significantly higher callus volume and callus staging were observed in the ovariectomized control group compared with the sham-operated and alpha-tocopherol groups. The ovariectomized control group also had significantly lower fracture healing scores than the sham-operated group. There were no differences between the alpha-tocopherol and sham-operated groups with respect to the above parameters. The healed femora of the ovariectomized control group demonstrated significantly lower load and strain parameters than the healed femora of the sham-operated group. Alpha-tocopherol supplementation was not able to restore these biomechanical properties. **Conclusion:** Alpha-tocopherol supplementation appeared to promote bone fracture healing in osteoporotic rats but failed to restore the strength of the fractured bone.

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#### J49 Tocotrienol supplementation improves late-phase fracture healing compared to alpha-tocopherol in a rat model of postmenopausal osteoporosis: A biomechanical evaluation

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Evidence- Based Complementary and Alternative Medicine, Vol.2012, Article ID: 372878

This study investigated the effects of  $\alpha$ -tocopherol and palm oil tocotrienol supplementations on bone fracture healing in postmenopausal osteoporosis rats. 32 female Sprague-Dawley rats were divided into four groups. The first group was sham operated (SO), while the others were ovariectomised. After 2 months, the right femora were fractured under anesthesia and fixed with K-wire. The SO and ovariectomised-control rats (OVXC) were given olive oil (vehicle), while both the alpha-tocopherol (ATF) and tocotrienol-enriched fraction (TEF) groups were given alpha-tocopherol and tocotrienol-enriched fraction, respectively, at the dose of 60 mg/kg via oral gavages 6 days per week for 8 weeks. The rats were then euthanized and the femora dissected out for bone biomechanical testing to assess their strength. The callous of the TEF group had

significantly higher stress parameter than the SO and OVXC groups. Only the SO group showed significantly higher strain parameter compared to the other treatment groups. The load parameter of the OVXC and ATF groups was significantly lower than the SO group. There was no significant difference in the Young's modulus between the groups. In conclusion, tocotrienol is better than  $\alpha$ -tocopherol in improving the biomechanical properties of the fracture callous in postmenopausal osteoporosis rat model.

## **J50 Expression of senescence-associated microRNAs and target genes in cellular aging and modulation by tocotrienol-rich fraction**

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Oxidative Medicine and Cellular Longevity, 2014, Article ID 725929, 1-12

Emerging evidences highlight the implication of microRNAs as a posttranscriptional regulator in aging. Several senescence-associated microRNAs (SA-miRNAs) are found to be differentially expressed during cellular senescence. However, the role of dietary compounds on SA-miRNAs remains elusive. This study aimed to elucidate the modulatory role of tocotrienol-rich fraction (TRF) on SA-miRNAs (miR-20a, miR-24, miR-34a, miR-106a, and miR-449a) and established target genes of miR-34a (CCND1, CDK4, and SIRT1) during replicative senescence of human diploid fibroblasts (HDFs). Primary cultures of HDFs at young and senescent were incubated with TRF at 0.5mg/mL. Taqman microRNA assay showed significant upregulation of miR-24 and miR-34a and downregulation of miR-20a and miR-449a in senescent HDFs ( $P<0.05$ ). TRF reduced miR-34a expression in senescent HDFs and increased miR-20a expression in young HDFs and increased miR-449a expression in both young and senescent HDFs. Our results also demonstrated that ectopic expression of miR-34a reduced the expression of CDK4 significantly ( $P<0.05$ ). TRF inhibited miR-34a expression thus relieved its inhibition on CDK4 gene expression. No significant change was observed on the expression of CCND1, SIRT1, and miR-34a upstream transcriptional regulator, TP53. In conclusion tocotrienol-rich fraction prevented cellular senescence of human diploid fibroblasts via modulation of SA-miRNAs and target genes expression.

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## **J51 Effects of $\alpha$ -tocopherol on the early phase of osteoporotic fracture healing**

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Fracture healing is a complex process, which is more complicated if the bone is osteoporotic. One of the vitamin E isomers,  $\alpha$ -tocopherol, has been found to prevent osteoporosis and improve bone fracture healing but its role in the healing of osteoporotic fractures is still unclear. We carried out a study on the effects of  $\alpha$ -tocopherol supplementation on osteoporotic fracture healing using an ovariectomized rat model, whereby we focused on the early phase of fracture healing, that is,

the phase with excessive production of free radicals. Twenty-four female Sprague-Dawley rats were divided into three groups: sham-operated (SO), ovariectomized-control (OVC), and ovariectomized +  $\alpha$ -tocopherol supplementation (ATF) groups. The right femora of all the rats were fractured at mid-diaphysis and K-wires were inserted for internal fixation. After 2 weeks of treatment, the rats were euthanized and the femora were dissected out for measurement of callous volume by CT-scan and radiological staging of callous formation and fracture healing. The oxidative parameters of the fractured femora were also measured. The results showed that the callous volume and callous staging were not different between the groups. However, the fracture healing stage of the OVC group was lower than the SO group, while  $\alpha$ -tocopherol supplementation in the ATF group had improved the healing until it was comparable to the SO group. The activities of the anti-oxidatant enzymes, superoxide dismutase, and glutathione peroxidase in the ATF group were found to be significantly higher than in the OVC group. In conclusion,  $\alpha$ -tocopherol improved fracture healing but had no effect on the callous volume and staging. The improvement in fracture healing may be due to the increased activities of the anti-oxidatant enzymes in the bone during the early phase of fracture healing of osteoporotic bone.

**J52 Comparative effects in biodynes, tocotrienol-rich fraction, and tocopherol in enhancing collagen synthesis and inhibiting collagen degradation in stress-induced premature senescence model of human diploid fibroblasts**

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Oxidative Medicine and Cellular Longevity, 2013, Article ID 298574

Biodynes, tocotrienol-rich fraction (TRF), and tocopherol have shown antiaging properties. However, the combined effects of these compounds on skin aging are yet to be investigated. This study aimed to elucidate the skin aging effects of biodynes, TRF, and tocopherol on stress-induced premature senescence (SIPS) model of human diploid fibroblasts (HDFs) by determining the expression of collagen and MMPs at gene and protein levels. Primary HDFs were treated with biodynes, TRF, and tocopherol prior to hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) exposure. The expression of COL1A1, COL3A1, MMP1, MMP2, MMP3, and MMP9 genes was determined by qRT-PCR. Type I and type III procollagen proteins were measured by Western blotting while the activities of MMPs were quantified by fluorometric Sensolyte MMP Kit. Our results showed that biodynes, TRF, and tocopherol upregulated collagen genes and downregulated MMP genes (P<0.05). Type I procollagen and type III procollagen protein levels were significantly increased in response to biodynes, TRF, and tocopherol treatment (P<0.05) with reduction in MMP-1, MMP-2, MMP-3, and MMP-9 activities (P<0.05). These findings indicated that biodynes, TRF, and tocopherol effectively enhanced collagen synthesis and inhibited collagen degradation and therefore may protect the skin from aging.

**J53** **Gamma-tocotrienol modulated gene expression in senescent human diploid fibroblasts as revealed by microarray analysis**

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Oxidative Medicine and Cellular Longevity, 2013, Article ID 454328

The effect of  $\gamma$ -tocotrienol, a vitamin E isomer, in modulating gene expression in cellular aging of human diploid fibroblasts was studied. Senescent cells at passage 30 were incubated with 70  $\mu$ M of  $\gamma$ -tocotrienol for 24 h. Gene expression patterns were evaluated using Sentrix HumanRef-8 Expression BeadChip from Illumina, analysed using GeneSpring GX10 software, and validated using quantitative RT-PCR. A total of 100 genes were differentially expressed ( $P < 0.001$ ) by at least 1.5 fold in response to  $\gamma$ -tocotrienol treatment. Amongst the genes were IRAK3, SelS, HSPA5, HERPUD1, DNAJB9, SEPR1, C18orf55, ARF4, RINT1, NXT1, CADPS2, COG6, and GLRX5. Significant gene list was further analysed by Gene Set Enrichment Analysis (GSEA), and the Normalized Enrichment Score (NES) showed that biological processes such as inflammation, protein transport, apoptosis, and cell redox homeostasis were modulated in senescent fibroblasts treated with  $\gamma$ -tocotrienol. These findings revealed that  $\gamma$ -tocotrienol may prevent cellular aging of human diploid fibroblasts by modulating gene expression.

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**J54** **Tocotrienol-rich fraction prevents cell cycle arrest and elongates telomere length in senescent human diploid fibroblasts**

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Journal of Biomedicine and Biotechnology, Vol. 2011, Article ID 506171

This study determined the molecular mechanisms of tocotrienol-rich fraction (TRF) in preventing cellular senescence of human diploid fibroblasts (HDFs). Primary culture of HDFs at various passages were incubated with 0.5 mg/mL TRF for 24h. Telomere shortening with decreased telomerase activity was observed in senescent HDFs while the levels of damaged DNA and number of cells in G<sub>0</sub>/G<sub>1</sub> phase were increased and S phase cells were decreased. Incubation with TRF reversed the morphology of senescent HDFs to resemble that of young cells with decreased activity of SA- $\beta$ -gal, damaged DNA, and cells in G<sub>0</sub>/G<sub>1</sub> phase while cells in the S phase were increased. Elongated telomere length and restoration of telomerase activity were observed in TRF-treated senescent HDFs. These findings confirmed the ability of tocotrienol-rich fraction in preventing HDFs cellular ageing by restoring telomere length and telomerase activity, reducing damaged DNA, and reversing cell cycle arrest associated with senescence.

**J55 Tocotrienol rich fraction (TRF) supplementation protects against oxidative DNA damage and improves cognitive functions in Wistar rats**

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La Clinica Terapeutica, Vol.162 (2), 2011, 93-98

**Aim:** Oxidative stress is caused by imbalance between the productions of reactive oxygen species (ROS) and antioxidant defense mechanisms. Palm oil antioxidants such as tocotrienol rich fraction (TRF) is known to have neuroprotective effects on neurones by acting against free radical induced neuronal cell death. This study was undertaken to elucidate the effect of TRF on oxidative DNA damage and cognitive functions in experimental rats. **Materials and Methods:** A total of 20 male Wistar rats (aged 3 months) were divided into 2 groups: (i) control group fed with distilled water and (ii) experimental group fed with TRF (200 mg/ kg body weight) for 8 months. DNA damage was determined using Comet assay. Antioxidant enzymes like superoxide dismutase (SOD), glutathione peroxidase (GPx) and catalase (CAT) were assessed in the blood. The Morris Water Maze (MWM) test was used to evaluate the cognitive functions. **Results:** DNA damage was significantly reduced in the experimental group supplemented with TRF compared to the control group ( $p < 0.05$ ). In the group supplemented with TRF, the percentage of DNA damage was  $2.87 \pm 0.48\%$  compared to  $5.96 \pm 0.43\%$  in the control group. SOD, GPx, and CAT enzyme activities increased in experimental group. Results from MWM showed improvement in cognitive functions as determined by latency to target platform, swim path and average speed between TRF and control groups. **Conclusions:** Continuous supplementation of TRF for 8 months reduced DNA damage and exhibited positive influence in spatial learning and memory.

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**J56 In vivo antistress and antioxidant effects of fermented and germinated mung bean**

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Biomedical Research International, 2014, Article ID: 694842

Mung bean has been traditionally used to alleviate heat stress. This effect may be contributed by the presence of flavonoids and  $\gamma$ -aminobutyric acid (GABA). On the other hand, fermentation and germination have been practised to enhance the nutritional and antioxidant properties of certain food products. The main focus of current study was to compare the antistress effect of none-process, fermented and germinated mung bean extracts. Acute and chronic restraint stresses were observed to promote the elevation of serum biochemical markers including cholesterol, triglyceride, total protein, liver enzymes, and glucose. Chronic cold restraint stress was observed to increase the adrenal gland weight, brain 5-hydroxytryptamine (5-HT), and malondialdehyde (MDA) level while reducing brain antioxidant enzyme level. However, these parameters were found

reverted in mice treated with diazepam, high concentration of fermented mung bean and high concentration of germinated mung bean. Moreover, enhanced level of antioxidant on the chronic stress mice was observed in fermented and germinated mung bean treated groups. In comparison between germinated and fermented mung bean, fermented mung bean always showed better antistress and antioxidant effects throughout this study.

## **J57 In vivo antioxidant and hypolipidemic effects of fermented mung bean on hypercholesterolemic mice**

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Evidence-Based Complementary and Alternative Medicine, Vol. 2015, Article ID 508029

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Legumes have previously been reported with hypolipidemic effect caused by the presence of flavonoid. This study was carried out to evaluate the antioxidant and hypolipidemic effects of fermented mung bean on hypercholesterolemic mice. Blood from all mice was collected and subjected to serum lipid and liver profiles biochemical analysis and quantitative RT-PCR for atherosclerosis related gene expressions. Besides, livers were collected for antioxidant assays and histopathology evaluation. Fermented mung bean was found to reduce the level of serum lipid and liver enzyme profiles of hypercholesterolemic mice. Furthermore, liver antioxidant and nitric oxide levels were also significantly restored by fermented mung bean in a dosage dependent manner. The gene expression study indicated that Apoe and Bcl2a1a were upregulated while Npy and Vwf expressions were downregulated after the treatment. The effects of fermented mung bean were greater than nonfermented mung bean. These results indicated that fermented mung bean possessed antioxidants that lead to its hypolipidemic effect on hypercholesterolemic mice.

**J**

**EXPERIMENTAL  
NUTRITION**

**(Herbs and Spices)**

## Effects of *Eurycoma Longifolia* on testosterone level and bone structure in an aged orchidectomised rat model

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Evidence-Based Complementary and Alternative Medicine, Vol.2012, Article ID 818072

Testosterone replacement is the choice of treatment in androgen-deficient osteoporosis. However, long-term use of testosterone is potentially carcinogenic. *Eurycoma longifolia* (EL) has been reported to enhance testosterone level and prevent bone calcium loss but there is a paucity of research regarding its effect on the bone structural parameters. This study was conducted to explore the bone structural changes following EL treatment in normal and androgen-deficient osteoporosis rat model. Thirty-six male Sprague-Dawley rats aged 12 months were divided into normal control, normal rat supplemented with EL, sham-operated, orchidectomised-control, orchidectomised with testosterone replacement, and orchidectomised with EL supplementation groups. Testosterone serum was measured both before and after the completion of the treatment. After 6 weeks of the treatment, the femora were processed for bone histomorphometry. Testosterone replacement was able to raise the testosterone level and restore the bone volume of orchidectomised rats. EL supplementation failed to emulate both these testosterone actions. The inability of EL to do so may be related to the absence of testes in the androgen deficient osteoporosis model for EL to stimulate testosterone production.

## Effect of methanolic extract of *Piper Sarmentosum* leaves on neointimal foam cell infiltration in rabbits fed with high cholesterol diet

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EXCLI Journal, Vol.11, 2012, 274-283

Previous research has shown the beneficial effects of aqueous extract of *Piper sarmentosum* (P.s) on atherosclerosis. The first stage in atherosclerosis is the formation of foam cell. The aim of this study was to investigate the effect of the methanol extract of P.s on fatty streaks by calculating neointimal foam cell infiltration in rabbits fed with high cholesterol diet. Thirty six male New Zealand white rabbits were divided equally into six groups: (i) C: control group fed normal rabbit chow; (ii) CH: cholesterol diet (1 % cholesterol); (iii) PM1: 1 % cholesterol with methanol extract of P.s (62.5 mg/kg); (iv) PM2: 1 % cholesterol with methanol extract of P.s (125 mg/kg); (v) PM3: 1 % cholesterol with methanol extract of P.s (250 mg/kg); (vi) SMV group fed 1 % cholesterol supplemented with Simvastatin drug (1.2 mg/kg). All animals were treated for 10



weeks. At the end of the treatment, the rabbits were fasted and sacrificed and the aortic tissues were collected for histological studies to measure the area of the neointimal foam cell infiltration using software. The thickening of intima ratio of atherosclerosis and morphological changes by scanning electron microscope were measured. The results showed that the atherosclerotic group had significantly bigger area of fatty streak compared to the control group. The area of fatty streak in the abdominal aorta was significantly reduced in the treatment groups which were similar with the SMV group. Similarly, there was a reduction in the number of foam cells in the treatment groups compared to the atherosclerotic group as seen under scanning microscope. In conclusion, histological study demonstrated that the methanol extract of the *P.s* could reduce the neointimal foam cell infiltration in the lumen of the aorta and the atherosclerotic lesion.

J60

### ***Eurycoma Longifolia* upregulates osteoprotegerin gene expression in androgen-deficient osteoporosis rat model**

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BMC Complementary and Alternative Medicine, Vol.12, 2012, 152

**Background:** *Eurycoma longifolia* (EL) has been shown recently to protect against bone calcium loss in orchidectomised rats, the model for androgen-deficient osteoporosis. The mechanism behind this is unclear but it may be related to its ability to elevate testosterone levels or it may directly affect bone remodeling. The aim of this study is to determine the mechanism involved by investigating the effects of EL extract on serum testosterone levels, bone biomarkers, biomechanical strength and gene expression of Receptor Activator of Nuclear Factor kappa-B ligand (RANKL), Osteoprotegerin (OPG) and Macrophage-Colony Stimulating Factor (MCSF) in orchidectomised rats. **Methods:** Thirty-two male Sprague-Dawley rats were divided into: Sham-operated group (SHAM); orchidectomised-control group (ORX); orchidectomised and given 15 mg/kg EL extract (ORX + EL) and orchidectomised and given 8 mg/kg testosterone (ORX + T). The rats were treated for 6 weeks. The serum levels of testosterone, osteocalcin and C-terminal telopeptide of type I collagen (CTX) were measured using the ELISA technique. The femoral bones were subjected to biomechanical testing. The tibial bone gene expressions of RANKL, OPG and MCSF were measured using the branch DNA technique. **Results:** The post-treatment level of testosterone was found to be significantly reduced by orchietomy ( $p < 0.05$ ). Both ORX + EL and ORX + T groups have significantly higher post-treatment testosterone levels compared to their pre-treatment levels ( $p < 0.05$ ). The bone resorption marker (CTX) was elevated after orchietomy but was suppressed after treatment in the ORX + EL and ORX + T groups ( $p < 0.05$ ). There was no significant finding for the femoral biomechanical parameters. The tibial OPG gene expression in the ORX group was significantly lower compared to the SHAM and ORX + EL groups ( $p < 0.05$ ). **Conclusion:** Supplementation with EL extract elevated the testosterone levels, reduced the bone resorption marker and upregulated OPG gene expression of the orchidectomised rats. These actions may be responsible for the protective effects of EL extract against bone resorption due to androgen deficiency.

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## J61 The anti-osteoporotic effect of *Eurycoma Longifolia* in aged orchidectomised rat model

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The Aging Male, Vol. 14(3), 2011, 150-154

Osteoporosis in elderly men is becoming an important health issue with the aging society. Elderly men with androgen deficiency are exposed to osteoporosis and can be treated with testosterone replacement. In this study, *Eurycoma longifolia* (EL), a plant with androgenic effects, was supplemented to an androgen-deficient osteoporotic aged rat as alternative to testosterone. Aged 12 months old Sprague-Dawley rats were divided into groups of normal control (NC), sham-operated (SO), orchidectomised-control (OrxC), orchidectomised and supplemented with EL (Orx + El) and orchidectomised and given testosterone (Orx + T). After 6 weeks of treatment, serum osteocalcin, serum terminal C-telopeptide Type 1 collagen (CTX) and the fourth lumbar bone calcium were measured. There were no significant differences in the osteocalcin levels before and after treatment in all the groups. The CTX levels were also similar for all the groups before treatment. However, after treatment, orchidectomy had caused significant elevation of CTX compared to normal control rats. Testosterone replacements in orchidectomised rats were able to prevent the rise of CTX. Orchidectomy had also reduced the bone calcium level compared to normal control rats. Both testosterone replacement and EL supplementation to orchidectomised rats were able to maintain the bone calcium level, with the former showing better effects. As a conclusion, EL prevented bone calcium loss in orchidectomised rats and therefore has the potential to be used as an alternative treatment for androgen deficient osteoporosis.

## J62 The effects of *Labisia Pumila var. alata* on bone markers and bone calcium in a rat model of post-menopausal osteoporosis

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Journal of Ethnopharmacology, Vol. 133(2), 2011, 538-542

**Aim of the study:** Postmenopausal osteoporosis is mainly treated with estrogen replacement therapy (ERT). However, ERT causes side effects, mainly breast cancer, uterine cancer and thromboembolic problems. *Labisia pumila var. arata* (LPva), a herb with phytoestrogenic effects has the potential to be used as an alternative agent to ERT. This study was conducted to determine the effects of LPva on bone biochemical markers and bone calcium content in ovariectomised rats.

**Materials and methods:** Thirty two Wistar rats were divided into 4 groups, with 8 rats in each group. The first group was sham operated (Sham), the second group was ovariectomised (OVX), the third (LPva) and fourth group (ERT) were also ovariectomised and given LPva 17.5 mg/kg and Premarin(r) 64.5 µg/kg, respectively. Blood samples were taken before and after treatment to

measure osteocalcin and C-terminal telopeptide of type 1 collagen levels using ELISA while the fifth lumbar bone samples were taken to measure bone calcium content using the Atomic Absorption Spectrophotometer (AAS). **Results:** The osteocalcin levels were significantly higher in both the LPva and ERT groups compared to the OVX group. The CTX levels were significantly lower in both the LPva and ERT groups compared to the OVX group. However, only the ERT group had significantly higher bone calcium level compared to the OVX group. **Conclusion:** The supplementation of 17.5 mg/kg of LPva to ovariectomised rats for 8 weeks was able to prevent the changes in bone biochemical markers but failed to prevent the bone calcium loss induced by ovariectomy.

J63

### **Changes in the vascular cell adhesion molecule-1, intercellular adhesion molecule-1 and C-reactive protein following administration of aqueous extract of *Piper Sarmentosum* on experimental rabbits fed with cholesterol diet**

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Lipids in Health and Disease, Vol. 10 (2), 2011, 1-8

**Background:** Inflammation process plays an important role in the development of atherosclerosis. Hypercholesterolemia is one of the major risk factors for atherosclerosis. The present study aimed to evaluate the effect of aqueous extract of *Piper sarmentosum* (P.s) on inflammatory markers like vascular cell adhesion molecule-1 (VCAM-1), intercellular adhesion molecule-1 (ICAM-1), and C-reactive protein (CRP). **Methods:** Forty two male New Zealand white rabbits were divided equally into seven groups; (i) C-control group fed normal rabbit chow (ii) CH- cholesterol diet (1%cholesterol) (iii) X1- 1% cholesterol with water extract of P.s (62.5 mg/kg) (iv) X2- 1% cholesterol with water extract of P.s (125 mg/kg) (v) X3- 1% cholesterol with water extract of P.s (250 mg/kg) (vi) X4- 1% cholesterol with water extract of P.s (500 mg/kg) and (vii) SMV group fed with 1% cholesterol supplemented with simvastatin drug (1.2 mg/kg). All animals were treated for 10 weeks. Blood serum was taken for observing the inflammatory markers at the beginning and end of the experiment. **Results:** Rabbits fed with 1% cholesterol diet (CH) showed significant increase in the level of VCAM-1, ICAM-1 and CRP compared to the C group. The levels of VCAM-1, ICAM-1 and CRP in the 1% cholesterol group and supplemented with P.s (500 mg/kg) were significantly reduced compared to the cholesterol group. Similar results were also reported with simvastatin group. **Conclusion:** These results suggest that the supplementation of *Piper sarmentosum* extract could inhibit inflammatory markers which in turn could prevent atherosclerosis.

## J64 Flavonoid of *Piper Sarmentosum* and its cyto-protective effects against oxidative stress

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EXCLI Journal, Vol. 11, 2012, 705-714

Abnormalities in endothelial cell structure and function may lead to diseases such as thrombosis and atherosclerosis. Oxidative stress plays an important role in the pathogenesis of various cardiovascular diseases including atherosclerosis. Previous studies have shown a relationship between a diet rich in flavonoid and a reduced incidence of cardiovascular diseases. *Piper sarmentosum* (PS) is a plant with high flavonoid content and it possesses antioxidant and anti-atherosclerotic activities. Therefore this study aimed to investigate the flavonoids present in aqueous extract of PS (AEPS) and its cytoprotective effects in oxidative stress-induced human umbilical vein endothelial cells (HUVEC). AEPS contained high total phenolic content ( $91.02 \pm 0.02$  mg QE/g DM) and total flavonoid content ( $48.57 \pm 0.03$  mg GAE/g DM). Screening using high performance liquid chromatography (HPLC) technique showed the presence of rutin and vitexin as the main flavonoids in AEPS. HUVEC were exposed to  $180 \mu\text{M}$  H<sub>2</sub>O<sub>2</sub> and treated with various concentrations of rutin or vitexin (10 to  $400 \mu\text{M}$ ) for 24 hours. Both rutin and vitexin at the concentration of  $150\text{-}400 \mu\text{M}$  significantly increased the viability of H<sub>2</sub>O<sub>2</sub>-induced HUVEC as denoted by 3-(4,5-dimethylthiazol-2-yl)-2,5 diphenyltetrazolium bromide (MTT) assay. Therefore rutin and vitexin as the main flavonoids present in PS may be involved in the protective effects of PS against oxidative stress.

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## J65 *Piper Sarmentosum* inhibits ICAM-1 and Nox4 gene expression in oxidative stress-induced human umbilical vein endothelial cells

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BMC Complementary Alternative Medicine, Vol. 11, 2011, 31

**Background:** Aqueous extract of *Piper sarmentosum* (AEPS) is known to possess antioxidant and anti-atherosclerotic activities but the mechanism responsible for it remains unclear. In early part of atherosclerosis, nuclear factor-kappa B (NF- $\kappa$ B) induces the expression of cellular adhesion molecules such as vascular cell adhesion molecule-1 (VCAM-1), intracellular adhesion molecule-1 (ICAM-1) and E-selectin. NADPH oxidase 4 (Nox4) is the predominant source of superoxide in the endothelial cells whereas superoxide dismutase 1 (SOD1), catalase (CAT) and glutathione peroxidase (GPx) are the antioxidant enzymes responsible for inactivating reactive oxygen species. The present study aimed to investigate the effects of AEPS on the gene expression of NF- $\kappa$ B, VCAM-1, ICAM-1, E-selectin, Nox4, SOD1, CAT and GPx in cultured human umbilical vein endothelial cells (HUVECs). **Methods:** HUVECs were divided into four groups:- control; treatment with  $180 \mu\text{M}$  hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>); treatment with  $150 \mu\text{g/mL}$  AEPS and concomitant treatment with AEPS and H<sub>2</sub>O<sub>2</sub> for 24 hours. Total RNA was extracted from all the groups of HUVEC using TRI reagent. Subsequently, qPCR was carried out to determine the mRNA

expression of NF- $\kappa$ B, VCAM-1, ICAM-1, E-selectin, Nox4, SOD1, CAT and GPx. The specificity of the reactions was verified using melting curve analysis and agarose gel electrophoresis. **Results:** When stimulated with H<sub>2</sub>O<sub>2</sub>, HUVECs expressed higher level of ICAM-1 (1.3-fold) and Nox4 (1.2-fold) mRNA expression. However, AEPS treatment led to a reduction in the mRNA expression of ICAM-1 ( $p < 0.01$ ) and Nox4 ( $p < 0.05$ ) in the H<sub>2</sub>O<sub>2</sub>-induced HUVECs. AEPS also upregulated the mRNA expression of SOD1 ( $p < 0.05$ ), CAT ( $p < 0.01$ ) and GPx ( $p < 0.05$ ) in oxidative stress-induced HUVECs. There was no significant change in the mRNA expression of VCAM-1 and E-selectin. **Conclusion:** The expressional suppression of ICAM-1 and Nox4 and induction of antioxidant enzymes might be an important component of the vascular protective effect of AEPS.

### J66 **In vitro cytotoxicity of *Strobilanthes crispus* ethanol extract on hormone dependent human breast adenocarcinoma MCF-7 cell**

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BMC Complementary and Alternative Medicine, Vol.12 (35), 2012

**Background:** *Strobilanthes crispus* has been traditionally used as antidiabetic, anticancer, diuretic, antilytic and laxative agent. However, cytotoxicity and antiproliferative effect of *S. crispus* is still unclear. **Results:** *Strobilanthes crispus* was able to reduce cell viability and proliferation in MTT and BrdU assays. Both cell cycle progression and Tunel assay suggested that IC<sub>50</sub> of *S. crispus* ethanol extract induced sub-G<sub>1</sub> cell cycle phase, and DNA fragmentation. On the other hand, translocation of mitochondria cytochrome c release, induction of caspase 3/7 and p53 while suppress XIAP on treated MCF-7 cell were also observed in this study. **Conclusion:** Our findings suggest that *S. crispus* ethanol extract induced apoptosis and DNA fragmentation on hormone dependent breast cancer cell line MCF-7 via mitochondria dependent p53 apoptosis pathway.

### J67 **In vitro evaluation of *Pandanus Amaryllifolius* ethanol extract for induction of cell death on non-hormone dependent human breast adenocarcinoma MDA-MB-231 cell via apoptosis**

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BMC Complementary and Alternative Medicine, Vol.12 (134), 2012

**Background:** Our previous study had shown that *P. amaryllifolius* was able to selectively inhibit cell proliferation of hormone independent breast cancer cell line MDA-MB-231. To understand the mode of killing and mechanism of action for *P. amaryllifolius*, the ethanol extract was evaluated for their alteration of cell cycle progression, PS externalization, DNA fragmentation and expression of anti/pro-apoptotic related protein. **Results:** Cell cycle progression analysis, Annexin V and Tunel assays suggested that IC<sub>50</sub> of *P. amaryllifolius* ethanol extract induced G<sub>0</sub>/G<sub>1</sub> cell cycle arrest, PS externalization and DNA fragmentation. On the other hand, ELISA for cytochrome c, caspase-3/7, 8 and 9 indicated that apoptosis was contributed by mitochondrial cytochrome c release via induction of caspase 3/7, 9, and p53 was associated with the suppression of XIAP in

*P. amaryllifolius* treated MDA-MB-231 cells. **Conclusion:** Our findings suggest that *P. amaryllifolius* ethanol extract induced apoptosis on hormone independent breast cancer cell line MDA-MB-231.

### J68 **Anti-proliferative effects of pandan leaves (*Pandanus Amaryllifolius*), kantan flower (*Etlingeraelatior*) and turmeric leaves (*Curcuma Longa*)**

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Nutrition & Food Science, Vol.41 (4), 238-241

**Background:** Our previous study had shown that *P.amaryllifolius* was able to selectively inhibit cell proliferation of hormone independent breast cancer cell line MDA-MB-231. To understand the mode of killing and mechanism of action for *P.amaryllifolius*, the ethanol extract was evaluated for their alteration of cell cycle progression, PS externalization, DNA fragmentation and expression of anti/pro -apoptotic related protein. **Results:** Cell cycle progression analysis, Annexin V and Tunel assays suggested that IC50 of *P.amaryllifolius* ethanol extract induced G0/G1 cell cycle arrest, PS externalization and DNA fragmentation. On the other hand, ELISA for cytochrome c, caspase-3/7, 8 and 9 indicated that apoptosis was contributed by mitochondrial cytochrome c release via induction of caspase 3/7, 9, and p53 was associated with the suppression of XIAP in *P.amaryllifolius* treated MDA-MB-231 cells. **Conclusion:** Our findings suggest that *P.amaryllifolius* ethanol extract induced apoptosis on hormone independent breast cancer cell line MDA-MB-231.

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### J69 **Histological changes in the fracture callus following the administration of water extract of Piper Sarmentosum (daun kadok) in estrogen-deficient rats**

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Iranian Journal of Medical Sciences, Vol. 36(4), 2011, 281-288

**Background:** The fracture healing is impaired in osteoporosis. Piper sarmentosum is a plant, which contains potent antioxidant, naringenin that may enhance fracture healing. The present histological study aimed to determine the effects of water extract of Piper sarmentosum on the late phase of fracture healing in estrogen-deficient rats. **Methods:** Twenty four female Sprague-Dawley rats (200-250 gm) were obtained. Six rats underwent sham operation and the rest were ovariectomized. Six weeks post-ovariectomy all the rats were fractured at the mid-diaphysis of the right femur and a K-wire was inserted for internal fixation. The sham group was given vehicle (normal saline) and the ovariectomized group was randomly subdivided into three groups: (i) ovariectomized-control group supplemented with vehicle; (ii) ovariectomized+estrogen replacement therapy group treated with estrogen (100 µg/kg/day) and (iii) ovariectomized+Piper sarmentosum group treated with Piper sarmentosum water extract (125 mg/kg). Following six weeks of treatment, the rats were sacrificed and the right femora were harvested for histological assessment of fracture callus. **Results:** The ovariectomized-control group showed a significant delay in fracture healing compared to the sham, ovariectomized-estrogen replacement therapy and

ovariectomized-Piper sarmentosum groups. The median callus score for the ovariectomized-Piper sarmentosum group was 4.50 (range, 4-5), which was significantly higher than the median callus score 3.50 (range, 3-4) for the ovariectomized-control group ( $P=0.019$ ). However, there was no significant ( $P>0.05$ ) difference in the callus score among the sham, ovariectomized-estrogen replacement therapy and ovariectomized-Piper sarmentosum groups. **Conclusion:** Treatment with water extract of Piper sarmentosum proved beneficial in the fracture healing in estrogen-deficient rats.

## J70 *Piper Sarmentosum* is comparable to glycyrrhizic acid in reducing visceral fat deposition in adrenalectomised rats given dexamethasone

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La Clinica Terapeutica, Vol. 164(1), 2013, 5-10

**Objectives:** Visceral obesity may be due to the dysregulation of cortisol production or metabolism that lead to metabolic disease. In adipose tissue, the enzyme 11beta-hydroxysteroid dehydrogenase type 1 regulates cortisol metabolism (11beta-HSD1). A previous study showed an increase in the visceral fat deposition in adrenalectomised rats given intramuscular dexamethasone. Glycyrrhizic acid (GCA) has been shown to reduce fat deposition because it is a known potent inhibitor of the 11beta-HSD1 enzyme. Piper sarmentosum (PS) is an edible medicinal plant commonly used in Asia as traditional medicine for treating diabetes, hypertension and joint pains. In this study, we determined the effects of PS extract on the disposition and morphology of perirenal adipocytes of adrenalectomised rats given intramuscular dexamethasone.

**Materials and Methods:** A total of 21 male Sprague Dawley rats were adrenalectomised and given intramuscular dexamethasone, 120 µg/kg/day. These rats were further divided into three groups: adrenalectomised control (ADR+Dexa; n=7), GCA-treated (ADR+Dexa+GCA; dose=240 mg/kg/day; n=7) and PS-treated (ADR+Dexa+PS; dose=125 mg/kg/day; n=7) groups. The various treatments were given via gastric gavage following 2 weeks of adrenalectomy. **Results:** Treatment with PS extract for 8 weeks showed decreased deposition of perirenal adipocytes which was similar to the GCA-treated group. However, PS-treated rats had thinner adipocyte membrane compared with that of the GCA-treated group. **Conclusion:** In conclusion, PS extract decreased perirenal fat deposition and reduced the diameter of the adipocyte membrane. However, the mechanisms of action needed further study.

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## J71 Effect of *Plantago major* extract on plasma cytokine changes in paracetamol-induced liver injury

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Cytokine, Vol. 70 (1), 2014, 49

**Background:** Inflammatory cytokines are released in response to cell injury. Liver is very susceptible to injury while serving its functions. It can be injured by several aetiological agents such as toxin, infectious agents, chemical and drugs including paracetamol (PCM). **Aims:** The present study was aimed to determine the changes of plasma inflammatory cytokines due to PCM-induced liver injury and the effect of *Plantago major* leaf extract on these changes. The changes of 11- $\beta$  hydroxysteroid dehydrogenase type 1 (11- $\beta$  HSD1) enzyme in the liver was also determined as it involves in conversion of inactive glucocorticoid to active form or vice versa. **Methods:** Thirty male Sprague Dawley rats were divided into control (C) and PCM-induced groups. The latter was subdivided into PCM without treatment (PCM), PCM with aqueous extract (PCM + AQ) and PCM with ethanol extract (PCM + ET). The PCM (2 g/kg) was given to the rats via intragastric tube. The plant extract (1 g/kg) was given orally for 6 days after 24 h of PCM induction. Plasma was collected to examine the interleukin (IL) 1 $\alpha$ , 1 $\beta$ , 6 and 10, and tumour necrosis factor- $\alpha$  (TNF- $\alpha$ ) while the liver tissue was prepared for 11- $\beta$  HSD enzyme study. **Results:** Our results revealed the increased level of IL 1 $\alpha$ , 1 $\beta$  and TNF- $\alpha$  in PCM group and this changes was attenuated by the extract treatment. There was no significant change in IL6 and IL10 among all groups. The 11- $\beta$  HSD1 activity and expression were reduced in PCM and it was corrected with the extract treatment. **Conclusion:** The *Plantago major* leaf extract treatment attenuated the liver injury by reducing the proinflammatory cytokines and the changes of 11- $\beta$  HSD1 activity and expression might link to the liver regeneration process and plasma cytokine level changes.

## J72 *Piper Sarmentosum* water extract attenuates diabetic complications in streptozotocin induced sprague-dawley rats

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Sains Malaysiana, Vol.42 (11), 2013, 1605-1612

*Piper sarmentosum* has been shown to possess antihyperglycemic effect. The effect of water extract of PS leaves was determined on the diabetic complications in streptozotocin induced rats. Eighteen male Sprague Dawley rats (n=18) were randomly divided into three groups with six rats each, namely, control, diabetic untreated and PS treated diabetic groups. Diabetes was induced with intramuscular injection of STZ (50 mg/kg). Ten days following the induction, the diabetes was confirmed with fasting blood sugar level more than 8 mmol/L and PS extract was administered orally (0.125 g/kg) for 28 days. The left kidneys were collected to analyze. The body weight and kidney weight index showed significant differences between control and diabetic groups (p<0.05). However, the lesser extent of body weight gain was observed in diabetic group compared with the control groups. The fasting blood sugar level was reduced in PS treated group. The percent area occupied by the glomerulus over a renal corpuscle was found to be 74.5% in DPS, 72% in DNT and 75% in C group; however it was statistically insignificant. Histological study revealed marked inflammatory cells infiltration and glomeruli contraction with widened urinary spaces revealed in DNT group following 28 days of hyperglycemic state whereas the DPS group showed features of improvement. The water extract of PS leaves has the potential preventive effect on the diabetic nephropathy by reducing hyperglycemia.



### J73 Hepato-protective role of the aqueous and n-hexane extracts of *Nigella Sativa* linn. in experimental liver damage in rats

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Asian Journal of Pharmaceutical and Clinical Research, Vol. 6(S3), 2013, 205-209

**Objective:** Liver disease is associated with the formation of oxygen derived free radicals. Reactive oxygen species (ROS) as well as nitrogen species are responsible for nuclear DNA fragmentation and cell death. The active principle of thymoquinone (TQ) of *Nigella sativa* acts as a scavenger of superoxide anion. The current study was conducted to evaluate the hepatoprotective effect of *Nigella sativa* on rats. **Methods:** The study was carried out at prime postgraduate medical University of Bangladesh. Liver damage and oxidative stress were evaluated by measuring serum alanine amino transferase (ALT), hepatic malondialdehyde (MDA) and hepatic Glutathione (GSH) levels. Aqueous extract of *Nigella sativa* and n-hexane extract of *Nigella sativa* were administered orally into two groups of rat through intra-gastric tube for 28 days. Both the groups received paracetamol intra-peritoneally on day 28 th and were sacrificed on day 30 th. Subsequently, the following parameters were studied: Serum ALT, hepatic MDA, and hepatic GSH. **Results:** Hepatic damage was evaluated by significant increases in serum ALT ( $p < 0.001$ ) and hepatic MDA ( $p < 0.001$ ) concentration with depleted hepatic GSH ( $p < 0.001$ ) in paracetamol treated group. Pre-treated with aqueous extract of *Nigella sativa* significantly reduced serum ALT ( $p < 0.001$ ) and hepatic MDA ( $p < 0.001$ ) levels and also significantly associated with the increase in hepatic GSH ( $p < 0.01$ ). Pretreatment with n-hexane extracts of *Nigella sativa* decreased serum ALT ( $p < 0.001$ ), hepatic MDA ( $p < 0.001$ ) and increased hepatic GSH ( $p < 0.001$ ). **Conclusion:** Hepatoprotective properties of *Nigella sativa* in liver damage of experimental rats by reducing oxidative stress are evident. The protection afforded by the n-hexane extract of *Nigella Sativa* in pre-treated group has also been validated.

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### J74 Rankl/ osteoprotegerin genes expression in glucocorticoid-induced osteoporotic male rats given Piper sarmentosum leaf extract

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Clinical Anatomy, Vol.27, 2014, 1361

**Purpose:** Glucocorticoid-induced osteoporosis is the most common cause of secondary osteoporosis. Glucocorticoid excess increases bone resorption and inhibits bone formation. Gene expression may correspond to alteration in bone metabolism with glucocorticoid exposure. Receptor Activator of NF- $\kappa$ B ligand (RANKL), RANK, and osteoprotegerin (OPG) form an essential cytokine system that is capable of regulating all aspects of osteoclast functions. *Piper sarmentosum* (Ps) extract is known to possess antioxidant and anti-inflammatory activities. Thus, the purpose is to determine the correlation of the effects of *Piper sarmentosum* leaves with RANKL/OPG genes expression of glucocorticoid-induced osteoporotic rats. **Methods:** Three-month-old male Sprague-Dawley rats (250-300 g) were adrenalectomized to remove the main source of circulating glucocorticoids. They were divided into three groups: sham, adrenalectomized group treated with Ps (AK), and adrenalectomized control group (AC). These animals were replaced with administration of dexamethasone 120mg/kg body weight /day intramuscularly. Water-based *Piper sarmentosum* leaf extract 125mg/kg body weight treatment was given for 2 months. The left femora were dissected out for gene expression analysis. Results: The results showed that *Piper sarmentosum* leaf extract had improved the RANKL/OPG genes expression ( $P < 0.05$ ) in the femoral bones of rats with excess glucocorticoids. **Conclusion:** The results showed that *Piper sarmentosum* leaf extract was able to prevent bone weakness due to long-term gluco-corticoid therapy. Thus, *Piper sarmentosum* may have the potential to be used as prophylaxis against osteoporosis and fracture in patients on long-term glucocorticoid treatment.

### J75 Effect of *Tinospora Crispa* on thioacetamide-induced liver cirrhosis in rats

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Indian Journal of Pharmacology, Vol.43 (1), 2011, 64-68Go to:

**Objectives:** This study was conducted to determine the effect of ethanolic extract of the dried stems of *Tinospora crispa* in a male rat model of hepatic fibrosis caused by the hepatotoxin, thioacetamide. **Materials and Methods:** The extract was gavaged daily to the rats, at doses of 100 and 200 mg/kg along with thioacetamide at a dose of 200 mg/kg twice weekly. To assess the effectivity of extract, against thioacetamide, the activity of aminotransferases (alanine aminotransferase, aspartate aminotransferase), alkaline phosphatase (AP); and bilirubin were measured, together with morphological and histopathological indices in the liver of healthy and thioacetamide-treated rats. **Results:** A significant increase in the activity of liver enzymes, bilirubin and G-glutamyl transferase and gross and histopathological changes were determined. Although previous *in vitro* study established that this extract had strong antioxidant activity, this *in vivo* study establishes that this extract contains hepatotoxins whose identity may be quite different from those compounds with antioxidant properties. **Conclusion:** The study confirms that complete reliance on data obtained using *in vitro* methodologies may lead to erroneous conclusions pertaining to the safety of phytopharmaceuticals.

### J76 *Labisia Pumila* prevents complications of osteoporosis by increasing bone strength in a rat model of postmenopausal osteoporosis

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Evidence- Based Complementary Alternative Medicine, Vol. 2012, Article ID 948080

Estrogen replacement therapy (ERT) is the main treatment postmenopausal osteoporosis. However, ERT causes serious side effects, such as cancers and thromboembolic problems. *Labisia pumila* var. *alata* (LPva) is a herb with potential as an alternative to ERT to prevent complications of osteoporosis, especially fragility fractures. This study was conducted to determine the effects of LPva on the biomechanical strength of femora exposed to osteoporosis due to estrogen deficiency, using the postmenopausal rat model. Thirty-two female rats were randomly divided into four groups: Sham-operated (Sham), ovariectomized control (OVXC), ovariectomized with *Labisia pumila* var. *alata* (LP), and ovariectomized with ERT (Premarin) (ERT). The LPva and ERT were administered via oral gavage daily at doses of 17.5 mg/kg and 64.5 µg/kg, respectively. Following two months of treatment, the rats were euthanized, and their right femora were prepared for bone biomechanical testing. The results showed that ovariectomy compromised the femoral strength, while LPva supplementation to the ovariectomized rats improved the femoral strength. Therefore, LPva may be as effective as ERT in preventing fractures due to estrogen-deficient osteoporosis.

### J77 *Labisia Pumila* protects the bone of estrogen-deficient rat model: A histomorphometric study

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Journal of Ethnopharmacology, Vol. 142(1), 2012, 294-299

**Ethnopharmacological Relevance:** *Labisia pumila* var. *alata* (LP) is a phytoestrogenic herb with potential as an alternative to Estrogen Replacement Therapy (ERT) in the treatment of postmenopausal osteoporosis. LP has been reported to produce similar effects to ERT on the bone markers, but could not match ERT in terms of maintaining the bone calcium in postmenopausal osteoporosis rat model. This study aimed to examine in detail the effects of LP on the bone of postmenopausal osteoporosis rat model using bone histomorphometry. **Materials and Methods:** Thirty two female rats were randomly divided into groups of: Sham operated (Sham), ovariectomized control (OVXC), ovariectomized with *Labisia pumila* var. *alata* (LP) and ovariectomized with ERT (Premarin(r)) (ERT). The LP and ERT were administered through the route of oral gavage daily at the dose of 17.5 mg/kg and 64.5 µg/kg respectively. Following 2 months of treatment, rats were euthanized and the left femurs were dissected out and prepared for bone histomorphometry. **Results:** Histomorphometric analysis revealed osteoporotic changes for the ovariectomized rats. Supplementation of LP to ovariectomized rats could prevent these osteoporotic changes, as effective as ERT. **Conclusion:** This confirmed that LP has potential as an alternative to ERT for prevention of postmenopausal osteoporosis.

## In vitro cytotoxic and antiproliferative effects of *Portulaca Oleracea* methanol extract on breast, cervical, colon and nasopharyngeal cancerous cell lines

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Sains Malaysiana, Vol. 42(7), 2013, 927-935

*Portulaca oleracea* is a ubiquitous garden weed that has been traditionally used as antidiabetic and anti-inflammation agent. However, the potential anti-proliferative and cytotoxic effects of *Portulaca oleracea* towards cancerous cells are still unclear. Human hormone dependent breast cancer MCF-7 cell, colon cancer HT-29, cervical cancer HeLa cell and nasopharyngeal cancer CNE-1 cell were used in this study. *P. oleracea* was extracted using methanol and the cytotoxicity against various cancerous cell lines was evaluated using 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide solution (MTT) assay. The antiproliferation effect and cell cycle arrest were assessed using BrdU proliferation assay and flow cytometry cell cycle RNase/PI analysis, respectively. *Portulaca oleracea* methanol extract was able to reduce viability of all the tested cancerous cell lines. However, IC50 was only observed in CNE-1 cell (92 µg/mL). BrdU incorporation assay indicated anti-proliferation of *Portulaca oleracea* treated MCF-7 cells in a dose-dependent manner. A significant increase in the sub G0/G1 cell population phase observed by cell cycle analysis indicates the occurrence of apoptotic events. In conclusion, *Portulaca oleracea* showed anti-proliferative effect on CNE-1, HeLa and HT-29 and DNA fragmentation on MCF-7 cells.

## Antiatherogenic potential of *Nigella Sativa* seeds and oil in diet-induced hypercholesterolemia in rabbits

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Evidence-Based Complementary and Alternative Medicine, 2011, Article ID: 213628

*Nigella sativa* or Black seed (*N. sativa* L.) is traditionally used for several ailments in many Middle Eastern countries. It is an annual herbaceous plant that belongs to the Ranunculaceae family with many beneficial properties as antitumor, antidiabetic, antihypertensive, antioxidative and antibacterial. This work attempted to study the effect of *N. sativa* seeds powder and oil on atherosclerosis in diet-induced hypercholesterolemic (HC) rabbits in comparison with simvastatin (ST). Twenty-five adult New Zealand male white rabbits, weighing 1.5-2.5 kg, were divided into five groups; normal group (NC, n = 5) and four hypercholesterolemic groups (n = 20): a positive control (PC) and three HC groups force fed diet supplemented with 1000 mg Kg(-1) body weight of *N. sativa* powder (NSP), 500 mg Kg(-1) body *N. sativa* oil (NSO) and 10 mg Kg(-1) ST for 8 weeks. Feeding HC rabbits with *N. sativa* either in powder or oil forms was shown to significantly reduce ( $P < .05$ ) total cholesterol (TC) and low-density lipoprotein cholesterol (LDLC) levels and enhance high-density lipoprotein cholesterol (HDL) levels after treatment for 2, 4, 6 and 8 weeks compared to the PC group. Plaque formation was significantly inhibited while the intima: media ratio was significantly reduced in the NSP and NSO supplemented groups compared to the PC group. In conclusion, treatment of HC rabbits with *N. sativa* seeds powder or oil showed hypocholesterolemic and antiatherogenic cardioprotective properties.

## Short-term effect of pegaga (*Centella Asiatica*) extract and powder on hydrogen peroxide-treated sprague -dawley rats

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Journal of Tropical Agriculture and Food Science, Vol. 39 (1), 2011, 45-54

A study was conducted to investigate then effect of *Centella asiatica* extract and powder on dietary intake, body weight, organs weight and blood lipid peroxidation of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) - treated male Sprtague-Dawley rats. The experimental rats were fed with 0.3% (w/w) *C. asiatica* extract, 1.5% (w/w) *C. asiatica* powder, 5.0% (w/w) *C. asiatica* powder and 0.3% (w/w)  $\alpha$ -tocopherol for 6 weeks. To induced oxidative stress, the rats were given drinking water spiked with 0.03% (v/v) H<sub>2</sub>O<sub>2</sub>. The amount of dietary intake, organs and body weight, and malonaldehyde (MDA) level throughout the study were monitored. Histopathological examination of selected organs was done at the end of the study. The results showed that MDA level was significantly ( $p < 0.005$ ) higher in the normal rats compared to treated rats. Dietary supplementation of *C. asiatica* (extract and powder) and  $\alpha$ -tocopherol significantly ( $p < 0.05$ ) reduced lipid peroxidation in the experimental rats. However, there were no significant differences in the dietary intake and histopathology observations on the organs of the rats.

## Combined effects of *Eurycoma Longifolia* and testosterone on androgen-deficient osteoporosis in a male rat model

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Evidence-Based Complementary and Alternative Medicine, Vol. 2012, Article ID 872406

Androgen-deficient osteoporosis in men is treated with testosterone therapy, which is associated with side effects. *Eurycoma longifolia* (EL) is known to possess androgenic properties and has been reported to protect bone from androgen-deficient osteoporosis in experimental animal models. The present study aimed to determine the effectiveness of combination therapy of EL and testosterone (T) in treating androgen-deficient osteoporosis. Forty male Sprague-Dawley rats were divided into: sham-operated (SHAM), orchidectomized-control (ORX), orchidectomized with testosterone (ORX + T), orchidectomized with EL (ORX + EL), and orchidectomized with combined T and EL therapy (ORX + T + EL). EL was administered via oral gavages daily at the dose of 15 mg/kg. T was injected intramuscularly at 8 mg/kg and 4 mg/kg for the ORX + T and ORX + T + EL groups, respectively. Following 6 weeks of treatment, the osteocalcin levels of ORX + T and ORX + T + EL groups were significantly lower than the SHAM group ( $P < 0.05$ ). The posttreatment CTX levels of ORX + T and ORX + T + EL groups were significantly lower than their pretreatment levels ( $P < 0.05$ ). Biomechanically, the strain parameter of the ORX + T + EL group was significantly higher than the ORX group ( $P < 0.05$ ). Thus, the combination therapy of EL and low-dose T has

potential for treatment of androgen-deficient osteoporosis. The lower T dose is beneficial in reducing the sideeffects of testosterone therapy.

## **J82 Combined effects of *Eurycoma Longifolia* and testosterone on androgen-deficient osteoporosis in a male rat model**

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Androgen-deficient osteoporosis in men is treated with testosterone therapy, which is associated with side effects. *Eurycoma longifolia* (EL) is known to possess androgenic properties and has been reported to protect bone from androgen-deficient osteoporosis in experimental animal models. The present study aimed to determine the effectiveness of combination therapy of EL and testosterone (T) in treating androgen-deficient osteoporosis. Forty male Sprague-Dawley rats were divided into: sham-operated (SHAM), orchidectomized-control (ORX), orchidectomized with testosterone (ORX + T), orchidectomized with EL (ORX + EL), and orchidectomized with combined T and EL therapy (ORX + T + EL). EL was administered via oral gavages daily at the dose of 15\_mg/kg. T was injected intramuscularly at 8\_mg/kg and 4 mg/kg for the ORX + T and ORX + T + EL groups, respectively. Following 6 weeks of treatment, the osteocalcin levels of ORX + T and ORX + T + EL groups were significantly lower than the SHAM group (. The posttreatment CTX levels of ORX + T and ORX + T + EL groups were significantly lower than their pretreatment levels (. Biomechanically, the strain parameter of the ORX + T + EL group was significantly higher than the ORX group (Thus, the combination therapy of EL and low-dose T has potential for treatment of androgen-deficient osteoporosis. The lower T dose is beneficial in reducing the sideeffects of testosterone therapy.

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## **J83 The effect of Ulam Raja (*Cosmos Caudatus*) on drug-metabolizing enzymes, lipid peroxidation and antioxidant status in mice liver**

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International Journal of PharmTech Research, Vol.6 (4), 2014, 1213-1225

Recent studies indicated that *C. caudatus*, a herbal plant, possesses strong antioxidant and free radical scavenging activities. It might also have potential tumour-inhibitory effect. This study was conducted to investigate the effects of *C. caudatus* on drug-metabolizing enzymes (DME), antioxidant status and lipid peroxidation in mice liver. The extent of liver injury was assessed by measuring lactate dehydrogenase (LDH) activity. This study involved 30 adult ICR male mice (25-35 grams) that were divided into 5 groups. Aqueous extract of *C. caudatus* (CC) were administered orally to mice for 21 days in three different doses [100, 500 and 1000 mg/kg body weight

respectively]. Positive control mice were given diet containing 0.5% butylated hydroxyanisole (BHA). After 21 days, the mice were sacrificed and their livers harvested. The results showed that NADPH-cytochrome P450 reductase activity was significantly increased only in mice treated with 500 mg/kg CC compared to the control group. DT-diaphorase (DTD) activity was significantly increased only in mice treated with 1000 mg/kg CC. Superoxide dismutase (SOD) activity was significantly increased only in mice treated with 500 mg/kg CC. Catalase (CAT) activity was significantly increased in mice treated with 1000 mg/kg CC. MDA level (which indicated the extent of lipid peroxidation) was significantly reduced in all CC-treated groups. Lactate dehydrogenase (LDH) level (which indicated the extent of liver injury) was significantly reduced in all CC-treated groups. In conclusion, *Cosmos caudatus* supplementation might be able to protect mice livers against damage caused by oxidative stress mainly through inhibition of the lipid peroxidation process and LDH activity, as well as through some modulation of the activities of certain antioxidant enzymes.

#### **J84 Curcumin protects against ovariectomy-induced bone changes in rat model**

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Evidence-Based Complementary and Alternative Medicine, Vol. 2012, Article ID 174916

Osteoporosis is a metabolic disease affecting both men and women especially in postmenopausal women. Curcumin possesses many medicinal properties. In this study, thirty two female Sprague-Dawley rats were used to determine the potential effect of curcumin in prevention of bone loss following ovariectomy. The animals were divided into Sham group, ovariectomised control, ovariectomised treated with curcumin 110 mg/kg and ovariectomised treated with Premarin 100 µg/kg. The treatments were given via daily oral gavages for 60 days. The structural parameters such as bone volume, trabecular number, trabecular thickness and trabecular separation were found to be deteriorated in ovariectomised rats compared to Sham group. Moreover, the reduced osteoblast count, the increased osteoclast count and increased eroded surface were found in ovariectomised groups. Treatment with curcumin was able to reverse all these ovariectomy-induced deteriorations. Curcumin treatment was as effective as Premarin in most parameters except the bone volume and eroded surface, which were better than Premarin. The high dose of curcumin treatment was not only able to reduce the osteoclast number but also increase the osteoblast count. Therefore, the potential effect of curcumin can be applied as an alternative to oestrogen for prevention of postmenopausal osteoporosis.

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#### **J85 Piper Sargentosum improves bone structure and biomechanical strength of rats given excess glucocorticoid**

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British Journal of Pharmaceutical Research, Vol.2 (3), 2012, 168-187

**Aims:** To determine the effect of *Piper sarmentosum* (Ps) leaf extract on biomechanical strength and trabecular structure of the bones of glucocorticoid-induced osteoporotic rats. **Study Design:** Administration of crude extract to rats with excessive glucocorticoids. **Place and Duration of Study:** Department of Anatomy and Pharmacology, National University of Malaysia, between September 2010 and December 2011. **Methodology:** Three-month old male Sprague-Dawley rats were adrenalectomized to remove the main source of circulating glucocorticoids. The animals were replaced with dexamethasone 120 µg/kg body weight/day. Treatment with *P. sarmentosum* 125 mg/kg body weight and glycyrrhizic acid (GCA) 120 mg/kg body weight were given simultaneously for 2 months. After been sacrificed, a three-point bending configuration test for assessing the biomechanical properties of the right femoral bones was done using an Instron Universal testing machine equipped with Instron Bluehill software. The left undecalcified femoral bones were embedded in resin, sectioned and stained with Von Kossa for structural histomorphometric measurements. **Results:** *P. sarmentosum* extract had significantly increased the intrinsic parameter (flexure modulus) and extrinsic parameter (energy at break) of the biomechanical properties of the bone. It had also significantly improved the trabecular structure by increasing the BV/TV, Tb.Th, Tb.N and by reducing the Tb.Sp based on histomorphometric analysis. **Conclusion:** *P. sarmentosum* extract was able to protect bone biomechanical strength in glucocorticoid-induced osteoporotic bone, as confirmed by the structural histomorphometric finding. Therefore, *Ps* extract has the potential to be used as an agent to protect the bone strength and structure against osteoporosis due to chronic glucocorticoid treatment. These results however, need further study for better justification.

### J86 Antiobesity effect of *Tamarindus Indica* L. pulp aqueous extract in high-fat diet-induced obese rats

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Journal of Natural Medicine, Vol.66 (2), 2012, 333-342

Obesity and overweight are associated with atherosclerosis, fatty liver, hyperlipemia, diabetes mellitus, and various types of cancer. The global prevalence of overweight and obesity has reached epidemic proportions. Here, we investigated the effect of *Tamarindus indica* pulp aqueous extract (TIE) in diet-induced obese Sprague-Dawley rats. The animals were divided into five groups and labeled as follows: the normal control (NC) group received normal diet; the positive control (PC) group received high-fat diet; and the TIE 5, 25, and 50 groups, after the induction of obesity via a high-fat diet, received TIE at 5, 25, or 50 mg/kg orally for 10 weeks. It was observed that TIE decreased the levels of plasma total cholesterol, low-density lipoprotein (LDL), and triglyceride, and increased high-density lipoprotein (HDL), with the concomitant reduction of body weight. Moreover, TIE decreased plasma leptin and reduced fatty acid synthase (FAS) activity and enhanced the efficiency of the antioxidant defense system. TIE exhibits antiobesity effects, as indicated by a significant reduction in adipose tissue weights, as well as lowering the degree of hepatic steatosis in the obesity-induced rats. The extract possesses hepatoprotective activity, as it reversed the plasma liver enzymes level elevation prior to the high-fat diet. In conclusion, TIE improved obesity-related parameters in blood, liver, and adipose tissue in a rat model and



suppressed obesity induced by a high-fat diet, possibly by regulating lipid metabolism and lowering plasma leptin and FAS levels. A dose-dependant effect of TIE is detected, where TIE at 50 mg/kg showed the most prominent effect, followed by TIE at 25 mg/kg and, subsequently, 5 mg/kg.

### **J87 Does oral ingestion of *Piper Sarmentosum* cause toxicity in experimental animals?**

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Evidence-Based Complementary and Alternative Medicine, Vol. 2013, Article ID 705950

The prevalence of diabetes mellitus has reached epidemic proportion in Malaysia and worldwide. Scientific studies have shown that herbal plant *Piper sarmentosum* exhibits an antidiabetic property. Despite the extensive usage and studies of this herb as alternative medicine, there is paucity of the literature on the safety information of this plant. Thus, the present study aimed to observe the subacute toxic effects of *Piper sarmentosum* aqueous extract (PSAE) on the haematological profile, liver, and kidney in rats. The extract was administered by oral gavage to 6 male and female Sprague Dawley rats in daily dose of 50 mg/kg, 300 mg/kg, and 2000 mg/kg for 28 consecutive days. The control group received normal saline. General behavior of the rats, adverse effects, and mortality were observed for 28 days. The haematological and biochemical parameters were determined at baseline and after the treatment. PSAE did not show abnormality on the body weight and gross observation of internal organs. The haematological, biochemical and histopathological profiles showed minimal changes and variation within normal clinical range except for significant increase in serum potassium level that suggests the need of regular monitoring. Nevertheless, these findings suggested that PSAE up to 2000 mg/kg/day did not show subacute toxicity in Sprague Dawley rats.

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### **J88 *Piper Sarmentosum* enhances fracture healing in ovariectomized osteoporotic rats: A radiological study**

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Clinics (Sao Paulo), Vol. 66(5), 2011, 865–872

## J89 Anti-proliferation activities of *Centella Asiatica* extracts on human respiratory epithelial cells in vitro

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Journal of Medicinal Plant Research, Vol. 8(24), 2014, 864-869

*Centella asiatica* or “pegaga” is well known for its ability in promoting wound healing. This study focused on the effect of *C. asiatica* on the proliferation of human respiratory epithelial (RE) cells. RE cells were cultured using co-culture techniques until first passage (P1). Viability cell test by trypan blue dye exclusion assay showed that there was high percentage of cell viability at both P0 (74%) and P1 (91.61%). Triplicate tetrazolium dye (MTT assays) were carried out with different concentrations of *C. asiatica* from 15.6, 31.3, 62.5, 125, 250, 500, 1000, until 2000 ppm. The higher the concentration of *C. asiatica*, the more inhibitory effect was seen. *C. asiatica* aqueous extract at concentration 1000 and 2000 ppm demonstrated a significant ( $p < 0.05$ ) inhibitory effect on human RE cells proliferation on day 4 and 7 after treatment. This provides potential use of *C. asiatica* extract for the treatment of conditions with respiratory epithelial cells overgrowth.

**Introduction:** Osteoporotic fractures are common during osteoporotic states. *Piper sarmentosum* extract is known to possess antioxidant and anti-inflammatory properties. **Objectives:** To observe the radiological changes in fracture calluses following administration of a *Piper sarmentosum* extract during an estrogen-deficient state. **Methods:** A total of 24 female Sprague-Dawley rats (200-250 g) were randomly divided into 4 groups: (i) the sham-operated group; (ii) the ovariectomized-control group; (iii) the ovariectomized + estrogen-replacement therapy (ovariectomized-control + estrogen replacement therapy) group, which was supplemented with estrogen (100 µg/kg/day); and (iv) the ovariectomized + *Piper sarmentosum* (ovariectomized + *Piper sarmentosum*) group, which was supplemented with a water-based *Piper sarmentosum* extract (125 mg/kg). Six weeks after an ovariectomy, the right femora were fractured at the mid-diaphysis, and a K-wire was inserted. Each group of rats received their respective treatment for 6 weeks. Following sacrifice, the right femora were subjected to radiological assessment. **Results:** The mean axial callus volume was significantly higher in the ovariectomized-control group (68.2±11.74 mm<sup>3</sup>) than in the sham-operated, estrogen-replacement-therapy and *Piper sarmentosum* groups (20.4±4.05, 22.4±4.14 and 17.5±3.68 mm<sup>3</sup>, respectively). The median callus scores for the sham-operated, estrogen-replacement-therapy and *Piper sarmentosum* groups had median (range, minimum - maximum value) as 1.0 (0 - 2), 1.0 (1 - 2) and 1.0 (1 - 2), respectively, which were significantly lower than the ovariectomized-control group score of 2.0 (2 - 3). The median fracture scores for the sham-operated, estrogen-replacement-therapy and *Piper sarmentosum* groups were 3.0 (3 - 4), 3.0 (2 - 3) and 3.0 (2 - 3), respectively, which were significantly higher than the ovariectomized-control group score of 2.0 (1 - 2) ( $p < 0.05$ ). **Conclusion:** The *Piper sarmentosum* extract improved fracture healing, as assessed by the reduced callus volumes and reduced callus scores. This extract is beneficial for fractures in osteoporotic states.

## Selected herbal extracts improve diabetes associated factors in 3T3-L1 adipocytes

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Procedia - Social and Behavioral Sciences, Vol.91, 2013, 357-375

Owing to the current worsening situation of the increasing burden of diabetes around the world including Malaysia it is worthwhile to discover non-pharmacological prevention or treatment for it. In order to have a useful explanation of the efficacy of herbs or nutrients for diabetes; it is desirable to know the effect on the balance between the adipogenesis, adipolysis and glucose uptake in the adipose tissues. Therefore, four herbs namely *Orthosiphon stamineus* (Cat whisker) (OS), *Peronema canescens* (Sungkai) (PC), *Momordica charantia* (Bitter gourd/bitter melon) (MC) and *Pithecellobium jiringa* (Jering) (PJ) were screened for their antidiabetic properties in in vitro model 3T3-L1 adipocytes. Water extracts of these herbs were prepared and evaluated for their effects on cell proliferation, adipogenesis, adipolysis and glucose uptake in 3T3-L1 preadipocytes cells. The aforementioned extracts promoted cell proliferation at a dose of 0.25 mg/ml which showed more than 90% viability after 48 hours of treatment. The result of this study indicates that OS extracts significantly ( $P < 0.001$ ) increased adipogenesis whereas PC, MC and PJ extracts were not effective compared to control. The extracts from all four plants caused increased lipolysis compared to control. The Extract from OS and PJ significantly ( $P < 0.05$ ) stimulated glucose uptake in the cells whereas PC, MC were not effective. When the glucose consumption was compared to control it was significantly ( $P < 0.001$ ) increased for all extracts in the medium. The present study provides some important baseline data on the biochemical aspects of the effect induced by the herbs and suggestive of possessing antidiabetic properties which can be exploited for diabetes prevention and associated metabolic dysfunctions.

## The effects of *Labisia Pumila* on postmenopausal osteoporotic rat model: Dose and time-dependent micro-CT analysis

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Journal of X-Ray Science and Technology, Vol.22 (4), 2014, 503-518

**Background:** Postmenopausal osteoporosis is best treated and prevented by estrogen replacement therapy (ERT). Although effective, ERT may cause breast cancer, uterine cancer and cardiovascular problems. *Labisia pumila* var. *alata* (LP), a herb with phytoestrogenic, antioxidative and anti-inflammatory effects has potential as an ERT alternative. **Objective:** This study aimed to evaluate micro-CT analysis on the effects of LP supplementation on the trabecular

microarchitecture of postmenopausal osteoporosis rat model. Micro-CT is an effective tool in detecting changes in trabecular bone structure and providing a three dimensional information which may replace other conventional bone analysis methods. **Methods:** Ninety-six female Sprague-Dawley rats (4 to 5 months old) were randomly divided into six groups of baseline group (BL) Sham-operated (Sham), ovariectomised control (OVXC), ovariectomised with 64.5 µg/kg of Premarin (ERT), ovariectomised with 20 mg/kg of LP (LP20) and ovariectomised with 100 mg/kg of LP at (LP100). The vehicle (deionized water), Premarin and LP were given via daily oral gavages for 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 and trabecular bone microarchitecture analysed with micro-CT. **Results:** Micro-CT analysis of OVXC rats revealed significant osteoporotic changes in connectivity density, trabecular bone volume, trabecular thickness, trabecular separation and trabecular number. Both ERT and LP were able to reverse all the OVX-induced bone changes with the best results seen with 100 mg/kg of LP for nine weeks duration of treatment. **Conclusion:** Micro-CT provides accurate and reliable information on trabecular bone parameters which aid in the diagnosis and treatment of osteoporosis. LP supplementation at 100 mg/kg was more effective than ERT in reversing ovariectomy-induced bone changes. Further studies are required to explore the potential of LP as ERT alternative in the treatment and prevention of postmenopausal osteoporosis.

## J92 Time and dose-dependent effects of *Labisia Pumila* on bone oxidative status of postmenopausal osteoporosis rat model

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Nutrients, Vol.6 (8), 2014, 3288-3300

Postmenopausal osteoporosis can be associated with oxidative stress and deterioration of antioxidant enzymes. It is mainly treated with estrogen replacement therapy (ERT). Although effective, ERT may cause adverse effects such as breast cancer and pulmonary embolism. *Labisia pumila* var. *alata* (LP), a herb used traditionally for women's health was found to protect against estrogen-deficient osteoporosis. An extensive study was conducted in a postmenopausal osteoporosis rat model using several LP doses and duration of treatments to determine if anti-oxidative mechanisms were involved in its bone protective effects. Ninety-six female Sprague-Dawley rats were randomly divided into six groups; baseline group (BL), sham-operated (Sham), ovariectomised control (OVXC), ovariectomised (OVX) and given 64.5 µg/kg of Premarin (ERT), ovariectomised and given 20 mg/kg of LP (LP20) and ovariectomised and given 100 mg/kg of LP (LP100). The groups were further subdivided to receive their respective treatments via daily oral gavages for three, six or nine weeks of treatment periods. Following euthanization, the femora were dissected out for bone oxidative measurements which include superoxide dismutase (SOD), glutathione peroxidase (GPx) and malondialdehyde (MDA) levels. **Results:** The SOD levels of the sham-operated and all the treatment groups were significantly higher than the OVX groups at all treatment periods. The GPx level of ERT and LP100 groups at the 9th week of treatment were significantly higher than the baseline and OVX groups. MDA level of the OVX group was significantly higher than all the other groups at weeks 6 and 9. The LP20 and LP100 groups at the 9th week of treatment had significantly lower MDA levels than the ERT group. There were no significant differences between LP20 and LP100 for all parameters. Thus, LP supplementations at both doses, which showed the best results at 9 weeks, may reduce oxidative stress which in turn may prevent bone loss via its anti-oxidative property.

## J93 The anti-inflammatory, phytoestrogenic, and antioxidative role of *Labisia Pumila* in prevention of postmenopausal osteoporosis

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Advances in Pharmacological Sciences, 2012, Article ID 706905

Osteoporosis is characterized by skeletal degeneration with low bone mass and destruction of microarchitecture of bone tissue which is attributed to various factors including inflammation. Women are more likely to develop osteoporosis than men due to reduction in estrogen during menopause which leads to decline in bone-formation and increase in bone-resorption activity. Estrogen is able to suppress production of proinflammatory cytokines such as IL-1, IL-6, IL-7, and TNF- $\alpha$ . This is why these cytokines are elevated in postmenopausal women. Studies have shown that estrogen reduction is able to stimulate focal inflammation in bone. *Labisia pumila* (LP) which is known to exert phytoestrogenic effect can be used as an alternative to ERT which can produce positive effects on bone without causing side effects. LP contains antioxidant as well as exerting anti-inflammatory effect which can act as free radical scavenger, thus inhibiting TNF- $\alpha$  production and COX-2 expression which leads to decline in RANKL expression, resulting in reduction in osteoclast activity which consequently reduces bone loss. Hence, it is the phytoestrogenic, anti-inflammatory, and antioxidative properties that make LP an effective agent against osteoporosis.

## J94 Piper betle leaf extract enhances the cytotoxicity effect of 5-fluorouracil in inhibiting the growth of HT29 and HCT116 colon cancer cells

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**Objective:** The combination effect of Piper betle (PB) and 5-fluorouracil (5-FU) in enhancing the cytotoxic potential of 5-FU in inhibiting the growth of colon cancer cells was investigated. **Methods:** HT29 and HCT116 cells were subjected to 5-FU or PB treatment. 5-FU and PB were then combined and their effects on both cell lines were observed after 24 h of treatment. PB-5-FU interaction was elucidated by isobologram analysis. Apoptosis features of the treated cells were revealed by annexin V/PI stain. High-performance liquid chromatography (HPLC) was performed to exclude any possible chemical interaction between the compounds. **Results:** In the presence of PB extract, the cytotoxicity of 5-FU was observed at a lower dose (IC<sub>50</sub> 12.5  $\mu$ mol/L) and a shorter time (24 h) in both cell lines. Both cell lines treated with 5-FU or PB alone induced a greater apoptosis effect compared with the combination treatment. Isobologram analysis indicated

that PB and 5-FU interacted synergistically and antagonistically in inhibiting the growth of HT29 and HCT116 cells, respectively. **Conclusions:** In the presence of PB, a lower dosage of 5-FU is required to achieve the maximum drug effect in inhibiting the growth of HT29 cells. However, PB did not significantly reduce 5-FU dosage in HCT116 cells. Our result showed that this interaction may not solely contribute to the apoptosis pathway.

## J95 Acute toxicity study of *Cosmos Caudatus* on biochemical parameters in male rats

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Sains Malaysiana, Vol. 42(9), 2013, 1247–1251

*Cosmos caudatus* or 'ulam raja' is a local plant with antioxidant properties and has the potential to treat free radicals associated diseases. However, its toxic effects need to be elucidated. Acute toxicity study was carried out in male rats. Rats aged 3 months, weighing 150-200 g were divided into 4 groups, i.e. rats being fed on distilled water (control), *Cosmos caudatus* extract dose 50 mg/kg (CC50), *Cosmos caudatus* 500 mg/kg (CC500) and *Cosmos caudatus* 2000 mg/ kg (CC2000), respectively. A single treatment was given to the respective groups and the animals were sacrificed after 7 days. Biochemical parameters before and after treatment were measured. Liver enzymes, i.e. alkaline phosphatase (ALP) and alanine transaminase (ALT), were found to be increased post treatment in CC500 and CC2000 groups. Creatinine levels were lower in CC500 and CC2000 groups post treatment compared with control group while albumin levels were lower in CC2000 group than all the other groups. In conclusion, *Cosmos caudatus* may cause acute hepatotoxicity at high doses.

## J96 The effects of *Cosmos Caudatus* (ulam raja) on dynamic and cellular bone histomorphometry in ovariectomized rats

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BMC Research Notes, Vol.6, 2013, 239

**Background:** *Cosmos caudatus* is a local plant which has antioxidant properties and contains high calcium. It is also reported to be able to strengthen the bone. This report is an extension to previously published article in Evidence Based Complementary and Alternative Medicine (doi:10.1155/2012/817814). In this study, we determined the effectiveness of *C. caudatus* as an alternative treatment for osteoporosis due to post-menopause by looking at the dynamic and cellular parameters of bone histomorphometry. **Methods:** Forty female Wistar rats were divided into four groups i.e. sham operated, ovariectomized, ovariectomized treated with calcium 1% ad libitum and ovariectomized force-fed with 500 mg/kg *C. caudatus* extract. Treatment was given six days a week for eight weeks. **Results:** Dynamic and cellular histomorphometry parameters

were measured. *C. caudatus* increased double-labeled surface (dLS/BS), mineral appositional rate (MAR), osteoid volume (OV/BV) and osteoblast surface (Ob.S/BS). *C. caudatus* also gave better results compared to calcium 1% in the osteoid volume (OV/BV) parameter. **Conclusions:** *C. caudatus* at the 500 mg/kg dose may be an alternative treatment in restoring bone damage that may occur in post-menopausal women.

### **J97** The effects of *Cosmos Caudatus* (ulam raja) supplementation on bone biochemical parameters in ovariectomized rats

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Pakistan Journal of Pharmaceutical Sciences, Vol.26 (5), 2013, 1027-1031

*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 100mg/kg, 200mg/kg or 300mg/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.

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### **J98** The effects of *Cosmos Caudatus* on structural bone histomorphometry in ovariectomized rats

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Evidence-Based Complementary and Alternative Medicine, Vol. 2012 Article ID: 817814

Osteoporosis is considered a serious debilitating disease. *Cosmos caudatus* (ulam raja), a plant containing antioxidant compounds and minerals, may be used to treat and prevent osteoporosis. This study determines the effectiveness of *C. caudatus* as bone protective agent in postmenopausal osteoporosis rat model. Thirty-two female rats, aged 3 months old, were divided into 4 groups. Group one was sham operated (sham) while group two was ovariectomized. These two groups were given ionized water by forced feeding. Groups three and four were ovariectomized and given calcium 1% ad libitum and force-fed with *C. caudatus* at the dose of 500 mg/kg, respectively. Treatments were given six days per week for a period of eight weeks. Body weight was monitored every week and structural bone histomorphometry analyses of the femur bones were performed. Ovariectomy decreased trabecular bone volume (BV/TV), decreased trabecular number (Tb.N), and increased trabecular separation (Tb.Sp). Both calcium 1% and 500 mg/kg *C. caudatus* reversed the above structural bone histomorphometric parameters to normal level. *C. caudatus* shows better effect compared to calcium 1% on trabecular number (Tb.N) and trabecular separation (Tb.Sp). Therefore, *Cosmos caudatus* 500 mg/kg has the potential to act as the therapeutic agent to restore bone damage in postmenopausal women.

### **J99** *Centella Asiatica* modulates neuron cell survival by altering caspase-9 pathway

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Journal of Medicinal Plants Research, Vol. 5(11), 2011, 2201-2109

Natural products have been reported to exert positive impact on neurodegenerative diseases which arise as a result of neuronal loss associated with oxidative stress. Therefore, this study was conducted to evaluate the neuroprotective potential of ethanolic extract of *Centella asiatica* (CA) compared to that of tocotrienol rich fraction (TRF) using human neuroblastoma, SH-SY5Y cells. Cytotoxicity and neuroprotective effects of CA and TRF were measured by using 3-(4, 5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulfophenyl)-2H-tetrazolium, inner salt (MTS) against BSO-induced neuron cell death. The rate of apoptotic cell death was measured via FITC Annexin V apoptosis flow cytometer. Presence of live and apoptotic cells were further confirmed with calcein-AM and propidium iodide fluorescence staining. Caspase-8 and -9 were measured to determine the mechanism of activation of the apoptotic pathway. Results showed that CA extract was toxic to neuron cell culture at  $\geq 100$   $\mu\text{g/ml}$ . TRF (1 to 50  $\mu\text{g/ml}$ ), as positive control and CA (1 to 50  $\mu\text{g/ml}$ ) conferred significant protection against BSO-induced cell death. Post-treatment with CA also significantly reduced caspase-9 activity against BSO-induced cell death. In conclusion, this study shows that low concentration of ethanolic extract of CA is able to protect neuron cells from oxidative stress probably by inhibiting the activation of caspase-9 pathway but it can exert neurocytotoxic effect at high concentrations.



## J100 Effects of methanolic extract of *Piper Sarmentosum* on paracetamol-induced hepatic oxidative injury in rats

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Sains Malaysiana, Vol.43 (3), 2014, 415-521

Piper sarmentosum or kaduk has high content of naringenin, a natural antioxidant. In this study, paracetamol-induced hepatotoxicity model was used to determine the antioxidant properties of kaduk. Eighteen male Wistar rats (200-250 g) were divided into three groups. The treated group was given methanolic extract of kaduk at a dose of 500 mg/kg orally, while the other two groups received vehicle orally for 28 days. After 28 days, the treated group and another group (PCM) were given 1 g/kg paracetamol intraperitoneally, while the last group (Control) was only given vehicle intraperitoneally. After 24 h, their blood was collected for aminotransferase enzymes assay. Later, the rats were sacrificed and livers were harvested for determinations of malondialdehyde, protein carbonyl contents and superoxide dismutase activity. There was a significant decrease in the contents of malondialdehyde and carbonyl protein as well as a significant increase in the superoxide dismutase activity in the Kaduk+PCM group compared to PCM group. However, there was no significant reduction in the aminotransferase enzyme activities in the Kaduk+PCM group compared with the PCM group. In conclusion, the administration of methanolic extract of Piper sarmentosum at the dose of 500 mg/kg for 28 days has the protective effects on the rat liver against paracetamol-induced oxidative injury.

## J101 *Piper Sarmentosum* Roxb protects lungs against oxidative stress induced by carbon tetrachloride in rats

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Journal of Medical Plants Research, Vol.5 (26), 2011, 6128-6135

This study was designed to investigate the effects of *Piper sarmentosum* supplementation on carbon tetrachloride (CCl<sub>4</sub>) induced oxidative stress in lung. Thirty-two male Wistar rats were divided into two groups; a control and a treatment group which was given 125 mg/kg body weight *P. sarmentosum* orally for 28 days, after which each group was further subdivided into two groups. A group was exposed to CCl<sub>4</sub> (1 ml/kg body weight, orally), while another group was given corn oil. After 24 h, blood and lung were taken. CCl<sub>4</sub> increased lung lipid peroxidation (TBARS) and glutathione peroxidase significantly. *P. sarmentosum* supplementation was able to reduce these increases. However, both CCl<sub>4</sub> and *P. sarmentosum* extract did not affect lung superoxide dismutase activity. In conclusion, *P. sarmentosum* is capable in reducing the oxidative stress in lungs by decreasing lipid peroxidation and maintaining the glutathione peroxidase activity towards the normal level.

**J102 Dose water extract of cinnamon (*Cinnamomum Zeylanicum*) exhibits anti-diabetic properties in cultured 3t3-l1 adipocytes: A concurrent assessment of adipogenesis, lipolysis and glucose uptakes**

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Journal of Food and Nutrition Research, Vol.2 (11), 2014, 764-769

Cinnamon is a common spice which is widely advocated for its efficacy controlling of hyperglycemia. However, the mechanism of action has yet to be established for the effect on the blood glucose concentration. Cinnamon was extracted with water and induced to cell line namely 3T3-L1 preadipocyte (American Type Cell Culture Collection). The cell proliferation, differentiation (adipogenesis) and glucose uptake activity were assessed by measuring the uptake of radio-labelled glucose. Furthermore, for comparison glucose oxidase assay was also performed by using Glucose Assay Kit (Sigma-Aldrich, Inc). The collected data was statistically analysed using SPSS version 12.0 for any possible differences. This study revealed that there was a significant ( $P < 0.01$ ) increase in the activity/adipogenesis. This increase in activity was accompanied by a significant ( $P < 0.01$ ) increase in the glucose uptake and reduced catalytic activity of lipids (lipolysis). The finding reveals that *C. Zeylanicum* extract has a similar effect to that of insulin activity. The present study suggests that the cinnamon enhances glucose uptake, reduces the lipid breakdown and resembles insulin activity.

**J103 Comparative antioxidant and anti-inflammatory activity of different extracts of *Centella Asiatica* (L.) urban and its active compounds, asiaticoside and madecassoside**

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Medicine & Health, Vol. 7(2), 2012, 62-72

The potential of *Centella asiatica* (CA) as an antioxidant and anti-inflammatory agent has been well described. However, the extraction method which gives the best yield is debatable. In this study, we evaluated three different methods of extraction and compared the extracts in terms of antioxidant, anti-inflammatory activities as well as the contents of its bioactive compounds, asiaticoside and madecassoside. *Centella asiatica* was extracted using ethanol, methanol and aqueous extraction methods. The extracts were then measured for their phenolic contents using Folin-Ciocalteu reagent. Asiaticoside and madecassoside were determined using HPLC.

Antioxidant activity was measured using the 2,2-diphenyl-1-picrylhydrazyl (DHPP) and ferric reducing antioxidant power (FRAP) assays. Anti-inflammatory activities were determined by the ability of the extracts to inhibit the inflammatory pathway enzyme, COX-1 and COX-2 as well as their ability to protect fibroblasts against 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced production of prostaglandin E2 (PGE2). Results showed that the level of phenolic constituents, asiaticoside and madecassoside were highest in the ethanol, followed by methanol and then aqueous extracts (17.76g/100g, 15.52g/100g, 13.16g/100g for phenolics, 42.86 mg/g, 36.37 mg/g, 2.82 mg/g for asiaticoside and 18.66 mg/g, 15.87 mg/g, 3.75 mg/g for madecassoside respectively). All extracts showed considerable antioxidant activity compared to the positive controls. The extracts, asiaticoside and madecassoside inhibited both COX-1 and COX-2 and suppressed the TPA-induced production of PGE2. The ethanol and methanol extracts were stronger COX inhibitors and more potent suppressor of PGE2 formation than aqueous extract. Thus although the aqueous extract showed higher antioxidant potential, in terms of anti-inflammatory activities, the hydrophobic solvents, ethanol and methanol, proved to be the better extraction method for *Centella asiatica*.

## **J104 Effects of curcumin on the cardiovascular system of ovariectomised experimental rats with high cholesterol and heated palm oil diet**

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British Journal of Medical and Health Sciences, Vol.191, 2012, 63-73

Heated palm oil increases the risk of atherosclerosis in the oestrogen deficient state. Curcumin, an active compound from the herb *Curcuma longa* (turmeric) possesses potent anti-oxidant effects. The main aim of the study was to observe the aortic changes in ovariectomised rats with high cholesterol and heated palm oil diet with or without curcumin. Thirty ovariectomized Sprague Dawley (200g-250g) rats were divided equally into five groups. Group I (Control+CN) was fed with 2% cholesterol and curcumin (50mg/ml/kg body weight), Group II (1HPO) with 2% cholesterol, once-heated palm oil diet and palm oil (1.0ml/kg body weight), Group III (1HPO+CN) was fed with 2% cholesterol, five-times heated palm oil diet and palm oil (1.0ml/kg body weight) daily, Group IV (5HPO) with 2% cholesterol, five-times heated palm oil and curcumin (50mg/ml/kg body weight) daily for sixteen weeks. The electron microscopy finding showed endothelial cells dysfunction, disruption of internal elastic lamina, presence of mononuclear cells in the intimal layer of the heated palm oil groups. The tunica media layer of the heated palm oil groups showed early sign of smooth muscle cells migration with the presence of vacuoles in the smooth muscle cell cytoplasm. However, all the changes were less seen in the curcumin treated groups. In conclusion, curcumin showed a protective effect on the aorta of ovariectomised rats fed with high cholesterol and heated palm oil diet.

## J105 *Eurycoma Longifolia* in Radix TM for the treatment of ethanol -induced gastric lesion in rats

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Pakistan Journal of Biological Sciences, Vol.16, 2013, 1815-1818

The effect of treatment with Radixon ethanol-induced gastric lesions was investigated. The main ingredient of Radix is *Eurycoma longifolia*. Twenty-four rats of the Sprague-Dawley species were randomly divided into four groups. Three groups were given 0.5MI 100% ethanol orally. Another group was used as a control and was given only distilled water orally (control). After 6 hall the rats were fed with normal diet. One group that was administered with ethanol was only given distilled water orally (no treatment). Another two groups that were administered with ethanol were treated with oral Radix 0.128 mg g (-1) b.wt. (Radix) and oral ranitidine 21.4 mg kg (-1) b.wt. (Ranitidine), respectively. After one week, all the rats were fasted overnight and sacrificed. The stomach was isolated and examined for the presence and severity of gastric lesions. Measurements for malondialdehyde content and gastric acid concentration were also done. It is found that the ulcer index was lower in the Radix and ranitidine group compared to the no treatment group whereas in the control group there was no lesion. There was no difference in the gastric acid concentration in all groups. Hence it is concluded that *Eurycoma longifolia* in Radix is as effective as ranitidine in the treatment of ethanol-induced gastric lesions in rats.

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## J106 *Piper Sarmentosum* influences the oxidative stress involved in experimental diabetic rats

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The Internet Journal of Herbal and Plant Medicine, Vol.2 (1), 2011

*Piper sarmentosum* (P.s) is an herbal plant that is widely used as food and traditional medicine and it is known to possess antioxidant as well as glucose lowering actions. Diabetes Mellitus (DM) is a chronic metabolic disease characterized by hyperglycemia. DM complications are linked to increased oxidative stress and impaired antioxidant mechanisms. Malondialdehyde (MDA), an oxidative stress biomarker and superoxide dismutase (SOD), an antioxidant enzyme are linked to oxidative stress. **Objective:** The present study aimed to observe the effects of P.s aqueous extract on malondialdehyde levels and superoxide dismutase activities of diabetic rats. **Methods:** Diabetes was induced in 30 male rats with streptozotocin (50 mg/kg, intramuscular; dissolved in 0.9% NaCl solution). A group of eight normal rats (I) were given vehicle in the similar volume (intramuscular; 0.9% NaCl solution). The diabetic rats were categorized into three groups; control diabetes (II), insulin treated diabetes (5 IU/kg Insulatard HM, subcutaneous daily) (III) and P.s treated diabetes (0.125 g/kg, per oral daily) (IV). Following 28 days, blood samples were obtained to examine the levels of serum MDA and erythrocyte SOD activities. **Results:** P.s treated diabetes rats (group IV) showed a significant decrease ( $p < .05$ ) in MDA level (2.5  $\mu$ M) and a significant

increase ( $p < .05$ ) in erythrocyte SOD activity (8.1 U/mgHb) compared to control diabetes rats (group II). **Conclusion:** Aqueous extract of P.s exhibits ameliorative effects on the oxidative stress in diabetic animals and helps in checking the complications arising out of DM.

### J107 Effect of subacute dose of mitragyna speciosa korth crude extract in female sprague dawley rats

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Journal of Medical and Bioengineering, Vol.3 (2), 2014, 98-101

Mitragyna speciosa Korth (MS) leaves are widely used as a traditional remedy. The main aim of the present study was to observe the subacute toxicity of MS crude extract on the liver, kidney and uterus in female Sprague Dawley rats. Thirty two rats (150-200g) were randomly divided into four groups: control acute (CA): control subacute (CS) : experimental acute (EA) and experimental subacute (ES). CA and CS groups were only given 15% Tween-80. Group EA rats were administered single oral dose of 100mg/kg MS extract for 14 days. Group ES rats were repeated dose of 500 mg/kg MS methanol for 28 days. Group ES rats were administered repeated dose of 500mg/kg MS methanol for 28 days. Liver of ES group showed severe sinusoidal congestion with enlarged hepatocytes and numerous vacuolation compared to EA group. The lining of epithelial cells of uterine tissue in ES group showed more vacuolated cells with increasing in height. No changes were observed in kidney with both doses.

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### J108 Effect of curcumin on aortic changes in ovariectomized rats fed with repeatedly heated soy oil: A preliminary electron microscopic study

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La Clinica Terapeutica, Vol.164 (4), 2013, 307-313

**Background and Aims:** Consumption of repeatedly heated soy oil has been linked with incidence of atherosclerosis particularly in oestrogen deficient states. In the present study, effect of curcumin extract on the prevention of atherosclerosis was evaluated. **Materials and Methods:** Forty eight female Sprague-Dawley rats (weighing 200-250 gm) were divided into eight groups. All groups were fed with 2% cholesterol diet. The sham control groups consisted of vitamin E free-RBD Olein (IV62) that acted as vehicle, and curcumin treated groups without undergoing ovariectomy. The other six groups were subjected to ovariectomy and later treated with vehicle-only, curcumin-only, once heated soy oil (1HSO) with vehicle, 1HSO with curcumin, five times heated soy oil (5HSO) with vehicle and 5HSO with curcumin. Curcumin was administered orally at a dose of 50 mg/kg which was commenced two weeks following ovariectomy. Following four months, the rats were sacrificed and serial sections of arch of aorta were harvested and processed for electron microscopic studies (EM). **Results:** EM studies showed thickened tunica intima, fenestration of internal elastic lamina and migration of smooth muscle cells from tunica media to tunica intima in the ovariectomized control, 1HSO and 5HSO treated groups, with the latter being

most prominent. There were no significant ultra structural changes in the curcumin-treated groups compared to the non-treated groups. **Conclusion:** Oral administration of curcumin at a dose of 50 mg/ kg body weight did not show any changes in the aorta of the ovariectomized rats fed with 2% cholesterol and heated soy oil.

### **J109 Bone micro-CT assessments in an orchidectomised rat model supplemented with *Eurycoma Longifolia***

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Evidence-Based Complementary and Alternative Medicine, Vol. 2012, Article ID 501858

Recent studies suggested that *Eurycoma longifolia*, a herbal plant, may have the potential to treat osteoporosis in elderly male. This study aimed to determine the effects of *Eurycoma longifolia* supplementation on the trabecular bone microarchitecture of orchidectomised rats (androgen-deficient osteoporosis model). Forty-eight-aged (10-12 months old) Sprague Dawley rats were divided into six groups of sham-operated (SHAM), orchidectomised control (ORX), orchidectomised + 7 mg/rat testosterone enanthate (TEN) and orchidectomised + *Eurycoma longifolia* 30 mg/kg (EL30), orchidectomised + *Eurycoma longifolia* 60 mg/kg (EL60), orchidectomised + *Eurycoma longifolia* 90 mg/kg (EL90). Rats were euthanized following six weeks of treatment. The left femora were used to measure the trabecular bone microarchitecture using micro-CT. Orchidectomy significantly decreased connectivity density, trabecular bone volume, and trabecular number compared to the SHAM group. Testosterone replacement reversed all the orchidectomy-induced changes in the micro-CT parameters. EL at 30 and 60 mg/kg rat worsened the trabecular bone connectivity density and trabecular separation parameters of orchidectomised rats. EL at 90 mg/kg rat preserved the bone volume. High dose of EL (90 mg/kg) may have potential in preserving the bone microarchitecture of orchidectomised rats, but lower doses may further worsen the osteoporotic changes.

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### **J110 Beneficial effects of traditional Chinese medicine on the treatment of osteoporosis on ovariectomised rat models**

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Current Drug Targets, Vol.14 (14), 2013, 1689-1693

Osteoporosis is a metabolic bone disorder that affects both men and women worldwide. It causes low bone mass and therefore increases bone susceptibility to fracture when bone undergoes a minor trauma. Lack of estrogen is the principal cause of osteoporosis. Estrogen, calcium, calcitonin, vitamin D and several antioxidants help in the prevention of osteoporosis. In order to effectively treat osteoporosis, there has been an extended research on the biological activities of traditional medicines since synthetic medicines possess several side effects that reduce their efficacy. Therefore, there is a need to develop new treatment alternatives for osteoporosis. This

review centres on the scientific researches carried out on the evaluation of Chinese traditional medicines in the treatment of osteoporosis. Various plants like *Achyranthes bidentata*, *Davallia formosana*, *polygonatum sibiricum*, *Cibotium barometz*, *Er-Zhi-Wan*, *Curculigo orchoides* and a combined treatment of *Hachimi-jio-gan* (*Ba-Wei-Di-Huang-Wan*) with alendronate proved active in preventing post-menopausal osteoporosis.

### J111 **Aqueous extract of *Centella Asiatica* promotes corneal epithelium wound healing in vitro**

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Journal of Ethnopharmacology, Vol. 140(2), 2012, 333-338

**Ethnopharmacological relevance:** *Centella asiatica* is a traditional herbal medicine that has been shown to have pharmacological effect on skin wound healing, and could be potential therapeutic agent for corneal epithelial wound healing. **Aim of the study:** This study was done to evaluate the effects of *Centella asiatica* on the proliferation and migration of rabbit corneal epithelial (RCE) cells in the in vitro wound healing model. **Materials and methods:** RCE cells were cultured with or without supplementation of *Centella asiatica* aqueous extract. Viability and proliferation of the RCE cells was determined by MTT assay and cell cycle was analyzed by flow cytometry. In vitro re-epithelization was studied by scratch assay and migration rate was evaluated quantitatively by image analyzer. Expression of corneal specific differentiation markers, CK12 and connexin 43, were studied via RT-PCR. **Results:** It was found that supplementation of *Centella asiatica* did not show any significant effect on the RCE cells proliferation at the concentration up to 500 ppm, while at the concentration of 1000 ppm significantly inhibited RCE cells proliferation ( $p < 0.05$ ). However, at the concentration up to 62.5 ppm, RCE cells shows significant enhancement of migration rate compared to the control group ( $p < 0.05$ ). It was also found that the supplementation of *Centella asiatica* aqueous extract did not alter the expression of differentiation markers and cell cycle. **Conclusion:** In conclusion, supplementation of *Centella asiatica* aqueous extract at low concentrations could be useful to promote corneal epithelium wound healing.

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### J112 ***Piper sarmentosum* prevents glucocorticoid-induced osteoporotic bone resorption by increasing 11 $\beta$ -hydroxysteroid dehydrogenase type 1 activity**

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Clinical Therapeutics, Vol.162 (4), 2011, 313-318

**Aims:** Osteoporosis is a proven complication of long-term glucocorticoid therapy. Concern on glucocorticoid induced osteoporosis has increased dramatically in recent years with the widespread use of synthetic glucocorticoids. Glucocorticoid action in bone depends upon the

activity of 11 $\beta$ hydroxysteroid dehydrogenase type 1 enzyme (11 $\beta$ HSD1). This enzyme plays an important role in regulating corticosteroids by locally interconverting cortisone into active cortisol. This has been demonstrated in primary cultures of human, mouse or rat osteoblasts. Therefore, inhibition of this enzyme may reduce bone resorption markers. Piper sarmentosum (Ps) is a potent inhibitor of 11 $\beta$ HSD1 in liver and adipose tissue. In this study we determined the effect of Ps on 11 $\beta$ HSD1 activity in bones of glucocorticoid-induced osteoporotic rats. **Materials and Methods:** Three-month old male Sprague-Dawley rats were adrenalectomised to remove the main source of circulating glucocorticoids. The animals were administered with dexamethasone 120  $\mu$ g/kg body weight/day. Treatment with Ps 125 mg/kg body weight and glycyrrhizic acid (GCA) 120 mg/kg body weight were given simultaneously. **Results:** The results showed that Ps extract reduced plasma corticosterone concentration (1.05 $\pm$ 0.02  $\mu$ g/ml) and induced 11 $\beta$ HSD1 dehydrogenase activity in bone (87.69 $\pm$ 1.41%). Consequently, it also reduced the bone resorption marker, pyridinoline, in dexamethasone-treated adrenalectomised rats (2.07 $\pm$ 0.62/L). Despite that, our data showed an inverse relationship between the plasma corticosterone level and the dehydrogenase activity of 11 $\beta$ HSD1 in the bone. **Conclusions:** This suggests that 11 $\beta$ HSD1 acts as the local regulator of glucocorticoid and its activity in bone was not correlated to systemic corticosterone level.

### J113 Comparative effect of *Piper Betle*, *Chlorella Vulgaris* and tocotrienol-rich fraction on antioxidant enzymes activity in cellular ageing of human diploid fibroblasts

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BMC Complementary and Alternative Medicine, Vol. 13, 2013, 210

**Background:** Human diploid fibroblasts (HDFs) undergo a limited number of cellular divisions in culture and progressively reach a state of irreversible growth arrest, a process termed cellular ageing. Even though beneficial effects of Piper betle, *Chlorella vulgaris* and tocotrienol-rich fraction (TRF) have been reported, ongoing studies in relation to ageing is of interest to determine possible protective effects that may reverse the effect of ageing. The aim of this study was to evaluate the effect of P. betle, C. vulgaris and TRF in preventing cellular ageing of HDFs by determining the activity of antioxidant enzymes viz.; catalase, superoxide dismutase (SOD) and glutathione peroxidase. **Methods:** Different passages of HDFs were treated with P. betle, C. vulgaris and TRF for 24 h prior to enzymes activity determination. Senescence-associated beta-galactosidase (SA  $\beta$ -gal) expression was assayed to validate cellular ageing. **Results:** In cellular ageing of HDFs, catalase and glutathione peroxidase activities were reduced, but SOD activity was heightened during pre-senescence. P. betle exhibited the strongest antioxidant activity by reducing SA  $\beta$ -gal expression, catalase activities in all age groups, and SOD activity. TRF exhibited a strong antioxidant activity by reducing SA  $\beta$ -gal expression, and SOD activity in senescent HDFs. C. vulgaris extract managed to reduce SOD activity in senescent HDFs. **Conclusion:** P. betle, C. vulgaris, and TRF have the potential as anti-ageing entities which compensated the role of antioxidant enzymes in cellular ageing of HDFs.



## J114 Protective effect of curcumin on experimentally induced arthritic rats: Detailed histopathological study of the joints and white blood cell count

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EXCLI Journal, Vol.11, 2012, 226-236

*Curcuma longa* (turmeric) rhizomes contains curcumin, an active compound which possesses anti-inflammatory effects. Collagen-induced arthritis (CIA) is an accepted experimental animal model of rheumatoid arthritis. The present study aimed to observe the histological changes in the joints of experimental arthritic rats treated with curcumin. Twenty four male Sprague-Dawley (approximately 7 weeks-old) rats were randomly divided into four groups. Three groups were immunized with 150 µg collagen. All rats with established CIA, with arthritis scores exceeding 1, were orally treated with betamethasone (0.5 mg/ml/kg body weight), curcumin (110 mg/ml/kg body weight) or olive oil (1.0 ml/kg body weight) daily, for two weeks. One remaining group was kept as normal control. Treatment with 110 mg/ml/kg curcumin showed significant mean differences in the average white blood cell (WBC) count ( $p < 0.05$ ) compared to the olive oil treated group. Pannus formation scores showed that curcumin supplementation successfully suppressed the pannus formation process that occurred in the articular cartilage of the CIA joints. The mean difference for histological scores for the curcumin group was significant compared to the betamethasone treated group. It is concluded that supplementation of curcumin has protective effect on the histological and degenerative changes in the joints of CIA rats which was at par with betamethasone.

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## J115 Anti-inflammatory effect of *Curcuma Longa* (turmeric) on collagen-induced arthritis: An anatomico-radiological study

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Clinical Therapeutics, Vol. 162(3), 2011, 201-207

**Introduction and Objective:** *Curcuma longa* (CL) or turmeric is an Ayurvedic herb that has been traditionally used to treat inflammatory conditions like rheumatoid arthritis (RA). Collagen-induced arthritis (CIA) is a well established experimental auto-immune mediated polyarthritis in susceptible strains of rodents. The main aim of the study was to observe the inflammatory, macroscopic and radiological changes in the arthritic ankle joints of experimentally collagen-induced arthritis animals treated with or without CL extract. **Materials and Methods:** Thirty six male Sprague-Dawley (6-8 weeks-old,  $150 \pm 50$ ) rats were equally divided into six groups. The first group served as a control while the rest five groups were immunized subdermally with 150 µg collagen type-II on day-0. All rats with established CIA with arthritis score (AS) exceeding 1 were treated orally with betamethasone (0.5 mg/ml/kg body weight) and varying doses of CL extract (30, 60 and 110 mg/ml/kg body weight) using olive oil as vehicle, daily for four weeks. Arthritic scoring (AS) of the paws, measurement of erythrocyte sedimentation rate (ESR) and paw thickness and radiological scoring were performed. **Results:** Treatment with 110 mg/ml/kg CL showed significant mean difference in the ESR ( $p < 0.01$ ), AS ( $p < 0.05$ ) and radiological scores ( $p < 0.01$ ) on day-28 compared to the vehicle treated group. The mean difference for the ESR, AS and

radiological scores of this highest CL dose group were found to be insignificant compared to the betamethasone treated group. **Conclusion:** The administration of CL extract arrested the degenerative changes in the bone and joints of collagen-induced arthritic rats.

### **J116 Modulation of cell cycle profile by *Chlorella Vulgaris* prevents replicative senescence of human diploid fibroblasts**

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Evidence-Based Complementary and Alternative Medicine, 2013, Article ID 780504

In this study, the effects of *Chlorella vulgaris* (CV) on replicative senescence of human diploid fibroblasts (HDFs) were investigated. Hot water extract of CV was used to treat HDFs at passages 6, 15, and 30 which represent young, presenescence, and senescence ages, respectively. The level of DNA damage was determined by comet assay while apoptosis and cell cycle profile were determined using FACSCalibur flow cytometer. Our results showed direct correlation between increased levels of damaged DNA and apoptosis with senescence in untreated HDFs ( $P < 0.05$ ). Cell cycle profile showed increased population of untreated senescent cells that enter G0/G1 phase while the cell population in S phase decreased significantly ( $P < 0.05$ ). Treatment with CV however caused a significant reduction in the level of damaged DNA and apoptosis in all age groups of HDFs ( $P < 0.05$ ). Cell cycle analysis showed that treatment with CV increased significantly the percentage of senescent HDFs in S phase and G2/M phases but decreased the population of cells in G0/G1 phase ( $P < 0.05$ ). In conclusion, hot water extract of *Chlorella vulgaris* effectively decreased the biomarkers of ageing, indicating its potential as an antiageing compound.

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### **J117 Effect of *Cosmos Caudatus* Kunth leaves on the lipid profile of a hyperlipidemia-induced animal model**

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Journal of Food Chemistry and Nutrition, Vol. 2 (1), 2014, 43-51

Hyperlipidemia, a metabolic disorder closely associated with the modern life-style and eating habits, is increasingly prevalent among the world population. This study was conducted on obese rats to evaluate the efficacy of *Cosmos caudatus* leaves as a treatment of hyperlipidemia. Hyperlipidemic conditions were induced in rats by submitting them to a high-fat diet during 3 months. After this, the rats were administered 200 mg/kg body weight of an ethanolic *C. caudatus* leaf extract or 35 mg/kg body weight atorvastatin for four weeks. The rats treated with the *C.*

caudatus extract showed a significant ( $P < 0.05$ ) reduction of plasma triglycerides, total cholesterol, low density lipoprotein-cholesterol and glucose, and a significant ( $P < 0.05$ ) increase in high density lipoprotein-cholesterol and Atherogenic Index values. The study indicated that supplementation with *C. caudatus* has a potential for the treatment of hyperlipidemia.

## J118 *Labisia Pumila* has similar effects to estrogen on the reproductive hormones of ovariectomised rats

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The Internet Journal of Herbal and Plant Medicine, Vol. 2 (1), 2011, 1-9

**Introduction:** The use of estrogen replacement therapy (ERT) in postmenopausal women has been linked to increased risks of endometrial and breast cancer. *Labisia pumila* (LP) which has been used traditionally for women's health is a potential alternative agent for ERT. In this study we have compared the effects of LP aqueous extract to ERT (Premarin(r)) on reproductive hormones using ovariectomized rat model. **Methods:** Thirty-four ovariectomized rats were divided into five groups, A, B, C, D and E. Group A (the ovariectomized-control group) was given distilled water. Group B was given Premarin 0.07 mg/kg body weight. Groups C, D and E were given LP at doses of 17.5, 35.0 and 70.0 mg/kg body weight, respectively. All treatments were given by daily oral gavages. Blood samples were taken through the tails at 30, 60 and 90 days of treatment for plasma follicle stimulating hormone (FSH), estradiol, luteinizing hormone (LH), testosterone, androstenedione and dehydroepiandrosterone sulphate (DHEA-S) analysis. **Results:** The results showed that 60-day treatment with LP at doses of 17.5 mg/kg body weight resembled the effects of Premarin whereby there were significant elevation of estrogen and testosterone levels, suppression of FSH and LH levels compared to ovariectomized-control group. The androstenedione and DHEA-S levels were not altered. Other doses or duration of treatment with LP gave inconsistent results. **Conclusions:** LP has shown potential as alternative to ERT which would require further study. The equivalent human dose of LP should be considered based on the dose of 17.5 mg/kg body weight and 60 days of treatment in ovariectomized rats.

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## J119 *Piper Betle* induces phase I & II genes through Nrf2/ARE signaling pathway in mouse embryonic fibroblasts derived from wild type and Nrf2 knockout cells

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BMC Complementary and Alternative Medicine, Vol. 14(72), 2014

**Background:** Nuclear factor-erythroid 2 p45 related factor 2 (Nrf2) is a primary transcription factor, protecting cells from oxidative stress by regulating a number of antioxidants and phase II detoxifying enzymes. Dietary components such as sulforaphane in broccoli and quercetin in

onions have been shown to be inducers of Nrf2. *Piper betle* (PB) grows well in tropical climate and the leaves are used in a number of traditional remedies for the treatment of stomach ailments and infections among Asians. The aim of this study was to elucidate the effect of Piper betle (PB) leaves extract in Nrf2 signaling pathway by using 2 types of cells; mouse embryonic fibroblasts (MEFs) derived from wild-type (WT) and Nrf2 knockout (NO) mice. **Methods:** WT and NO cells were treated with 5 and 10 µg/ml of PB for 10 and 12-h for the determination of nuclear translocation of Nrf2 protein. Luciferase reporter gene activity was performed to evaluate the antioxidant response element (ARE)-induction by PB. Real-time PCR and Western blot were conducted on both WT and NO cells after PB treatment for the determination of antioxidant enzymes [superoxide dismutase (SOD1) and heme-oxygenase (HO-1)], phase I oxidoreductase enzymes [NAD(P)H: quinone oxidoreductase (NQO1)] and phase II detoxifying enzyme [glutathione S-transferase (GST)]. **Results:** Nuclear translocation of Nrf2 by PB in WT cells was better after 10 h incubation compared to 12 h. Real time PCR and Western blot analysis showed increased expressions of Nrf2, NQO1 and GSTA1 genes with corresponding increases in glutathione, NQO1 and HO-1 proteins in WT cells. Reporter gene ARE was stimulated by PB as shown by ARE/Luciferase assay. Interestingly, PB induced SOD1 gene and protein expressions in NO cells but not in WT cells. **Conclusion:** The results of this study confirmed that PB activated Nrf2-ARE signaling pathway which subsequently induced some phase I oxidoreductase, phase II detoxifying and antioxidant genes expression via ARE reporter gene involved in the Nrf2 pathway with the exception of SOD1 which may not be dependent on this pathway.

## J120 Curcumin as an anti-arthritic agent in collagen-induced arthritic sprague-dawley rats

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Sains Malaysiana, Vol.41 (5), 2012, 591-595

Curcuma longa or turmeric has long been used in traditional medicine by the local population in Malaysia as an antiinflammatory agent. It has been proven to contain natural antiarthritic compound called curcumin. Joints abnormality and destruction have been implicated in the pathogenesis of rheumatoid arthritis (RA) due to inflammatory reactions. In this study, collagen-induced arthritis (CIA) model was utilized to study the effects of curcumin on joint inflammation in Sprague-Dawley rats. Body weight measurement, arthritis score assessment and radiology score assessment were carried out at specific intervals throughout this study. The results showed that the mean arthritis and radiology scores for animal groups designated as CIA CurcuminC and CIA CurcuminT were significantly lower compared with the negative control (CIA OV) group respectively. The mean arthritis scores for CIA CurcuminC group is significantly lower compared with CIA CurcuminT group but there is no significant difference in the mean radiology scores between the CIA CurcuminC and CIA CurcuminT groups. In conclusion, the oral supplementation of curcumin at the dose of 110 mg/mL/kg/day has a potential to delay and improve joint abnormality and injury in Sprague-Dawley rats with CIA. **Keywords:** Arthritis score; collagen-induced arthritis; curcumin; radiology scores between the CIA CurcuminC and CIA CurcuminT groups. In conclusion, the oral supplementation of curcumin at the dose of 110mg/ml/kg/day has a potential to delay and improve joint abnormality and injury in Sprague-Dawley rats with CIA.

## J121 Effect of piper sarmentosum extract on the cardiovascular system of diabetic sprague-dawley rats: electron microscopic study

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Evidence-Based Complementary and Alternative Medicine, Vol. 2012, Article ID 628750,

Although Piper sarmentosum (PS) is known to possess the antidiabetic properties, its efficacy towards diabetic cardiovascular tissues is still obscured. The present study aimed to observe the electron microscopic changes on the cardiac tissue and proximal aorta of experimental rats treated with PS extract. Thirty-two male Sprague-Dawley rats were divided into four groups: untreated control group (C), PS-treated control group (CTx), untreated diabetic group (D), and PS-treated diabetic group (DTx). Intramuscular injection of streptozotocin (STZ, 50 mg/kg body weight) was given to induce diabetes. Following 28 days of diabetes induction, PS extract (0.125 g/kg body weight) was administered orally for 28 days. Body weight, fasting blood glucose, and urine glucose levels were measured at 4-week interval. At the end of the study, cardiac tissues and the aorta were viewed under transmission electron microscope (TEM). DTx group showed increase in body weight and decrease in fasting blood glucose and urine glucose level compared to the D group. Under TEM study, DTx group showed lesser ultrastructural degenerative changes in the cardiac tissues and the proximal aorta compared to the D group. The results indicate that PS restores ultrastructural integrity in the diabetic cardiovascular tissues.

## J122 Histological changes in the heart and the proximal aorta in experimental diabetic rats fed with Piper Sarmentsoum

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African Journal of Traditional Complementary and Alternative Medicines, Vol.9 (3), 2012, 396-404

Cardiovascular complications are one of the major causes of death in diabetes mellitus. Piper sarmentosum (P.s) is an herb that possesses antihyperglycaemic effects. The main aim of the study was to observe the histological changes in the heart and the proximal aorta of streptozotocin-induced diabetic rats following P.s administration. Twenty-four male Sprague-Dawley rats (n=24) were equally randomized into four groups: control group supplemented with normal saline (C); control group supplemented with P.s (CTx); diabetic group supplemented with normal saline (D) and, diabetic group supplemented with P.s (DTx). Diabetes was induced by STZ (50mg/kg body weight) intramuscularly. P.s extract (0.125g/kg) was administered orally for 28 days, following four weeks of STZ induction. The cardiac and aortic tissues were collected and processed under different stains: Haematoxylin and Eosin (H & E), Verhoeff-Van Gieson (VVG), Masson's Trichome (MT) and Periodic Acid- Schiff (PAS). There were abnormal cardiomyocytes nuclei, disarray of myofibres and increase in connective tissue deposits in cardiac tissues of the diabetic untreated group. The thickness of tunica media and ratio of tunica intima to media were found to be significantly increased in the aorta of diabetic untreated group ( $P < 0.05$ ) compared

to the control group. There were degenerative changes in the proximal aorta in diabetic untreated groups. All the histological damages of cardiac and aortic tissues were found to be lesser in the diabetic treated groups. Supplementation with P.s extract prevented the oxidative damage arising from diabetes mellitus, and reduced its complications.

**J**

**EXPERIMENTAL  
NUTRITION**

**(Oils and Fats)**

## J123 Effects of plant-derived frying oils on the bone structure of normal male rats

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The Internet Journal of Herbal and Plant Medicine, Vol. 2(1), 2011

Vitamin E has been shown to have anabolic action on bone of normal male rats. The presence of vitamin E in palm and soy oil, the commonly used plant-derived frying oils have rendered them more resistant to oxidation when repeatedly heated. Previous studies have shown that repeatedly heated frying oils had caused bone loss in ovariectomised rats. This was believed to be contributed by the generation of free radicals in the heated frying oils. Our study aimed to evaluate the effects of repeatedly heated palm and soy oils on the bone of normal male rats. Methods: Forty-two male Sprague-Dawley rats were randomly assigned into seven groups according to their diet; normal control (NC), fresh palm oil (FPO), fresh soy oil (FSO), five times heated palm oil (5HPO), five times heated soy oil (5HSO), ten times heated palm oil (10HPO) and ten times heated soy oil (10HSO). The rats were fed for six months with rat chow mixed with the respective oils at 15% (w/w). Bone structural changes were assessed by performing histomorphometry on the rat femora. The parameters measured were Trabecular volume (BV/TV), Trabecular thickness (TbTh), Trabecular separation (TbSp) and Trabecular Number (TbN). Results: There were no significant differences in all the structural histomorphometric parameters of the repeatedly heated oils groups when compared to normal control and fresh oils groups. Conclusion: Repeatedly heated palm and soy oils are safe and not detrimental to the bone structure of normal male rats. The vitamin E content in the oils may be responsible for these bone protective effects.

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## J124 Oil palm phenolics and vitamin E reduce atherosclerosis in rabbits

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Journal of Functional Foods, Vol. 7, 2014, 541-550

The protective effects of oil palm vitamin E and phenolics against atherosclerosis, either singly or in combination, were studied in an atherogenic rabbit model. Rabbits were either fed atherogenic diet only (CTR), or atherogenic diet with vitamin E (VIT E), or atherogenic diet with oil palm phenolics (OPP), or atherogenic diet with both vitamin E and oil palm phenolics (VIT E + OPP). Results from lipid profile and antioxidant analyses were not significantly different between groups ( $p > 0.05$ ). However, fibrous plaques were associated with the CTR group ( $8.90 \pm 5.41\%$ ) and these were significantly less ( $p < 0.05$ ) in the VIT E ( $2.88 \pm 2.01\%$ ) and OPP ( $1.48 \pm 4.45\%$ ) groups. Fibrous plaques were not detected at all in the VIT E + OPP group. Our findings suggest that oil palm vitamin E and oil palm phenolics individually inhibited atherosclerotic lesion development. However, oil palm vitamin E in combination with oil palm phenolics provided the highest protective effect against development of atherosclerotic lesions.



## J125 Recycled deep-frying oil causes blood pressure elevation and vascular hypertrophy in sprague-dawleys rats

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Research Updates in Medical Sciences, Vol.1 (1), 2013, 2-6

**Background:** Recycling cooking oil for deep frying makes the oil more vulnerable to lipid peroxidation that generates oxidative compounds, linking to an increased risk of cardiovascular diseases. The study aimed to investigate the long-term effect of recycled deep-frying oil and blood pressure and aortic structure in rats. **Methods:** Adult male Sprague-Dawley rats were divided into four groups, namely (a) control; (b) fresh oil (FO), (c) deep-frying oil (DO); and (d) recycled deep-frying oil (RDO). Feeding duration was six months. Blood pressure was measured at baseline and the end of the study using tail-cuff method. After six months the rats were sacrificed and aortic arches were obtained to quantitate intimal and media thickness as well as to examine pathological changes. **Results:** Both FO and DO groups did not show any significant blood pressure and aortic microscopic structure. There was a significant increase in blood pressure in rats fed RDO compared to other groups. Aortic media thickness was significantly increased in RDO group, while intimal thickness did not differ among the groups. Microscopic examination showed an enlarged space between elastic lamellae in aorta of RDO group. **Conclusions:** Long-term intake food containing recycled deep-frying oil causes blood pressure elevation and vascular hypertrophy in rats.

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## J126 Involvement of inflammation and adverse vascular remodelling in the blood pressure raising effect of repeatedly heated palm oil in rats

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Oil thermoxidation during deep frying generates harmful oxidative free radicals that induce inflammation and increase the risk of hypertension. This study aimed to investigate the effect of repeatedly heated palm oil on blood pressure, aortic morphometry, and vascular cell adhesion molecule-1 (VCAM-1) expression in rats. Male Sprague-Dawley rats were divided into five groups: control, fresh palm oil (FPO), one-time-heated palm oil (1HPO), five-time-heated palm oil (5HPO), or ten-time-heated palm oil (10HPO). Feeding duration was six months. Blood pressure was measured at baseline and monthly using tail-cuff method. After six months, the rats were sacrificed and the aortic arches were dissected for morphometric and immunohistochemical analyses. FPO group showed significantly lower blood pressure than all other groups. Blood pressure was increased significantly in 5HPO and 10HPO groups. The aortae of 5HPO and 10HPO groups showed significantly increased thickness and area of intima-media, circumferential wall tension, and VCAM-1 than other groups. Elastic lamellae were disorganised and fragmented in

5HPO- and 10HPO-treated rats. VCAM-1 expression showed a significant positive correlation with blood pressure. In conclusion, prolonged consumption of repeatedly heated palm oil causes blood pressure elevation, adverse remodelling, and increased VCAM-1, which suggests a possible involvement of inflammation.

### **J127 Effect of different vegetable oils (red palm olein, palm olein, corn oil and coconut oil) on lipid profile in rat**

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Food and Nutrition Sciences, Vol.2, 2011, 253-258

The objective of the study was to evaluate the effects of different vegetable oils [red palm olein (RPO), palm olein (PO), corn oil (CO) and coconut oil (COC)] on lipid profile in rat. Sixty six Sprague Dawley male rats were randomly divided into eleven groups of 6 rats per group and were treated with 15% concentrations of RPO, PO, CO and COC for 4 and 8 weeks. Rats in control group were given normal rat pellet only while in treated groups 15% of additional vegetable oils were given. The results at 4 weeks showed a decline in Low Density Lipoprotein Cholesterol (LDL-C) values at RPO and PO groups whereas in CO and COC groups the LDL-C were increased compared to the control group. The High Density Lipoprotein Cholesterol (HDL-C) values increased in RPO and PO groups whereas it was declined in CO and COC groups compared to the control group. At 8 weeks, there was no significant difference ( $P \geq 0.05$ ) in HDL-C of rats treated with vegetable oils compared to the control group. However, the LDL-C in RPO and PO was significantly decreased ( $P \leq 0.05$ ) in the LDL-C and there was no significant difference ( $P \geq 0.05$ ) for CO and COC groups compared to the control groups. The mean value of the LDL-C after 8 weeks in the control group, RPO, PO, CO, and COC groups were 66.1 mg/dl, 31.9 mg/dl, 41.1 mg/dl, 50.41 mg/dl and 54.31 mg/dl respectively. There was significant decreased ( $P \leq 0.05$ ) in the total cholesterol (TC) in RPO group for 4 weeks compared to the control group while the TC in PO, CO and COC were within the normal range. The results of TC in all treated rats for 8 weeks were within the normal range. There was no significant difference in TC of rats treated with vegetable oils compared to the control group. Triglycerides (TG) in all treated rats for 4 weeks were within the normal range whereas the TG in RPO, PO and CO groups for 8 weeks were significant increase ( $P \leq 0.05$ ) compared to the control group but there was no significant difference between the control group and COC group.

### **J128 Lipid profile and antioxidant enzymes in normal and stressed rat fed with palm olein**

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American Journal of Applied Sciences, Vol. 9 (7), 2012, 1071-1078

**Problem statement:** The objective of the study was to evaluate the effect of Red Palm Olein (RPO) and Palm Olein (PO) on lipid profile and antioxidant enzyme in normal and stressed rat. **Approach:**

Thirty six Sprague Dawley male rats which were randomly divided into six groups of 6 rats per group (three normal groups and three stressed groups) were treated with 15% of RPO and PO for four weeks. Results: The results at 4 weeks of treatment showed a decline in Low Density Lipoprotein Cholesterol (LDL-C) level at RPO and PO for normal and stressed groups compared to the control group. The High Density Lipoprotein Cholesterol (HDL-C) level increased in RPO and PO of the normal and stressed groups. There was significant decreased ( $p \leq 0.05$ ) in the TC in RPO normal group for 4 weeks of treatment compared to the control group while the TC in PO was within the normal range and increased in stressed group. After 4 weeks of treatment the study indicated that there was no significant ( $p \geq 0.05$ ) effect on antioxidant enzyme (superoxide dismutase) in stressed rat liver but there was a significant decreased ( $p \leq 0.05$ ) on catalase in stressed rat liver. **Conclusion:** These results could be due to the high content of vitamin E (tocopherols and tocotrienols) and  $\beta$ -carotene in red palm olein.

### **J129 Effect of different concentrations of red palm olein on blood lipid profile in rat**

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International Research Journal of Biochemistry and Bioinformatics, Vol. 1(7), 2011, 184-189

In this paper, we aimed to investigate the effect of different concentration of red palm olein (RPO) on blood lipid profile in rat. Seventy eight Sprague Dawley male rats were randomly divided into thirteen groups of 6 rats per group with 6 rats for T0 group which kill before any treatment. Treated groups were given with different concentrations of RPO (5%, 10% and 15%) for 2, 4 and 8 weeks. Rats in control group were given normal rat pellet only while in treated groups 5%, 10% and 15% of additional RPO were given. Results showed a decline in Low Density Lipoprotein Cholesterol (LDL-C) values whereas the High Density Lipoprotein Cholesterol (HDL-C) values increased. Rats treated with 15% RPO for 8 weeks showed an increased in the mean LDL-C level and decreased in HDL-C compared to the control group. At 2 and 4 weeks of treatment, the total cholesterol was no significant difference ( $p \geq 0.05$ ) between control group and groups fed with different concentration (5%, 10%, and 15%) RPO but At 8 weeks, the total cholesterol level decreases in all concentrations compared to control group. The results of triglyceride (TG) in all treated rats were within the normal range. There was no significant difference ( $p \geq 0.05$ ) in TG of rats treated with RPO compared to the control group.

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### **J130 Effect of four different vegetable oils (red palm olein, palm olein, corn oil, coconut oil) on antioxidant enzymes activity of rat liver**

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Pakistan Journal of Biological Sciences, Vol.14(6), 2011, 399-403

The objective of the study was to evaluate the effect of four different vegetable oils [red palm

olein (RPO), palm olein (PO), corn oil (CO), coconut oil (COC)] on antioxidant enzymes activity of rat liver. Sixty six Sprague Dawley male rats which were randomly divided into eleven groups of 6 rats per group and were treated with 15% of RPO, PO, CO and COC for 4 and 8 weeks. Rats in the control group were given normal rat pellet only while in treated groups, 15% of additional different vegetable oils were given. After 4 weeks of treatment the catalase (CAT) activity results showed that there was no significance difference ( $p > \text{or} = 0.05$ ) between the control group and treated groups while after 8 weeks of treatment showed that there was no significant different ( $p > \text{or} = 0.05$ ) between control group and RPO group but the treated rat liver with PO, CO and COC groups were the lowest and it were significantly lower ( $> \text{or} = 0.05$ ) than control group. For superoxide dismutase (SOD) there was no significance difference ( $p > \text{or} = 0.05$ ) between the control group and treated groups of vegetable oils after 4 and 8 weeks of treatment. Thus the study indicated that there was no significant ( $p > \text{or} = 0.05$ ) effect on antioxidant enzyme (superoxide dismutase) but there was significant effect ( $p > \text{or} = 0.05$ ) on catalase in rat liver.

### **J131 Stearic acids at sn-1, 3 positions of TAG are more efficient at limiting fat deposition than palmitic and oleic acids in C57BL/6 mice**

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British Journal of Nutrition, Vol. 111(7), 2014, 1174-1180

In the present study, we investigated the effect of long-acyl chain SFA, namely palmitic acid (16:0) and stearic acid (18:0), at sn-1, 3 positions of TAG on obesity. Throughout the 15 weeks of the experimental period, C57BL/6 mice were fed diets fortified with cocoa butter, sal stearin (SAL), palm mid fraction (PMF) and high-oleic sunflower oil (HOS). The sn-1, 3 positions were varied by 16:0, 18:0 and 18:1, whilst the sn-2 position was preserved with 18:1. The HOS-enriched diet was found to lead to the highest fat deposition. This was in accordance with our previous postulation. Upon normalisation of total fat deposited with food intake to obtain the fat:feed ratio, interestingly, mice fed the SAL-enriched diet exhibited significantly lower visceral fat/feed and total fat/feed compared with those fed the PMF-enriched diet, despite their similarity in SFA-unsaturated fatty acid-SFA profile. That long-chain SFA at sn-1, 3 positions concomitantly with an unsaturated FA at the sn-2 position exert an obesity-reducing effect was further validated. The present study is the first of its kind to demonstrate that SFA of different chain lengths at sn-1, 3 positions exert profound effects on fat accretion.

### **J132 Long-chain SFA at the sn-1, 3 positions of TAG reduce body fat deposition in C57BL/6 mice**

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British Journal of Nutrition, Vol.110 (11), 2013, 1987-1995

The present study aimed to determine the effect of positional distribution of long-chain SFA in

TAG, especially at the sn-1, 3 positions, on fat deposition using the C57BL/6 mouse model. Throughout the 15 weeks of the study, mice were fed with diets fortified with palm olein (POo), chemically interesterified POo (IPOo) and soyabean oil (SOY). Mice receiving the SOY-enriched diet gained significantly higher amounts of subcutaneous fat ( $P= 0.011$ ) and total fat ( $P= 0.013$ ) compared with the POo group, despite similar body mass gain being recorded. During normalisation with food consumption to obtain the fat: feed ratio, mice fed with the POo-enriched diet exhibited significantly lower visceral ( $P= 0.044$ ), subcutaneous ( $P= 0.006$ ) and total ( $P= 0.003$ ) fat: feed than those fed with the SOY-enriched diet. It is noteworthy that mice fed with the IPOo-enriched diet gained 14.3 % more fat per food consumed when compared with the POo group ( $P= 0.013$ ), despite their identical total fatty acid compositions. This was mainly attributed to the higher content of long-chain SFA at the sn-1, 3 positions of TAG in POo, which results in delayed absorption after deacylation as evidenced by the higher amounts of long-chain SFA excreted in the faeces of mice fed with the POo-enriched diet. Negative correlations were found between the subcutaneous, visceral as well as total fat accretion per food consumption and the total SFA content at the sn-1, 3 positions, while no relationships were found for MUFA and PUFA. The present results show that the positional distribution of long-chain SFA exerts a more profound effect on body fat accretion than the total SFA content.

### **J133 High fat diet increases uptake of particles by the peyer's patches of ileum in rats**

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International Medical Journal, Vol. 20 (4), 2013, 432-434

Structure and functions of different organs especially cardiovascular, cerebrovascular and reproductive systems are compromised by the consumption of high fat diet. Gastrointestinal system has gained less attention in this respect. An intact and efficient gastrointestinal barrier protects us from different harmful agents. Objective: Our objective was to observe the effect of high fat diet on the uptake of particles by the peyer's patches (PP) and its transport to mesenteric lymph nodes of rats. Materials and Methods: Twenty, four weeks old male Wistar rats were used for the study. Rats were divided into two groups, control ( $n = 10$ ) and HFD ( $n = 10$ ) group. They received the respective diet for 6 weeks. 1 hour prior to sacrifice, 1 ml of fluorescent latex bead solution was given to all rats by gavage tube. After sacrifice, small intestinal samples containing PP were collected. Samples of ileum were fixed in formalin, cut in microtome for hematoxylin and eosin stain to observe and analyze small intestinal morphology. Ileum samples containing Peyer's patches and mesenteric lymph nodes were frozen in liquid nitrogen, cut in cryostat, taken on poly-1-lysine coated glass slides, observed and analyzed the number of fluorescent particles under confocal laser scan microscope. Statistical comparisons were performed by student's independent t test. Result: Body weight of the rats were significantly higher in HFD group as compared to the control group ( $C = 223 \pm 25.6$  gm, HFD =  $339 \pm 11$  gm,  $p < 0.001$ ). Height of the villi and crypt depth were significantly higher in HFD group as compared to the control group ( $C = 217 \pm 7.7$   $\mu$ m, HFD =  $324 \pm 54.3$   $\mu$ m,  $p < 0.001$  and  $108 \pm 7.6$   $\mu$ m, HFD =  $136 \pm 31.4$   $\mu$ m respectively). Uptake of particles by the PP was significantly higher in HFD group as compared to the control group ( $C = 23 \pm 7.5$ , HFD =  $106 \pm 25.4$ ,  $p < 0.001$ ). Number of particles in the mesenteric lymph nodes was not different significantly between the two groups ( $C = 8 \pm 3$ , HFD =  $12 \pm 3$ ). Conclusion: We conclude that HFD for 6 weeks in rats increased the uptake of particles by the PP. We recommend that further studies should be conducted to find out the underlying mechanism to prevent or ameliorate such changes by several modulating agents.

### J134 The effects of heated vegetable oils on blood pressure in rats

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Clinics, Vol.66 (12), 2011, 2125-2132

**Objectives:** The goal of this study was to determine the possible mechanism that is involved in the blood pressure-raising effect of heated vegetable oils. **Methods:** Adult male Sprague-Dawley rats were divided into 11 groups; the control group was fed with rat chow, and the other groups were fed with chow that was mixed with 15% weight/weight palm or soy oils, which were either in a fresh form or heated once, twice, five, or ten times. Blood pressures were measured at the baseline and throughout the 24-week study. Plasma nitric oxide levels were assessed prior to treatment and at the end of the study. Following 24 weeks, the rats were sacrificed to investigate their vascular reactivity using the thoracic aorta. **Results:** Palm and soy oils had no detrimental effects on blood pressure, and they significantly elevated the nitric oxide contents and reduced the contractile responses to phenylephrine. However, trials using palm and soy oils that were repeatedly heated showed an increase in blood pressure, enhanced phenylephrine-induced contractions, reduced acetylcholine- and sodium nitroprusside-induced relaxations relative to the control and rats that were fed fresh vegetable oils. **Conclusions:** The blood pressure-raising effect of the heated vegetable cooking oils is associated with increased vascular reactivity and a reduction in nitric oxide levels. The chronic consumption of heated vegetable oils leads to disturbances in endogenous vascular regulatory substances, such as nitric oxide. The thermal oxidation of the cooking oils promotes the generation of free radicals and may play an important contributory role in the pathogenesis of hypertension in rats.

### J135 Virgin coconut oil (VCO) decreases the level of malondialdehyde (MDA) in the cardiac tissue of experimental sprague-dawley rats fed with heated palm oil

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Journal of Medical and Bioengineering, Vol.3 (2), 2014, 102-106

Heating of edible oils maybe harmful for human consumption. However, with the advent of newer oils like virgin coconut oil, it is interesting to observe the effects of the oil on inflammatory markers associated with cardiovascular diseases. The present study aimed to investigate the influence of virgin coconut oil on the malondialdehyde level in the heart tissue of rats fed with heated palm oil. Thirty two male Sprague-Dawley rats (200-280 g) were equally assigned into four groups and fed as follows: Control-group with normal rat chow; VCO-group with rat chow and supplemented with 1.43ml/kg body weight of VCO; Five times heated palm oil (5HPO)-group with rat chow fortified with 15% weight/weight (w/w) of 5HPO; and 5HPO + VCO-group with rat chow fortified with 15% w/w of 5HPO plus 1.43ml/kg body weight of VCO simultaneously. The treatment duration continued for four months. Thereafter, the thirty two rats were sacrificed and heart tissues

were harvested for biochemical analyses. There was a significant ( $p < 0.05$ ) decrease in peroxide value in the VCO. The MDA level in the VCO and 5HPO+VCO groups was reduced significantly ( $p < 0.05$ ) compared to the 5HPO group. In conclusion, VCO supplementation reduced the oxidative stress as depicted with decrease in peroxide value and MDA level.

### **J136 The antimicrobial activity of enhanced virgin coconut oil (EVCO) on growth of mastitis pathogens**

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Malaysian Journal of Microbiology, Vol. 10 (2), 2014, 112-118

The effect of EVCO, containing about 57.48% triglycerides, 26.88% diglycerides, 1.51% monoglycerides and 14.13% free fatty acids, against clinical mastitis pathogens, bought from American Type Cultures Collection (ATCC), was investigated. The present study aims to determine the efficacy of EVCO against three potent mastitis causal agents, namely *S. aureus* (ATCC 31885), *S. agalactiae* (ATCC 12927) and *S. dysagalactiae* (ATCC 27957). Methodology and results: The In-vitro study showed that EVCO can act as a potent agent to inhibit the growth of *Staphylococcus aureus* (ATCC 31885), *Streptococcus agalactiae* (ATCC 12927) and *Streptococcus dysgalactiae* (ATCC 27957). A time kill study showed that EVCO at 2.5% is able to kill both *Streptococcus* spp. (ATCC 12927 & ATCC 27957) in 5 min of incubation time. Among three mastitis pathogens, *S. aureus* was the most difficult to eradicate and required at least 5% EVCO for 100% inhibition after 30 min of treatment. The In-vivo study on mastitis-induced lactating cows showed the amount of EVCO introduced into the infected mammary gland was considered over dosage; 50% concentration of EVCO was over dosage, even though it reduced the growth of pathogens from 104 to 100. The acidic characteristics of EVCO caused the protein in milk to clot and the udders to swell, even after several days of treatment. Conclusion, significance and impact study: The EVCO had shown its antimicrobial efficacy against three potent mastitis causal agents. The amount of EVCO used to treat mastitis-induced cows and the number of treatments applied needed to be reduced to avoid the milk clotting and udders swelling as a result of the acidic characteristics of EVCO.

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### **J137 Effect of repeatedly heated palm olein on blood pressure-regulating enzymes activity and lipid peroxidation in rats**

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Malaysian Journal of Medical Sciences, Vol. 19 (1), 2012, 20-29

**Background:** Oxidative stress is associated with the pathogenesis of cardiovascular diseases. The process of deep-fat frying in dietary cooking oil plays a role in the generation of free radicals. In this study, palm olein heated to 180 °C was tested for its effect on the activity of blood pressure-regulating enzymes and lipid peroxidation. **Methods:** Forty-two adult male Sprague-Dawley rats were equally assigned into 6 groups. The first group was fed with normal rat chow as the control

group, and the subsequent groups were fed with rat chow fortified with 15% weight/weight of the following: fresh palm olein, palm olein heated once, palm olein heated twice, palm olein heated 5 times, or palm olein heated 10 times. The duration of feeding was 6 months. Fatty acid analyses of oil were performed using gas chromatography. Peroxide values were determined using standard titration. Plasma was collected for biochemical analyses. **Results:** Repeatedly heated palm olein increased the levels of peroxide, angiotensin-converting enzyme, and lipid peroxidation as well as reduced the level of heme oxygenase. Fresh palm olein and palm olein heated once had lesser effects on lipid peroxidation and a better effect on the activity of blood pressure-regulating enzymes than repeatedly heated palm olein. **Conclusion:** Repeatedly heated palm olein may negatively affect the activity of blood pressure-regulating enzymes and increase lipid peroxidation.

### J138 Oil palm phenolics confer neuroprotective effects involving cognitive and motor functions in mice

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Nutritional Neuroscience, Vol. 16(5), 2013, 207-217

**Objectives:** Phenolics are important phytochemicals which have positive effects on chronic diseases, including neurodegenerative ailments. The oil palm (*Elaeis guineensis*) is a rich source of water-soluble phenolics. This study was carried out to discover the effects of administering oil palm phenolics (OPP) to mice, with the aim of identifying whether these compounds possess significant neuroprotective properties. **Methods:** OPP was given to BALB/c mice on a normal diet as fluids for 6 weeks while the controls were given distilled water. These animals were tested in a water maze and on a rotarod weekly to assess the effects of OPP on cognitive and motor functions, respectively. Using Illumina microarrays, we further explored the brain gene expression changes caused by OPP in order to determine the molecular mechanisms involved. Real-time quantitative reverse transcription-polymerase chain reaction experiments were then carried out to validate the microarray data. **Results:** We found that mice given OPP showed better cognitive function and spatial learning when tested in a water maze, and their performance also improved when tested on a rotarod, possibly due to better motor function and balance. Microarray gene expression analysis showed that these compounds up-regulated genes involved in brain development and activity, such as those under the regulation of the brain-derived neurotrophic factor. OPP also down-regulated genes involved in inflammation. **Discussion:** These results suggest that the improvement of mouse cognitive and motor functions by OPP is caused by the neuroprotective and anti-inflammatory effects of the extract.

### J139 Oil palm phenolics attenuate changes caused by an atherogenic diet in mice

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European Journal of Nutrition, 52(2), 2013, 443-456



**Background:** Water-soluble phenolics from the oil palm possess significant biological properties. **Purpose:** In this study, we aimed to discover the role of oil palm phenolics (OPP) in influencing the gene expression changes caused by an atherogenic diet in mice. **Methods:** We fed mice with either a low-fat normal diet (14.6 % kcal/kcal fat) with distilled water, or a high-fat atherogenic diet (40.5 % kcal/kcal fat) containing cholesterol. The latter group was given either distilled water or OPP. We harvested major organs such as livers, spleens and hearts for microarray gene expression profiling analysis. We determined how OPP changed the gene expression profiles caused by the atherogenic diet. In addition to gene expression studies, we carried out physiological observations, blood hematology as well as clinical biochemistry, cytokine profiling and antioxidant assays on their blood sera. **Results:** Using Illumina microarrays, we found that the atherogenic diet caused oxidative stress, inflammation and increased turnover of metabolites and cells in the liver, spleen and heart. In contrast, OPP showed signs of attenuating these effects. The extract increased unfolded protein response in the liver, attenuated antigen presentation and processing in the spleen and up-regulated antioxidant genes in the heart. Real-time quantitative reverse transcription-polymerase chain reaction validated the microarray gene expression fold changes observed. Serum cytokine profiling showed that OPP attenuated inflammation by modulating the Th1/Th2 axis toward the latter. OPP also increased serum antioxidant activity to normal levels.

#### J140 The effects of virgin coconut oil on bone oxidative status in ovariectomised rat

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Evidence-Based Complementary and Alternative Medicine, Vol. 2012, Article ID 525079

Virgin coconut oil (VCO) was found to have antioxidant property due to its high polyphenol content. The aim of this study was to investigate the effect of the virgin coconut oil on lipid peroxidation in the bone of an osteoporotic rat model. Normal female Sprague-Dawley rats aged 3 months old were randomly divided into 4 groups, with 8 rats in each group: baseline, sham, ovariectomised (OVX) control group, and OVX given 8% VCO in the diet for six weeks. The oxidative status of the bone was assessed by measuring the index of lipid peroxidation, which is malondialdehyde (MDA) concentration, as well as the endogenous antioxidant enzymes glutathione peroxidase (GPX) and superoxide dismutase (SOD) in the tibia at the end of the study. The results showed that there was a significant decrease in MDA levels in the OVX-VCO group compared to control group. Ovariectomised rats treated with VCO also had significantly higher GPX concentration. The SOD level seemed to be increased in the OVX-VCO group compared to OVX-control group. In conclusion, VCO prevented lipid peroxidation and increased the antioxidant enzymes in the osteoporotic rat model.

#### J141 The anti proliferative effect of palm oil gamma-tocotrienol involves alterations in MEK-2 and ERK-2 protein expressions in CaSki cells

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**Background:** Vitamin E is a potent growth inhibitor of various cancer cell types in vitro and in vivo. The cell death mechanism is believed to be via cell cycle blockage, differentiation, and apoptosis. **Objectives:** To determine the possible involvement of protein expression of MEK-2 and ERK-2 in the cell death mechanism induced by palm oil gamma-tocotrienol and alpha-tocopherol in human cervical cancer cell line, CaSki cells. **Methods:** In this study, we tested the effect of gamma-tocotrienol and alpha-tocopherol on the proliferation and apoptosis in CaSki cells. Western blot analysis was used to determine the involvement of MEK-2 and ERK-2 in regulating the cell death mechanism. **Results:** Gamma-tocotrienol and alpha-tocopherol efficiently inhibited the proliferation of CaSki cells by 85.2% to 90.8% ( $p < 0.01$ ,  $n=4$ ) and 10.2% to 39.1% ( $p < 0.01$ ,  $n=4$ ) beginning at 100  $\mu\text{M}$  and 50  $\mu\text{M}$  respectively. The possible cell death mechanism induced by both compounds may be due to apoptosis as confirmed by the presence of cellular DNA fragments separated by electrophoresis and enhancement of apoptotic activity. Treatment with gamma-tocotrienol at 150  $\mu\text{M}$  markedly decreased the protein expression of MEK-2 and ERK-2 at 12 hours and 18 hours. In contrast, treatment with alpha-tocopherol at 300  $\mu\text{M}$  has no effect on both protein expressions. **Conclusion:** The transient decreases in the protein expression of MEK-2 and ERK-2 suggested that the anti proliferative effect of  $\gamma$ -tocotrienol might involve alteration of the proliferative signaling cascade.

## J142 The role of repeatedly heated soybean oil in the development of hypertension in rats: Association with vascular inflammation

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International Journal of Experimental Pathology, Vol.93, 2012, 377-387

Thermally oxidized oil generates reactive oxygen species that have been implicated in several pathological processes including hypertension. This study was to ascertain the role of inflammation in the blood pressure raising effect of heated soybean oil in rats. Male Sprague-Dawley rats were divided into four groups and were fed with the following diets, respectively, for 6 months: basal diet (control); fresh soybean oil (FSO); five-time-heated soybean oil (5HSO); or 10-time-heated soybean oil (10HSO). Blood pressure was measured at baseline and monthly using tail-cuff method. Plasma prostacyclin (PGI(2)) and thromboxane A(2) (TXA(2)) were measured prior to treatment and at the end of the study. After six months, the rats were sacrificed, and the aortic arches were dissected for morphometric and immunohistochemical analyses. Blood pressure was increased significantly in the 5HSO and 10HSO groups. The blood pressure was maintained throughout the study in rats fed FSO. The aortae in the 5HSO and 10HSO groups showed significantly increased aortic wall thickness, area and circumferential wall tension. 5HSO and 10HSO diets significantly increased plasma TXA(2)/PGI(2) ratio. Endothelial VCAM-1 and ICAM-1 were significantly increased in 5HSO, as well as LOX-1 in 10HSO groups. In conclusion, prolonged consumption of repeatedly heated soybean oil causes blood pressure elevation, which may be attributed to inflammation.

## **J143 Virgin coconut oil prevents blood pressure elevation and improves endothelial functions in rats fed with repeatedly heated palm oil**

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Evidence-Based Complementary and Alternative Medicine, Vol. 2013, Article ID: 629329

This study was performed to explore the effects of virgin coconut oil (VCO) in male rats that were fed with repeatedly heated palm oil on blood pressure, plasma nitric oxide level, and vascular reactivity. Thirty-two male Sprague-Dawley rats were divided into four groups: (i) control (basal diet), (ii) VCO (1.42\_mL/kg, oral), (iii) five-times-heated palm oil (15%) (5HPO), and (iv) five-times-heated palm oil (15%) and VCO (1.42\_mL/kg, oral) (5HPO + VCO). Blood pressure was significantly increased in the group that was given the 5HPO diet compared to the control group. Blood pressure in the 5HPO + VCO group was significantly lower than the 5HPO group. Plasma nitric oxide (NO) level in the 5HPO group was significantly lower compared to the control group, whereas in the 5HPO + VCO group, the plasma NO level was significantly higher compared to the 5HPO group. Aortic rings from the 5HPO group exhibited attenuated relaxation in response to acetylcholine and sodium nitroprusside as well as increased vasoconstriction to phenylephrine compared to the control group. Aortic rings from the 5HPO + VCO group showed only attenuated vasoconstriction to phenylephrine compared to the 5HPO group. In conclusion, VCO prevents blood pressure elevation and improves endothelial functions in rats fed with repeatedly heated palm oil.

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## **J144 Positive outcomes of oil palm phenolics on degenerative diseases in animal models**

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British Journal of Nutrition, Vol.106 (11), 2011, 1644-1675

It is well established that plant phenolics elicit various biological activities, with positive effects on health. Palm oil production results in large volumes of aqueous by-products containing phenolics. In the present study, we describe the effects of oil palm phenolics (OPP) on several degenerative conditions using various animal models. OPP reduced blood pressure in a NO-deficient rat model, protected against ischaemia-induced cardiac arrhythmia in rats and reduced plaque formation in rabbits fed an atherogenic diet. In Nile rats, a spontaneous model of the metabolic syndrome and type 2 diabetes, OPP protected against multiple aspects of the syndrome and diabetes progression. In tumour-inoculated mice, OPP protected against cancer progression. Microarray studies on the tumours showed differential transcriptome profiles that suggest anti-tumour molecular mechanisms involved in OPP action. Thus, initial studies suggest that OPP may have potential against several chronic disease outcomes in mammals.

## J145 Differential transcriptomic profiles effected by oil palm phenolics indicate novel health outcome

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BMC Genomics, Vol. 12 (432), 2011

**Background:** Plant phenolics are important nutritional antioxidants which could aid in overcoming chronic diseases such as cardiovascular disease and cancer, two leading causes of death in the world. The oil palm (*Elaeis guineensis*) is a rich source of water-soluble phenolics which have high antioxidant activities. This study aimed to identify the *in vivo* effects and molecular mechanisms involved in the biological activities of oil palm phenolics (OPP) during healthy states via microarray gene expression profiling, using mice supplemented with a normal diet as biological models. **Results:** Having confirmed via histology, haematology and clinical biochemistry analyses that OPP is not toxic to mice, we further explored the gene expression changes caused by OPP through statistical and functional analyses using Illumina microarrays. OPP showed numerous biological activities in three major organs of mice, the liver, spleen and heart. In livers of mice given OPP, four lipid catabolism genes were up-regulated while five cholesterol biosynthesis genes were down-regulated, suggesting that OPP may play a role in reducing cardiovascular disease. OPP also up-regulated eighteen blood coagulation genes in spleens of mice. OPP elicited gene expression changes similar to the effects of caloric restriction in the hearts of mice supplemented with OPP. Microarray gene expression fold changes for six target genes in the three major organs tested were validated with real-time quantitative reverse transcription-polymerase chain reaction (qRT-PCR), and the correlation of fold changes obtained with these two techniques was high ( $R^2 = 0.9653$ ). **Conclusions:** OPP showed non-toxicity and various pleiotropic effects in mice. This study implies the potential application of OPP as a valuable source of wellness nutraceuticals, and further suggests the molecular mechanisms as to how dietary phenolics work *in vivo*.

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## J146 Reheated palm oil consumption and risk of atherosclerosis: Evidence at ultrastructural level

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Evidence-based complementary and alternative medicine, 2012, Article ID: 828170

**Background:** Palm oil is commonly consumed in Asia. Repeatedly heating the oil is very common during food processing. **Aim:** This study is aimed to report on the risk of atherosclerosis due to the reheated oil consumption. **Material and Methods:** Twenty four male Sprague Dawley rats were divided into control, fresh-oil, 5 times heated-oil and 10 times heated-oil feeding groups. Heated palm oil was prepared by frying sweet potato at 180°C for 10 minutes. The ground standard rat chows were fortified with the heated oils and fed it to the rats for six months. **Results:** Tunica intima thickness in aorta was significantly increased in 10 times heated-oil feeding group ( $P <$

0.05), revealing a huge atherosclerotic plaque with central necrosis projecting into the vessel lumen. Repeatedly heated oil feeding groups also revealed atherosclerotic changes including mononuclear cells infiltration, thickened subendothelial layer, disrupted internal elastic lamina and smooth muscle cells fragmentation in tunica media of the aorta. Conclusion: The usage of repeated heated oil is the predisposing factor of atherosclerosis leading to cardiovascular diseases. It is advisable to avoid the consumption of repeatedly heated palm oil.

## **J147 Virgin coconut oil supplementation prevents bone loss in osteoporosis rat model**

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Evidence- Based Complementary and Alternative Medicine, Vol. 2012, Article ID: 237236

Oxidative stress and free radicals have been implicated in the pathogenesis of osteoporosis. Therefore, antioxidant compounds have the potential to be used in the prevention and treatment of the disease. In this study, we investigated the effects of virgin coconut oil (VCO) on bone microarchitecture in a postmenopausal osteoporosis rat model. VCO is a different form of coconut oil as it is rich with antioxidants. Three-month-old female rats were randomly grouped into baseline, sham-operated, ovariectomized control (Ovx), and ovariectomized rats fed with 8% VCO in their diet for six weeks (Ovx+VCO). Bone histomorphometry of the right femora was carried out at the end of the study. Rats supplemented with VCO had a significantly greater bone volume and trabecular number while trabecular separation was lower than the Ovx group. In conclusion, VCO was effective in maintaining bone structure and preventing bone loss in estrogen-deficient rat model.



**J**

**EXPERIMENTAL  
NUTRITION**

**(Fruits and Vegetables)**

## J148 Radioprotective effect of watermelon juice against low dose ionizing radiation-induced inflammatory response in mice

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World Journal of Medical Sciences, Vol. 10 (2), 2014, 191-197

Exposure to ionizing radiation (IR) may increase tumor formation risk and has been linked to inflammatory response. It is known that IR can cause direct tissue damage, with activation of pro-inflammatory mediators released by macrophages, epithelial cells and fibroblasts. Production of pro-inflammatory cytokines induced by radiation may be overcome by lycopene, a naturally occurring antioxidant in watermelon. Watermelon is known to have about 40% higher lycopene than raw tomatoes. Lycopene has the ability in down regulation of inflammatory response that includes inhibiting the pro-inflammatory cytokines. The present study was designed to evaluate the radioprotective effect of watermelon juice [*Citrullus lanatus* (Thunb.) Matsum. and Nakai] on low dose ionizing radiation induced inflammation in mice. Fifteen mice were divided randomly into 3 groups: negative control (normal diet), positive control (normal diet + low dose IR) and supplementation (50% watermelon juice + low dose IR). Supplementation group was given 50% watermelon juice (v/v) for 28 consecutive day ad libitum and low dose IR was given on day 29 with single dose 100 $\mu$ Gy. In lung, TNF- and IL-6 levels showed significant differences ( $p = 0.05$ ,  $p = 0.01$ ) respectively between supplementation and positive control groups. There were significant differences in lung IL-6 levels between negative and positive control groups ( $p = 0.01$ ). Significant differences were also observed in liver TNF- levels between negative control and supplementation groups ( $p = 0.02$ ). In conclusion, the study demonstrated that watermelon juice has a protective effect against low dose IR - induced inflammatory response.

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## J149 Cytotoxic effect of Red Seaweeds *Kappaphycus Alvarezii* and *Kappaphycus Striatum* on Hepatocarcinoma HEPG2 cell line

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Advances in Environmental Biology, Vol. 8(15), 2014, 79

**Background:** Food antioxidants have been considered as effective agents to reduce oxidative stress which can lead to cancer. **Objective:** The aim of this study was to investigate the potential cytotoxic effect of antioxidant extracts of two commonly found seaweeds namely *Kappaphycus alvarezii* and *Kappaphycus striatum* against hepatocarcinoma HepG2 cell. **Methods:** Cell viability was evaluated by the 3-(4,5-dimethyl thiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay. Annexin V/FITC/PI flowcytometry assay was used to determine the cell death mode of HepG2 cells treated by *K. alvarezii* and *K. striatum* extracts. **Results:** The IC<sub>50</sub> concentration of *K. alvarezii* and



K. striatum extracts that inhibit the proliferation of hepatocarcinoma HepG2 cells was 1.8 mg/mL and 0.9 mg/mL respectively. This finding showed that the antioxidant extracts of K. striatum exhibited better antiproliferative effect against hepatocarcinoma HepG2 cell than the antioxidant extracts of K. alvarezii. However, using Annexin V-FITC/PI showed more than 80% of hepatocarcinoma HepG2 cell were viable after treatment with IC50 concentration of each K. alvarezii and K. striatum extract. This result suggested that cytostatic effect of K. alvarezii and K. striatum extracts to hepatocarcinoma HepG2 cells was found at high concentrations. **Conclusion:** The result of the study indicated that antioxidant extracts of K. alvarezii and K. striatum did not show cytotoxic effect to hepatocarcinoma HepG2 cells.

## J150 Sub-chronic toxicological evaluation of the *Baccaurea Angulata* (Belimbing Dayak) fruit juice in rats

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International Journal of Applied Research in Natural Products, Vol.6 (4), 2013, 23 -32

**Summary:** Toxicity study on normal rats was carried out using freeze-dried whole fruit (FDWF) sample of *Baccaurea angulata*. Animals in these sub-chronic studies illustrated no significant changes in general behaviour, growth, and relative organ weights. In liver function test, total protein and alkaline phosphatase significantly decreased in male treated Group-II (300 mg/kg), giving 36.50±2.65 g/L and 47.90±4.48 U/L, respectively. Meanwhile, low dose female group (Group-II), there was significant increase in the same parameters, giving 63.70±5.28 g/L and 73.50±12.91 U/L respectively. In general, there was no evidence that demonstrated any tissue injury, the no-observable adverse effect level for *B. angulata* was 1,200 mg/kg administered orally for 13 weeks. **Industrial relevance:** The whole fruit juice of *B. angulata*, one of underutilized fruits found in Borneo island of Malaysia, has the potential to be utilized for preparation of health drink. Our earlier studies on the fruit showed that it contains the essential nutrients including dietary fiber that are good in promoting human health. Besides that, it has also been found to contain essential amount of antioxidant constituents as confirmed by antioxidant activities. This present study, additionally, found it to be safe and thus offer diverse potentials to be developed for nutraceutical and functional fruit product.

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## J151 In vitro inhibitory potential of selected Malaysian plants against key enzymes involved in hyperglycemia and hypertension

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Malaysian Journal of Nutrition, Vol.17 (1), 2011, 77-86

**Introduction:** This study was conducted to determine the inhibitory potential of selected Malaysian plants against key enzymes related to type 2 diabetes and hypertension. **Methods:** The samples investigated were pucuk ubi (*Manihot esculenta*), pucuk betik (*Carica papaya*), ulam raja (*Cosmos*

caudatus), pegaga (*Centella asiatica*) and kacang botol (*Psophocarpus tetragonolobus*). The inhibitory potential of hexane and dichloromethane extracts against the enzymes were determined by using alpha-amylase, alpha-glucosidase and angiotensin I-converting enzyme (ACE) inhibition assay. Results: In alpha-amylase inhibition assay, the inhibitory potential was highest in pucuk ubi for both hexane (59.22%) and dichloromethane extract (54.15%). Hexane extract of pucuk ubi (95.01%) and dichloromethane extract of kacang botol (38.94%) showed the highest inhibitory potential against alpha-glucosidase, while in ACE inhibition assay, the inhibitory potential was highest in hexane extract of pegaga (48.45%) and dichloromethane extract of pucuk betik (59.77%). **Conclusion:** This study suggests a nutraceutical potential of some of these plants for hyperglycemia and hypertension prevention associated with type 2 diabetes.

### **J152 Changes in the markers of atherosclerosis following administration of Belimbing Dayak (*Baccaurea Angulata*) fruit juice in experimental rabbits fed with cholesterol diet**

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International Journal of Advances in Agricultural & Environmental Engineering (IJAE), Vol. 1 (1), 2014, 151-154

The aims of this present study were to investigate the potential antioxidant, anti-inflammatory and plaque-reducing activity of *Baccaurea angulata* (BA) fruit as a new anti-atherogenic plant. Twenty five male rabbits of New Zealand strain used were randomly assigned to five groups. Rabbits were fed either a standard chow diet (group N) or a high-cholesterol diet (groups CH, C1, C2 and C3). Groups C1, C2 and C3 were also given 0.5ml or 1ml or 1.5ml/kg/day BA whole fruit juice respectively. BA juice had high antioxidant activities indicated by the increase in the SOD activity and total antioxidant capacity (TAC), when comparing the C1, C2 and C3 groups with group CH. In the group CH, there was statistically significant increase in IL-8 and IL-18 levels as compared to C1, C2 and C3 groups. Likewise, BA juice reduced plaque formation in rabbits' aorta. Therefore, BA juice is beneficial in preventing atherosclerosis.

### **J153 Hepatoprotective effect of fermented soybean (nutrient enriched soybean tempeh) against alcohol-induced liver damage in mice**

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Recently, soybean tempeh has received great attention due to many advantages such as higher nutritional value, lower production cost, and shorter fermentation time. In this study, the in vivo hepatoprotective and antioxidant effects of nutrient enriched soybean tempeh (NESTE) were determined. NESTE fermentation process which involved anaerobic incubation was previously proclaimed to increase the content of amino acids and antioxidant properties remarkably. The evaluation of histological sections, serum biochemical markers (aspartate aminotransferase (AST), alanine aminotransferase (ALT), and cholesterol and triglycerides (TG)), liver immune response level (nitric oxide (NO)) and liver antioxidant level (superoxide dismutase (SOD), ferric reducing antioxidant power (FRAP), and malondialdehyde (MDA)) was conducted in order to compare the effects of nonfermented soybean extract (SBE) and fermented soybean extract (NESTE) on alcohol-induced liver damage in mice. Results demonstrated that 1000\_mg/kg of NESTE can significantly reduce the levels of AST, ALT, cholesterol, TG, MDA, and NO. On the other hand, it also raised the level of SOD and FRAP. Furthermore, the histological examination on 1000\_mg/kg NESTE treatment group showed that this extract was capable of recovering the damaged hepatocytes to their normal structures. Thus, it can be concluded that NESTE produced through fermentation process was able to enhance hepatoprotective and antioxidant effects in vivo.

#### J154 Does extract of *Pleurotus sajor-caju* affect liver enzymes and histological integrity?

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Annals of Microscopy, Vol. 14, 2014, 18-27

*Pleurotus sajor-caju* (PSC) is believed to have both antihyperlipidemic and hepatoprotective activities. The present study aimed to investigate the effect of PSC on liver enzymes and histological integrity. This study used five groups of rats fed with ghee, in the ratio 32g ghee per 68g pellet, to induce hypercholesterolemia and one group was fed on cholesterol free basal diet. Rats treated with 100 mg/kg of PSC for a month was found to have an effect on the liver enzymes activities since plasma alkaline phosphatase (ALP) concentration in this group showed a significant reduction ( $P < 0.05$ ) and a higher percentage reduction (66.01%) as compared to 20 mg/kg-PSC and 200 mg/kg-PSC treatment groups. The plasma aspartate aminotransferase (AST) and alanine aminotransferase (ALT) only showed a mild increased by 35.04% and 15.00% respectively in 100 mg/kg-PSC treatment group and there was no significant increased ( $P > 0.05$ ) found in these both AST and ALT concentrations. Atorvastatin treatment also showed reduction in ALP enzymes but no significant reduction ( $P > 0.05$ ) as compared to 100 mg/kg-PSC treatment group. On the other hand, plasma AST and ALT in 20 mg/kg of atorvastatin treatment were increased in percentage by 275.97% and 112.50% respectively indicated the adverse effects of statin in term of elevation of plasma enzymes activities. Histologically, there was no significant finding in the micrograph study between treatment and hypercholesterolemic (HPC) liver rat. The micrograph of rat liver treated with 100 mg/kg PSC showed smooth and clear surface of hepatocytes compared to HPC group.

### J155 Effects of pink guava (*Psidium Guajava*) puree supplementation on antioxidant enzyme activities and organ function of spontaneous hypertensive rat

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Sains Malaysiana, Vol. 40(4), 2011, 375-378

This study was aimed to determine the effects of pink guava (*Psidium guajava*) puree supplementation on enzyme activities, kidney and liver function tests of Spontaneous Hypertensive Rats (SHR). Twenty-four male SHR were divided into four groups (control, CG (distilled water); low dosage group, LDG (0.5 g/kg body weight); medium dosage group, MDG (1.0 g/kg body weight); high dosage group, HDG (2.0g/kg body weight). The rats were given pink guava puree via force-feeding and fed rat pellets ad libitum for 28 days in individual cages at 25±2°C. At the end of experiment, the rats were fast overnight (12 to 14 h) and euthanized under an anesthetic condition with ether, and blood was collected from the portal vein or posterior vena cava. The specific activities of glutathione peroxidase (GPx) was significantly higher in LDG (2332.5±81.8 U/L), MDG (2424.8±97.1 U/L) and HDG (2594.6±82.8 U/L) respectively, as compared to CG (2171.8±65.9 U/L). Significant differences were also seen in glutathione reductase (GR) activities among all treated groups (LDG (132.5±11.8 U/L), MDG (141.5±16.4 U/L), HDG (148.8±13.2 U/L) compared to CG (126.1±14.2 U/L)). Liver function tests for total antioxidant status (TAS), alanine aminotransferase (ALT), aspartate aminotransferase (AST), lactate dehydrogenase (LDH) and  $\gamma$ -glutamyl transpeptidase (GGT) showed significant differences in the treated group compared to control group. In conclusion, this study shows pink guava puree supplementation increase antioxidant enzyme activity in SHR's blood concentration.

### J156 Immunomodulatory effects of oyster mushroom (*Pleurotus sajor-caju*) extract in balb/c mice

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Journal of Pharmacy and Pharmaceutical Sciences, Vol.3 (3), 2014, 27-32

*Pleurotus sajor-caju* (oyster mushroom, PSC) is widely used in culinary due to its various benefits on human health. However, no study has been reported on its immunomodulating properties. Cultivated mushroom powder was used for hot aqueous extraction using Soxhlet technique. The PSC extract was suspended into CMC and prepared into 3 groups: 0.2g/kg, 1g/kg and 2kg/kg. Balb/c mice were orally fed daily for 21 consecutive days. Treatment of mice with various concentrations of PSC showed increased populations of CD3 +/CD4+, CD3+/CD8+, CD14+, and CD19+ cells. Interestingly PSC-treated mice demonstrated significant increase in CD3+/CD4+, CD3+/CD8+, CD14+, and CD19+ cells. Most importantly, mice treated with PSC showed improved CD4+/CD8+ ratio; which indicated potential immunostimulating activity by PSC. In addition, no physical changes and signs of mortality could be detected from PSC-treated mice. The results

suggest that PSC may improve general immune status when consumed consistently as a daily food option.

### **J157 Protective effect of *Momordica Charantia* fruit extract on hyperglycaemia-induced cardiac fibrosis**

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Oxidative Medicine and Cellular Longevity, Vol. 2014, Article ID: 429060

In diabetes mellitus, cardiac fibrosis is characterized by increase in the deposition of collagen fibers. The present study aimed to observe the effect of *Momordica charantia* (MC) fruit extract on hyperglycaemia-induced cardiac fibrosis. Diabetes was induced in the male Sprague-Dawley rats with a single intravenous injection of streptozotocin (STZ). Following 4 weeks of STZ induction, the rats were subdivided (n = 6) into 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 150\_mg/kg of metformin (DM-Met). Administration of MC fruit extract (1.5\_g/kg body weight) in diabetic rats for 28 days showed significant increase in the body weight and decrease in the fasting blood glucose level. Significant increase in cardiac tissues superoxide dismutase (SOD), glutathione contents (GSH), and catalase (CAT) was observed following MC treatment. Hydroxyproline content was significantly reduced and associated morphological damages reverted to normal. The decreased expression of type III and type IV collagens was observed under immunohistochemical staining. It is concluded that MC fruit extract possesses antihyperglycemic, antioxidative, and cardioprotective properties which may be beneficial in the treatment of diabetic cardiac fibrosis.

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### **J158 Anti-hyperglycemic effects of fermented and nonfermented mung bean extracts on alloxan-induced-diabetic mice**

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Journal of Biomedicine and Biotechnology, Vol.2012, Article ID 285430

Mung bean was reported as a potential antidiabetic agent while fermented food has been proposed as one of the major contributors that can reduce the risk of diabetes in Asian populations. In this study, we have compared the normoglycemic effect, glucose-induced hyperglycemic effect, and alloxan-induced hyperglycemic effect of fermented and nonfermented mung bean extracts. Our results showed that fermented mung bean extracts did not induce hypoglycemic effect on normal

mice but significantly reduced the blood sugar levels of glucose- and alloxan-induced hyperglycemic mice. The serum levels of cholesterol, triglyceride (TG), and low-density lipoprotein (LDL) were also lowered while insulin secretion and antioxidant level as measured by malonaldehyde (MDA) assays were significantly improved in the plasma of the fermented mung bean-treated group in alloxan-induced hyperglycemic mouse. These results indicated that fermentation using *MardiRhizopus* sp. strain 5351 inoculums could enhance the antihyperglycemic and the antioxidant effects of mung bean in alloxan-treated mice. The improvement in the antihyperglycemic effect may also be contributed by the increased content of GABA and the free amino acid that are present in the fermented mung bean extracts.

### **J159 Soursop (*Anona muricata* L.): Blood hematology and serum biochemistry of Sprague-Dawley rats**

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International Food Research Journal, Vol. 19 (3), 2012, 955-959

This study was aimed to evaluate the effect of soursop (*Annona muricata* L.) extract on Sprague-Dawley rats subjected to in vivo 28-day repeated doses. The extract was given to the study group via force feeding. In the 28-day study, *Annona muricata* L. extract was dosed at 0 (CD, control dose), 0.5 (LD, low dose), 1.0 (MD, medium dose), 2.0g/kg (HD, high dose) body weight. For control group, distilled water was given to the animals. Administration of *Annona muricata* L. extract did not cause negative effect in blood hematology even though a statistically significant ( $p < 0.005$ ) increase in platelet level was noted. Result from serum biochemical test showed that the consumption of the extract did not result in liver and kidney failure. The total antioxidant status (TAS) increased significantly as the dosages increased. However the increases were within the normal laboratory limits.

### **J160 Inhibitory activities of three Malaysian edible seaweeds on lipase and $\alpha$ -amylase**

**Vimala B<sup>1</sup>, Suraiami M<sup>1</sup>, Norhayati MK<sup>1</sup>, Aswir AR<sup>1</sup>, Mohd Fairulnizal MN<sup>1</sup>, Matthew DW<sup>2</sup>, Peter IC<sup>2</sup>, Iain AB<sup>3</sup> and Jeffrey PP<sup>2</sup>**

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Journal of Applied Phycology, Vol. 25(5), 2013, 1405-1412

Ethanol extracts, dried powders and fibres (total and soluble fibre) of the tropical red algae *Kappaphycus alvarezii*, *Kappaphycus striatus* and *Eucheuma denticulatum* were analysed for their effect on lipase and  $\alpha$ -amylase activity using turbidimetric method and dinitrosalicylic acid (DNS) assay, respectively. The nutrient composition analyses were determined using standard methods.

The ethanol extract of dried *K. striatus* (Ks-III) showed the highest reduction in lipase activity with 92 % inhibition followed by seaweed powders (*K. alvarezii* (Ka-III), *K. striatus* (Ks-III) and *E.denticulatum* (Ed-III)) with average inhibition of 60 %. Soluble fibres of *K. alvarezii* (Ka-V) and *E.denticulatum* (Ed-V) showed significant inhibition with 60 and 57 % reduction, respectively. Only the ethanol extract of fresh *E. denticulatum* (Ed-I) showed 88 % inhibition of  $\alpha$ -amylase. Nutritional component analyses showed that all three seaweeds are low in crude fat, suggesting the possible use of seaweed as a dietary supplement and for potential weight and glycaemia management.





**J**

**EXPERIMENTAL  
NUTRITION**

**(Others)**

## J161 Modulation of Nrf2/ Keap1 pathway by dietary phytochemicals

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International Journal of Research in Medical Sciences, Vol. 2(2), 2014, 375-381

Nuclear factor (erythroid-derived 2)-like 2 (Nrf2), also known as NFE2L2, has emerged as a transcription factor that plays a crucial role in cellular protection against free radical damage and reduce the incidence of the radical derived degenerative diseases such as cancer. Nrf2 is a basic leucine zipper transcription factor that binds to ARE leading to induction of a verity of ARE driven detoxification and antioxidant genes. In basal conditions, Nrf2 is sequestered in the cytoplasm by an inhibitory partner the cytoskeletal anchoring protein Kelch-like ECH associated protein-1 (Keap1) through extensive hydrogen bonds. Inducers dissociate this complex, allowing Nrf2 to translocate to the nucleus. A number of studies have elucidated that nutritional compounds can modulate the activation of Nrf2/Keap1 system. This review aims to discuss some of the key nutritional compounds that enhance the activation of Nrf2, with consequent antioxidant and anti-inflammatory defensive effects.

## J162 Colostrum supplementation protects against exercise-induced oxidative stress in skeletal muscle in mice

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BMC Research Notes, Vol. 5, 2012, 649

**Background:** This study examined the effects of bovine colostrum on exercise -induced modulation of antioxidant parameters in skeletal muscle in mice. Adult male BALB/c mice were randomly divided into four groups (control, colostrum alone, exercise and exercise with colostrum) and each group had three subgroups (day 0, 21 and 42). Colostrum groups of mice were given a daily oral supplement of 50 mg/kg body weight of bovine colostrum and the exercise group of mice were made to exercise on the treadmill for 30 minutes per day. Total antioxidants, lipid hydroperoxides, xanthine oxidase and super oxide dismutase level was assayed from the homogenate of hind limb skeletal muscle. **Results:** Exercise-induced a significant oxidative stress in skeletal muscles as evidenced by the elevated lipid hydroperoxides and xanthine oxidase levels. There was a significant decrease in skeletal muscle total antioxidants and superoxide dismutase levels. Daily colostrum supplement significantly reduced the lipid hydroperoxides and xanthine oxidase enzyme level and increased the total antioxidant levels in the leg muscle. **Conclusion:** Thus, the findings of this study showed that daily bovine colostrum supplementation was beneficial to skeletal muscle to reduce the oxidant-induced damage during muscular exercise.

## **J163 In vitro study to determine the effect of zinc on non-heme iron absorption**

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International Journal of Collaborative Research On Internal Medicine and Public Health, Vol. 3 (5), 2011, 354-368

It has been well documented that bioavailability of iron is influenced by other food constituents. We carried out a kinetic study to look at the effect of zinc on ferric iron uptake in human epithelial Caco-2 TC7 cell-line. Zinc reduced iron uptake in a concentration-dependent manner. Iron uptake was significantly increased in the presence of ascorbic acid in the medium. We also found that zinc significantly increased the main iron transporter Divalent Metal Transporter-1 (DMT1) expression in whole cell and membrane proteins. The evidence from in vitro studies show that zinc suppressed iron uptake by Caco-2 cells and this phenomenon could be reversed by the presence of ascorbic acid in the growth media.

## **J164 Effect of edible bird's nest on cell proliferation and tumor necrosis factor- alpha (TNF- $\alpha$ ) release in vitro**

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International Food Research Journal, Vol. 18(3), 2011, 1123-1127

The human colonic adenocarcinoma cell line (Caco-2 cells) and a macrophage cell line (RAW 264.7 cells) are widely used in vitro model to study the intestinal system and Tumor Necrosis Factor- alpha (TNF- $\alpha$ ) release in cells, respectively. The objectives of this study were to assess the proliferative effect of EBN on Caco-2 cells and its effect on TNF- $\alpha$  release in RAW cells. The percentage of cell proliferation when treated with 2 commercial EBN, brand Y1 and brand X1, were 84% and 115% respectively, while when treated with unprocessed EBN from East Coast, North and South Zones were 91%, 35% and 47% respectively. Several EBN from specific zones (brand Y1, South and East Coast Zones) significantly affect the TNF- $\alpha$  production in RAW cells, where it was reduced to 43%, 24% and 32% respectively. Results showed that depending on the source and type of EBN used, there were differences in the percentages of proliferation of Caco-2 cells. EBN is able to influence the production of anti-inflammatory TNF- $\alpha$  in RAW cells. Keywords: Edible bird's nest, cell viability, cell count, caco-2 cells, RAW 264.7 cells.

## J165 Effect of acacia honey on cultured rabbit corneal keratocytes

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BMC Cell Biology, Vol.15, 2014, 19

**Background:** Acacia honey is a natural product which has proven to have therapeutic effects on skin wound healing, but its potential healing effects in corneal wound healing have not been studied. This study aimed to explore the effects of Acacia honey (AH) on corneal keratocytes morphology, proliferative capacity, cell cycle, gene and protein analyses. Keratocytes from the corneal stroma of six New Zealand white rabbits were isolated and cultured until passage 1. The optimal dose of AH in the basal medium (FD) and medium containing serum (FDS) for keratocytes proliferation was identified using MTT assay. The morphological changes, gene and protein expressions of aldehyde dehydrogenase (ALDH), marker for quiescent keratocytes and vimentin, marker for fibroblasts were detected using q-RTPCR and immunocytochemistry respectively. Flowcytometry was performed to evaluate the cell cycle analysis of corneal keratocytes. **Results:** Cultured keratocytes supplemented with AH showed no morphological changes compared to control. Keratocytes cultured in FD and FDS media supplemented with 0.025% AH showed optimal proliferative potential compared with FD and FDS media, respectively. Gene expressions of ADLH and vimentin were increased in keratocytes cultured with AH enriched media. All proteins were expressed in keratocytes cultured in all media in accordance to the gene expression findings. No chromosomal changes were detected in keratocytes in AH enriched media. **Conclusion:** Corneal keratocytes cultured in media supplemented with 0.025% AH showed an increase in proliferative capacity while retaining their morphology, gene and protein expressions with normal cell cycle. The results of the present study show promising role of AH role in accelerating the initial stage of corneal wound healing.

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## J166 Effects of Gelam honey (*Melaleuca Cajuputi*) on alveolar bone loss in experimental periodontitis

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Journal of Dental Surgery, Vol. 2014, Article ID: 907970

Gelam honey has been shown to exhibit antioxidant and anti-inflammatory activities in animal model. The aim of this study was to determine the effects of Gelam honey (*Melaleuca cajuputi*) on alveolar bone level in experimental periodontitis. Thirty male Sprague-Dawley rats were used

in this study and randomly divided into four groups: ligated saline (LS), ligated honey (LH), nonligated saline (NLS), and nonligated honey (NLH). Fifteen days after supplementation with Gelam honey (3 g/kg), the rats were sacrificed and alveolar bone level was determined by radiography and histomorphometry. The number of osteoclasts was also calculated for all groups. Both radiographic and histomorphometric analyses showed that alveolar bone resorption was severely induced around the ligated molar in the LS and LH groups. There was no significant difference in alveolar bone level between the LS and LH groups. However, there was a nonsignificant reduction of osteoclast number by 15.2% in LH group compared to LS group. In the NLH group, there was less alveolar bone resorption and the number of osteoclasts was reduced by 13.2% compared to NLS group. In conclusion, systemically supplemented Gelam honey was shown to have the potential of reducing osteoclast activity in the experimental periodontitis rats, even though the effect on alveolar bone level was not well demonstrated and it warrants further research.

## J167 Effect of zinc on chronic stress induced small intestinal changes in rats

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International Medical Journal, Vol.20 (1), 2013, 29-33

Zinc is essential for the development of enterocytes. Healthy enterocytes help to maintain efficient intestinal barrier to prevent excessive intestinal permeability to harmful agents. Chronic stress compromises morphology and permeability of the small intestine of rats. **Objectives:** To observe whether zinc supplementation can attenuate chronic stress induced small intestinal morphology and permeability changes in rats. **Materials and methods:** Forty male Sprague Dawley rats were divided into control (C), control with zinc (CZ), stress (S) and stress with zinc (SZ) groups with ten rats in each group. Water avoidance stress was applied one hour daily for 10 consecutive days. Body weight gain, food and water intake and number of stool pellet after every stress session was measured. On the 11th day, fluorescent Isothiocyanate Dextran (FITC) was injected into the surgically created small intestinal loops. Blood was collected one hour after the injection to measure serum FITC dextran. Jejunum and ileum was collected to measure morphological parameters. One way ANOVA was done to analyze data. **Results:** S group had significantly shorter crypt depth in ileum, shorter villus height in jejunum, fewer goblet cells in crypts of ileum and jejunum and fewer goblet cells in villus of jejunum as compared to the C group. SZ group had significantly longer crypt depth, longer villus height and higher number of goblet cells in crypts and villus of ileum and jejunum as compared to the S group. S group had significantly higher permeability to FITC and increased inflammatory cell infiltration in ileum and jejunum as compared to the C group. SZ group had significantly lower permeability to FITC and fewer inflammatory cells infiltration in ileum and jejunum as compared to the S group. **Conclusion:** Chronic stress compromised the small intestinal morphology and permeability which were attenuated by zinc supplementation.

## J168 Acute and sub-chronic toxicological assessment of *Nannochloropsis oculata* in rats

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African Journal of Agricultural Research, Vol.7 (7), 2012, 1220-1225

The aim of this study was to investigate the acute and sub-chronic toxicities of *Nannochloropsis oculata* biomass. In the acute toxicity study, twelve Sprague-Dawley rats of both sexes were gavaged with 12 g/kg body weight (bw) of *N. oculata* one time, and then tested for morbidity and mortality in 14 days. The oral LD50 of *N. oculata* in rats was greater than 12 g/kg bw, and no toxicity effects were observed on biomass in terms of morbidity signs, plasma biochemical parameters, organ tissue, or body weight gain in response to *N. oculata* doses up to 12 g/kg rat bw. In the sub-chronic toxicity study, thirty-six Sprague-Dawley rats of both sexes were chosen and divided into three groups and provided with a diet containing 0, 3, and 6 g of *N. oculata* per kg bw, respectively, early every morning and then allowed free access to normal food and water ad libitum for 60 days. No biologically significant effects of *N. Oculata* on organ weights, male body weight gain, or on the plasma biochemical parameters were observed in either treatment group. However, low creatinine and significant differences in body weight gain by female rats were noted in the treatment groups. These changes were not considered as toxicologically significant. The no observable adverse effect level (NOAEL) for *N. Oculata* under the conditions of this study was 12 g/kg bw/day for acute toxicity and 6 g/kg bw/day for sub-chronic toxicity for both male and female rats.

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## J169 Edible bird's nest extract as a chondo-protective agent for human chondrocytes isolated from osteoarthritic knee: In vitro study

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BMC Complementary & Alternatice Medicine, Vol. 13, 2013, 19

**Background:** Osteoarthritis (OA) is a degenerative joint disease that results in the destruction of cartilage. Edible Bird's Nest (EBN) extract contains important components, which can reduce the progression of osteoarthritis and helps in the regeneration of the cartilage. The present study aimed to investigate the effect of EBN extract on the catabolic and anabolic activities of the human articular chondrocytes (HACs) isolated from the knee joint of patients with OA. **Methods:** A single batch of EBN extract was prepared with hot-water extraction and coded as HMG. HACs were isolated from the knee joint cartilage removed during surgery. The optimum concentration of

HMG for HAC cultures was determined using MTT assay. The effect of HMG on the catabolic and anabolic genes' expression in HACs was measured by real-time PCR. The total amount of prostaglandin E2 (PGE2) production was determined by ELISA method, and the total sulphated glycosaminoglycan (GAGs) production was quantified by 1,9-dimethylmethylene blue (DMMB) assay. **Results:** MTT assay showed 0.50% - 1.00% HMG supplementation promoted HACs proliferation. HMG supplementation was able to reduce the catabolic genes' expression in cultured HACs such as matrix metalloproteinases (MMP1 & MMP3), Interleukin 1, 6 and 8 (IL-1, IL-6 & IL-8), cyclooxygenase-2 (COX-2) and inducible nitric oxide synthase (iNOS). Prostaglandin E2 (PGE2) production was significantly reduced in HAC cultures supplemented with HMG. With regard to anabolic activity assessment, type II collagen, Aggrecan and SOX-9 gene expression as well as sGAG production was increased in the HMG supplemented groups. **Conclusion:** Edible Bird's Nest extract coded as HMG demonstrated chondro-protection ability on human articular chondrocytes in vitro. It reduced catabolic activities and increased cartilage extracellular matrix synthesis. It is concluded that HMG is a potential agent in the treatment of osteoarthritis.

### **J170 Malaysian gelam honey reduces oxidative damage and modulates antioxidant enzyme activities in young and middle aged rats**

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Journal of Medicinal Plant Research Vol. 5(23), 2011, 5618-5625

Honey contains antioxidants such as phenolic compounds that prevent cellular oxidative damage that lead to aging, diseases and death. The aim of this study is to determine the effect of local gelam honey supplementation on oxidative status of young and middle-aged rats. Thirty-six male Sprague-Dawley rats were divided into two age groups; young (2 months) and middle aged (9 months). Each group was further divided into three groups; fed with plain water (control), supplemented with 2.5 and 5.0 g/kg of gelam honey for 30 days. DNA damage level was determined by comet assay, plasma malondialdehyde by high performance liquid chromatography and antioxidant enzymes activities (superoxide dismutase; SOD, glutathione peroxidase; GPx and catalase; CAT) were determined in the erythrocytes and liver. Results showed that supplementation of gelam honey reduced DNA damage, MDA level and GPx activity in the liver of both age groups. But erythrocytes GPx activity in young rats increased markedly with 5 g/kg of gelam honey supplementation. Liver and erythrocytes CAT activities decreased in both age groups when two different doses were used. Liver SOD activity also decreased in young rats supplemented with 5 g/kg of gelam honey. In conclusion, gelam honey reduces oxidative damage of young and middle aged rats by modulating antioxidant enzyme activities which was more prominent at higher concentration (5 g/kg body weight) compared to lower concentration (2.5 g/kg body weight).

### **J171 Gelam honey and ginger potentiate the anti cancer effect of 5-FU against HCT 116 colorectal cancer cells**

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Asian Pacific Journal of Cancer Prevention, Vol. 15(11), 2014, 4651-4657

The development of chemopreventive approaches using a concoction of phytochemicals is potentially viable for combating many types of cancer including colon carcinogenesis. This study evaluated the anti-proliferative effects of ginger and Gelam honey and its efficacy in enhancing the anti-cancer effects of 5-FU (5-fluorouracil) against a colorectal cancer cell line, HCT 116. Cell viability was measured via MTS (3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulphenyl)-2H-tetrazolium) assay showing ginger inhibiting the growth of HCT 116 cells more potently (IC<sub>50</sub> of 3mg/mL) in comparison to Gelam honey (IC<sub>50</sub> of 75 mg/mL). Combined treatment of the two compounds (3mg/mL ginger+75 mg/mL Gelam honey) synergistically lowered the IC<sub>50</sub> of Gelam honey to 22 mg/mL. Combination with 35 mg/mL Gelam honey markedly enhanced 5-FU inhibiting effects on the growth of HCT 116 cells. Subsequent analysis on the induction of cellular apoptosis suggested that individual treatment of ginger and Gelam honey produced higher apoptosis than 5-FU alone. In addition, treatment with the combination of two natural compounds increased the apoptotic rate of HCT 116 cells dose- dependently while treatment of either ginger or Gelam honey combined with 5-FU only showed modest changes. Combination index analysis showed the combination effect of both natural compounds to be synergistic in their inhibitory action against HCT 116 colon cancer cells (CI 0.96 < 1). In conclusion, combined treatment of Gelam honey and ginger extract could potentially enhance the chemotherapeutic effect of 5-FU against colorectal cancer.

### **J172 Antiproliferation and apoptosis induction of phytic acid in hepatocellular carcinoma (HEPG2) cell lines**

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African Journal of Biotechnology, Vol.10 (73), 2011, 16646-16653

Phytic acid is a naturally occurring polyphosphorylated carbohydrate, present ubiquitous in plants and animals. It is not only a natural antioxidant, but may also be the precursor/ storage of intracellular inositol phosphates, important for various cellular functions and potential as anticancer compound. A prominent anticancer action of phytic acid has been demonstrated both in vivo and in vitro in a variety of tumor types, possibly through inhibition of tumor cell growth and differentiation. In this study, the growth inhibitory effect of phytic acid extracted from rice bran



on hepatocellular cell lines (HEPG2), cell cycle modulation and apoptosis induction were undertaken. Phytic acid prove to induce growth inhibition and differentiation in HepG2 in a dose and time-dependent manner with IC50 value of 17.0 µg/ml. Analysis of flow cytometry was performed for the analysis of cell cycle and apoptosis. Treatment of phytic acid against HepG2 also resulted in cell cycle arrest in HEPG2 cell at G2/M phase cell cycle arrest. Besides, Annexin V-assay and propidium iodide confirmed the apoptosis occurred early and late in the cell line. In conclusion, with the results taken from our findings, phytic acid extracted from rice bran was revealed as a potent candidate for adjuvant chemotherapy and prevention of cancer.

### **J173 Improving the lipid profile in hypercholesterolemia-induced rabbit by supplementation of germinated brown rice**

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Journal of Agricultural and Food Chemistry, Vol.59 (14), 2011, 7985-7991

It is imperative that there be a diet designed specifically to improve lipid profile in order to impede the progress of atherosclerosis. Because rice is a staple food in Asia, it will be chosen as the diet of interest. This study sets out to discover whether consumption of different processed rice diets may result in a change of the lipid profile. The experiment was done on male New Zealand white rabbits after 10 weeks of treatment with diet containing 0.5% cholesterol. The experimental diets include white rice (WR), brown rice (BR), and germinated brown rice (GBR). Among them, rabbits fed a GBR diet demonstrated significantly lower levels of total cholesterol (TC), low-density lipoprotein (LDL), LDL/HDL, and atherogenic index (AI) and a higher level of high-density lipoprotein (HDL). Results from atherosclerotic plaque assessment further support the findings. The level of malondialdehyde (MDA), which acts as an indicator for oxidative stress, was also reduced by GBR diet. The positive change in lipid profile in the rabbits fed GBR appeared to correspond with the higher amounts of  $\gamma$ -oryzanol, tocopherol, and monounsaturated fatty acid (MUFA) content.

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### **J174 An evaluation of the anticancer activity in *Hopea Odorata* extracts**

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Journal of Medicinal Plants Research, Vol. 6(8), 2012, 1382-1388

Possible anticancer characteristics of *Hopea Odorata* extracts were investigated by cell proliferation and viability studies of cells in culture. The mechanism of action was studied by determining the rate of apoptosis and expression of protein involved in signal transduction. The result indicated that the butanol extract of *H. Odorata* had selective inhibition to both Hep G2 and Chang cells with IC50 of 20.14 and 377µg/ml, respectively. Growth inhibition by the extract showed an increased of apoptosis at concentration of 25 µg/ml. Cell study demonstrated morphologic changes characteristic of apoptosis such as chromatin condensation and fragmentation, as well as formation of apoptotic bodies. However, MAPK kinase signal

transduction pathway indicated no difference in ERK1 and ERK2 expression level after exposure at varying time. P53 protein level also showed no changes in expression compared to control. In conclusion, the increase in apoptosis observed was not due to changes in MAPK pathways involving ERK1, ERK2 and p53 but may involve other pathway, which require further investigation.

## J175 The establishment of metabolic syndrome model by induction of fructose drinking water in male Wistar rats

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Journal of Biomedicine and Biotechnology, Vol. 2014, Article ID: 263897, 1-8

**Background:** Metabolic syndrome can be caused by modification of diet by means of consumption of high carbohydrate and high fat diet such as fructose. **Aims:** To develop a metabolic syndrome rat model by induction of fructose drinking water (FDW) in male Wistar rats. **Methods:** Eighteen male Wistar rats were fed with FDW 20% and FDW 25% for a duration of eight weeks. The physiological changes with regard to food and fluid intake, as well as calorie intake, were measured. The metabolic changes such as obesity, dyslipidaemia, hypertension, and hyperglycaemia were determined. Data was presented in mean  $\pm$  SEM subjected to one-way ANOVA. **Results:** Male Wistar rats fed with FDW 20% for eight weeks developed significant higher obesity parameters compared to those fed with FDW 25%. There was hypertrophy of adipocytes in F20 and F25. There were also systolic hypertension, hypertriglyceridemia, and hyperglycemia in both groups. **Conclusion:** We conclude that the metabolic syndrome rat model is best established with the induction of FDW 20% for eight weeks. This was evident in the form of higher obesity parameter which caused the development of the metabolic syndrome.

## J176 Proliferative capacity of in vitro corneal epithelium: Role of acacia honey in the initial step of wound healing

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Journal of Medical and Bioengineering, Vol. 3(2), 2014, 107-112

Proliferation of corneal epithelial cells (CEC) is vital in the initial stage of wound healing. This study aimed to investigate the proliferative capacity of Acacia Honey (AH) on rabbit CEC via assessment on morphology, proliferation, cell cycle, gene and protein expressions. The optimal dose of AH in basal medium (BM) and complete cornea medium (CCM) was identified via MTT assay. CEC cultured in both media supplemented with 0.025% AH showed optimal proliferative capacity compared to the control. There were no abnormal changes in morphology and cell cycle analysis. Gene and protein expression of CK3 was increased in the CEC cultured with 0.025% AH in both media. CEC cultured in media supplemented with 0.025% AH promotes

proliferation while retaining its normal morphology, cell cycle, gene and protein expressions. These promising results serve as an impetus in realizing the proliferative potential of AH in promoting the initial step of corneal wound healing.

### **J177 Effect of the combination of gelam honey and ginger on oxidative stress and metabolic profile in streptozotocin-induced diabetic sprague-dawley rats**

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BioMed Research International, Vol.2014, Article ID: 160695

Diabetic complications occur as a result of increased reactive oxygen species (ROS) due to long term hyperglycaemia. Honey and ginger have been shown to exhibit antioxidant activity which can scavenge ROS. The main aim of this study was to evaluate the antioxidant and antidiabetic effects of gelam honey, ginger, and their combination. Sprague-Dawley rats were divided into 2 major groups which consisted of diabetic and nondiabetic rats. Diabetes was induced with streptozotocin intramuscularly (55 mg/kg body weight). Each group was further divided into 4 smaller groups according to the supplements administered: distilled water, honey (2 g/kg body weight), ginger (60 mg/kg body weight), and honey + ginger. Body weight and glucose levels were recorded weekly, while blood from the orbital sinus was obtained after 3 weeks of supplementation for the estimation of metabolic profile: glucose, triglyceride (TG), superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), reduced glutathione (GSH): oxidized glutathione (GSSG), and malondialdehyde (MDA). The combination of gelam honey and ginger did not show hypoglycaemic potential; however, the combination treatment reduced significantly ( ) SOD and CAT activities as well as MDA level, while GSH level and GSH/GSSG ratio were significantly elevated in STZ-induced diabetic rats compared to diabetic control rats.

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### **J178 A qPCR-based assay to quantify oxidized guanine and other FPG-sensitive base lesions within telomeric DNA**

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BioTechniques, Vol. 51(6), 2011, 403-412

Telomere shortening is an important risk factor for cancer and accelerated aging. However, it is becoming evident that oxidatively damaged DNA within the telomere sequence may also cause telomere dysfunction. Here we describe a reliable, cost-effective quantitative PCR (qPCR)-based method to measure the amount of oxidized residues within telomeric DNA that are recognized and excised by formamidopyridine DNA glycosylase (FPG). We also report that in an in vitro model of oxidative stress oxidized base lesions measured using this method are more prevalent within

telomeric sequences. Furthermore, this method is sufficiently sensitive to detect changes in oxidative stress induced by zinc deficiency and hydrogen peroxide within the physiological range.

### **J179 Gelam honey attenuates carrageenan-induced rat paw inflammation via NF- $\kappa$ B pathway**

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Plos ONE, Vol. 8(8), 2013, e72365

The activation of nuclear factor kappa B (NF- $\kappa$ B) plays a major role in the pathogenesis of a number of inflammatory diseases. In this study, we investigated the anti-inflammatory mechanism of Gelam honey in inflammation induced rats via NF- $\kappa$ B signalling pathway. Rats paw edema was induced by subplantar injection of 1% carrageenan into the right hind paw. Rats were pre-treated with Gelam honey at different doses (1 or 2 g/kg, p.o.) and NSAID Indomethacin (10 mg/kg, p.o.), in two time points (1 and 7 days). Our results showed that Gelam honey at both concentrations suppressed the gene expressions of NF- $\kappa$ B (p65 & p50) and I $\kappa$ B $\alpha$  in inflamed rats paw tissues. In addition, Gelam honey inhibited the nuclear translocation and activation of NF- $\kappa$ B and decreased the cytosolic degradation of I $\kappa$ B $\alpha$  dose dependently in inflamed rats paw tissues. The immunohistochemical expressions of pro-inflammatory mediators COX-2 and TNF- $\alpha$  were also decreased in inflamed rats paw tissues when treated with Gelam honey. The results of our findings suggest that Gelam honey exhibits its inhibitory effects by attenuating NF- $\kappa$ B translocation to the nucleus and inhibiting I $\kappa$ B $\alpha$  degradation, with subsequent decrease of inflammatory mediators COX-2 and TNF- $\alpha$ .

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### **J180 Gelam honey inhibits the production of proinflammatory, mediators NO, PGE2, TNF- $\alpha$ , and IL-6 in carrageenan-induced acute paw edema in rats**

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Evidence-Based Complementary and Alternative Medicine, Vol.2012, Article ID 109636

Natural honey is well known for its therapeutic value and has been used in traditional medicine of different cultures throughout the world. The aim of this study was to investigate the anti-inflammatory effect of Malaysian Gelam honey in inflammation-induced rats. Paw edema was induced by a subplantar injection of 1% carrageenan into the rat right hind paw. Rats were treated with the nonsteroidal anti-inflammatory drug (NSAID) Indomethacin (10 mg/kg, p.o.) or Gelam honey at different doses (1 or 2 g/kg, p.o.). The increase in footpad thickness was considered to be edema, which was measured using a dial caliper. Plasma and paw tissue were collected to analyze the production of inflammatory mediators, such as NO, PGE2, TNF- $\alpha$ , and IL-6, as well as iNOS and COX-2. The results showed that Gelam honey could reduce edema in a dose-dependent fashion in inflamed rat paws, decrease the production of NO, PGE2, TNF- $\alpha$ , and IL-6

in plasma, and suppress the expression of iNOS, COX-2, TNF- $\alpha$ , and IL-6 in paw tissue. Oral pretreatment of Gelam honey at 2 g/kg of body weight at two time points (1 and 7 days) showed a significantly decreased production of proinflammatory cytokines, which was similar to the effect of the anti-inflammatory drug Indomethacin (NSAID), both in plasma and tissue. Thus, our results suggest that Gelam honey has anti-inflammatory effects by reducing the rat paw edema size and inhibiting the production of proinflammatory mediators. Gelam honey is potentially useful for treating inflammatory conditions.

### **J181 The effect of Gelam (*Melaleuca Cajuputi*) Honey on inflammatory mediators in periodontitis-induced sprague-dawley rats**

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International Journal of Applied Research in Natural Products, Vol.7 (3), 2014, 7-16

Periodontitis is an inflammatory condition of the tooth supporting structures that will lead to tooth loss. Research has proven that Gelam honey has an anti-inflammatory effect and potential for treating inflammatory condition. This study aimed to determine the effect of Gelam honey on the inflammatory mediators systemically and locally in Sprague-Dawley rats with periodontitis. Twenty-eight rats were randomly assigned into 4 groups; NLS (control treated with saline), NLH (control treated with Gelam honey, 3g/kg body weight), LS (periodontitis treated with saline), LH (periodontitis treated with Gelam honey, 3g/kg body weight). Periodontitis was induced by ligating the lower left first molar with 4/0 Black Silk Suture. On day 15, plasma and tissue samples were analysed using ELISA and histological staining. The LS group exhibited significantly higher levels of inflammatory cells and IL-1 $\beta$  in the tissues than other groups. No significant difference of plasma IL-1 $\beta$  levels was found between all of the groups. Gelam honey was able to reduce the level of IL-1 $\beta$  in diseased rats with a total reduction of 21.26% in plasma, 81.27% in immunohistochemical staining. In conclusion, Gelam honey was able to reduce the level of IL-1 $\beta$  in periodontitis rats. Therefore, Gelam honey has potential to be included in dental products especially for treating periodontal disease.

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### **J182 Zinc deficiency or excess within the physiological range increases genome instability and cytotoxicity, respectively, in human oral keratinocyte cells**

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Genes and Nutrition, Vol. 7(2), 2012, 139-154

Zinc (Zn) is an essential component of Zn-finger proteins and acts as a cofactor for enzymes required for cellular metabolism and in the maintenance of DNA integrity. The study investigated the genotoxic and cytotoxic effects of Zn deficiency or excess in a primary human oral keratinocyte cell line and determined the optimal concentration of two Zn compounds (Zn Sulphate (ZnSO<sub>4</sub>) and Zn Carnosine (ZnC)) to minimise DNA damage. Zn-deficient medium (0 µM) was produced using Chelex treatment, and the two Zn compounds ZnSO<sub>4</sub> and ZnC were tested at concentrations of 0.0, 0.4, 4.0, 16.0, 32.0 and 100.0 µM. Cell viability was decreased in Zn-depleted cells (0 µM) as well as at 32 µM and 100 µM for both Zn compounds ( $P < 0.0001$ ) as measured via the MTT assay. DNA strand breaks, as measured by the comet assay, were found to be increased in Zn-depleted cells compared with the other treatment groups ( $P < 0.05$ ). The Cytokinesis Block Micronucleus Cytome assay showed a significant increase in the frequency of both apoptotic and necrotic cells under Zn-deficient conditions ( $P < 0.05$ ). Furthermore, elevated frequencies of micronuclei (MNi), nucleoplasmic bridges (NPBs) and nuclear buds (NBuds) were observed at 0 and 0.4 µM Zn, whereas these biomarkers were minimised for both Zn compounds at 4 and 16 µM Zn ( $P < 0.05$ ), suggesting these concentrations are optimal to maintain genome stability. Expression of PARP, p53 and OGG1 measured by western blotting was increased in Zn-depleted cells indicating that DNA repair mechanisms are activated. These results suggest that maintaining Zn concentrations within the range of 4-16 µM is essential for DNA damage prevention in cultured human oral keratinocytes.

### J183 The role of zinc in genomic stability

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Mutation Research, Vol.733 (1-2), 2012, 111-121

Zinc (Zn) is an essential trace element required for maintaining both optimal human health and genomic stability. Zn plays a critical role in the regulation of DNA repair mechanisms, cell proliferation, differentiation and apoptosis involving the action of various transcriptional factors and DNA or RNA polymerases. Zn is an essential cofactor or structural component for important antioxidant defence proteins and DNA repair enzymes such as Cu/Zn SOD, OGG1, APE and PARP and may also affect activities of enzymes such as BHMT and MTR involved in methylation reactions in the folate-methionine cycle. This review focuses on the role of Zn in the maintenance of genome integrity and the effects of deficiency or excess on genomic stability events and cell death.

### J184 The effect of zinc sulphate and zinc carnosine on genome stability and cytotoxicity in the WIL2-NS human lymphoblastoid cell line

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Zinc (Zn) is an essential cofactor required by numerous enzymes that are essential for cell metabolism and the maintenance of DNA integrity. We investigated the effect of Zn deficiency or excess on genomic instability events and determined the optimal concentration of two Zn compounds that minimize DNA-damage events. The effects of Zn sulphate (ZnSO<sub>4</sub>) and Zn carnosine (ZnC) on cell proliferation were investigated in the WIL2-NS human lymphoblastoid cell line. DNA damage was determined by the use of both the comet assay and the cytokinesis-block micronucleus cytome (CBMN-Cyt) assay. Zn-deficient medium (0\_M) was produced using Chelex treatment, and the two Zn compounds (i.e. ZnSO<sub>4</sub>) and ZnC) were tested at concentrations of 0.0, 0.4, 4.0, 16.0, 32.0 and 100.0µM. Results from an MTT assay showed that cell growth and viability were decreased in Zn-depleted cells (0µM) as well as at 32µM and 100µM for both Zn compounds (P<0.0001). DNA strand-breaks, as measured by the comet assay, were found to be increased in Zn-depleted cells compared with the other treatment groups (P<0.05). The CBMN-Cyt assay showed a significant increase in the frequency of both apoptotic and necrotic cells under Zn-deficient conditions (P<0.0001). Elevated frequencies of micronuclei (MNi), nucleoplasmic bridges (NPBs) and nuclear buds (NBuds) were induced in Zn-depleted cells (P<0.0001), whereas genome damage was reduced in supplemented cultures for both Zn compounds at 4µM and 16µM, possibly suggesting that these concentrations may be optimal for genome stability. The potential protective effect of ZnSO<sub>4</sub>) and ZnC) was also investigated following exposure to 1.0Gy γ-radiation. Culture in medium containing these compounds at 4-32µM prior to irradiation displayed significantly reduced frequencies of MNi, NPBs and NBuds compared with cells maintained in 0µM medium (P<0.0001). Expression of γ-H2AX and 8-oxoguanine glycosylase measured by western blotting was increased in Zn-depleted cells. These results suggest that Zn plays important role in genomic stability and that the optimal Zn concentration-range for prevention of DNA damage and cytotoxicity in vitro lies between 4 and 16µM.

### J185 Protective effects of Tualang honey on bone structure in experimental postmenopausal rats

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Clinics (Sao Paulo), Vol.67 (7), 2012, 779-784

**Objective:** The objective of this study was to evaluate the effects of Tualang honey on trabecular structure and compare these effects with those of calcium supplementation in ovariectomized rats. **Methods:** Forty female, Sprague-Dawley rats were randomly divided into five groups (n = 8): four controls and one test arm. The control arm comprised a baseline control, sham-operated control, ovariectomized control, and ovariectomized calcium-treated rats (receiving 1% calcium in drinking water ad libitum). The test arm was composed of ovariectomized, Tualang honey-treated rats (received 0.2 g/kg body weight of Tualang honey). Both the sham-operated control and ovariectomized control groups received vehicle treatment (deionized water), and the baseline control group was sacrificed without treatment. **Results:** All rats were orally gavaged daily for six

weeks after day one post-surgery. The bone structural analysis of rats in the test arm group showed a significant increase in the bone volume per tissue volume (BV/TV), trabecular thickness (Tb.Th) and trabecular number (Tb.N) and a significant decrease in inter-trabecular space (Tb.Sp) compared with the ovariectomized control group. The trabecular thickness (Tb.Th) in the test arm group was significantly higher compared with the ovariectomized-calcium treated group, and the inter-trabecular space (Tb.Sp) in the test arm group was significantly narrower compared with the ovariectomized-calcium treated group. **Conclusion:** In conclusion, ovariectomized rats that received Tualang honey showed more improvements in trabecular bone structure than the rats that received calcium.

### **J186 In vivo immunomodulation and lipid peroxidation activities contributed to chemoprevention effects of fermented mung bean against breast cancer**

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Evidence-based Complementary and Alternative Medicine, Vol.2013, Article ID 708464

Mung bean has been reported to have antioxidant, cytotoxic, and immunomodulatory effects in vitro. Fermented products are reported to have enhanced immunomodulation and cancer chemopreventive effects. In this study, fermented mung bean treatments in vivo were studied by monitoring tumor development, spleen immunity, serum cytokine (interleukin 2 and interferon gamma) levels, and spleen/tumor antioxidant levels after injection with low and high risk 4T1 breast cancer cells. Pretreatment with fermented mung bean was associated with delayed tumor formation in low risk mice. Furthermore, this treatment was connected with higher serum anticancer cytokine levels, spleen T cell populations, splenocyte cytotoxicity, and spleen/tumor antioxidant levels. Histopathological evaluation of fermented mung bean treated tumor revealed lower event of mitotic division. On the other hand, antioxidant and nitric oxide levels that were significantly increased in the untreated mice were inhibited in the fermented mung bean treated groups. The results suggested that fermented mung bean has potential cancer chemoprevention effects through the stimulation of immunity, lipid peroxidation, and anti-inflammation.

### **J187 Gelam honey attenuated radiation-induced cell death in human diploid fibroblasts by promoting cell cycle progression and inhibiting apoptosis**

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**Background:** The interaction between ionizing radiation and substances in cells will induce the production of free radicals. These free radicals inflict damage to important biomolecules such as chromosomes, proteins and lipids which consequently trigger the expression of genes which are involved in protecting the cells or repair the oxidative damages. Honey has been known for its antioxidant properties and was used in medical and cosmetic products. Currently, research on honey is ongoing and diversifying. The aim of this study was to elucidate the role of Gelam honey as a radioprotector in human diploid fibroblast (HDFs) which were exposed to gamma-rays by determining the expression of genes and proteins involved in cell cycle regulation and cell death.

**Methods:** Six groups of HDFs were studied viz. untreated control, irradiated HDFs, Gelam honey-treated HDFs and HDF treated with Gelam honey pre-, during- and post-irradiation. HDFs were treated with 6 mg/ml of sterilized Gelam honey (w/v) for 24 h and exposed to 1 Gray (Gy) of gamma-rays at the dose rate of 0.25 Gy/min. **Results:** Our findings showed that, gamma-irradiation at 1 Gy up-regulated ATM, p53, p16ink4a and cyclin D1 genes and subsequently initiated cell cycle arrest at G0/G1 phase and induced apoptosis ( $p < 0.05$ ). Pre-treatment with Gelam honey however caused down regulation of these genes in irradiated HDFs while no significant changes was observed on the expression of GADD45 and PAK genes. The expression of ATM and p16 proteins was increased in irradiated HDFs but the p53 gene was translated into p73 protein which was also increased in irradiated HDFs. Gelam honey treatment however significantly decreased the expression of ATM, p73, and p16 proteins ( $p < 0.05$ ) while the expression of cyclin D1 remained unchanged. Analysis on cell cycle profile showed that cells progressed to S phase with less percentage of cells in G0/G1 phase with Gelam honey treatment while apoptosis was inhibited. **Conclusion:** Gelam honey acts a radioprotector against gamma-irradiation by attenuating radiation-induced cell death.

## J188 Effects of edible bird's nest on tumour necrosis factor-alpha secretion, nitric oxide production and cell viability of lipopolysaccharide-stimulated RAW 264.7 macrophages

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Food and Agricultural Immunology, Vol. 23(4), 2012, 303-314

Edible bird's nest (EBN) is a popular delicacy among the Chinese diaspora associated with various health claims. This study investigated the anti-inflammatory effects of white-EBN acid hydrolysate on tumour necrosis factor-alpha (TNF- $\alpha$ ) and nitric oxide (NO) generation, while examining its cytotoxic effect on a lipopolysaccharide-stimulated RAW 264.7 macrophage cell line. Processed commercial EBN and unprocessed raw EBN collected from different geographical zones and at different harvesting seasons were studied. The cytotoxic effect was determined by cell viability assessed by MTS assay, while NO production was determined by the Griess reaction and TNF- $\alpha$  concentration was measured using an ELISA kit. The results showed that both commercial and raw EBN inhibited TNF- $\alpha$  and NO generation, the highest inhibition 58% and 63%, respectively without significant cytotoxic effect was brought about by raw EBN from the South zone. The results suggest that EBN may possess anti-inflammatory properties that should be further studied.

## J189 Gelam and Nenas honeys inhibit proliferation of HT 29 colon cancer cells by inducing DNA damage and apoptosis while suppressing inflammation

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Asian Pacific Journal of Cancer Prevention, Vol.13 (4), 2012, 1605-1610

Gelam and Nenas monofloral honeys were investigated in this study for their chemopreventive effects against HT 29 colon cancer cells. MTS (3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulfophenyl)-2H-tetrazolium) assays showed more effective inhibition of colon cancer cells proliferation by Gelam honey with IC<sub>50</sub> values of 39.0 mg/ml and 85.5 mg/ml respectively after 24 hours of treatment. Alkali comet assays revealed both honeys increased DNA damage significantly in a dose dependent manner. In addition, annexin V-FITC/PI flow cytometry demonstrated that at IC<sub>50</sub> concentrations and above, both Gelam and Nenas honeys induced apoptosis significantly at values higher than for necrosis ( $p < 0.05$ ). Measurement of prostaglandin E<sub>2</sub> (PGE<sub>2</sub>) confirmed that Gelam and Nenas honeys reduced its production in H<sub>2</sub>O<sub>2</sub> inflammation-induced colon cancer cells. In conclusion, our study indicated and confirmed that both Gelam and Nenas honeys are capable of suppressing the growth of HT 29 colon cancer cells by inducing apoptosis and suppressing inflammation.

## J190 Effects of edible bird's nest (EBN) on cultured rabbit corneal keratocytes

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BMC Complementary and Alternative Medicine, Vol. 11 (49), 2011

**Background:** There has been no effective treatment or agent that is available for corneal injury in promoting corneal wound healing. Previous studies on edible bird's nest extract (EBN) had reported the presence of hormone-like substance; avian epidermal growth factor that could stimulate cell division and enhance regeneration. This study aimed to investigate the effects of EBN on corneal keratocytes proliferative capacity and phenotypical changes. **Methods:** Corneal keratocytes from six New Zealand White Rabbits were isolated and cultured until Passage 1. The proliferative effects of EBN on corneal keratocytes were determined by MTT assay in serum-containing medium (FDS) and serum-free medium (FD). Keratocytes phenotypical changes were morphologically assessed and gene expression of aldehyde dehydrogenase (ALDH), collagen type 1 and lumican were determined through RT-PCR. **Results:** The highest cell proliferation was observed when both media were supplemented with 0.05% and 0.1% EBN. Cell proliferation was also consistently higher in FDS compared to FD. Both phase contrast micrographs and gene expression analysis confirmed the corneal keratocytes retained their phenotypes with the addition of EBN. **Conclusions:** These results suggested that low concentration of EBN could synergistically induce cell proliferation, especially in serum-containing medium. This could be a novel breakthrough as both cell proliferation and functional maintenance are important during corneal wound healing. The in vitro test is considered as a crucial first step for nutri-pharmaceutical formation of EBN-based eye drops before in vivo application.

## J191 Manuka honey protects middle-aged rats from oxidative damage

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Clinics, Vol.68 (11), 2013, 1446-1454

**Objective:** This study aimed to determine the effect of manuka honey on the oxidative status of middle-aged rats. **Method:** Twenty-four male Sprague-Dawley rats were divided into young (2 months) and middle-aged (9 months) groups. They were further divided into two groups each, which were either fed with plain water (control) or supplemented with 2.5 g/kg body weight of manuka honey for 30 days. The DNA damage level was determined via the comet assay, the plasma malondialdehyde level was determined using high performance liquid chromatography, and the antioxidant enzyme activities (superoxide dismutase, glutathione peroxidase, glutathione peroxidase and catalase) were determined spectrophotometrically in the erythrocytes and liver. The antioxidant activities were measured using 1,1-diphenyl-2-picrylhydrazyl and ferric reducing/antioxidant power assays, and the total phenolic content of the manuka was analyzed using UV spectrophotometry and the Folin-Ciocalteu method, respectively. **Results:** Supplementation with manuka honey reduced the level of DNA damage, the malondialdehyde level and the glutathione peroxidase activity in the liver of both the young and middle-aged groups. However, the glutathione peroxidase activity was increased in the erythrocytes of middle-aged rats given manuka honey supplementation. The catalase activity was reduced in the liver and erythrocytes of both young and middle-aged rats given supplementation. Manuka honey was found to have antioxidant activity and to have a high total phenolic content. These findings showed a strong correlation between the total phenolic content and antioxidant activity. **Conclusions:** Manuka honey reduces oxidative damage in young and middle-aged rats; this effect could be mediated through the modulation of its antioxidant enzyme activities and its high total phenolic content. Manuka honey can be used as an alternative supplement at an early age to improve the oxidative status.

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## J192 Antiproliferative activity and apoptosis induction by Gelam Honey on liver cancer cell line

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International Journal of Applied Science and Technology, Vol. 2(4), 2012, 135-141

Gelam honey is a Malaysian monofloral honey produced by *Apis mellifera* from *Melaluca* spp. It has high polyphenols content that possesses antioxidant and free radical scavenging activity towards preventing cancer and diseases. This study was to determine the antiproliferative effects of gelam honey on liver cancer, HepG2. MTS assay was carried to obtain IC<sub>50</sub> value of gelam honey towards HepG2 and normal liver, WRL-68 cell lines. The cells proliferation rates were determined by BrdU assay and morphological cell changes were detected by using propidium iodide staining. The IC<sub>50</sub> value of gelam honey towards HepG2 and WRL-68 cells was 25% and 70% respectively. Gelam honey reduced the proliferation of HepG2 at concentrations of 3% to

70%. Morphological analysis for apoptosis detection using fluorescent microscope under 400X magnification producing typical apoptotic characteristic. It showed that gelam honey has antiproliferative activity towards cancer cell by its ability to induce apoptosis.

### **J193 Protective effects of Gelam Honey against oxidative damage in young and aged rats**

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Oxidative Medicine and Cellular Longevity, Vol. 2014 (2014), Article ID 673628

Aging is characterized by progressive decline in physiological and body function due to increase in oxidative damage. Gelam honey has been accounted to have high phenolic and nonphenolic content to attenuate oxidative damage. This study was to determine the effect of local gelam honey on oxidative damage of aged rats. Twenty-four male Sprague-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 mg/kg body weight of gelam honey for 8 months. DNA damage level was determined by comet assay and plasma malondialdehyde (MDA) by high performance liquid chromatography (HPLC). The activity of blood and cardiac antioxidant enzymes was determined by spectrophotometer. The DNA damage and MDA level were reduced in both gelam honey supplemented groups. Gelam honey increases erythrocytes CAT and cardiac SOD activities in young and cardiac CAT activity in young and aged groups. The DNA damage was increased in the aged group compared to young group, but reduced at the end of the study. The decline of oxidative damage in rats supplemented with gelam honey might be through the modulation of antioxidant enzyme activities.

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**Nutrition Education,  
Promotion and  
Strategies**

## A pilot study: The development of a culturally tailored Malaysian diabetes education module (my-demo) based on the health belief model

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BMC Endocrine Disorder, Vol. 14, 2014, 31

**Background:** Diabetes education and self-care remains the cornerstone of diabetes management. There are many structured diabetes modules available in the United Kingdom, Europe and United States of America. Contrastingly, few structured and validated diabetes modules are available in Malaysia. This pilot study aims to develop and validate diabetes education material suitable and tailored for a multicultural society like Malaysia. **Methods:** The theoretical framework of this module was founded from the Health Belief Model (HBM). The participants were assessed using 6-item pre- and post-test questionnaires that measured some of the known HBM constructs namely cues to action, perceived severity and perceived benefit. Data was analysed using PASW Statistics 18.0. **Results:** The pre- and post-test questionnaires were administered to 88 participants (31 males). In general, there was a significant increase in the total score in post-test ( $97.34 \pm 6.13\%$ ) compared to pre-test ( $92.80 \pm 12.83\%$ ) ( $p < 0.05$ ) and a significant increase in excellent score ( $>85\%$ ) at post-test (84.1%) compared to pre-test (70.5%) ( $p < 0.05$ ). There was an improvement in post-test score in 4 of 6 items tested. The remaining 2 items which measured the perceived severity and cues to action had poorer post-test score. **Conclusions:** The preliminary results from this pilot study suggest contextualised content material embedded within MY DEMO maybe suitable for integration with the existing diabetes education programmes. This was the first known validated diabetes education programme available in the Malay language.

## Design of an interactive digital nutritional education package for elderly people

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Informatics for Health and Social Care, Vol. 37(4), 2012, 217-219

Designing a system for the elderly is crucial, as aging is associated with physiological changes that may impair perception, cognition and other social aspects; therefore, many aspects need consideration, especially in interface design. This study was conducted to develop a digital nutritional education package (WE Sihat) by following appropriate guidelines for elderly people to achieve better design interface and interaction. Touch-screen technology was used as a platform for user interaction. The nutritional content was based on previous nutrition studies and a lifestyle education package on healthy aging, which contains four modules. The questionnaires were distributed to 31 Malay subjects aged 60-76 years old, containing an evaluation about the overall content, graphics, design layout, colour, font size, audio/ video, user-perceived satisfaction and acceptance levels. The findings showed positive feedback and acceptance. Most subjects agreed that the digital nutritional education package can increase their nutritional knowledge for a healthy lifestyle and is easy to use. The touch-screen technology was also well accepted by elderly people and can be used as a kiosk for disseminating nutrition education for healthy aging.

### The academia's multidisciplinary approaches in providing education, scientific training and services to the Malaysian halal industry

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Middle-East Journal of Scientific Research 13 (Approaches of Halal and Thoyyib for Society, Wellness and Health), 2013, 79-84

The major challenge faced by the Halal industry is the shortage of knowledgeable work force that understands syariah requirements and implementing this theoretical knowledge into actual industrial practice. This paper highlights a multi-disciplinary approach towards Halal education, scientific training and services. As a multi-racial country, in Malaysia, one needs not necessarily become a Muslim, in order to be actively involved in the Halal services and production line. Ignorance, confusion or deliberate fraudulent practices will consequently result in the presence of adulterants or contaminants in the product, making it Haram or Syubhah with negative consequence on Halal branding. The Halal integrity and values are thus compromised. The Malaysian Standard MS 1500:2009 and the Trade Description Act 2011 are legal guidelines, mandatory for the acquiring of the Malaysian Halal logo. Understanding the principles and practices of Halalan and thoyyiban, with hands-on knowledge that meets industrial needs and demand, is necessary to cater for the rapid expansion of the Halal industry and to achieve compliance. As a niche-comprehensive university, Universiti Sains Islam Malaysia have collaborated with the Halal industry and government agencies in the development and implementation of training modules for meat slaughterers, laboratory analysts and those involved in the areas of food, pharmaceutical, cosmetics and consumer goods. The Halal Executive Program with HDC was done, to fulfill the needs for trained human resources for the monitoring and surveillance agencies. This holistic initiative of combining syariah knowledge with technology has benefited the Halal industry, the NGOs, education system and the Muslim communities and consumers.

### Nutrition and cancer prevention: knowledge, attitudes and practices among young Malaysians

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Asian Pacific Journal of Cancer Prevention, Vol. 12(3), 2011, 691-694

**Objective:** The objective of this study was to determine the knowledge, attitudes and practices of university students toward nutrition related to cancer prevention. **Methodology:** A total of 396 students from the Management and Science University (MSU) participated during the semester of March 2010. Stratified random sampling was used and consent was obtained before the questionnaire was distributed. ANOVA and the t-test were used for the univariate analysis and multiple linear regression was used for the multivariate analysis. **Results:** The participants ages ranged from 18 to 27 years (Mean  $\pm$  SD = 23.3  $\pm$  1.57), more than half being female (62.4%). The majority were 23 years old or younger, single, Malay and from non-Medical and Health Science

faculties and with a family monthly income of less than 10,000 Ringgits Malaysia (79.5%; 99%, 65.9, 52.5%, 63.9%; respectively). Only 18.4% of participants reported a family history of cancer. About 32.1% had a medical check-up in the previous 12 months and 17.4% were smokers. Multivariate analysis showed the faculty type to be significantly associated with knowledge of cancer prevention ( $p = 0.04$ ). Regular medical check-ups were associated with attitudes and practices of cancer prevention ( $p = 0.04$ ,  $p=0.003$  respectively), the latter being significantly influenced by sex, family history of cancer and smoking ( $p = 0.034$ ,  $p=0.013$ ,  $p=0.002$ ; respectively). Conclusion: The majority of participants had poor knowledge of nutrition as related to cancer prevention. Attention should be given to regular medical check-ups, awareness of family history and smoking influence.

## K5 Knowledge regarding vitamin D among private university students in Malaysia

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Annals of Nutritional Disorders & Therapy, Vol. 1(2), 2014, 1-5

**Background:** Vitamin D is known as the sunlight vitamin which mainly helps in bone metabolism and calcium homeostasis. It is estimated that one billion people have vitamin D deficiency and it is considered as a public health problem. The purpose of this study is to explore the knowledge among students regarding vitamin D and its associated factors. **Methods:** A cross-sectional study was conducted among 360 private university students using self-administered questionnaires regarding vitamin D. Knowledge on aspects of vitamin D sources, health benefits, factors of vitamin D deficiency and recommended intakes and some others. **Results:** Females were more predominant in this study (69.4%). Most students are aware and have good knowledge regarding vitamin D with male having a higher knowledge compared to female. Besides that, 69% of them agreed that vitamin D main source is the sun. Only 11.1% know the correct answer regarding the recommended daily dosage of vit. D which is 600 IU per day. **Conclusion:** Results acquired have shown some understanding towards the insight of vitamin D among university students. Implementing campaigns and future health programs to the public helps building more awareness and knowledge about vitamin D importance.

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## K6 Level of knowledge, attitude and practice of night market food outlet operators in Kuala Lumpur regarding the usage of repeatedly heated cooking oil

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The Medical Journal of Malaysia, Vol. 67(1), 2012, 91-101

Consumption of repeatedly heated oil can be detrimental to health. The objective of this study was to determine the level of knowledge, attitude and practice of night market food outlet operators



in Kuala Lumpur regarding the usage of repeatedly heated cooking oil. The quality of cooking oil was also investigated. A cross-sectional study involving pretested questionnaire was undertaken in April 2009. The questionnaire was designed as a tool to collect data from the respondents (n=100) by face-to-face interview. The results showed that majority of respondents had only moderate (53.0%) or low (18.0%) level of knowledge regarding this issue. Most respondents (67.0%) agreed that it is not a good practice. The majority (69.0%) agreed that the usage of repeatedly heated cooking oil is detrimental to health. Despite that, most respondents (63.0%) admitted that they had used cooking oil repeatedly. Most (62.0%) of the cooking oil samples taken from the night market food outlets were considered fit for human consumption. In conclusion, the level of knowledge of night market food outlet operators in Kuala Lumpur regarding this issue needs to be improved in order to ensure the safety of fried food purchased from such establishments.

K7

### **Effect of concurrent physical education and obesity-prevention training programme on anthropometry and cardiorespiratory fitness in children**

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African Journal for Physical Health Education, Recreation and Dance, Vol.20, 2014, 74-81

School-based, activity-focused physical education (PE) may be an effective, evidence-based method for reducing childhood overweight and obesity. However, it has been found that learners do not engage in vigorous activity during PE classes and spend the majority of class time standing while roll is taken or awaiting their turn to play. This study determined the effect of a 12-week concurrent physical education and obesity-prevention training programme (CON) on the anthropometry and cardiorespiratory measures in children already at the upper limit (50<sup>th</sup> centile) of a healthy body mass index (BMI). Anthropometric measures included body mass, stature, body mass index (BMI), body fat percentage while maximal cardiorespiratory fitness (VO<sub>2</sub> max) was measured using the one-mile walk test. CON performed a 10-minute warm-up, followed by 40 minutes of strength and endurance training using dumbbells, medicine balls and gym ball exercises, free hand exercises using callisthenic exercises and agility and flexibility exercises using ladder and gym ball exercises and concluded each session with 10 minutes of stretching. Analysis of variance (ANOVA) with repeated measures was used to determine the differences in anthropometric and cardiorespiratory variables over time between groups. A separate ANOVA with repeated measures for each group was used to determine differences over time in each group. One-way ANOVA was performed to determine the significance of differences between groups. When significance was revealed, a post-hoc test (Tukey HSD) was used to determine the differences between specific means. In the CON, there were no significant ( $p \leq 0.01$ ) differences in body mass, body fat percentage and maximal oxygen consumption (VO<sub>2</sub> max). However, a deleterious, significant increase was found in BMI at post-test when compared to pre-test ( $p = 0.001$ ). In the PEG, there was no significant difference in body fat percentage ( $p = 0.108$ ) and VO<sub>2</sub> max ( $p = 0.103$ ), and the PEG too demonstrated significant increase in BMI ( $p = 0.008$ ) and body mass ( $p = 0.002$ ) from pre-to post-test. These findings indicate that a 12-week callisthenic programme in addition to physical education classes was not more effective than physical education classes alone. As such, more comprehensive programmes that include other treatments such as nutritional and/or behavioural modifications may be needed to curb childhood overweight and obesity.

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## Awareness about diet and its association with dietary self-care practice among T2DM patients in a primary care clinic

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Malaysian Family Physician, 2014, 50-51

**Introduction:** Dietary self-care practice plays a crucial role in successful diabetes management and it is associated with the patients' awareness about the recommended diabetic diet. This study aimed to examine the association between the awareness about diabetic diet and practice of dietary self-care activities among type 2 diabetes mellitus (T2DM) patients attending Klinik Kesihatan Sungai Buloh, Gombak. **Methods:** This cross-sectional study involved 360 T2DM patients selected through systematic random sampling. The data were collected using a self-administered questionnaire assessing patients' awareness about diabetic diet and their dietary practice using the summary of diabetes self-care activities (SDSCA). The data were subsequently analysed using SPSS version 21. **Results:** Most of the respondents were aware about general healthful eating plan (85%). Almost similar proportion of them (81.9%) knew about high fat food other than red meat and full-fat dairy products. However, only a half of them knew about carbohydrate spacing in a day. About four-fifths of those who were aware about healthful eating plan knew about high fat food (85.6%) and recommended serving of fruits and vegetables (77.1%), but a lower proportion of them knew about meaning of carbohydrate (70.3%), recommended quantity of high fat food (65.4%), and particularly carbohydrate spacing (59.2%). Surprisingly, two-thirds of those who were not aware about healthy eating plan admitted that they knew about high fat food. Awareness of the assessed specific diet was found to be significantly associated with practice of the related dietary self-care activities except for the association between the patients' awareness about high fat food and their intake of high fat food in a week ( $p=0.02$ ). **Conclusion:** In general, the respondents had reasonable awareness about diabetic diet. However, their knowledge about diabetic diet may be superficial and patchy, and education reinforcement is needed to improve their awareness especially on carbohydrate spacing. Furthermore, awareness of diabetic diet influences the respondents' practice of dietary self-care activities.

## Sociodemographic predictors of recall and recognition of colorectal cancer symptoms and anticipated delay in help-seeking in a multiethnic Asian population

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Asian Pacific Journal of Cancer Prevention, Vol. 14(6), 2013, 3799-3804

**Background:** Colorectal cancer is the second most common cancer in Malaysia. The prognosis of the disease is excellent if detected at an early stage, but the majority of Malaysian patients present at late stages. We aimed to assess the awareness of cancer warning signs and anticipated delay in help-seeking as possible contributors to this phenomenon. **Materials and methods:** A

population-based cross-sectional survey using the Colorectal Cancer Awareness Measure was initiated in Perak, Malaysia. A total of 2,379 respondents aged 18 years and above were recruited using a multi-stage sampling in five locations. Analysis of covariance was used to examine independent sociodemographic predictors of scores for symptom awareness. **Results:** Younger age, being female, a higher education, and higher income were significantly associated with better scores for both recall and recognition of warning symptoms. Among the ethnic groups, Malays had better recognition of symptoms whereas Chinese recalled the most symptoms. Passing bloody stool was associated with the least anticipated delay and unexplained anal pain had the highest anticipated delay. **Conclusions:** The level of awareness across all ethnicities in Malaysia is generally low, especially among minorities. Targeted public education, which is culturally and linguistically appropriate, should be developed to encourage early help-seeking and improve clinical outcomes.

**K10 Multimodal nutrition education intervention: A cluster randomised controlled trial study on weight gain and physical activity pattern among university students in Terengganu, Malaysia**

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Malaysian Journal of Nutrition, Vol.19 (3), 2013, 339-352

**Introduction:** This cluster randomised controlled study design aimed to evaluate the effectiveness of implementing nutrition education intervention (NEI) that targeted at incremental reduction of body weight and increased physical activity level among university students. **Methods:** Body weight and physical activity level were assessed before and after intervention. A total of 417 university students from four public universities in Terengganu participated in the study. They were randomly selected and assigned into two arms, that is, intervention group (IG) or control group (CG) according to their cluster. The IG received 10 weeks intervention focused on NEI promotion using three modes which were conventional lecture, three brochures as take-home messages and text messages for intervention reinforcement while CG did not receive any intervention. Analysis of covariance (ANCOVA) and adjusted effect size were used to determine differences in body weight and physical activity levels between groups and time. **Results:** No significant changes in body weight were observed among both groups. The average weight and body mass index (BMI) were slightly reduced in IG compared to CG after the 10-week intervention ( $p>0.05$ ). Nevertheless, physical activity level improved significantly among IG participants compared to CG with increased metabolic equivalent (MET) min/week spent for walking, moderate and vigorous activities and significantly decreased sitting time. The largest adjusted effect size was shown in total physical activity (0.75). **Conclusion:** The multimodal NEI had a positive influence on physical activity outcomes among university students. NEI should be continuously implemented in this particular population group.

## K11 Malaysian dietary guidelines 2010 in practice: Acceptability and applicability of nutrition education delivery tools among university students in Terengganu, Malaysia

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International Journal of Current Research and Review, Vol.4 (15), 2012, 126-135

**Objective:** To evaluate the acceptability and applicability of nutrition education delivery through three tools; 1) conventional lectures, 2) brochures and 3) text messages via short messaging system (SMS). **Methods:** A prospective, cross sectional study was conducted among university undergraduates in Terengganu, Malaysia. Included students firstly went through a 1-hour lecture followed by the provision of brochures and contents of text messages. They then completed an evaluation form. Data analysis was carried out using SPSS 16.0 utilising descriptive statistics. 116 undergraduates were enrolled (mean age=19.3). **Results:** Majority of male (91.9%) and female students (91.1%) rated the slides as comprehensible. Both genders (male=70.3%, female=74.7%) ranked the presentation as “interesting” while, 64.7% of them ranked the information included as adequate. Brochures were considered to be at least “good” with regard to its pictorial graphics (85.3%) and languages (81.9%). Most of the students were also generally contented with the information given through the SMS (86.2%). Overall, 94.0% of students believed that nutrition education delivery through a variety of methods can provide and enhance their awareness and knowledge. **Conclusion:** This provides early evidence that these tools are acceptable and applicable in assisting undergraduates improve their diet and undergo active lifestyle.

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## K12 Psychometric properties of DAPonDEN: Definitions, attitudes and practices in relation to diarrhea during enteral nutrition questionnaire

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Preventive Medicine, Vol.57, 2013, 64-66

**Objectives:** To investigate the psychometric properties of the developed 21 item questionnaire to measure definitions, attitudes and management practices in relation to diarrhea during enteral nutrition (DAPonDEN). **Methods:** Data were analyzed using exploratory factor analysis from a cross sectional study of 102 nurses aged 18 and over, conducted from December 2011 to February 2012 in Malaysia. Face and content validity of DAPonDEN were first evaluated by few expert panels and patients. For this study, adult nurses were recruited from the adult wards. **Results:** In the final model, three items in DAPonDEN were dropped. In the exploratory factor analysis, five factors were extracted that explained a total of 55% of the variation in the remaining 18 items. The Kaiser-Meyer-Olkin (KMO) value was 0.723. For definition, there were two underlying factors: ‘Key items in defining diarrhea’ and ‘non-key items in defining diarrhea’. For attitude there was a single factor. For practice, there were two underlying factors: ‘enteral nutrition (EN) related’ and ‘awareness related’. **Conclusion:** The items in each of the underlying dimensions seem to measure the respective concepts for definition, attitude and practices adequately. The 18-items DAPonDEN instrument can be a suitable education tool to be used in relation to diarrhea during EN.

## K13 Definitions, attitudes, and management practices in relation to diarrhea during enteral nutrition: A survey of patients, nurses, and dietitians

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Nutrition in Clinical Practice, Vol. 27(2), 2012, 252-260

**Background:** Diarrhea is a common complication in patients receiving enteral nutrition (EN), and understanding this problem among patients and healthcare professionals is required. The aim of the study was to investigate patients', nurses', and dietitians' definitions of diarrhea during EN, the attitudes of nurses and patients toward it, and the management practices of nurses and dietitians in response to diarrhea during EN. **Methods:** Twenty-two patients receiving EN, 57 nurses, and 33 dietitians were recruited and interviewed in a cross-sectional study, using a questionnaire that had been developed following an extensive literature review and pretested for clarity. **Results:** The ratings assigned by the 3 groups differed significantly for all the characteristics used to define diarrhea: frequency ( $P = .006$ ), quantity ( $P < .001$ ), consistency ( $P = .003$ ), color ( $P < .001$ ), odor ( $P < .001$ ), and incontinence ( $P < .001$ ). Patients gave incontinence the highest rank when defining diarrhea, whereas the healthcare professionals gave fecal consistency and frequency the highest ranks. Patients and nurses rated the unpleasantness of each characteristic of diarrhea during EN differently, with patients rating incontinence and fecal frequency and nurses rating odor and changing the patients' underwear as the most unpleasant characteristics. Nurses and dietitians differed in the frequency with which they adopted various strategies to manage patients who developed diarrhea during EN. **Conclusions:** Patients have different definitions and attitudes toward diarrhea during EN from those of nurses and dietitians. Patients' perceptions need to be understood and respected by healthcare professionals to improve patient-centered care.

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## K14 The effects of transmission of Malay daily food knowledge on the generation practices

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Procedia Social and Behavioral Sciences, Vol. 85, 2013, 227-235

This study explored the effects of food transmission activities among the Malay ethnic's food knowledge and the generation practice. Mother and daughter in a family selected as informant in this study. All information analysed using thematic analysis. Commercialization of ingredients, convenience food products, economy, educational level and lifestyles apparently reduced the practices of Malay traditional foods among the young generations. Mothers in particular can play a significant role in preserving the practice of Malay traditional foods. Parents should ensure that the traditional food knowledge is passed down to their generations to ensure the Malay food tradition retains and evolves further.

## K15 How could the transfer of food knowledge be passed down?

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Procedia - Social and Behavioral Sciences, Vol. 105, 2013, 429 - 437

This study attempts to identify and recognize the approach of food knowledge transfer that can be applied by the younger generation practices. This study is based on an observation and ethnographic technique performed during the actual food preparation process of the Malay festive celebrations. Purchasing food ingredients, making an observation, hands-on cooking, regular practices, attending ceremonial events and consume the Malay traditional food were the behaviour that's been identified in introducing and passing the Malay traditional food knowledge to the younger generations. Family food tradition should be passed down and evolved along with the social and technological progress to retain the ethnic cultural identity.

## K16 Evaluation of environmental hygiene and microbiological status of primary school canteen in Kota Bharu, Kelantan, Malaysia

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Health and the Environment Journal, Vol. 5(3), 2014

Ten Primary School canteens in Kota Bharu, Kelantan were investigated on the hygiene level under which these premise operated and the microbiological status of the environmental hygiene. A simple random sampling was applied to select the school. The environmental samples collected included swab from food handles' hand, apron, chopping board, wipe clothes, spoon containers and knives. A structured checklist known as Food Premise Assessment Format was used for inspection and assessment of premise hygiene. Fisher's Exact Test was conducted to investigate the difference in microbiological status with environmental parameters. Thirty-two(32.7%) primary school canteens included in this study out of 98 listed school canteens. Majority of premises did not comply with pest control treatment (68.8%), management of refuse (50.0%), proper clothing of food handlers (46.9%), and proper personal hygiene (28.1%). Nine out of 32 (28.1%) primary school canteens selected randomly for microbiological study. Of 171 swabs taken from 9 schools, 90 (52.6%) were from food handles' hand, 45 (26.3%) from apron and 9 (5.3%) from chopping board, wipe clothes, spoon containers and knives each. Microbiological analysis showed the highest unsatisfactory results accounted for total plate count (62.0%) followed by total coliform (55.0%). Less than 5% of samples showed the presence of *Bacillus Cereus* and *E. Coli*. This study suggested that there is a need to have more effective training program of food handlers in school canteen in order to bring into positive behavior toward good hygienic practices.

## K17 Parental concerns and control in feeding of 9 to 12-year-old children in a primary school in Kuala Lumpur, Malaysia

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Malaysian Journal of Nutrition, Vol.18 (1), 2012, 47-55

**Introduction:** Body weight of children is affected by many factors including food habits which are influenced by their parents. Studies in the West have shown that parents tend to control child feeding in response to their child's weight status. The aim of this study was to assess Malaysian parental concerns about child weight and the control they exert on child feeding. **Methods:** This cross-sectional study was conducted on parents and their children aged 9 to 12 years from a primary school in Kuala Lumpur. The weight status of the children was classified according to the body mass index-for-age growth chart. Parental concerns about child weight and control in child feeding was assessed using the adapted Malay version of Child Feeding Questionnaire. **Results:** A total of 204 parents participated in this study. The study found that being a female served as a protective factor against becoming overweight (OR: 0.28, CI: 0.13-0.62). Parents with overweight children were significantly older (OR: 1.08, CI: 1.01-1.15), concerned about their child's weight (OR: 2.77, CI: 1.49-5.12) and controlled their child's feeding by restricting food intake (OR: 2.70, CI: 1.30-5.60). They were less likely to pressure their children to eat (OR: 0.32, CI: 0.19-0.56). Parents from the low income group were more likely to have underweight children (OR: 4.15, CI: 1.28-13.47). **Conclusion:** There was significant difference in level of parental concern across differing child weight status. Parents with overweight children were likely to be more concerned about their child's weight, tending to control their feeding. In contrast, parents with underweight children did not exert control on their feeding.

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## K18 The use of nutrition label on food purchasing decision among university students in Kuantan, Malaysia

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Health and the Environment Journal, Vol. 4(1), 2013

Nutrition label provides nutrition status of the pre-packaged foods and is very useful for people when making decision for healthy foods. However, there is a lack of awareness among Malaysians regarding the use of nutrition label when purchasing foods. Hence, a cross sectional study among tertiary students (IIUM) was conducted. The aim of this study was to determine the relationship between gender, attitude and knowledge of the tertiary students with the use of nutrition labeling. Assessments were done by distributing 25-item questionnaires composed of pair-wise, open-ended and 5-item Likert scale questions to the subjects. The prevalence of level of nutrition knowledge and attitudes were determined. Our analysis showed that 95 students (57.6%) were moderately making use of the nutrition label. There was no significant difference between gender and the use of nutrition label on food purchasing decision among these students. There was also no association between knowledge and the use of nutrition label on food purchasing decision

among them. However, there was significant association between attitude and the use of nutrition label on food purchasing decision among the students ( $p = 0.001$ ,  $r = 17.842$ ). Our results show that attitude is the key factor in regards with the use of nutrition label while gender and knowledge has no effect on the use of nutrition label on food purchasing.

## **K19 The transmission modes of Malay traditional food knowledge within generations**

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Procedia - Social and Behavioral Sciences, Vol.1, (50), 2012, 79-88

Malay modern society especially the young generation has gradually ignored the practice of Malay traditional food. Social transition and unlimited information technology are believed to influence the changes of food intake and practices. This study empirically investigates the transmission modes of Malay traditional food knowledge within generation. Using Klang Valley as a contextual setting, 5 sets of respondents consist of mother and daughter was interviewed. Qualitative approaches are employed by using thematic analysis to understand the phenomena. Observation, be a helper, received instruction and task from the mothers are the modes of transmission in Malay families which influenced their practices.

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## **K20 Understanding and use of food package nutrition label among educated young adults**

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Pakistan Journal of Nutrition, Vol. 11 (10), 2012, 836-842

Nutrition information on food labels has become one of the major components included in Malaysian Dietary Guideline in order to promote healthy dietary habits among Malaysians. This study was aimed to assess the understanding on nutrition label information and ability to perform common nutrition label task and to explore the extent of nutrition label usage as well as the reason associated with the intensity of label used among educated young adults. Cross sectional study conducted by distributing 357 self-administered questionnaires among students in UiTM Puncak Alam and only 295 returned (response rate = 82.6%). The questionnaires collected information of demographics, nutrition knowledge and understanding, nutrition label task, item used on nutrition label and the reason of nutrition label use. The mean ages are  $21 \pm 1.745$  which most of the respondent currently study at degree (73.9%) and diploma (26.1%) level. The nutrition knowledge means score  $12.08 \pm 4.287$  where about 37.6% have low knowledge and only 30.5% have good knowledge. In nutrition label task section, majority of the subjects (69.5%) unable to perform resulting in mean score  $0.94 \pm 1.097$ . The most item used on food labels are ingredient



list (78.3%) while percent daily value information are the least use (56.5%) by the subjects. More than half (53.6%) of the subjects do not use the nutrition label mainly because they do not understand the terms on the label (32.4%). In contrast, the label user uses the label to assess specific nutrient content of the food (38.4%). The level of nutrition knowledge is significantly associated with performance on nutrition label task ( $p = < 0.001$ ) where high proportion of subject with low nutrition knowledge unable to perform the nutrition label task. In conclusion, this study found that there is low understanding of nutrition knowledge and use of nutrition label among young adults.

## **K21 Health risk factors and health promoting behaviour among medical and non-medical students**

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Malaysian Journal of Public Health Medicine, Vol.14 (2), 2014, 1-11

Students in tertiary level education are mostly young adults that are transiting from the teenage years to adulthood. Since there is less restriction as compared to their teenage years, university and college students might involve in risky behaviours that may affect their health, social and academic performance. Thus, the purpose of this study is to investigate and identify the differences of health risk factors and health promoting behaviour that have been practiced by students in Malaysia. A cross sectional study was conducted using closed-ended questionnaires distributed to university and college students via emails. The results showed that 77.0% students claimed they have no health problem. However 49.0% of the non-medical students did not know whether they have normal BMI. Among the medical students, 62.0% rarely do physical exercise even though most are seriously concern about their fat consumption (95.0%). Only 30.0% of the total students have awareness of wearing seat belt. For health promoting behaviour, 33.0% of female students have never perform breast self examination (BSE), while 65.0% of male students have never perform testicular self examination (TSE). These findings confirmed that there are differences in health risk factors and health promoting behaviour that have been practiced by the students.

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## **K22 Nutrition quality of life among female-majority Malay undergraduate students of health sciences**

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The Malaysian Journal of Medical Sciences, Vol.19 (4), 2012, 37-49

**Background:** University students generally tend to engage in problematic eating behaviours, including unhealthy dieting, skipping meals, and high intake of fast food, although they are aware

of the negative consequences. Eating behaviours have been shown to be interestingly related to quality of life (QoL). Our study aimed to 1) assess general nutrition quality of life (NQoL) status and 2) compare NQoL status based on gender, financial resources, study courses, year of study, and body mass index (BMI) profiles. **Methods:** This study was conducted among undergraduates of health sciences in a local public university in Terengganu. Students completed the Malay version of NQoL (6 domains; 50 items; Likert-type responses 1-5). Data analysis was carried out by using SPSS 16.0, utilising descriptive and parametric statistics. **Results:** A total of 241 students were enrolled [age = 19.7 (0.1) years; female (83.0%); Malay (96.7%)]. Social/Interpersonal Factors [3.84 (0.43)] emerged as the best component, while Food Impact [3.10 (0.40)] was the worst. Across all variables, only gender and study courses showed significantly different NQoL. Females scored better than males in Self-Efficacy (confidence in food selection ability) ( $P < 0.05$ ). Nursing students also experienced significantly greater NQoL (mean = 3.58, 95% CI = 3.47, 3.68) than radiography students in Self-Efficacy ( $p < 0.05$ ). Medical laboratory technology students had a significantly more favourable NQoL rating (mean = 3.62, 95% CI = 3.47, 3.76) than nursing students in Self-Image ( $p < 0.05$ ). Study courses significantly influenced the NQoL status of students with Good NQoL, while those with Poor NQoL were mostly influenced by gender and financial resources ( $p < 0.05$ ). **Conclusion:** These outcomes indicate that specific demographic characteristics seemed to make a difference in the NQoL of undergraduate students.

## K23 Development of a local malnutrition risk screening tool-hospital (MRST-H) for hospitalised elderly patients

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Malaysian Journal of Nutrition, Vol. 18(2), 2012, 137-147

**Introduction:** Hospitalised elderly patients are at high risk of malnutrition due to the presence of chronic diseases and inadequate food intake. It was on this premise that a Malnutrition Risk Screening Tool-Hospital (MRST-H) was developed for identifying the risk of malnutrition among Malaysian elderly patients. **Methods:** A total of 181 respondents aged 65 years and above who had been admitted to the Geriatric Ward of the University Malaya Medical Centre were recruited. The respondents' nutritional assessment was assessed using the Global Indicator of Malnutrition (GIM), a reference gold standard of malnutrition consisting of anthropometric measurements, biochemical indicators and the Subjective Global Assessment (SGA). Important predictive factors of malnutrition were determined by logistic regression analysis. **Results:** Five out of 18 predictive factors were significantly associated with malnutrition ( $p < 0.05$ ) in the final multivariate logistic regression model. These five factors were used to develop the MRST-H. Its validity was tested among 100 elderly inpatients in the Kuala Lumpur Hospital. The MRST-H was found to have 66.7% sensitivity, 96.2% specificity and 82.4% positive predictive value to GIM. The MRST-H was tested for reliability among 40 patients involving three raters (a dietitian and two nurses). The Kappa index of agreement was excellent between the dietitian with nurse A (81.3%, Kappa=0.84) and nurse B (87.5%, Kappa=0.89) respectively. **Conclusion:** The MRST-H developed showed high validity and reliability as a screening tool for identifying hospitalised elderly patients with high risk of malnutrition.

## K24 Lowering dietary glycaemic index through nutrition education among Malaysian women with a history of gestational diabetes mellitus

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Malaysian Journal of Nutrition, Vol.19 (1), 2013, 9-23

**Introduction:** Gestational diabetes mellitus (GDM) increases risks for type 2 diabetes and cardiovascular diseases. Low glycaemic index (GI) diets improve cardio-metabolic outcomes in insulin-resistant individuals. We examined the feasibility of lowering GI through GI-based-education among Asian post-GDM women. **Methods:** A 3-month investigation was carried out on 60 Malaysian women with a mean age of 31.0 +/- 4.5 years and a history of GDM. Subjects were randomised into two groups: LGIE and CHDR. The CHDR group received conventional healthy dietary recommendations only. The LGIE group received GI based-education in addition to conventional healthy dietary recommendations. At baseline and after 3-months, dietary intake of energy and macronutrient intakes including GI diet and glycaemic load was assessed using 3-day food records. Diabetes-Diet and GI-concept scores and physical activity levels were assessed using a questionnaire. Adherence to dietary instructions was measured at the end of 3 months. **Results:** At the end of 3 months, the LGIE group had significant reductions in energy intake (241.7 +/- 522.4Kcal, P = 0.037, ES=0.463), total carbohydrate (48.7 +/- 83.5g, P = 0.010, ES = 0.583), GI (3.9 +/- 7.1, P = 0.017, ES = 0.549) and GL (39.0 +/- 55.3, P = 0.003, ES = 0.705) and significant increases in protein (3.7 +/- 5.4g, 0.003, ES = 0.685) and diet fibre (4.6 +/- 7.3g, P = 0.06). The CHDR group had a significant reduction in fat only (5.7 +/- 9.4g, P = 0.006, ES = 0.606). There was a 30% increase in GI-concept scores in the LGIE group (p < 0.001). Changes in GI-concept scores correlated significantly to the reduction in dietary GI (r = -0.642, P = 0.045). Dietary adherence was comparable in both groups. **Conclusion:** GI-education improves GI-concept knowledge and helps lower dietary glycaemic index among women with a history of GDM.

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## K25 A nutrition education intervention for anthropometric and biochemical profiles of rural older Malays with metabolic syndrome

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Public Health Nursing, Vol. 30(2), 2013, 140-149

**Objective:** This study aimed to determine the effectiveness of a nutrition education intervention package in improving anthropometric, clinical and biochemical indicators of rural older Malays

with metabolic syndrome (MS). Design and sample: In this study, 47 older Malays diagnosed with MS were assigned to either the intervention group (n = 24) or the control group (n = 23) based on their geographical site. **Intervention:** The intervention group received nutrition education via group counselling sessions, talks, and cooking and exercise demonstrations using a specifically developed healthy aging package for 6 months. **Measures:** The efficacy of the nutrition education intervention on anthropometric and biochemical parameters was assessed. **Results:** Women in the nutrition education group showed a significant reduction in waist circumference ( $p < .01$ ) compared to the control group. Men who received the nutrition education intervention maintained their total cholesterol (TC) level ( $p < .05$ ) compared to the control group. **Conclusions:** The nutrition education intervention showed potential for improving TC levels in men and waist circumference in women with MS. Similar intervention studies could be initiated among the older adults in the community as a preventive measure.

## K26 Quality and accuracy assessment of nutrition information on the Web for cancer prevention

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Informatics for Health and Social Care, Vol. 38(1), 2013, 15-26

This study aimed to assess the quality and accuracy of nutrition information about cancer prevention available on the Web. The keywords 'nutrition + diet + cancer + prevention' were submitted to the Google search engine. Out of 400 websites evaluated, 100 met the inclusion and exclusion criteria and were selected as the sample for the assessment of quality and accuracy. Overall, 54% of the studied websites had low quality, 48 and 57% had no author's name or information, respectively, 100% were not updated within 1 month during the study period and 86% did not have the Health on the Net seal. When the websites were assessed for readability using the Flesch Reading Ease test, nearly 44% of the websites were categorised as 'quite difficult'. With regard to accuracy, 91% of the websites did not precisely follow the latest WCRF/AICR 2007 recommendation. The quality scores correlated significantly with the accuracy scores ( $r = 0.250$ ,  $p < 0.05$ ). Professional websites (n = 22) had the highest mean quality scores, whereas government websites (n = 2) had the highest mean accuracy scores. The quality of the websites selected in this study was not satisfactory, and there is great concern about the accuracy of the information being disseminated.

## K27 Development and analysis of acceptance of a nutrition education package among a rural elderly population: An action research study

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BMC Geriatrics, Vol. 7, 2012, 12-24

**Background:** It is well known that older adults are often vulnerable to malnutrition. This action research was conducted to develop a nutrition education package for promoting healthy ageing and reducing risk of chronic diseases among older adults in a rural area of Malaysia. **Methods:** This study was designed and conducted in three stages, including needs assessment, development of the package and analysis of acceptance among 33 older adults aged 60 years and over in rural communities, and 14 health staff members at rural health clinics. Subjects completed a questionnaire including sociodemographic factors and acceptance evaluation of the nutrition education package with respect to content, graphics and design. Data were analysed descriptively using numbers and percentages. **Results:** A nutrition education package comprising a booklet, flipchart and placemats was developed. A total of 42.4% of the older adults expressed that the sentences in the flipchart needed to be simplified and medical terms explained. Terminology (60%), illustrations (20%) and nutrition recommendations (20%) were the aspects that prevented elderly subjects from fully understanding the booklet. Information on the placemats was easily understood by subjects. **Conclusions:** A well accepted nutrition education package for promoting healthy ageing and reducing risk of chronic diseases was developed that incorporated modifications based on feedback from older adult subjects and health clinic staff in a rural area. It is a tool that can effectively be used for health education in this population.

## K28 A 10-week multimodal nutrition education intervention improves dietary intake among university students: Cluster randomised controlled trial

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Journal of Nutrition and Metabolism, Vol. 2013, Article ID 658642

The aim of the study was to evaluate the effectiveness of implementing multimodal nutrition education intervention (NEI) to improve dietary intake among university students. The design of study used cluster randomised controlled design at four public universities in East Coast of Malaysia. A total of 417 university students participated in the study. They were randomly selected and assigned into two arms, that is, intervention group (IG) or control group (CG) according to their cluster. The IG received 10-week multimodal intervention using three modes (conventional lecture, brochures, and text messages) while CG did not receive any intervention. Dietary intake was assessed before and after intervention and outcomes reported as nutrient intakes as well as average daily servings of food intake. Analysis of covariance (ANCOVA) and adjusted effect size were used to determine difference in dietary changes between groups and time. Results showed that, compared to CG, participants in IG significantly improved their dietary intake by increasing their energy intake, carbohydrate, calcium, vitamin C and thiamine, fruits and 100% fruit juice, fish, egg, milk, and dairy products while at the same time significantly decreased their processed food intake. In conclusion, multimodal NEI focusing on healthy eating promotion is an effective approach to improve dietary intakes among university students.

**K29 Assessing the children's views on foods and consumption of selected food groups: Outcome from focus group approach**

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Nutrition Research and Practice, Vol.7 (2), 2013, 132-138

The food choices in childhood have high a probability of being carried through into their adulthood life, which then contributes to the risk of many non-communicable diseases. Therefore, there is a need to gather some information about children's views on foods which may influence their food choices for planning a related dietary intervention or programme. This paper aimed to explore the views of children on foods and the types of foods which are usually consumed by children under four food groups (snacks, fast foods, cereals and cereal products; and milk and dairy products) by using focus group discussions. A total of 33 school children aged 7-9 years old from Selangor and Kuala Lumpur participated in the focus groups. Focus groups were audio-taped, transcribed and analyzed according to the listed themes. The outcomes show that the children usually consumed snacks such as white bread with spread or as a sandwich, local cakes, fruits such as papaya, mango and watermelon, biscuits or cookies, tea, chocolate drink and instant noodles. Their choices of fast foods included pizza, burgers, French fries and fried chicken. For cereal products, they usually consumed rice, bread and ready-to-eat cereals. Finally, their choices of dairy products included milk, cheese and yogurt. The reasons for the food liking were taste, nutritional value and the characteristics of food. The outcome of this study may provide additional information on the food choices among Malaysian children, especially in urban areas with regard to the food groups which have shown to have a relationship with the risk of childhood obesity.

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**K30 Level of colorectal cancer awareness: A cross sectional exploratory study among multi-ethnic rural population in Malaysia**

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BMC Cancer, Vol. 13, 2013, 376

**Background:** This paper presents the level of colorectal cancer awareness among multi-ethnic rural population in Malaysia. **Methods:** A rural-based cross sectional survey was carried out in Perak state in Peninsular Malaysia in March 2011. The survey recruited a population-representative sample using multistage sampling. Altogether 2379 participants were included in this study. Validated bowel/ colorectal cancer awareness measure questionnaire was used to assess the level of colorectal cancer awareness among study population. Analysis of variance (ANOVA) was done to identify socio-demographic variance of knowledge score on warning signs and risk factors of colorectal cancer. **Results:** Among respondents, 38% and 32% had zero knowledge score for warning signs and risk factors respectively. Mean knowledge score for warning signs and risk factors were 2.89 (SD 2.96) and 3.49 (SD 3.17) respectively. There was

a significant positive correlation between the knowledge score of warning signs and level of confidence in detecting a warning sign. Socio-demographic characteristics and having cancer in family and friends play important role in level of awareness. **Conclusions:** Level of awareness on colorectal cancer warning signs and risk factors in the rural population of Malaysia is very low. Therefore, it warrants an extensive health education campaign on colorectal cancer awareness as it is one of the commonest cancer in Malaysia. Health education campaign is urgently needed because respondents would seek medical attention sooner if they are aware of this problem.

### **K31 Outcomes on psychosocial factors and nutrition-related quality of life: Evaluation of a 10-week nutrition education intervention in university students**

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ASEAN Journal of Psychiatry, Vol. 15 (1), 2014, 39-53

**Objective:** The purpose of this study was to evaluate the effectiveness of nutrition education intervention among university students in terms of social, psychological factors and nutrition-related Quality of Life (NQoL) outcomes after receiving a 10-week nutrition education. Longitudinal and randomised study design was adopted for the study. **Methods:** A total of 417 respondents from four public universities in Terengganu were randomly assigned to either intervention group (IG = 205) or control group (CG = 212). The IG received nutrition education through three tools; 1) conventional lecture, 2) brochures and 3) text messages via short messaging system (SMS) while the CG not received any intervention. Students completed the Malay version of NQoL (6 domains; 49 items; Likert-type responses=1-5) and SF-36 (8 domains; 36 items) at pre-intervention and post-intervention. Data analysis was carried out by using SPSS 16.0 utilising descriptive and parametric statistics. **Results:** Ninety-one percent of participants (IG = 178; CG = 202) completed the study (age = 19.1±1.1 years; female = 87.6%; Malay = 98.2%). After controlling for possible confounders (eg. weight, waist, hip circumferences and pre-intervention scores for each domain), IG possessed relatively higher NQoL score in Food Impact (p = 0.001), Social / Interpersonal (p = 0.008), Physical Functioning (p = 0.011) and Overall NQoL (p = 0.001). However, Psychological Factors did not show any significant difference for both groups. **Conclusion:** Although the intervention did not generate significant impact in the psychological component over a period of 10 weeks, significant positive impacts in Social/ Interpersonal aspects and NQoL were clearly shown.

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### **K32 Food insecurity and the metabolic syndrome among women from low income communities in Malaysia**

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Asia Pacific Journal of Clinical Nutrition, Vol. 23(1), 2014, 138-147

This cross-sectional study examined the relationship between household food insecurity and the

metabolic syndrome (MetS) among reproductive-aged women (n=625) in low income communities. The Radimer/ Cornell Hunger and Food Insecurity instrument was utilized to assess food insecurity. Anthropometry, diet diversity, blood pressure and fasting venous blood for lipid and glucose profile were also obtained. MetS was defined as having at least 3 risk factors and is in accordance with the Harmonized criteria. The prevalence of food insecurity and MetS was 78.4% (household food insecure, 26.7%; individual food insecure, 25.3%; child hunger, 26.4%) and 25.6%, respectively. While more food secure than food insecure women had elevated glucose (food secure, 54.8% vs food insecure, 37.3-46.1%), total cholesterol (food secure, 54.1% vs food insecure, 32.1-40.7%) and LDL-cholesterol (food secure, 63.7% vs food insecure, 40.6-48.7%), the percentage of women with overweight/ obesity, abdominal obesity, hypertension, high triglyceride, low HDL-cholesterol and MetS did not vary significantly by food insecurity status. However, after controlling for demographic and socioeconomic covariates, women in food insecure households were less likely to have MetS (individual food insecure and child hunger) ( $p < 0.05$ ), abdominal obesity (individual food insecure and child hunger) ( $p < 0.01$ ), elevated glucose (household food insecure), total cholesterol (child hunger) ( $p < 0.05$ ) and LDL-cholesterol (household food insecure and child hunger) ( $p < 0.05$ ) compared to food secure women. Efforts to improve food insecurity of low income households undergoing nutrition transition should address availability and accessibility to healthy food choices and nutrition education that could reduce the risk of diet-related chronic diseases.

### **K33 Reliability and validity of television food advertising questionnaire in Malaysia**

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Health Promotion International, Vol.30 (3), 2015, 523-530

Interventions to counter the influence of television food advertising amongst children are important. Thus, reliable and valid instrument to assess its effect is needed. The objective of this study was to determine the reliability and validity of such a questionnaire. The questionnaire was administered twice on 32 primary schoolchildren aged 10-11 years in Selangor, Malaysia. The interval between the first and second administration was 2 weeks. Test-retest method was used to examine the reliability of the questionnaire. Intra-rater reliability was determined by kappa coefficient and internal consistency by Cronbach's alpha coefficient. Construct validity was evaluated using factor analysis. The test-retest correlation showed moderate-to-high reliability for all scores ( $r = 0.40^*$ ,  $p = 0.02$  to  $r = 0.95^{**}$ ,  $p = 0.00$ ), with one exception, consumption of fast foods ( $r = 0.24$ ,  $p = 0.20$ ). Kappa coefficient showed acceptable-to-strong intra-rater reliability ( $K = 0.40-0.92$ ), except for two items under knowledge on television food advertising ( $K = 0.26$  and  $K = 0.21$ ) and one item under preference for healthier foods ( $K = 0.33$ ). Cronbach's alpha coefficient indicated acceptable internal consistency for all scores ( $0.45-0.60$ ). After deleting two items under Consumption of Commonly Advertised Food, the items showed moderate-to-high loading (0.52, 0.84, 0.42 and 0.42) with the Scree plot showing that there was only one factor. The Kaiser-Meyer-Olkin was 0.60, showing that the sample was adequate for factor analysis. The questionnaire on television food advertising is reliable and valid to assess the effect of media literacy education on television food advertising on school children.





**L**

**Methodologies**

## L1 The validity and intramodel reliability of the omron HJ-005 pedometer for quantifying steps in free-living conditions and over a 400-meter walk

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Health and the Environment Journal, Vol. 5(1), 2014, 98-112

The purpose of this study was to determine the validity and intramodel reliability of the Omron HJ-005 pedometer under free-living conditions and over a 400-meter walk. For the first part of the study, data were analysed from subjects who wore both motion sensors (the Kenz Lifecorder e-Steps accelerometer and the Omron HJ-005 pedometer) during waking hours for two consecutive weekdays and one weekend day. For the second part of the study, subjects walked 400 meters around an outdoor track while wearing two Omron HJ-005 pedometers (one each on the right and left side of the waist and centred over the foot). Under free-living conditions, the subjects reported an averaged  $6,588 \pm 1,240$  accelerometer steps per day and  $7,676 \pm 1,327$  pedometer steps per day. There was a significant correlation between the mean accelerometer outputs and the mean pedometer outputs for two consecutive weekdays and one weekend day ( $r = 0.954$ ,  $p < 0.001$ ). The mean difference in steps detected between the Kenz Lifecorder e-Steps accelerometer and the Omron HJ-005 pedometer was  $1,088 \pm 399$  steps per day [ $t(53) = 20.037$ ,  $p < 0.001$ ]. On a 400-meter outdoor track, the Omron HJ-005 pedometer reported step counts with an absolute percent error (APE) of less than 5% for pedometers at both the right and left sides of the waist (at slow, moderate and fast paces) compared to manual step counts. Pedometer step counts at the right and left sides of the waist were significantly correlated (intra-class correlation coefficient  $>0.9$ ) at slow, moderate and fast paces. In conclusion, the Omron HJ-005 pedometer demonstrated validity and intramodel reliability over a 400-meter walk at slow, moderate and fast paces. The correlation between the outputs from the Kenz Lifecorder e-Steps accelerometer and the Omron HJ-005 pedometer supports the interchangeability of the outputs (steps per day) from two motion sensors if only relative values are desired.

## L2 Validation of screening tools to assess appetite among geriatric patients

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The Journal of Nutrition, Health & Aging, Vol.16 (7), 2012, 660-665

Poor appetite is one of the main contributing factors of poor nutritional status among elderly individuals. Recognizing the importance of assessment of appetite, a cross sectional study was conducted to determine the validity of appetite screening tools namely, the Council on Nutrition Appetite questionnaire (CNAQ) and the simplified nutritional appetite questionnaire (SNAQ) against the appetite, hunger and sensory perception questionnaire (AHSPQ), measures of nutritional status and food intake among geriatric patients at the main general hospital in Malaysia. Nutritional status was assessed using the subjective global assessment (SGA) while food intake was measured using the dietary history questionnaire (DHQ). Anthropometric parameters included weight, height, body mass index (BMI), calf circumference (CC) and mid upper arm

circumference (MUAC). A total of 145 subjects aged 60 to 86 years ( $68.3 \pm 5.8$  years) with 31.7% men and 68.3% women were recruited from outpatients (35 subjects) and inpatients (110 subjects) of Kuala Lumpur Hospital of Malaysia. As assessed by SGA, most subjects were classified as mild to moderately malnourished (50.4%), followed by normal (38.6%) and severely malnourished (11.0%). A total of 79.3% and 57.2% subjects were classified as having poor appetite according to CNAQ and SNAQ, respectively. CNAQ (80.9%) had a higher sensitivity than SNAQ (69.7%) when validated against nutritional status as assessed using SGA. However, the specificity of SNAQ (62.5%) was higher than CNAQ (23.2%). Positive predictive value for CNAQ and SNAQ were 62.6% and 74.7%, respectively. Cronbach's alpha for CNAQ and SNAQ were 0.546 and 0.578, respectively. History of weight loss over the past one year (Adjusted odds ratio 2.49) ( $p < 0.01$ ) and thiamine intake less than the recommended nutrient intake (RNI) (Adjusted odds ratio 3.04) ( $p < 0.05$ ) were risk factors for poor appetite among subjects. In conclusion, malnutrition and poor appetite were prevalent among the geriatric outpatients and inpatients. SNAQ was more reliable and valid as an appetite screening tool among this special group of population. There is a need to regularly include nutritional and appetite assessment for early intervention measures in order to prevent consequences of malnutrition.

L3

### Validation of bioelectrical impedance analysis for total body water assessment against the deuterium dilution technique in Asian children

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European Journal of Clinical Nutrition, Vol. 65(12), 2011, 1321-1327

**Background/objectives:** To develop and cross-validate bioelectrical impedance analysis (BIA) prediction equations of total body water (TBW) and fat-free mass (FFM) for Asian pre-pubertal children from China, Lebanon, Malaysia, Philippines and Thailand. **Subjects/ methods:** Height, weight, age, gender, resistance and reactance measured by BIA were collected from 948 Asian children (492 boys and 456 girls) aged 8-10 years from the five countries. The deuterium dilution technique was used as the criterion method for the estimation of TBW and FFM. The BIA equations were developed using stepwise multiple regression analysis and cross-validated using the Bland-Altman approach. **Results:** The BIA prediction equation for the estimation of TBW was as follows:  $TBW = 0.231 \times \text{height}^2 / \text{resistance} + 0.066 \times \text{height} + 0.188 \times \text{weight} + 0.128 \times \text{age} + 0.500 \times \text{sex} - 0.316 \times \text{Thais} - 4.574$  ( $R^2 = 88.0\%$ , root mean square error (RMSE) = 1.3 kg), and for the estimation of FFM was as follows:  $FFM = 0.299 \times \text{height}^2 / \text{resistance} + 0.086 \times \text{height} + 0.245 \times \text{weight} + 0.260 \times \text{age} + 0.901 \times \text{sex} - 0.415 \times \text{ethnicity}$  (Thai ethnicity = 1, others = 0) - 6.952 ( $R^2 = 88.3\%$ , RMSE = 1.7 kg). No significant difference between measured and predicted values for the whole cross-validation sample was found. However, the prediction equation for estimation of TBW/FFM tended to overestimate TBW/ FFM at lower levels whereas underestimate at higher levels of TBW/ FFM. Accuracy of the general equation for TBW and FFM was also valid at each body mass index category. **Conclusions:** Ethnicity influences the relationship between BIA and body composition in Asian pre-pubertal children. The newly developed BIA prediction equations are valid for use in Asian pre-pubertal children.

#### L4 Development and validation of a cancer awareness questionnaire for Malaysian undergraduate students of Chinese ethnicity

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Asian Pacific Journal of Cancer Prevention, Vol.14 (1), 2013, 565-570

**Objectives:** To describe the development and validation of a cancer awareness questionnaire (CAQ) based on a literature review of previous studies, focusing on cancer awareness and prevention. **Materials and methods:** A total of 388 Chinese undergraduate students in a private university in Kuala Lumpur, Malaysia, were recruited to evaluate the developed self-administered questionnaire. The CAQ consisted of four sections: awareness of cancer warning signs and screening tests; knowledge of cancer risk factors; barriers in seeking medical advice; and attitudes towards cancer and cancer prevention. The questionnaire was evaluated for construct validity using principal component analysis and internal consistency using Cronbach's alpha ( $\alpha$ ) coefficient. Test-retest reliability was assessed with a 10-14 days interval and measured using Pearson product-moment correlation. **Results:** The initial 77-item CAQ was reduced to 63 items, with satisfactory construct validity, and a high total internal consistency (Cronbach's  $\alpha = 0.77$ ). A total of 143 students completed the questionnaire for the test-retest reliability obtaining a correlation of 0.72 ( $p < 0.001$ ) overall. **Conclusions:** The CAQ could provide a reliable and valid measure that can be used to assess cancer awareness among local Chinese undergraduate students. However, further studies among students from different backgrounds (e.g. ethnicity) are required in order to facilitate the use of the cancer awareness questionnaire among all university students.

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#### L5 Validity of a children's physical activity questionnaire (cPAQ) for the study of bone health

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Pediatrics International, Vol. 55(2), 2013, 223-228

**Background:** The aim of this cross-sectional study was to examine the ability of a children's physical activity questionnaire (cPAQ) to assess physical activity levels and bone health status of school children. **Methods:** Subjects consisted of 90 pre-pubertal and early pubertal children aged 9-10 years. Components of physical activity were assessed using metabolic intensity (METPA) scores and mechanical bone strain (MECHPA) scores. An Actical accelerometer was used to validate METPA scores among a sub-sample of 57 children. Reliability was assessed by test-retesting all children after a 7 day interval. Whole body bone mineral content (BMC) was measured using dual-energy X-ray absorptiometry. **Results:** The reliability of cPAQ for assessment of various categories of physical activity was moderate to high ( $r$  ranged from 0.55 to 0.68,  $P < 0.001$ ). Agreement was fair for repeated use of the cPAQ (Cohen's kappa = 0.32,  $P < 0.001$ ). Bland-Altman plots show cPAQ had fair agreement only for moderate activity (mean difference 35.4 min/week; 95% limits of agreement - 434.0 to + 504.9 min/week). Approximately 69.6% of

children were correctly classified (into the same or adjacent quartiles) according to the quartiles of BMC for METPA score, and 58.7% were correctly classified according to MECHPA score. Only 10.9% and 12.0% of children were grossly misclassified as compared to METPA and MECHPA scores, respectively. **Conclusions:** The cPAQ has reasonable validity in assessing moderate physical activity, and it demonstrates good ability to accurately classify children according to BMC. It fails, however, to assess other activity levels, suggesting that objective measurement is still a better method of assessment of physical activity among primary school children.

## **L6 Dietary iodine from Interview-Based Semi-Quantitative Food Frequency Questionnaire: Correlation with 24h dietary recall**

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Pakistan Journal of Nutrition, Vol.12 (7), 2013, 688-691

Iodine deficiency is a major public health problem throughout the world. Malaysia's latest IDD survey in 2008 showed that 12.5% of the school children had urinary iodine above adequate requirement ( $>200 \mu\text{g/L}$ ), where 7.6% were above the adequate value ( $200-299 \mu\text{g/L}$ ) and 4.9% were excessive ( $>300 \mu\text{g/L}$ ) particularly in the Federal Territory of Putrajaya (19.9%) and Sabah (16.6%). Socio-demography, environment and dietary are three main factors contributing to an increase in the prevalence of high urinary iodine in a population. Therefore, this study was conducted to validate an interview-based semi-quantitative Food Frequency Questionnaire (FFQ) with 24h dietary recall method on iodine nutrition for use in future studies in Malaysia particularly among school children. A total of 35 healthy euthyroid consented school children in the Federal Territory of Putrajaya were enrolled in the study. Each subject completed 24h dietary recall, followed by an interview-based food frequency questionnaire to assess dietary iodine intake. A standardized coloured book containing photos of food high in iodine and household measuring tools were used to help the respondents in answering the questions. Daily iodine intake was calculated for each participant in both FFQ and 24h dietary recall. Median daily iodine intake was  $423.95 \pm 225.49 \mu\text{g/L}$  from the interview-based FFQ and  $436.45 \pm 217.37 \mu\text{g/L}$  in the 24h dietary recall. The iodine content from the 24h dietary recall was strongly correlated with the iodine content from the interview-based FFQ where  $r = 0.954$ . It is concluded that the semi-quantitative FFQ is sufficiently reliable to inquire the daily iodine intake of school children.

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## **L7 A comparison study of portable foot-to-foot bioelectrical impedance scale to measure body fat percentage in Asian adults and children**

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BioMed Research International, 2014; 475659

**Objective:** To compare the measurements of body fat percentage (BF %) using the foot-to-foot bioelectrical impedance analysis (FTF-BIA) with the direct segmental multifrequency BIA (DSM-BIA). **Methods:** There were 36 men and 52 women ( $37.1 \pm 14.3$  years) with 57% Malays, 30% Chinese, and 13% Indian. For children, there were 45 boys and 26 girls ( $11.5 \pm 2.5$  years) with 52% Malay, 15% Chinese, and 33% Indian. **Results:** Mean height for men was 168.4 cm, 11 cm taller than women. Men were 10 kg heavier than women at 70 kg. BF% in women was 32% and 33% whereas BF% in men was 23% and 25% when measured using FTF-BIA and DSM-BIA, respectively. In children, BF% measured with FTF-BIA and DSM-BIA was 49% and 46%, respectively. The correlations were significant for men ( $r = 0.92$ ,  $SEE = 2.80$ ), women ( $r = 0.91$ ,  $SEE = 3.31$ ), boys ( $r = 0.95$ ,  $SEE = 5.44$ ), and girls ( $r = 0.96$ ,  $SEE = 5.27$ ). The BF% in underweight/normal ( $r = 0.92$ ,  $SEE = 2.47$ ) and that in overweight/obese adults ( $r = 0.89$ ,  $SEE = 3.61$ ) were strongly correlated. The correlations were significant in normal/underweight ( $r = 0.94$ ,  $SEE = 3.78$ ) and obese/overweight children ( $r = 0.83$ ,  $SEE = 6.49$ ). All ethnic groups showed significant correlation with BF%. Malay adults ( $r = 0.92$ ,  $SEE = 3.27$ ) and children ( $r = 0.94$ ,  $SEE = 0.88$ ) showed significant mean differences in BF%. **Conclusion:** The FTF-BIA showed higher accuracy for all normal/underweight and Chinese group with acceptable overestimation in children and underestimation in adults. Caution should be taken when interpreting BF% depending on gender, BMI, and ethnicity.

## L8 Prevalence of energy intake misreporting in Malay children varies based on application of different cut points

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Journal of Tropical Pediatrics, Vol.60 (6), 2014, 472-475

This study aimed to identify the prevalence of energy misreporting amongst a sample of Malay children aged 9-11 years ( $n = 14$ ) using a range of commonly used cut points. Participants were interviewed using repeated 24 h dietary recalls over three occasions. The Goldberg equations (1991 and 2000), Torun cut points and the Black and Cole method were applied to the data. Up to 11 of 14 children were classified as misreporters, with more under-reporters (between seven and eight children) than over-reporters (four or less children). There were significant differences in the proportion of children classified as energy misreporters when applying basal metabolic rate calculated using FAO/UNU/WHO (1985) and Malaysian-specific equations ( $p < 0.05$ ). The results show that energy misreporting is common amongst Malay children, varying according to cut point chosen. Objective evaluation of total energy expenditure would help identify which cut point is appropriate for use in Malay paediatric populations.



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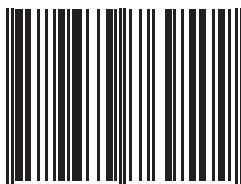


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