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Scientists must be made aware of the impact of their work and its possible applications to the society and public. It is hoped that this bulletin will provide the opportunity to interact, particularly through feedback or direct mail, with the scientists from either the private sector or other government research institutions.

Readership

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Letters to the Editors

If you have any comments about the content of the publication or contributions for the forthcoming issues, please send them to: The Editors, Synthesis, Publication Division, Research Management Centre, Tower II, UPM-MTDC Technology Centre, 43400 UPM, Serdang, Selangor, Malaysia or e-mail to fatimah@rmc.upm.edu.my. The editors reserve the right to edit articles before publication.

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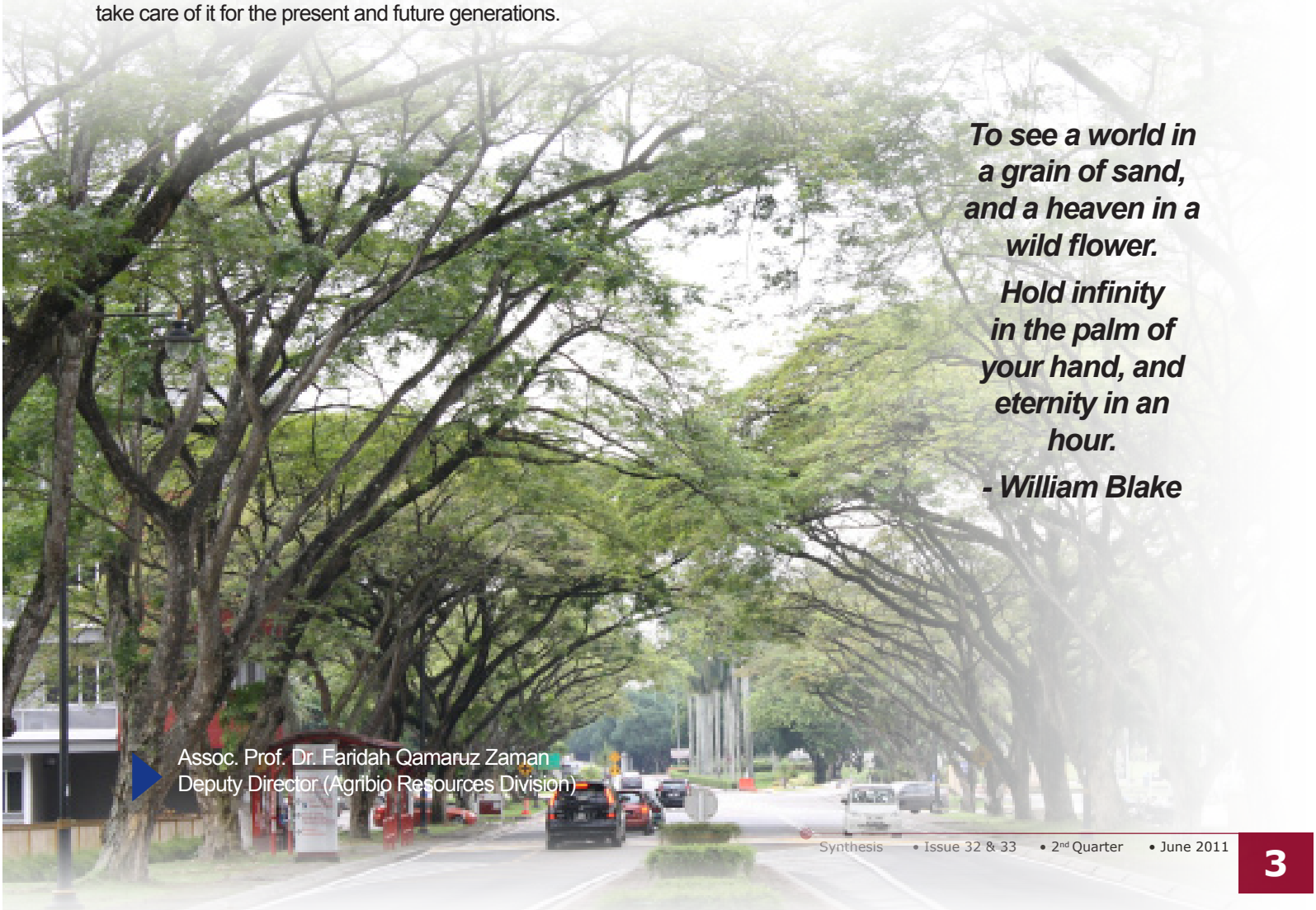
A Green Conscience towards a Green Campus

Recently, a group of 20 staff from the Research Management Centre (RMC), UTM Johor came for a study visit here in the Research Management Centre (RMC), UPM. The group leader, Mr. Afandi complimented UPM as being different from other Universities he had visited. “In other places, the first sight that greeted me was the buildings; in UPM you see the forest before you see the buildings”, he remarked. I too am happy entering this Green Campus of ours, with its majestic raintrees. Sometimes we get to see flushes of white flowers decorating the old trees which surround the campus. These flowers appear when there is rain after a dry, hot spell. What are they? They are known as *Dendrobium crumenatum* or Pigeon Orchid. However, we are able to enjoy these flowers for a day only due to their short blooming time. The flower buds develop up to a certain stage, then they wait till the rain comes before continuing to mature. I, for one would be sad if the blooming occurs during the weekends, as then I would have to wait for the next blooming time again.

As our country is jumping on the Green Bandwagon, UPM has not missed out on this golden opportunity to pioneer and practise Green Technologies. One of the university’s initiatives to carry out this Green mission is through the launch of The Green Mandate by the Office of the Deputy Vice Chancellor (Industry and Community Relations). The aim of The Green Mandate is to encourage industries to participate in the Green movement. Besides that, the recycling effort should be actively encouraged throughout the campus by promoting the provision of recycling litter bins. The funds collected can be pumped back into supporting more Green Initiatives within UPM. As they say, Green is the new Black. As researchers and members of an elite university such as UPM, we hold the responsibility to help save the Earth before it is too late and become drivers that local communities could emulate. Going Green is vital as most of Earth’s resources that we depend on for our daily life are finite resources such as fossil fuels. Even water would be scarce in the future; can you imagine life without fresh, drinking water? Today, as the energy tariff goes up, the trend of rising prices will surely continue.

Above all the, Agribio Resources Division strives to be the guardian of biological knowledge in UPM. We are currently working on a comprehensive public database called ARMS (Agribio Resource Management System) which will contain information of all the biological entities within the campus. The system is a joint effort by various faculties – Faculty of Science, Agriculture, Forestry, Biotechnology and Biomolecular Sciences, Design and Architecture as well as the University Agriculture Park and Institute of Bioscience. We welcome you to visit the Mini Natural History Museums located in RMC and some above-mentioned faculties. God has created this beautiful planet Earth, so as custodians we *Homo sapiens* should do our utmost to take care of it for the present and future generations.



To see a world in a grain of sand, and a heaven in a wild flower.

Hold infinity in the palm of your hand, and eternity in an hour.

- William Blake

Assoc. Prof. Dr. Faridah Qamaruz Zaman
Deputy Director (Agribio Resources Division)

Healing Power of Malaysian Seaweeds

Expert's Snapshots

Prof. Dr. Suhaila Mohamed graduated with a Double Major, B. Sc. (Hons.) in Physiology and Food Science (University of Leeds, UK) and later received her Ph.D in Biophysical Chemistry of Food (University of Leeds, UK) at the age of 26. Prof. Dr. Suhaila Mohamed specialises in Functional Food as complementary and alternative medicine for cardiovascular health, cancer and food related ailments. It requires a multidisciplinary approach involving chemistry, physiology, food sciences and nutrition. She received numerous national and international research and product awards including the National Innovation Award, National Patent Award, Malaysian Toray Science Foundation Award and Tribute to Women Award for Science and Technology. Her major scientific discoveries are – (i) a nutritious Low Sodium Hi Calcium salt replacer /seasoning / flavor enhancer for individuals prone to hypertension and kidney problems, with anti-cancer properties; (ii) world's first palm leaf extract products capable of enhancing mental cognitive functions and cardiovascular health as well as preventing cancer; (iii) world's first anti-oil adsorption and antioxidative additive that can reduce oil absorption in the fried food by as high as 85% for incorporation into frying oils; and (iv) a composition that is capable of enhancing wound healing, tissue/organ repair and helps to manage diabetes, hypertension, hypercholesterol, other cardiovascular ailments and cancers, especially useful for patients with compromised healing process such as diabetic patients.

Seaweeds are macroalgae, that do not possess true roots, stems or leaves. However, some of the larger species possess attachment organs or holdfasts that have the appearance of roots, and there may also be a stem-like portion called a stipe, which flattens out into broad leaf-like portion or lamina.Seaweeds are classified into three divisions, Rhodophyta (red algae), Chlorophyta (green algae) and Phaeophyta (brown algae). The red algae are characterized by having red pigments called phycobilins, which mask the color of chlorophyll though some may show different colors. The group is essentially marine; only a few of the approximately 4,000 species live in fresh water. The green algae are largely unicellular and non-marine. They are typically bright green since chlorophyll is not masked by other pigments. The colors of brown algae vary from olive green to dark brown, due to a preponderance of yellow pigments, particularly fucoxanthin, over chlorophyll.

Human consumption of brown seaweed (66.5%), red seaweed (33%) and green seaweed (5%) is high in Asian countries, mainly Japan, China and Korea. Seaweeds have been used since ancient times as food, fodder, fertiliser and medicinal drugs. Tropical seaweed, rich in dietary fibres and bioactive phenolic compounds, for example *Eucheuma cottonii* and *Sargassum polycystum* are used in food and medicine due to its anti-diabetic, anti-hypertensive, cardiovascular protective and anti-oxidative tissue protective properties.

In the present study, we evaluated in vitro antioxidant activity and the total phenolic screenings of eight Malaysian seaweed species (*Kappaphycus alvarezii, Eucheuma denticulatum, Halymenia durvillaei, Caulerpa lentillifera, Caulerpa racemosa, Dicyota dichotoma, Sargassum polycystum and Padina* spp.), determined chemical composition of three selected edible seaweeds and investigated effects of these seaweeds as antioxidative and cholesterol-lowering as well as their effects on biochemical, morphological and histological characteristics of selected tissues of rats fed on high-cholesterol/high-fat (HCF) diets. In vitro antioxidant activity of the eight species of seaweeds was evaluated using TEAC (trolox equivalent antioxidant capacity) and FRAP (ferric reducing antioxidant power) assays. The total phenolic contents of these seaweeds were determined using a Folin-Ciocalteu assay. The antioxidant activities of the eight edible Malaysian North Borneo seaweed species obtained from Sabah waters (Kudat, Tanjung Aru and Semporna) consisting of three red seaweeds (*Eucheuma cottonii*, *Eucheuma spinosum* and *Halymenia durvillaei*), two green seaweeds (*Caulerpa lentillifera* and *Caulerpa racemosa)* and three brown seaweeds (*Dicyota dichotoma, Sargassum polycystum* and *Padina spp*.) were determined. Methanol and diethyl ether were used as extraction solvent. The methanolic extracts of green seaweeds, *C. lentillifera* and *C. racemosa*, and the brown seaweed, *S. polycystum* showed better radical-scavenging and reducing power ability, and higher phenolic content than the other seaweeds. The TEAC and FRAP assays showed positive and significantly high correlation (R2 = 0.89). There was a strong correlation (R2 = 0.96) between the reducing power and the total phenolic content of the seaweeds methanolic dry extracts. These seaweeds could be potential rich sources of natural antioxidants.

In addition, the proximate composition, vitamin C, α-tocopherol, dietary fibers, minerals, fatty acid and amino acid profiles of three tropical edible seaweeds, *Eucheuma cottonii* (red seaweed), *Caulerpa lentillifera* (green seaweed) and *Sargassum polycystum* (brown seaweed) were analysed. The seaweeds were high in ash (37.15-46.19%) and dietary fibers (25.05-39.67%) while low in lipid content (0.29-1.11%) on dry weight (DW) basis. These seaweeds contained 12.09-15.53% macrominerals (Na, K, Ca and Mg) and 8.47-72.30 mg/100g trace minerals (Fe, Zn, Cu, Se and I). The crude protein contents of *E. cottoni* (9.76% DW) and *C. lentillifera* (10.41% DW) were higher than that of *S. polycystum* (5.4% DW), and the protein chemical scores were between 20-67% which are common for plant proteins. The PUFA content of *E. cottonii* was 51.55%; *C. lentillifera*, 16.76% and *S. polycystum*, 20.34%. Eicosapentaenoic acid (EPA), accounted for 24.98% of all fatty acids in *E. cottonii*. These seaweeds have significant vitamin C (~35mg/100g) and α-tocopherol (5.85-11.29 mg/100g) contents. They are also potential health ingredient for use in human and animal nutrition.

Besides that, biochemical markers for liver, heart and kidney damage such as alanine aminotransferase (ALT), aspartate aminotransferase (AST), α-glutamyltransferase (GGT), creatinine kinase (CK), CK-MB isoenzyme, urea, creatinine and uric acid were measured. Somatic index and descriptive histological changes in the liver, heart, kidney, brain, spleen and eye of the experimental rats were also performed, while quantitative histology was restricted only to necrosis in the liver, kidney and brain.

Red seaweed (*K.alvarezii*), green seaweed (*C.lentillifera*) and brown seaweed (*S. polycystum*) were selected based on their high in vitro antioxidant activity. We investigated

the comparative in vivo cardiovascular protective effects of red, green, and brown tropical seaweeds, namely, *Eucheuma cottonii, Caulerpa lentillifera*, and *Sargassum polycystum*, in rats fed on high-cholesterol/high-fat (HCF) diets. Male Sprague-Dawley rats (weighing 260–300 g) on the HCF diet had significantly increased body weight, plasma total cholesterol (TC), plasma low-density lipoprotein cholesterol (LDL-C), plasma triglycerides (TG), lipid peroxidation and erythrocyte glutathione peroxidase (GSH-Px) as well as superoxide dismutase levels after 16 weeks. Supplementing 5% seaweeds to HCF diet significantly reduced plasma TC (–11.4% to –18.5%), LDL-C (–22% to –49.3%) and TG levels (–33.7% to –36.1%) while significantly increased HDL-C level (16.3–55%). Among the seaweeds, *S.polycystum* showed the best anti-obesity and blood GSH-Px properties, *E.cottonii* showed the best antihyperlipemic and in vivo antioxidation effects, while *C.lentillifera* was the most effective at reducing plasma TC. All seaweeds significantly reduced body weight gain, erythrocyte GSH-Px, and plasma lipid peroxidation of rats with HCF diets towards the values of normal rats.

Histological examinations demonstrated consumption of all three seaweeds did not exert any damage to the liver, heart, kidney, brain, spleen and eyes in normal rats. In conclusion, *K.alvarezii* and *C.lentillifera* showed hypolipidaemic effects, improved antioxidant status and exerted a protective effect in mitigating the cardiac, hepatic, renal and brain abnormalities in rats fed with HCF diet. The presence of high dietary fibers especially soluble fiber, omega-3 fatty acids such as eicosapentaenoic acid (C20:5ω3), and antioxidant compounds such as polyphenols, vitamin C, α-tocopherol, carotenoids and selenium may probably contribute to the cholesterol-lowering and antioxidant efficacy of these seaweeds.

We also evaluated the potential anti-cancer, immune-regulating and tissue healing properties of ethanolic and aqueous extracts of *Eucheuma cottonii*. With regard to that, inflammation and proliferation phases of tissue healing including wound contraction, re-epithelization and granulation tissue development were monitored. It was found that the ethanolic extracts enhanced epithelization and tissue granulation significantly compared to both positive and negative control groups. *E.cottonii* possesses several antioxidant compounds, which may be responsible for the accelerated tissue healing. In short, we demonstrated for the first time in the present study that these seaweed extracts showed faster healing even when compared to honey.

Figure 1: Fat deposits of a rat fed with ACF alone

Figure 2: Little fat deposits of a rat fed on a normal diet

Figure 3: Cultivation farm at Banggi Island North Coast of Sabah

First prize *National Innovation Award in National Innovation Conference and Exhibition, MOSTI (NICE 2009)*

GOLD *International Trade Fair Ideas-Inventions-New Products, Nuremburg, Germany (IENA 2008)*

GOLD *18th International Invention, Innovation Industrial Design and Technology Exhibition (ITEX 2007)*

GOLD *International Trade Fair Ideas-Inventions-New Products, Nuremburg, Germany (IENA 2006)*

SILVER *Malaysian Technology Expo (MTE 2006)*

BRONZE *International Exposition of Research and Inventions of Institutions of Higher Learning (PECIPTA 2007)*

Picture on the cover:
"Dead Sea Mud for Skin Conditions like Psoriasis" Shampoos and Hair Treatments, Retrieved Aug. 5, 2011 from http://nascarjuice.com/?cat=25

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R. Shukri, **S. Mohamed** and N. M. Mustapha, 2010. Cloves Protect the Heart, Liver and Lens of Diabetic Rats. Food Chemistry. 122, 4, 1116-1121.

Reader Enquiry

Suhaila Mohamed

UPM-MAKNA Cancer Research Laboratory, Institute Bioscience, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
Tel: +603-8946 2168 E-mail: suhaila@food.upm.edu.my

Chemometric Approach to Validate Faecal Sterols as Source Tracer for Faecal Contamination in Water

Faecal pollution has become a concern due to the deterioration of aquatic environment caused by human and animal wastes within the Langat River Basin. In this study, water samples from point sources of faecal pollution (sewage treatment plants, chicken farms, quail farms and horse stables) were collected to determine the actual representative of faecal sterols. The water samples were collected once every 2-4 weeks. Extraction of sterols was performed by using solid-phase extraction (SPE) to achieve faster extraction of faecal sterols from water samples.

The main purpose of this study was to validate sterol components in water samples with regard to the sources of faecal pollution. This was done by interpreting the results of the laboratory measurements using chemometric methods such as cluster analysis (CA), principal component analysis (PCA) and discriminant analysis (DA) which assisted in the interpretation of complex datasets and offered a better understanding of the data.

Impact Factor: 4.36

Cluster analysis was applied to discover natural groupings within real data, in terms of the similarities of sterols and samples. Cluster analysis grouped the objects (cases) into classes (clusters) on the basis of similarities within a class and dissimilarities among different classes. Three clusters composed of coprostanol, cholesterol, stigmasterol, b-sitosterol and stigmastanol were clearly identified. Coprostanol was grouped in the first cluster, followed by the second cluster (cholesterol and b-sitosterol), while the third cluster included stigmasterol and stigmastanol. Based on the results, it can be concluded that cluster 1 included samples from chicken and quail farms, cluster 2 mainly consisted of human (sewage treatment plants) and the horse stables while cluster 3 represented one sample each from the chicken and horse farms.

Discriminant analysis was applied to distinguish the faecal pollution sources that had a prominent role in the segregation of classes. The results showed a clear separation of human, chicken, quail and horse sources. To find the discriminating variables, the data were subjected to standard, forward and backward stepwise DA. DA results suggested that coprostanol, cholesterol and b-sitosterol were the most significant parameters to discriminate among the faecal pollution sources, labelled as “chicken”, “horse”, “human” and “quail”.

Title : Chemometric Approach to Validate Faecal Sterols as Source Tracer for Faecal Contamination in Water
Author : **H.Juahir** *et al.*
Journal : Water Research
Volume : 43
Issue : 20
Page : 5023-5030

GOLD *Research and Innovation Expo UKM (2004)*

GOLD *Research and Innovation Expo UKM (2005)*

SILVER *UPM Invention, Research & Innovation Exhibition (PRPI 2006)*

SILVER *UPM Invention, Research & Innovation Exhibition (PRPI 2007)*

BRONZE *Malaysia Technology Expo (MTE 2009)*

GOLD *UPM Invention, Research & Innovation Exhibition (PRPI 2010)*

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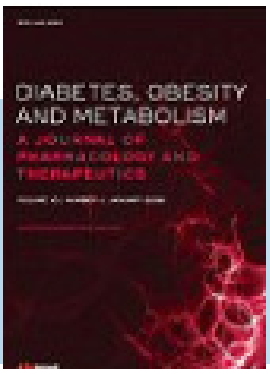
Reader Enquiry
Hafizan Hj. Juahir
Department of Environmental Studies, Faculty of Environmental Studies, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
Tel: +603-8947 7460 E-mail: hafizan@env.upm.edu.my

Title : A Low Glycemic Index Diet: New Insight into the Management of Diabetes
Author : **B. N. M.Yusof** *et al.*
Journal : Diabetes, Obesity and Metabolism
Volume : 56
Issue : 11
Page : 387-396



A Low Glycemic Index Diet: New Insight into the Management of Diabetes

Diet is the cornerstone of diabetes management. However, there is a marked disagreement about what kind of dietary advice is the best, particularly regarding carbohydrate. It is recognised that different carbohydrate foods produce different glycemic responses.

The glycemic index (GI) concept is a tool used for assessing and classifying the carbohydrate foods based on their impact to the blood glucose level after eating. The GI concept is used to rank carbohydrate on a scale from 0 to 100 according to the extent to which they raise blood glucose level after eating. The most common forms of starch e.g. white rice and bread are high GI while parboiled rice, whole grain bread, fruits and legume are low GI. Foods with high GI value produce a higher peak and greater overall blood glucose response than low GI foods.

In Malaysia, research in the area of GI is still at its infancy. Most of the previous studies have been conducted in Western countries where potatoes and wheat are the primary diets. The effectiveness of the GI concept may differ among Asian populations where rice is the staple food. This is particularly important as white rice is a high GI food and consuming rice excessively has been associated with high blood glucose among Japanese and Chinese women.

Therefore, this randomised controlled study was conducted to assess the effect of a low GI vs. conventional dietary advice on blood glucose and cardiovascular risk factors among 105 patients with type 2 diabetes. Both groups received similar dietary prescriptions for diabetes. The only differences were made to the carbohydrate component. Due to lack of availability for low GI foods in Malaysia, subjects were strictly encouraged to consume the key carbohydrate foods with known low GI values.

Impact Factor: 4.26

We found that a low GI diet was associated with significant improvement in fructosamine (an indicator for one month blood glucose control), fasting and postprandial glucose level and waist circumference at week 4 and 12 compared to the conventional group. Hemoglobin A1c - an index to measure the average blood glucose for 3 months period did not differ significantly between groups. However, the improvement within the GI group was more pronounced and of clinical benefit. Interestingly, most of the subjects from the low GI group were able to consume more parboiled or basmati rice, pasta, milk and dairy products and fruits from the low GI varieties throughout the study. The modest improvement in blood glucose level seen in our subjects on a low GI diet has provided insight into another option for managing diabetes among Malaysian diabetics. Nevertheless, the shortage of low GI foods limits the clinical utility of the concept and therefore, more researches are required to determine the GI values of Malaysian food products. Of particular interest, the endorsement of a G1 logo as part of food labeling by the Malaysian government is necessary to facilitate the application of this concept.

Travel award by International Diabetes Federation to present this work at World Diabetes Congress, Canada (2009)

Travel award by International Atomic Energy Agency to present this work at International Congress of Nutrition, Bangkok (2009)

Best presentation at 14th Congress of the ASEAN Federation of Endocrine Societies (2007)

B. N. M. Yusof, R. A. Talib, N. A. Kamaruddin, H. Gilbertson and N. A. Karim, 2010. Improvement of Dietary Quality with the Aid of a Low Glycemic Index Diet in Asian Patients with Type 2 Diabetes Mellitus. J Am Coll Nutr. 29, 3, 161-170.

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B. N. M. Yusof, R. A. Talib, N. A. Kamaruddin and N. A. Karim, 2005. Glycemic Index of Eight Commercial Rice in Malaysia. Mal J Nutr. 11, 2, 151-163.

Reader Enquiry

Barakatun Nisak Mohd. Yusof

Department of Nutrition and Dietetics, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
Tel: +603-8947 2524 E-mail: bnisak@medic.upm.edu.my

Transport and Release of Chemicals from Plastics to the Environment and Wildlife

Plastic debris presents in the marine environment (marine plastics) carries chemicals of smaller molecular size (MW < 1000) which include resin pellets, fragments and microscopic plastic debris as well as organic contaminants. Some of the compounds are added during plastic manufacturing, while others are adsorbed from the surrounding seawater. This is due to the fact that these chemicals can penetrate into cells, chemically interact with biologically important molecules and may disrupt the endocrine system.

Plasticisers, other plastics additives, and constitutional monomers are a potential threat to terrestrial environments because they can leach from waste disposal sites into groundwater and/or surface waters. Leaching and degradation of plasticizers and polymers are complex phenomena dependent on environmental conditions in the landfill and the chemical properties of each additive. Besides that, BPA concentrations in leachates from municipal waste disposal sites in tropical Asia ranged from sub µg/L to mg/L, and are correlated with the level of economic development. This is as economic growth and industrialization bring larger amount of plastics into the society and may increase the amount of plastic wastes.

Impact Factor: 5.56

Hence, concentrations of hydrophobic contaminants adsorbed in plastics showed distinct spatial variations reflecting global pollution patterns. Model calculations and experimental observations consistently showed that polyethylene accumulates more organic contaminants than other plastics such as polypropylene and polyvinyl chloride (PVC). This is as the extent of uptake varies among plastics; polyethylene has a higher contaminant diffusivity and exhibits greater uptake of contaminants than other plastics including polypropylene and PVC. A mathematical model using equilibrium partitioning and experimental data demonstrated the transfer of contaminants from plastics to benthic organisms.

In short, many additives and constitutional monomers leach out of plastics, and the discharged leachate can introduce plastic-derived contaminants into the environment. Findings from the present study warn us that we should not underestimate the environmental impacts of discarded plastics. As production and usage of plastics continue to increase, particularly in economically developing countries, the environmental implications of their disposal should be carefully considered to avoid inadvertent release, magnification and transport of contaminants to the environment and wildlife.

Title	:	Transport and Release of Chemicals from Plastic to the Environment and Wildlife
Author	:	**M. P. Zakaria** *et al.*
Journal	:	Philosophical Transactions of the Royal Society B: Biological Sciences
Volume	:	364
Issue	:	1526
Page	:	2027-2045

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Reader Enquiry

Mohammad Pauzi Zakaria

Centre of Excellence in Environmental Forensics, Faculty of Environmental Studies, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

Tel: +603-8946 8024 E-mail: mpauzi@env.upm.edu.my

Generation and Characterisation of Mesenchymal Stem Cells Derived from Human Myocardiac Tissues

In the last one decade, overwhelming research work has promised stem cells as an ideal tool for tissue regenerative therapy. In line with this, mesenchymal stem cells (MSC) have been actively investigated on their role in repopulating parenchymal and mesenchymal tissues in organ specific diseases. To date, MSC have been clinically applied to treat patients with osteogenesis imperfecta as a tool to improve bone structure and density. Myocardial infarction (MI) has often become a fatal disease due to the inability of local cardiac stem cells at side of injury to regenerate mature functioning myocardiocytes. Therefore an ex-vivo expansion of myocardiocytes derived mesenchymal stem cells serves as an ideal reagent to treat heart diseases.

To realise this notion, a collaborative network has been established with the National Heart Institute (IJN) and Kyoto Prefectural University, Japan. Our main experimental work focusses in formulating an optimal protocol to expand a rare population of cardiac stem cells thus, achieves a substantial volume that is required for clinical use. In order to materialise this aim, myocardial biopsy specimens from stage III heart failure patients were minced and disassociated by enzymatic degradation to obtain a single cell suspension. The single cell suspension was added with growth factor supplemented media and the colony forming ability was observed. Once the cells formed a colony, they were grown to confluence and tested for their stem cell properties. Based on our optimisation of using specific types of growth factors, initial cell seeding density, utilisation of human serum and plastic wares indicated high yields of cell numbers with rapidly expanding stem cells. However, one should bear in mind that production of larger cell numbers should be accompanied by subsequent confirmative assay to verify the nature of stem cells. Therefore once the cells achieved optimal cell growth, these cells will be tested for stem cell surface marker. The regenerated cells were stro-1 positive, an indication of primitive stem cell population. Besides that, they also expressed early transcription markers for embryonic stem cells such as Oct3/4, Sox2, Rex-1 and Nanog.

In terms of their myocardial origin, cardiac stem cells express early cardiac lineage markers such as NKX2.5 and GATA4 which are unique patterns only found in myocardium derived MSC. We have shown the proof of concept whereby the ability of regenerating cardiac stem cells from MI patients within the required time period and the cells generated are free from potential risk of infections and toxins. Most importantly the cardiac derived stem cells possess a unique character of cardiac stem cells by expressing relevant proteins and RNA. In conclusion, myocardium could potentially serve as a cardiac stem cell source and can be exploited towards treating MI patients.

Figure 1: Expansion of cardiac stem cells

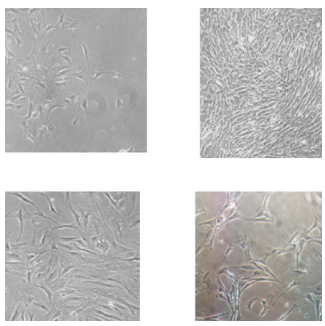

Figure 2: Culture of cardiac stem cells at various incubation periods

GOLD *UPM Invention, Research & Innovation Exhibition (PRPI 2009)*

SILVER *BioMalaysia 2009*

SILVER *Malaysian Technology Expo (MTE 2010)*

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Reader Enquiry

Rajesh Ramasamy

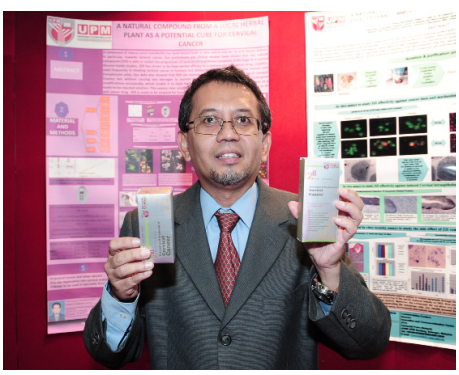
Department of Pathology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
Tel: +603-8946 2377 E-mail: r.rajesh@medic.upm.edu.my

UPM's Latest Products and Innovations

UPM Discovers a Product to Prevent Cancer using Forest Herbs

Dr. Ahmad Bustamam Abdul showing the displayed product to Prof. Ir. Dr. Salleh Jaafar, UPM's Deputy Vice Chancellor (Research and Innovation).

Medals and certificates awarded to the product.



Dr. Ahmad Bustamam Abdul showing his product made of 'Lempoyang' or forest ginger.

UPM - Savannah to Forge Academic and Research Collaboration

The MoU signing ceremony between Universiti Putra Malaysia and the Savannah State University, USA.

Former Deputy Vice Chancellor (Research and Innovation) of UPM, Prof. Dato' Abu Bakar Salleh and Associate Vice President of Research and Sponsored Programmes of SSU, Assoc. Prof. Dr. Chetty Chellu in a firm handshake to seal the MoU.

R&D&C HAPPENINGS

UPM Wins 4 Gold Medals and 'The Best Award' at MTE 2011

Prof. Ir. Dr. Mohd Salleh Jaafar, Deputy Vice Chancellor (Research and Innovation) receives a gold medal.

Dr. Rosnah Shamsudin (right), representative for Assoc. Prof. Dr. Siti Mazlina showing the medal and 'The Best Award' certificate.

UPM – UPE Aims to Increase the Quality of the Country's Agricultural Sector

The MoU between UPM and UPE in the effort of increasing comprehensive agricultural economic model in Malaysia.

UPM Produces Low Sodium Salt

Prof. Dr. Suhaila Mohamed showing her research product, Cardio-mate.

The displayed Cardio-mate: pill and powder forms.

Prof. Dr. Suhaila Mohamed providing descriptions of her product which is good for heart patients and those with diabetes and high blood pressure.

UPM WINS 10 GOLD MEDALS AT ITEX 2011

23 researchers from Universiti Putra Malaysia (UPM) won 10 gold medals, a Special Award, 10 silver medals and 2 bronze medals at the International Invention, Innovation Industrial Design and Technology Exhibition (ITEX 2011) on 20th – 22nd May 2011 at the Kuala Lumpur Convention Centre.

Assoc. Prof. Dr. S. Vijayaletchumy from the Faculty of Modern Languages and Communication walked away with a Special Award from the World Intellectual Property Organisation (WIPO) and a gold medal for her product - Phonic Tutor Software for Visual Dyslexia Students which is a software that will assist dyslexia students to learn the Malay language.

The Dean of the Faculty of Biotechnology and Biomolecular Sciences, Prof. Dr. Ali Hasan won two gold medals for his product – Comamonas putranesis sp. nov.: A Novel Bacterium which is a new bacteria to produce PHA plastics through an eco-friendly non-halogenated method for recovery of Intracellular Polyhydroxyalkanotes (PHA). The method is a novel method to extract PHA using alkaline solution with low thickness and water compared to the usual usage of organic solvent.

Assoc. Prof. Dr. S. Vijayaletchumy receiving World Intellectual Property Organisation (WIPO) Special Award (Best Award Invention).

Another gold medal went to Prof. Dr. Mahiran Basri with her product – New Nano-Emulsion Intervention for Pesticide Auxiliary which is a formulation of greener nano-sized substances for an effective herbicide application. Assoc. Prof. Dr. Abdul Rashid Mohamed Shariff from the Institute of Advanced Technology, Faculty of Engineering won the next gold medal for his product – Spatial Macro Language V3.0 (SMAL) which enables computer to use spatial relations for communication purpose.

Assoc. Prof. Dr. Samsilah Roslan from the Faculty of Educational Studies won a gold medal for her product – PUTRA University Major Selection and Career Guidance Software that assists students in identifying their personality tendencies in vocational fields and selecting suitable programmes. Dr. Rajesh Ramasamy from the Faculty of Medicine and Health Sciences on the other hand won a gold medal for Stem Cell Therapy for Neutrophil Mediated Immune Disease which is an application of mesenchymal stem cells for diseases caused by excessive neutrofil activities.

Dr. Zeenathul Nazariah Allaudin from the Faculty of Veterinary Medicine won a gold medal for – The Use of Poultry Gene for Cancer Treatment that uses gen of chicken base to eliminate and destroy human cancer cells such as skin cell cancer, breast cell cancer, cervical cell cancer and colon cell cancer whereby pre-clinical test has been conducted.

Dr. Siti Aslina Hussain from the Faculty of Engineering received a gold medal for her product – Cosmo Ball Model which is a stimulation process to witness irregular water and air bubble movements surrounding the Cosmo Ball. Besides that, Assoc. Prof. Dr. Nor Azah Yusof from the Faculty of Science won a gold medal for her invention – Portable Heavy Metal which is able to detect heavy metals in water such as in mineral water or the river in the shortest period of time. The device is easy to be used and there is no need of skilled labour to handle it.

The exhibition saw entries from 14 countries - Malaysia, Russia, Poland, Canada, Saudi Arabia, Iran, Sri Lanka, Philippines, Korea, China, Hong Kong, Taiwan, Brunei and Vietnam.

UPM DISCOVERS PRODUCT TO PREVENT CERVICAL CANCER USING FOREST HERBS

A group of reseachers in UPM has successfully discovered a new treatment technology to prevent early stage cervical cancer using a local plant known as 'lempoyang' or forest ginger. 'Lempoyang' is a type of ginger known as the forest or wild ginger.

The head of the research, Dr. Ahmad Bustamam Abdul from the Institute of Bioscience, UPM said the susbtance, in solid form contains a compound that has the same treatment ability with anti cancer commercial medicine and it is non-lethal to human normal cells. "This technology is safe and has high ability to remove cervical cancer cells and reduce complications that cancer patients face as they undergo chemotherapy treatment", he noted during the press conference for UPM researchers' research findings organised by the Research Management Centre (RMC) and Corporate Communication Division (BKK).

Dr. Ahmad Bustamam Abdul providing information regarding his product to the Deputy Vice Chancellor (Research and Innovation) of UPM, Prof. Ir. Dr. Saleh Jaafar.

He further added that the susbtance which had undergone pre-clinical test, is capable of giving high therapeutic doses that are safe. It can be marketed in capsule or liquid form and used with other chemotherapy commercial drugs as well as taken in high doses without damaging normal tissues.

Dr. Ahmad mentioned that with the discovery of this technology, treatment costs for cervical cancer patients are lower compared to imported medicines or substances that are not suitable to be taken together with chemotherapy treatment. He also noted that this research, which has been carried out since eight years ago, has been filed for patent and funded by UPM research grants and the National Cancer Council Malaysia (MAKNA), can be applied together with other anti cancer treatments. Dr. Ahmad is assisted by five other researchers which are Prof. Dr. Rashedee Abdullah, Prof. Dr. Mohd Aspollah Sukari, Prof. Dato' Dr. Tengku Azmi Tengku Ibrahim, Dr. Murali Syam Mohan and Assoc. Prof. Dr. Siddiq Ibrahim Abdel Wahab.

The product, which can be applied in the herbapeutic industry, received a gold medal recognition during the Malaysia Technology Expo (MTE) in 2008 and the 17th International Invention Innovation Industrial Design & Technology Exhibition (ITEX) in 2006, a silver medal during the International Trade Fair Ideas-Invention-New Products IENA 2006 and Bio Inno Awards, Bio Malaysia in 2010 as well as a bronze medal during Bio Inno Awards, Bio Malaysia in 2009.

Prof. Ir. Dr. Saleh Jaafar, Deputy Vice Chancellor (Research and Innovation) and Assoc. Prof. Dr. Samsilah Roslan, Deputy Director for the Promotion Division, Research Management Centre (RMC) attended the press conference as well. Prof. Ir. Dr. Saleh said that the product is in its final development level. "I hope local pharmaceutical companies will take the opportunity to market this anti cancer product in the global market," he added further.

UPM – UPE AIMS TO INCREASE THE QUALITY OF THE COUNTRY'S AGRICULTURAL SECTOR

Universiti Putra Malaysia (UPM) and the Economic Planning Unit (UPE), Prime Minister's Department foster a research collaboration to build an empirical forecasting model for the quality of the country's agricultural sector.

Speech by the Vice Chancellor of UPM, Dato' Ir. Dr. Radin Umar Radin Sohadi.

The collaboration would implement the simulation and identify the effects of policy and international environment changes in the agricultural sector in Malaysia. Besides that, officers from the involved ministries and agencies would be trained regarding the process of building the forecasting model to produce a perfect agricultural manual.

"This agreement provides benefits to the development of government agencies and UPM, as well as to produce research output especially academic publications. The research will be implemented by the Institute of Agricultural and Food Policy Studies, UPM which is responsible in conducting research regarding agriculture food policy in order to produce

research that is moving towards permanent agriculture," said Dato' Ir. Dr. Radin Umar Radin Sohadi, the Vice Chancellor of UPM during the Memorandum of Agreement (MoA) signing ceremony between UPM and UPE.

The collaboration between UPM and UPE in the Agricultural Sector Modeling: Forecasting and Capacity Building project or the Malaysian Agricultural Policy Analysis (MAgPA) is seen to assist in the effort of increasing comprehensive agricultural economic model in Malaysia. UPE is an institution that enacts policy to determine the nation's development direction.

RESEARCH PRODUCT BY THE FACULTY OF VETERINARY MEDICINE EMERGES CHAMPION AT THE ICC CONVENTION 2010

The Faculty of Veterinary Medicine emerged as the champion with their research product – the Water Improver, a product to reduce toxic content (chlorine levels) in aquarium that causes fish death, during the Innovative and Creative Circle (ICC) Convention 2010 held at university level.

The head of the research team, Noorazira Ishak said the product removes chlorine content in tap water and it is proven to be faster and economical. "Conventionally, we remove chlorine in tap water using the old method of adding anti-chlorine followed by anti ammonia after 30 minutes. This method can be cumbersome and time consuming. However, with Water Improver, one will only have to add the product and the chlorine content in tap water will disappear quickly. The most important feature is that the product is safe for aquatic livings," he added further.

The team from the Faculty of Veterinary Medicine with their mock cheque presented by the Registrar of UPM, Dato' Wan Azman Wan Omar (middle).

The veterinary research group consisted of Dr. Mohd. Fuad Matori, Arifah Mohd. Riduan, Ismail Md. Shairi, Rosmaniar Mohd. Nor, Md. Nazim Razali, Saipunizam Ali, Jefri Norsidin, Mior Mohd Nizam, Narizam and Fauziah Sulaiman Nordin. The group walked away with a RM1,550 cash prize and a certificate of appreciation.

The convention had eight participants from various departments and faculties in UPM and they were divided into two technical innovations and six management innovations. It is held annually by the Registrar's Office to promote new innovations at all service levels

STEDEX SHOWCASES STUDENTS' AND LECTURERS' CREATIVITIES

The Sustainable Tropical Environment Design Exhibition 2010 (STEdex'10) organised by the Faculty of Design and Architecture, Universiti Putra Malaysia (UPM) is the best medium used to showcase UPM students' and lecturers' architectural masterpieces to a more professional height.

One of the displayed product during the Sustainable Tropical Environment Design Exhibition 2010 (STEdex'10).

The Dean of the Faculty of Design and Architecture, UPM, Assoc. Prof. Dr. Osman Mohd. Tahir said that previous exhibitions, which showcased a number of architectural masterpieces, have earned them international recognitions. "The displayed works have gone through a process of concept development, a thorough research design and rigorous assessment in terms of studio presentation. They also underwent a session of evaluation and selection from professional juries and external assessors. From our vital assessments, the Faculty of Design and Architecture, UPM has succeeded in organising exhibitions and came up with an indexed STEdex catalog. In addition, most of the displayed products managed to acquire product IDs and awaiting the process to be patented and commercialised. On a positive note, the STEdex catalog has been listed as one of the journals in the Design and Applied Arts Index (DAAI) under ProQuest, Cambridge University and is also listed in Scopus-CSA Illumina Arts and Humanities Index," he said during the opening ceremony of STEdex'10, officiated by the Vice Chancellor of UPM, Dato' Ir. Dr. Radin Umar Radin Sohadi.

The Vice Chancellor of UPM, Dato' Ir. Dr. Radin Umar Radin Sohadi (middle) accompanied by Prof. Dr. Tai Shzee Yew, Deputy Vice Chancellor (Industry and Community Relations) and Assoc. Prof. Dr. Osman Mohd. Tahir, Dean of the Faculty of Design and Architecture listening to a presentation.

STEdex is held to showcase the design and architecture works produced by UPM lecturers and students besides increase research and development (R & D) activities. A total of 60 exhibitions and 200 participants took part in the exhibition, which will end on November 9th, 2011.

PROF. DR. MOHD. ADZIR MAHDI WINS COMSTECH YOUNG SCIENTIST AWARD

A professor from the Department of Computer and Communication Systems, Faculty of Engineering, Universiti Putra Malaysia, Prof. Dr. Mohd. Adzir Mahdi was awarded COMSTECH Young Scientist Award in conjunction with the Fourteenth Session General Assembly Meeting of COMSTECH/ OIC held at Islamabad, Pakistan on 11th - 13th January 2011.

Prof. Dr. Mohd. Adzir (2nd from left) receives a cash prize of USD3,000, an award plaque and a certificate of achievement from the Prime Minister of Pakistan, Yousuf Raza Gillani (right)

The Young Scientist Award is for scientists under the age of 40 who have significantly contributed to the field of science and technology. The selection of recipients for the award is based on criteria such as the number of publications with impact factor (number of citations), as well as the number publications (research papers in ISI journals, books, and conference papers), patents, research grants, awards and recognitions.

The certificate of achievement and award plaque that were awarded to Prof. Dr. Mohd. Adzir.

Prof. Dr. Mohd. Adzir received a cash prize of USD3,000, an award plaque and a certificate of achievement from the Prime Minister of Pakistan, Yousuf Raza Gillani who is also the Co-Chairman of COMSTECH.

The COMSTECH also awarded COMSTECH Awards in Biology to Prof. Dr. Wasim Ahmad (Pakistan) and Prof. Dr. Ilkay Erdagon Orhan (Turkey) while COMSTECH Award in Chemistry went to Prof. Dr. Muhammad Iqbal Choudhary (Pakistan) and Prof. Yusuf Yagci (Turkey).

These awards are expected to foster healthy competitions among researchers of the OIC countries and enhance one's advancement in science and technology that would lead to a nationally competitive environment.

Ruminants to Poultry: Beneficial Microbe and Gene

The rumen, which is the largest compartment in the stomach of ruminants, harbors a high population of microorganisms, mainly bacteria, fungi and protozoa. These microorganisms secrete a wide array of enzymes to degrade roughages which could not be digested by monogastric animals. Thus, the microorganisms in the rumen could be tapped and manipulated to enhance feed degradation in monogastric animals.

One of the important nutrients which is available in the feeds of monogastric animals such as poultry and swine is phosphorus, but it could not be utilised by the monogastric animals because they lack the enzyme, phytase. Phytate is the major form of phosphorus storage in plants and is converted into biologically active forms of phosphorus by phytase. The unutilised phytate in the diet of monogastric animals chelates with proteins and minerals, thus, reducing the nutritional value of the feeds. It also accumulates in animal excreta, causing pollution of water table when degraded by soil microorganisms in agriculture-intensive areas. In the livestock industry, inorganic phosphate is supplemented into animal feed to meet the nutritional requirements of the animals. This practice has led to increase cost of feed and excessive phosphorus excreted in the manure which causes even more severe phosphorus pollution in the environment. Thus, in recent years, supplemental phytase enzyme has been used as an alternative to increase the phytate phosphorus utilisation of animal feed.

In this study, a novel phytase producing bacterium, *Mitsuokella jalaludinii*, was isolated from the rumen of a local cattle and supplementation of active *Mitsuokella jalaludinii* culture into animal feed was found to improve growth performance of the broiler chickens. Despite the effectiveness of the bacterium, the requirement of *M. jalaludinii* for strict anaerobic growth conditions may hamper its mass production as well as increase the cost of production of the phytase enzyme. Therefore, biotechnological approach was used to overcome this problem. The phytase gene of *M. jalaludinii* was successfully cloned and sequenced. Analysis showed that the novel phytase gene which was cloned was fully functional. Therefore, in addition to the cells of *M. jalaludinii* which are used as a feed supplement, this phytase gene can be introduced into other industrially important organisms to increase the phytase production or further engineered to improve the characteristics of the enzyme. It could also be cloned into other "generally regarded as safe microorganisms" or probiotics and incorporated into the feeds to improve their beneficial effects in the host animals.

Figure 1: Mitsozyme™, a feed supplement for poultry, which contains *Mitsuokella jalaludinii*, to improve phytate degradation in animal feeds. Inset: A Phytase PCR Amplification Kit, which contains functional phytase gene from *Mitsuokella jalaludinii*, ready to be cloned into industrially important microorganisms

GOLD *International Invention, Innovation and Technology Exhibition (ITEX 2009)*

GOLD *UPM Invention, Research & Innovation Exhibition (PRPI 2008)*

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Reader Enquiry
Sieo Chin Chin
Department of Microbiology, Faculty of Biotechnology and Biomolecular Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
Tel: +603-8946 6702 E-mail: ccsieo@biotech.upm.edu.my

New Solar Cell Materials from Ternary Chacogenide Compounds

In search of new semiconducting materials for efficient solar energy conversion through photoelectrochemical solar cells, metal chalcogenides are increasingly studied. These materials are known to be potential candidates as replacement for expensive silicon-based solar cells. The vast preparation and number of studies of metal chalcogenide thin films can be classified into two categories: binary compounds and ternary compounds. Examples of binary compounds are MnS, ZnSe, Cu_2S, SnSe and SnS while $CuInSe_2$, CdSSe and $CuInS_2$ are examples of ternary metal chalcogenides. Among the ternary semiconducting materials, sulphur-containing compounds occupy an important place. There are many methods to prepare thin films such as chemical bath deposition, electrodeposition, thermal evaporation, spray pyrolysis, sputter deposition and plasma-enhanced chemical vapor deposition. The cost of deposition method plays important role in determining the mass output of thin film products in the market.

In this work, we reported on the preparation of copper tin sulphide thin films onto indium tin oxide glass substrates by using simple and cheaper methods such as electrodeposition and chemical bath deposition technique. There was no report on the deposition of Cu_4SnS_4 thin films from an aqueous acidic solution using disodium salt of ethylenediaminetetraacetic acid (Na_2EDTA) as a complexing agent during deposition process. The presence of complexing agent was found to improve the lifetime of the deposition bath and the quality of thin films. Here, the thin films were deposited under various deposition parameters such as deposition potential, deposition time, bath temperature, pH and concentrations in order to investigate the best deposition parameters for the deposition of thin films.

Based on the experimental results, we concluded that the properties of thin films obtained from electrodeposition method and chemical bath deposition method were more or less similar. According to the XRD patterns, the films deposited under optimised conditions such as bath temperature (50 ^{0}C), deposition time (120 min), electrolyte concentration (0.05 M) and bath pH (pH 1.5) were polycrystalline in nature. The X-ray data exhibited the most intense peak which occurred at 2θ = 30.2° as belonged to (221) plane of Cu_4SnS_4. Atomic force microscopy image revealed that grains were uniformly distributed over the surface of substrate (**Figure 1**). The films prepared under optimised conditions showed the highest photoresponse activity and better absorption values in the wavelength of 300-800 nm. The optical absorption at the visible region indicated that these materials could be used for photoelectrochemical cells. The band gap was found to be 1.6 eV with direct transition.

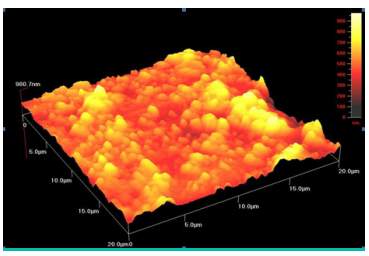

Figure 1: An atomic force microscopy image of Cu_4SnS_4 thin films deposited on indium tin oxide glass substrate

BRONZE *UPM Invention, Research & Innovation Exhibition (PRPI 2007)*

SILVER *UPM Invention, Research & Innovation Exhibition (PRPI 2008)*

BRONZE *UPM Invention, Research & Innovation Exhibition (PRPI 2009)*

BRONZE *Malaysia Technology Expo (MTE 2009)*

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Reader Enquiry

Anuar Kassim

Department of Chemistry, Faculty of Science,
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
Tel: +603-8946 6779 E-mail: anuar@science.upm.edu.my

Outcomes from the UPM-MTDC Symbiosis™ Programme

Following the joint collaboration between Innovation and Commercialisation Centre (ICC) UPM and Malaysian Technology Development Corporation (MTDC) in organising UPM-MTDC Symbiosis™ programme, 20 selected young UPM graduates were chosen to be entrepreneurs to commercialise research technologies of UPM to local and international markets. The programme provided these young entrepreneurs with the required entrepreneurial skills and high confidence level to set up and manage companies to commercialise the products/technologies. This collabrative effort would enchance the nation's economy growth and development. **Table 1** shows the selected UPM researchers and their technologies for the programme. There are 9 UPM researchers with 13 technologies for the programme. The entrepreneurs will undergo an incubation period of 24 months in UPM where they will continue to receive assistance and guidance to ensure the success of the programme.

NO.	UPM RESEARCHER	TECHNOLOGY
1.	Assoc. Prof. Dr. Ratnasamy Muniandy Tel: 03-8946 6373/7847 ratnas@eng.upm.edu.my	• Turamesin/Stone Mastic
2.	Ir. Prof. Ir. Dr. Norman Mariun Tel: 03-8946 6321/1601 norman@eng.upm.edu.my	• Ohmic Heated Pasteuriser
3.	Assoc. Prof. Dr. Faridah Qamaruz Zaman Tel: 03-8947 2155/1413 faridahqz@gmail.com	• Therapeutic Herbal Bath (Putra Aromatic)
4.	Prof. Dr. Suhaila Mohamed Tel: 03-8947 6990 mohamed.suhaila@gmail.com	• Cardio Mate Seasoning from Seaweed • Kardi Mind Palm Tea Sachet
5.	Prof. Dr. Zulkifli Shamsuddin Tel: 03-8947 6990 zulsham@agri.upm.edu.my	• UPM B10: Biofertiliser
6.	Assoc. Prof. Dr. Abdul Rashid Mohamed Shariff Tel: 03-8946 7543/6383 rashidpls3@gmail.com	• Real Time Oil Palm Fruit Grading System • Fresh Fruit Bunch (FFB) Hyperspectral Scanner
7.	Prof. Dr. Fauziah Othman Tel: 03-8947 2315 fauziah@medic.upm.edu.my	• Berberis Vulgaris Fruit Extract as Potential Prevention Agent for Liver Cancer (Vitaberry Supplements)
8.	Prof. Dr. Maznah Ismail Tel: 03-8947 2115 maznah@medic.upm.edu.my	• TQRF (Thymoquinone Rich Fraction as Cardioprotective and Neuroprotective Agents
9.	Prof. Dr. Maznah Ismail Tel: 03-8947 2115 maznah@medic.upm.edu.my	• Production of GBR (Germinated Brown Rice) as Neutraceutical and Funtional Food-specialty Rice Bran Oil (RIBO Hypercolestrolemic
10.	Assoc. Prof. Dr. Vijayaletchumy Subramaniam Tel: 03-8946 8769 letchumy@fbmk.upm.edu.my	• Phonic Software, a Form of Tutor for Children with Visual Dyslexia

Table 1: The selected UPM researchers and their technologies/products for the UPM-MTDC Symbiosis™ Programme

Reader Enquiry
Norhadida Irdayu Mohd. Hanafi
UPM Research & Development Sdn. Bhd,
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
Tel: +603-8946 1632/1244 E-mail: irdayu1982@gmail.com

BACTERIOCIN UL4 (LACTONIC) – ANOTHER OPTION TO A HEALTHY LIFESTYLE

PRODUCT DESCRIPTIONS

- An antimicrobial compound that possesses vast applications in health, food and livestock industries
- No deleterious health effect but has an environmentally friendly proteinaceous inhibitory compound
- Produces by locally isolated "Generally Regarded as Safe" (GRAS) food-grade Lactic Acid Bacteria, identifying as *Lactobacillus plantarum* I-UL4
- Hydrolyses by proteolytic enzymes present in the gastrointestinal tract, hence no harmful health impact
- Exhibits broad inhibitory spectrum where it is able to inhibit a number of foodborne and clinical pathogens
- Possesses broad temperature stability in which it is able to withstand high temperature up to 121°C for 60 days
- Stable at pH between 2 to 8
- Vast potential as a bio-preservative for food and feed industries
- May not have to undergo stringent and extensive testing that is generally required for other new compounds before commercialisation

Reader Enquiry
Foo Hooi Ling
Department of Bioprocess Technology, Faculty of Biotechnology and Biomolecular Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
Tel: +603-8946 7476 E-mail: hlfoo@biotech.upm.edu.my

ORCHID LIFE – HIGH QUALITY ORCHID THROUGH MICROPROPAGATION

PRODUCT DESCRIPTIONS

- a technology for rapid propagation of value added orchid plantlet

PRODUCT ADVANTAGES

- the tissue-cultured plants are of superior and uniform quality
- profits are increased with reduced costs of production
- the superior/elite plants and subsequently the clones produced are a result of research and biotechnological processes
- the application of enzyme markers to predict the color and fragrance of the flower petals
- the application of DNA markers to determine the authenticity of the clones

PRODUCT AWARDS

- awarded "BioNexus Status" from Biotechcorp on the 30th October 2007
- awarded "1InnoCERT" with 'AA' rating from SME Corp./MIGHT (MITI/MOSTI) on the 31st May 2010 (1InnoCERT Certification)

Reader Enquiry
Maziah Mahmood
Department of Biochemistry, Faculty of Biotechnology and Biomolecular Sciences,
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
Tel: +603-8946 6703 E-mail: maziahm@biotech.upm.edu.my

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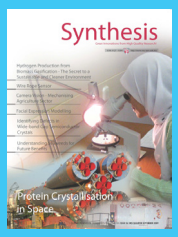

Editorial: A Proposal that Sells
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Research Highlight: Protein Crystallisation in Space

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- Wire Rope Sensor
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- Identifying Defects in Wide-band Gap Semiconductor Crystals
- Understanding Seaweeds for Future Benefits

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- *Bifidobacterium pseudocatenulatum* G4: A Potential Probiotic for Gut Health

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- An Efficient Technology to Control Ammonia Pollution
- Nucleotide Probes - For Quicker and Faster Detection of *Candida* Infections
- Affinity Precipitation - The Latest Discovery

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- MURoC 2010
- Cancer Awareness Carnival (3K)

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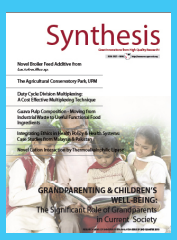

Editorial: Facts & Figures 2010
Research Highlight: Grandparenting & Children's Well-being: The Significant Role of Grandparents in Current Society

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- Integrating Ethics in Health Policy & Health Systems: Case Studies from Malaysia & Pakistan
- Novel Cation Interaction by Thermoalkalophilic Lipase
- Duty Cycle Division Multiplexing: A Cost Effective Multiplexing Technique
- Novel Broiler Feed Additive from *Lactobacillus sp.*
- The Agricultural Conservatory Park, UPM
- Guava Pulp Composition – Moving from Industrial Waste to Useful Functional Food Ingredients

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- Natural Gas Vehicle (NGV) Front Platform
- Agricultural Technology for Farmers
- World Engineering Congress 2010 (WEC 2010)

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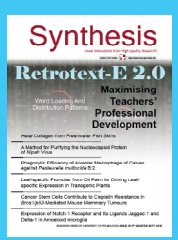

Editorial: Pursuit of a New Indicator: *h*-index
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- Cancer Stem Cells Contribute to Cisplatin Resistance in *Brca1/p53*-Mediated Mouse Mammary Tumours
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- Phagocytic Efficiency of Alveolar Macrophage of Calves against *Pasteurella multocida* B:2
- *Halal* Collagen from Freshwater Fish Skins
- Leaf-specific Promoter from Oil Palm for Driving Leaf-specific Expression in Transgenic Plants
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- UPM's Latest Products and Innovations
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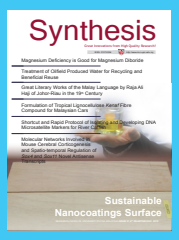

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- Magnesium Deficiency is Good for Magnesium Diboride
- Great Literary Works of the Malay Language by Raja Haji of Johor-Riau in the 19th Century
- Shortcut and Rapid Protocol of Isolating and Developing DNA Microsatellite Markers for Rivers Catfish
- Treatment of Oilfield Produced Water for Recycling and Beneficial Reuse
- Formulation of Tropical Lignocellulose *Kenaf* Fibre Compound for Malaysian Cars

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