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RÉPUBLIQUE FRANÇAISE
MINISTÈRE
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INTERNATIONAL

Present :

Bio-Asia

Bio-Asia 2015 Conference

20-22 May 2015 @Matrix Biopolis, Singapore

Workshop Programme and Abstract Book

Organised by :

INSTITUT FRANÇAIS
SINGAPOUR

UNESCO
United Nations
Educational, Scientific and
Cultural Organization

CONTENTS

WELCOME MESSAGE

On the behalf of the organising committee, it is my pleasure to welcome you to the 2015 Bio-Asia Conference. This is a regional programme implemented by the French Ministry of Foreign Affairs and International Development, in partnership with the Ministry of National Education, Higher Education and Research, and the French research organizations and higher education institutions, and in collaboration with the UNESCO Regional Science Bureau for Asia and the Pacific.

Through this workshop, we want to strengthen cooperation between France and Asian countries and be the catalyst for the development of collaborative research projects in areas such as: Biodiversity, Biotechnologies, Biochemistry, Food, Green Chemistry, Biomedical and Health.

These two and a half days will leverage on the existing collaborations between our countries and the strong expertise of our guest scientists to better stimulate dialogue, develop networks and create new growth potential in biological sciences research.

This 6th Bio-Asia seminar provides an extraordinary opportunity to meet scientists from France and all over Asia, in particular from Singapore, Vietnam, Malaysia, Japan, Cambodia, India, Sri Lanka, Pakistan and the Philippines.
BIO-Asia 2015 Call for Projects, to be issued by the end of the Workshop, will help to fund the best collaborative projects set up by Franco-Asian research teams in the relevant fields. We hope this workshop will offer a venue for potential partners to meet and, perhaps, start to discuss on high-level scientific cooperation projects with a mutual benefit.

In conclusion, we would like to express our gratitude to our partners and sponsors for their unstinting support. And a big thank you to all participants, for helping make the 2015 Bio-Asia Conference a resounding success.

Best regards,

H.E Mr Benjamin Dubertret,

Ambassador of France in Singapore

ORGANISING COMMITTEE

Pascal Loubière, Attaché for Science and Higher Education at Institut Français de Singapour (IFS)
Florent Beau, Deputy Attaché at IFS
Adeline Martin, Scientific Officer at IFS
Audrey Tay, Assistant to the Attaché at IFS
Philomène Robin, French International Technical Expert to UNESCO Asia-Pacific

INSTITUT FRANÇAIS

The Service for Cultural Cooperation and Cultural Action (SCAC) / Institut Français Singapour (IFS) leads and supports cultural, scientific and educational cooperation between France and Singapore. It promotes the teaching of French language, the French creative industries and the French savoir-faire in the fields of higher education and research.

It aims at strengthening the French influence in Singapore, while also acting as a centre of expertise. Facing current global challenges, IFS endeavours to promote French attractiveness and expertise through innovation.

Through the wide network of Institut Français in South-East Asia, IFS is able to build large-scale projects of significant impact in the region.

In order to achieve these goals, Institut Français Singapour benefits from partial financial autonomy. This enables IFS to launch innovative programmes such as "FIVE!" (for French companies in Singapore) and ambitious cultural festivals ("Rendez-Vous with French Cinema" and "Voilah!, French Festival Singapore").

http://www.institutfrancais.sg/?lang=en

United Nations Educational, Scientific and Cultural Organization

As Regional Bureau for Science, UNESCO Jakarta provides strategic expertise, advisory, monitoring and evaluation functions to Member States, other UNESCO Field Offices and UN Country Teams in the area of Science.

As Cluster Office, UNESCO Jakarta covers all UNESCO mandates: education, sciences, culture, communication and information. It is responsible for the implementation of related programmes in Brunei Darussalam, Indonesia, Malaysia, the Philippines, and Timor Leste.

UNESCO-Jakarta and French MOFAID signed a MOU in 2014 to jointly implement regional scientific projects and programs. Under this partnership, the Secretariat of BIO-Asia is posted at UNESCO-Jakarta.

http://www.unesco.org/new/en/jakarta/home/

BIO-ASIA PROGRAMME

BIO-Asia is a French initiative directed at Asia in order to strengthen, on the basis of mutual benefits, high-level scientific cooperation with and among Asian countries in the field of biology-related studies.

It aims to contribute to regional integration by driving a search for excellence and support for scientific communities in Asia, with a strong focus on ASEAN.

BIO-Asia contributes, through an annual Call for Projects, to the funding of research projects involving France and at least two partner countries in Asia. The overall purpose is to support the initiation of new collaborations, to facilitate the building of research networks , and to foster future participation in other regional or multilateral programs.

BIO-Asia Workshop

BIO-Asia regional workshop is held every year for attendance by researchers who have participated in or intend to participate in the program together with the representatives of French and Asian partner organizations. It offers a venue for dialogue between French and Asian scientists, with the objective of promoting further scientific cooperation (building of research teams for application to the Call for Projects, integration of participants to existing cooperation networks, dialogue between potential partners).

Objectives

- Strengthen the network of scientists in BIO research fields for further cooperation, eventually leading to the constitution of trilateral (or more) research teams;
- Offer a venue for open discussion on BIO-Asia programme and Call for Projects (priorities and eligible fields, terms of implementation, foreseeable evolutions of the programme and funding schemes, etc.) ;
- Offer a venue for the promotion of France-Asia multi-partners cooperation opportunities.

Target groups

The BIO-Asia workshop is open to:

Scientists from France, ASEAN member countries, Timor Leste , China (mainland), Taiwan, Hong Kong, Japan, South Korea, India, Pakistan, Nepal, Bangladesh, and Bhutan, in the relevant fields.

Representatives from:

- French and Asian public and private bodies supporting R&D, regional scientific cooperation and networking in BIO-related fields
- Offices in Ministries in charge of R&D and regional cooperation, ASEAN Sectorial bodies and centers in relevant fields

Expected outputs

- Strengthening of a Franco-regional network in the relevant fields ;
- Scientists to team up to submit projects under the 2015 BIO-Asia Call for Projects, eventually leading to long-lasting cooperation / international research teams with a capacity to apply to international call for projects.

Call for Projects

The yearly call for projects funds the costs of mobility, missions and international workshops. Applicant teams should consist of at least 1 researcher from an ASEAN country, 1 researcher from a second eligible Asian country (ASEAN or other) and 1 French researcher. Additional candidates are welcome.

The amount of the grant awarded by the French Ministry of Foreign Affairs is a maximum of € 40,000 for the two years of the project (or € 20,000 per project and per year, paid on an annual basis). In addition to this grant, the current main funding partners of the programme are the French research institutions (CNRS, IRD, IFREMER, INSERM, INRA and French universities).

Other Asian and European research and innovation structures (public or private), and international institutions can become full partners of the programme through the co-funding of the yearly Call for Projects.

The grant only funds the costs arising from the international nature of the project (ie travel, team missions and joint workshops). It may not, in any case, fund wages or research equipments.

Terms and conditions are available on CampusFrance website:
http://www.campusfrance.org/sites/default/files/bio-asie-uk.pdf

2015 Call for projects will be issued at the end of BIO-Asia workshop.
Publication on CampusFrance website is expected by the 8th of June 2015.
Deadline for applications: August 31st 2015.
Selection by November 2015.

Facts & figures

Since the beginning of the Programme in 2007, 4 BIO-Asia call of proposals have been launched and helped funding 27 projects involving 116 researchers, including 40 French researchers.

It is estimated that 60% of the teams are still working together after the end of their BIO-Asia projects. Around 20 PhD candidates have been trained with the support of BIO-Asia funds duringthis period.

Any queries please contact the Secretariat - Philomene ROBIN- p.robin@unesco.org

KEYNOTE SPEAKERS

Benjamin Seet

Executive Director, Biomedical Research Council
A*STAR

Dr Benjamin Seet is the Executive Director of the Biomedical Research Council, Agency for Science, Technology and Research (A*STAR). Prior to joining A*STAR, he served as Chief of the Singapore Armed Forces Medical Corps; Chief Army Medical Officer; and Chief Medical Officer of the United Nations Department of Peacekeeping Operations. Other appointments held included Visiting Consultant to the Ministry of Health; Director, Agri-food and Veterinary Authority; Director, Health Promotion Board; Chairman, Executive Committee, Singapore Bioimaging Consortium; and Chairman, InVivos Pte Ltd. He currently serves on the Board of the National Medical Research Council.

Dr Seet graduated with a Bachelor in Medicine and Surgery, and Master of Medicine from the National University of Singapore; is a Fellow of the Royal College of Surgeons in Edinburgh; and holds a Master of Public Health from Johns Hopkins University.

André de Bussy

Regional Counselor for development in ASEAN
French Ministry of Foreign Affairs

His career in international relations took him from Europe (London and Berlin) 1982 to 1995 as Director of students' international programs, to Washington DC 1996-1998 as European Adviser to the Chairman of NASSP Foundation, then to South East Asia (Cambodia, Laos, Thailand) 1998-2002 as Program Director for European Union, then Canada 2002-2006 as Director of Alliance française Toronto, finally to China 2006-2009 as country representative for Alliance française.

After one year in Protocol at the Ministry of Foreign Affairs and International Development in Paris in 2010 he was appointed Adviser to the Secretary General for the G8 and G20 at the French President's Office, where he coordinated the two summits and ministerial meetings 2010-2011.

In 2012 he was appointed Regional Counselor for Development in ASEAN based at the French Embassy in Jakarta where he currently develops strong links with ASEAN Secretariat and multilateral organisations such as European Union, ADB, World Bank.

Andre studied law and international relations at Clermont-Ferrand University in France.

PROGRAMME

TIME	EVENT	SPEAKER
Wednesday 20 May		
14:00 - 17:00	Choice of visits: research facilities or innovation hubs	
Thursday 21 May – Opening Session		
08:30 - 09:00	Registration and coffee	
09:00 - 09:20	**Welcome and Opening Remarks by guests of honour**	**Mr Bertrand Pous**, Counselor for Culture, Science and Education, French Embassy in Singapore **Dr Benjamin Seet**, Executive Director of BMRC, A*STAR
09:20 - 09:40	R&D landscape in Singapore and strategies in Biomedical Sciences	**Dr Benjamin Seet**, Executive Director of BMRC, A*STAR
09:40 - 09:50	Overview of scientific cooperation between France and Asia	**Ms Julie BLAZY,** Officer for Research and Scientific Cooperation with Asia and the Pacific, French MOFAID*
09:50 – 10:00	R&D challenges in South East Asia and French strategy	**Mr André de Bussy**, Regional Counselor for Cooperation -ASEAN, French MOFAID*

10:00 - 10-10	CNRS STRATEGIES IN SEA – FOCUS ON SG	**Mr Luc Le CALVEZ,** CNRS@ASEAN, Regional representative office for South-East Asia
10:10 - 10:30	Tea Break	

*MOFAID: Ministry Of Foreign Affairs and International Development

TIME	EVENT	SPEAKER
Thursday 21 May – Session A: Biotechnology		
10:30 - 10:50	A1. Mammalian microRNAs mediate repression predominantly by decreasing target mRNA levels	**Huili Guo**, Institute of Molecular and Cell Biology, A*STAR, Singapore
10:50 - 11:10	A2. Gold Nanoparticles Assembly on Surfaces for Nano-organization and Biosensing of small molecules	**Souhir Boujday**, University Pierre et Marie Curie, France
11:10 - 11:30	A3. Program for Rehabilitation and Restoration of Mined-out Areas through Phytotechnologies	**Teresita Perez**, Ateneo de Manila University, Philippines
11:30 - 11:50	A4. Mining of marine invertebrate glycoconjugates with anti-microbial activity	**Ken Kitajima**, Nagoya University, Japan
11:50 - 12:10	A5. Isolation and over-expression of cassava-derived Starch Synthase class IV for enhanced starch production in plant	**Le Thu Ngoc**, Vietnam Academy of Science and Technology, Vietnam
12:10 - 13:40	Lunch / Poster Session 1	

TIME	EVENT	SPEAKER
Thursday 21 May – Session B: Food		
13:40 - 14:00	B1. Exploring Biodiversity and Technological Innovation for Food Quality and Safety	**Son Chu-Ky**, Hanoi University of Science and Technology, Vietnam
14:00 - 14:20	B2. Current State of Extended Spectrum β-lactamase-producing Bacteria in Retail Food in Vietnam	**Yoshimasa Yamamoto**, Osaka Prefectural Institute of Public Health, Japan
14:20 - 14:40	B3. Antimicrobial resistance and occurence of resistant genes in *E. coli* and in three common *Salmonella* serovars isolated along the chicken value chain in Phnom Penh open market	**Kruy Sunlay**, Institut Pasteur du Cambodge, Cambodia
14:40 - 15:00	B4. Utilisation of dietary intake biomarkers to improve nutritional assessment	**Sumanto Haldar**, Clinical Nutrition Research Centre, Singapore
15:00 - 15:20	Tea Break	

TIME	EVENT	SPEAKER
Thursday 21 May – Session C: Biomedical and Health		
15:20 - 15:40	C1. Omics data analysis for human health and diseases: challenges in Asia	**Jean-Daniel Zucker**, Institut de Recherche pour le Développement, France
15:40 - 16:00	C2. Results of Phase III efficacy trials on Sanofi Pasteur's Candidate Dengue Vaccine	**Carina Frago**, Sanofi Pasteur, Singapore
16:00 - 16:20	C3. Drug like Molecules from Nature-New Paradigm in Pharmaceutical Research	**Muhammad Iqbal Choudhary**, University of Karachi, Pakistan
16:20 - 16:40	C4. 3D digital pathology by quantitative multimodal imaging	**Cyril Petibois**, University of Bordeaux - Inserm, France
16:40 - 17:00	C5. The Rise of Mobile Lab - The Use of SmartPhone Apps in Biomedical Research	**Samuel Ken-En Gan**, Bioinformatics Institute, A*STAR, Singapore
17:00 - 17:20	C6. Preclinical Models of Chikungunya Disease	**Pierre Roques,** DSV/iMETI, CEA, France
17:20 - 18:30	Poster Session 2	
19:00	Gala Dinner @ The Singapore Resort & Spa Sentosa	

TIME	EVENT	SPEAKER
Friday 22 May – Session D: Biotechnology		
08:30 - 09:00	Coffee	
09:00 - 09:20	D1. Data mining and evolutionary approaches for infrared spectroscopy chemometrics	**Valeriu Vrabie,** Université de Reims Champagne-Ardenne, France
09:20 - 09:40	D2. Co-grafting of rhamnolipids and antimicrobial compounds from Chinese Herbs on patterned gold surfaces: test for antifouling and antibacterial activities	**Claude Jolivalt**, University Pierre et Marie Curie, France
09:40 - 10:00	D3. Bioactive compounds of Sargassum species from Indonesia : potential application as antibacterial, antioxydant, antifouling and biofuel	**Ita Widowati**, University of Diponegoro, Indonesia
10:00 - 10:20	D4. Temporal gene expression patterns of dental pulp stem cells from carious tooth upon differentiation toward hepatocyte-like cells	**Nareshwaran Gnanasegaran**, University of Malaya, Malaysia
10:20 - 10:40	Tea Break	

TIME	EVENT	SPEAKER
Friday 22 May – Session E: Biodiversity		
10:40 - 11:00	E1. Assessment and rehabilitation of Philippine reef biodiversity: Towards improved coastal productivity and resilience to climate change	**Maria Ching Villanueva**, IFREMER, France
11:00 - 11:20	E2. Diversity, Bioactivity, and Secondary Metabolite Profiles of Bacteria Isolated from Different Tissue of the Mollusk Gastropod *Truncatella* sp	**Joyce A. Ibana**, University of the Philippines, Philippines
11:20 - 11:40	E3. Applying research developments and methodologies to monitor planktonic communities. Examples from Harmful Algae Blooms and Ballast Water activities	**Aurore Trottet**, DHI Water & Environment, Singapore
11:40 - 12:00	E4. National Cambodian Pharmacopoeia: a new tool for the quality control of the medicinal plants, the plant extracts and the plant-based medicines	**Sothea Kim**, University of Health Sciences, Cambodia
12:00 - 13:40	Lunch / Poster Session 3	

TIME	EVENT	SPEAKER
Friday 22 May – Session F: Green Chemistry		
13:40 - 14:00	F1. Carbon neutral, low pollution extraction and chromatography	**Mark Ritchie**, Waters Pacific, Singapore
14:00 - 14:20	F2. Eco-friendly Zeolite Nanoparticles as Effective Antioxidant in Halting Palm Oil Oxidation	**Ka-Lun Wong**, Universiti Sains Malaysia, Malaysia
14:20 - 14:40	F3. Bioprocess intensification: challenges related to transfer limitation - HTMS	**Gérard Goma**, Laboratoire d'Ingénierie des Systèmes Biologiques et des Procédés, INSA – INRA – CNRS, France **Kim Anh,** Ecole de Biotechnologie et Technologie Alimentaire , (IPH-EBTA), Vietnam
14:40 - 15:00	F4. Use of insects as animal feed - the Insect biorefinery	**Antoine Hubert**, Ynsect, France
15:00 - 15:20	Tea Break	
15:20 - 17:00	Panel Discussion with launch of Bio-Asia funding programme. Presentations from the Partners, priorities for Bio-Asia, evolution of the programme	
17:00 - 17:10	Closing Remarks	

ABSTRACTS – ORAL PRESENTATIONS

A1. Mammalian microRNAs mediate repression predominantly by decreasing target mRNA levels

Huili Guo[1,2,3,4,5,6,13], Stephen W. Eichhorn[4,5,6,13], Sean E. McGeary[4,5,6], Ricard A. Rodriguez-Mias[7], Chanseok Shin[4,5,8], Daehyun Baek[4,5,9,10,11], Shu-hao Hsu[12], Kalpana Ghoshal[12], Judit Villen[7], David P. Bartel[4,5,6]

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Abstract

Introduction: MicroRNAs (miRNAs) regulate target mRNAs through a combination of translational repression and mRNA destabilization, with mRNA destabilization dominating at steady state in the few contexts examined globally[1-3].

Methods and Results: Using ribosome profiling and RNA-Seq to measure translational efficiencies and mRNA expression levels respectively, we have extended the global steady-state measurements to additional mammalian contexts and find that regardless of the miRNA, cell type, growth condition, or translational state, mRNA destabilization explains most (66%–>90%) miRNA-mediated repression. We also determine the relative dynamics of translational repression and mRNA destabilization for endogenous mRNAs as a miRNA is induced. Although translational repression occurs rapidly, its effect is relatively weak, such that by the time consequential repression ensues, the effect of mRNA destabilization dominates.

Conclusions: These results imply that consequential miRNA-mediated repression is largely irreversible and provide other insights into the nature of miRNA-mediated regulation. They also simplify future studies, dramatically extending the known contexts and time points for which monitoring mRNA changes captures most of the direct miRNA effects.

Past benefits from cooperation with Asian or French research units: This work is done in collaboration with researchers at Seoul National University and the Institute of Basic Science in the Republic of Korea.

A2. Gold Nanoparticles Assembly on Surfaces for Nano-organization and Biosensing of small molecules

S. Boujday[1, 2,3*], M. Ben Haddada[1, 2], M. Huebner[4], Sandra Casale[1, 2], R. Niessner[4], M. Salmain[5], and D. Knopp[4]

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Abstract

Assembly of gold nanoparticles (AuNP) on planar surfaces is of great interest to many scientific communities: chemists, physicists, biologists, and the various communities working at the interfaces of these disciplines. Controlling the immobilization step, especially nanoparticles dispersion and coverage, is an important issue for all the applications. For subsequent functionalization of the assembled layer its stability is crucial, particularly for biosensors where beside the stability, reproducibility and reliability are crucial. We investigated the parameters governing the assembly, on gold and silicon substrates, including the nature of the terminal chemical function, the chain length and the protocol of nanoparticle deposition on Gold and silicon substrates. Surface characterization of gold nanoparticles layers was performed by Scanning Electron Microscopy (SEM), Raman and X-Ray Photoelectron Spectroscopy (XPS). These characterization techniques provided valuable data on gold nanoparticles binding to surfaces. The resulting nanoparticles layers were then used to prepare Infrared and/or Quartz Crystal Microbalance (QCM) biosensors for the specific detection of small molecules. The input of gold nanoparticles was established by comparing the efficiency of Au-NP sensors to classical sensors. Moreover, the stability of the gold nanoparticles layer upon the successive recognition/regeneration processes was studied by SEM. The optimal assembly protocol led to an extremely stable layer both in terms of coverage and dispersion.

References

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2. Ben Haddada, M., Blanchard, J., Casale, S., Krafft, J-M., Vallée, A, and Boujday, S., *Gold Bulletin, 2013, 46(4), 335–341*

A3. Program for Rehabilitation and Restoration of Mined-out Areas through Phytotechnologies

Perez, T.[1], Claveria, R.[1], Sikat, G.[1] ,Fernando, E.[2], Quimado, M.[2], Agoo, M[3]. and Banez, G.[3]

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The Philippines with it unique geological history is rich in biodiversity as well as mineral resources. Mining industry flourished with corresponding economic and environmental impacts. The Program for rehabilitation and restoration of mined-out areas through phytotechnologies aims a) to identify and study the bio-ecology and chemistry of indigenous metallophyte species that can be used in phytotechnologies to restore mined-out areas and b) to develop protocols for propagating metallophyte species for use as metal bio-indicators, and for phytostabilization and post-mining metal recovery. There are three projects under this program focused on a) Conservation of native metallophytes, phytochemistry of nickel hyperaccumulators and phytostabilization to restore mined-out areas in Palawan, Surigao, and Zambales using native metallophytes b) Metal bio-indicator plant species of the Philippines c) Copper and arsenic recovery as a post-mining activity using indigenous plant hyperaccumulators. This paper will present the output of the three projects under the program in consideration of the objectives such as identified metal accumulators and plant bioindicators of metal, propagation in plant nurseries and studies on the biology of metallophytes. Linkage with small scale miners and mining companies have been established for the application of the developed phytotechnologies.

A4. Mining of marine invertebrate glycoconjugates with anti-microbial activity

Ken Kitajima[1*], Yann Guérardel[2]

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Abstract

Organisms usually consist of a number of cells that contain heavily glycosylated molecules, such as polysaccharides and glycoconjugates (glycoproteins and glycolipids) on their outermost surface. It has been demonstrated that surface glycoconjugates play important roles in cell-cell interactions and cellular recognition through glycan-mediated interactions. When pathogenic bacteria or virus are attached on host cells during their pathogenic process, host cell surface glycoconjugates are recognized by glycan-recognition molecules of the pathogenic organisms. This recognition process is essential for the pathogenesis. It is known that glycan epitopes recognized by pathogenic organisms are useful for designing inhibitors for the pathogen-host interactions. The objective of this study is to explore the capability of marine natural resources to provide new alternatives for the treatment of infectious diseases by identifying glycan-based anti-adherence molecules toward pathogenic organisms that colonize human and cattle digestive tract. Rationale for this idea came from out own results that marine invertebrates contain mammalian mimicries of glycan epitopes in their glycoconjugates. In this report, we showed that glycoconjugate fractions prepared from an ascidian *Halocynthia roretzi* had the activity to inhibit *Helicobacter pylori* adherence to the cultured epithelial cells *in vitro* and that the interaction of *H. pylori* with the gastric epithelium was actually reduced in the mice treated with the glycoconjugate fractions. We also show potential usefulness of glycoconjugate fractions from other marine animals as therapeutic molecules that inhibit other pathogenic organisms adherence to host cells. It is concluded that glycoconjugates from marine invertebrates has high therapeutic potentials for pathogenic diseases. Finally, it should be pointed out that our long collaboration of the Japanese and French groups has been expanded to strong collaborations with Thai groups studying marine organisms.

A5. Isolation and over-expression of cassava-derived Starch Synthase class IV for enhanced starch production in plant

Le Thu Ngoc[1], Nguyen Van Doai[1], Nguyen Thi Minh Hong[1,2], Pham Bich Ngoc[1], Chu Hoang Ha[1*]
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Abstract

Cassava (*Manihot esculenta* Crantz) is a root crop belonging to section fructicosae of family Euphorbiaceae, Dicotyledonae. The starchy roots of cassava are a valuable source of calories for about 600 million people in the developing tropical countries. The crop improvement towards increasing starch yields is one of significant research directions and attracts a lot of attention. So far, many efforts have been done to increase the starch accumulation largely focused on enhancing the activity of enzymes involved in starch biosynthesis pathways by genetic engineering. Among these enzyme candidates, Starch Synthase class IV was proved as one of the regulatory steps involved in the control of the amount of starch accumulated in plastids. In this work, we isolated the complete cds sequence of *MeSSIV* gene encoding cassava Starch Synthase IV, produced *MeSSIV* transgenic tobaco lines and investigated the effect of overexpressing *MeSSIV* in the amount of starch accumulated in tobaco leaves. The *MeSSIV* gene of 3186 bp in length was successfully amplified from cDNA of cassava variety KM94 and then was TOPO-cloned into vector pENTR/D. Nucleotide sequencing result showed that the isolated *MeSSIV* gene is 99% similar to the CDS sequence of *MeSSIV* on Phytozome. Construction of the plant transgenic vector was then performed and the *Agrobacterium tumefaciens* strain C58/pGV2260, which contains the *MeSSIV* gene controlled by the promoter 35S in binary vector was subjected for transformation of *Nicotiana tabacum*. The result of Southern blot demonstrated the integration of the T-DNA into plant genome with the copy number of the transgenic gene varied from one to two copies. Northern analysis of RNA isolated from leaf tissue showed the strongest expression of the *MeSSIV* gene in five transgenic lines. Interestingly, these plants displayed an increase in the levels of starch accumulated in the leaves, approximately 10%–30% higher than WT plants. These results indicated that over-expression of *MeSSIV* is one of effective strategies for enhanced starch production in plant.

Keywords: *Agrobacterium tumefaciens*; cassava; plant transformation; starch production, Starch Synthase IV, tobaco.

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2. Yang Z, Wang Y, Xu S, Xu C, Yan C (2013) Molecular evolution and functional divergence of soluble starch synthase genes in cassava (manihot esculenta crantz). *Evol Bioinform Online 9*: 239–249.

B1. Exploring Biodiversity and Technological Innovation for Food Quality and Safety

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Abstract

Food quality and especially food safety issues have reached a dramatic level in most Asian Countries. In its "integration program" ASEAN has put food security as one of its 12 priorities. It is abundantly documented that most of these problems are due to both qualitative and quantitative limitations in the management of food safety and quality. Numerous attention and research work have focused on the exploring the underexploited biodiversity in South Est Asia region and technological innovation to improve the quality as well as to manage food safety. That why a regional network with support of some French partner have been set up based on the regional need, partner expertise and strong cooperation. This network is composed of 14 dynamic and active partners from France (IRD, CIRAD, AgroSup Dijon), Thailand (AIT), China (YU), Indonesia (IPP) and Vietnam (HUST, VAST, VNUA, FIRI, NTU, CTU, HCMUT, HUFI), who have been involved in the PCSI project (http://pcsi2013.hust.edu.vn) funded by the Agency for French Speaking Universities (AUF) during 2013-2014, BioAsia-ESTAFS funded by French Ministry of Foreign Affairs during 2013-2015 and the Joint AgroSup Dijon – HUST Laboratory "Tropical Bioresources & Biotechnology" (www.umr-pam.fr/relation-internationale/tropical-bioresources-biotechnology.html). Our presentation will share experience to set up this network across the region and with French partners, highlight our original research interests as well as future prospects with respect to North-South and South-South interactions. We will overview and point out some interesting research results related to the successive projects associated to this network (BioAsia, PCSI, TBB) such as ethnobotanical research in two regions of northern Vietnam and Central Java (Indonesia), antibacterial properties of essential oils of Lisea cubeba in aquaculture and biodiversity of actinomycetes associated with medicinal plants as well as lactic acid bacteria in Vietnamese traditional fermented foods.

B2. Current State of Extended Spectrum β-lactamase-producing Bacteria in Retail Food in Vietnam

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Abstract

Food contaminated with multi-antibiotic resistant bacteria, particularly extended spectrum β-lactamase (ESBL)-producing Enterobacteriaceae, is considered to be a potential source for the wide dissemination of ESBL-producing bacteria among communities. However, little is known about the extent of contamination of food with ESBL-producing bacteria in developing countries such as Vietnam. This study was conducted to assess the characteristics of ESBL-producing *Escherichia coli* isolated from retail foods in Nha Trang, Vietnam. Food samples (total, 350) were purchased in July and November 2013 from a local market. Homogenates of these food samples were plated on cefotaxime-supplemented tryptone bile X-glucuronide agar. The colonies grown were confirmed ESBL-producing *E. coli.* The isolates were assigned to various phylogenetic groups, and assessed for the expression of β-lactamase-encoding genes by multiplex PCR. Antibiotic resistance profiles were obtained by the disc diffusion method. The results revealed the high prevalence of ESBL-producing *E. coli* in retail foods (40.6%). The prevalence of contamination was observed to be the highest in poultry (58.7%), followed by pork (32%) and shrimp (18.3%). We also observed the expression of the *bla*CTX-M-1 (50.7%), *bla*CTX-M-9 (41.5%), *bla*TEM (59.9%), and *bla*SHV (2.8%) groups. A large number of single isolates obtained in our study expressed two or three ESBL genes (54.2%, 77/142). We observed an 85.9% prevalence of multi-drug resistance (MDR; resistance to ≥3 antimicrobial groups) in ESBL-producing *E. coli* isolated from the food samples. Our findings indicated that retail foods are contaminated with ESBL-producing *E. coli*, many of which were resistant to multiple antibiotics. Since the wide dissemination of MDR ESBL-producing bacteria in communities can be a major threat to public health, further monitoring and greater public health efforts targeting food administration is required to control the spread of ESBL-producing bacteria in communities. This study was supported by the Vietnam Ministry of Health and the SATREPS program, Japan.

B3. Antimicrobial resistance and occurence of resistant genes in E coli and in three common Salmonella serovars isolated along the chicken value chain in Phnom Penh open market, Cambodia, 2012-2013

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Abstract

A study was conducted in Cambodia in chicken farms and chicken slaughter chains to evaluate *Escherichia coli* and *Salmonella* prevalences, resistances and resistant genes to antibiotics currently used in human. Samples were 80 feces, and 682 market samples. The identification of micro-organisms used standard methods. Susceptibilities were performed by agar diffusion methods. The identification of resistant genes was obtained by PCR methods.

All market samples were positive for *E coli*. In total 376 *Salmonella* isolates were obtained from the samples and classified into 53 serovars, with three serovars accounted for 48.1% (Albany, Corvallis, and Kentucky).

The *E coli* resistance reflected two *E coli* populations from farm and market environments. Percentage of resistant salmonella to sulfonamide, and tetracycline was high in the three serovars (Albany, Corvallis and Kentucky.

Most of *E coli* resistant to aminoglycoside carried *StrA* and *StrA + aadA* genes. The *StrA* gene occurred in 90% of *Salmonella* Corvallis resistant to aminoglycoside.

The *sul2* gene was the more prevalent in *E coli* and *Salmonella* Corvallis resistant to sulfonamide. In contrast the *sul1* gene was predominantly found in *Salmonella* Albany and *Salmonella* Kentucky. The *Tet(A)* gene was observed in *E coli*, *Salmonella* Corvallis, and *Salmonella* Kentucky resistant to tetracycline. The *gyr*A gene occurred in *E coli*, *Salmonella* Albany, *Salmonella* Corvallis, and *Salmonella* Kentucky resistant to nalidixic acid.

Our study shows that chicken value chains are reservoirs of several resistant genes to antibiotics used by human. This may have implication in human public health.

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B4. Utilisation of dietary intake biomarkers to improve nutritional assessment

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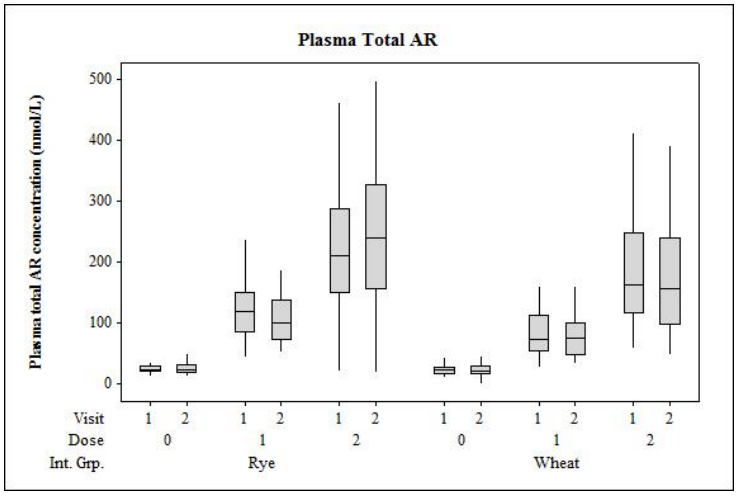
Abstract

Accurate and objective assessment of food and nutrient intake is one of the most challenging aspects of nutritional sciences. This is because traditional dietary assessment methods based on subject recall have considerable random and systematic errors. These include poor recall ability and/or record keeping, inaccurate portion size estimation, inappropriate food composition data. To overcome some of these problems, dietary intake biomarkers are increasingly being used as objective measurements, undertaken mainly in biological samples such as blood, urine etc.

In a recent study we have explored the utility of plasma alkylresorcinols (AR) as biomarkers of whole grain wheat (WGW) or whole grain rye (WGR) intake within the UK dietary setting. A randomised parallel-group dietary intervention was carried out with 68 volunteers. No WG foods were consumed for 4 weeks (Dose 0), followed by consumption of 3 servings/d of either WGW or WGR foods (Dose 1; 48 g/d) for 4 weeks, further followed by consumption of 6 servings/d of the same foods (Dose 2; 96 g/d) for the final 4 weeks. Plasma ARs were measured twice, two days apart, at the end of each intervention period. Changes in plasma total alkylresorcinols with increasing intake of wholegrain are shown in the figure below.



We found that all AR homologues and total AR were strongly (R>0.66; p<0.0001) correlated with reported WGW and WGR intake. Favourable associations between several markers of cardiometabolic disease risk (e.g., LDL cholesterol, glucose, blood pressure) and that of plasma alkylresorcinols were also found, supporting the widely accepted notion that wholegrain foods may reduce the risk of cardiovascular diseases. Using existing analytical platforms and expertise from reputed institutes in France, further collaborative research can be undertaken to explore targeted and non-targeted biomarkers to better assess diet-disease association here in Singapore.

C1. Omics data analysis for human health and diseases: challenges in Asia

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Abstract

Omics, the emerging trend of integrative biology research, has become a popular yet challenging approach in life science. Aiming at a systematic and broad understanding of the structure, function, and dynamics of an organism or a biome at molecular level, omics includes but not limited to genomics, transcriptomics, epigenomics, metabolomics, lipidomics and metagenomics. Generally, each relies on two components: high-throughput experimental technologies to collect data and scalable data analysis techniques. One ultimate goal is to translate omics analysis into applications in health, agriculture, etc. While genome projects of medium and large scale is much more feasible now with next generation sequencing (NGS) than in the 2000s (Human Genome Project), the challenge is, however, to process the huge amount of heterogeneous data and interpret the results. The optimal research environment where wet and dry lab scientists working closely together requires both large lab/sequencing facilities and computing system. Although laboratories in developed countries are clearly leading omics research, there are significant benefits in building capacity for achieving high-level scientific one in developing countries generally and in Vietnam particularly. Indeed, the notion that developing countries should wait for advances in science and technology and later import at great cost has recently been challenged [1]. Furthermore, there are location dependent problems, especially in health, that need the involvement and then taking over of local scientists in developing countries. With that vision in mind, we initiated a project for Human Health and Diseases in Vietnam (called HealthOmics) capitalizing on researchers from USTH departments (ICT and Biopharma), Vietnamese Academy of Science and Technology and Oxford Wellcome Trust (OUCRU, Vietnam). We have developed new predictive approaches to handling high dimensional metagenomic data [2,3] applied to obesity-related diseases and are looking for collaboration in Asia in omics data mining and analysis.

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C2. Results of Phase III efficacy trials on Sanofi Pasteur's Candidate Dengue Vaccine

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Abstract

Globally, approximately 3.9 billion people are at risk of acquiring dengue in 128 countries[1]. The World Health Organization (WHO) estimates up to 390 million infections per year with 500,000 individuals developing severe dengue necessitating hospitalization[1]. Sanofi Pasteur (SP) is committed to developing a safe and effective dengue vaccine that will be accessible to all regions of the world where dengue is a public health issue.

Two phase III efficacy trials on SP's recombinant live attenuated tetravalent dengue vaccines are ongoing in Asia Pacific and Latin America. Both studies were randomized, observer-blind, multi-center trials to determine the efficacy of the dengue vaccine in preventing symptomatic virologically confirmed dengue (VCD) cases after three doses. A total of 10, 275 children aged 2 to 14 years old in Asia and 20,869 children 9 to 16 years old in Latin America who received either dengue vaccine or placebo were followed up for occurrence of VCD and evaluated for safety [2,3].

Over the 25-month active phase surveillance, consistent results were observed in the two studies[2,3]. Both studies met their primary endpoints with vaccine efficacies of 56.5 % (95%CI 43.8; 66.4) in Asia[2] and 60.8 % (95%CI 52;68) in Latin America[3]. Both studies demonstrated clinically important reductions in severe disease and hospitalizations due to dengue[2,3]. Similar safety profiles were also observed between the two trials[2,3].

The results of the trials are promising: SP's candidate vaccine could potentially prevent dengue and contribute to the WHO goal of reducing morbidity by at least 25% and mortality by at least 50% by 2020.

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C3. Drug like Molecules from Nature-New Paradigm in Pharmaceutical Research

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Abstract

Modern drug development is an expensive and lengthy process, which needs a focused work of a large interdisciplinary team of scientists involving years of work and screening of a large chemical space. This level of investments and human resources are only available with the large multinational conglomerates. Unfortunately this situation has out-resourced the academic institutions and pharmaceutical R & D of developing nations. The role of academic institutions in drug development, particularly in developing countries, is gradually diminishing. Ironically, the decision of developing a drug by multinational companies is largely based on economic feasibility, rather than human-need based. As a result, several diseases affecting the lives of poor population of the South remains untreated. During the presentation, results of our research on medicinal plants will be presented to prove that the knowledge-based research on the medicinal flora is a key to discover potential drug candidates at low cost.

Multidrug resistance is a challenging problem for the healthcare sector. We have discovered several novel and potent inhibitors of MDR *Staphylococcus aureus* from natural sources. Resistance-reversal studies at molecular level were carried out by employing flow cytometric and microscopic techniques. Synergistic and partial synergistic effects of these compounds, in combination with antibiotics, were investigated. This work has so far resulted in the identification of novel "helper molecules", which can increase the efficacy of existing antibiotics to over 1000-fold in some cases.

Hyperglycaemia, or raised blood sugar, is a common feature of uncontrolled diabetes. Diabetic patients are prone to long-term complications, such as retinopathy, cataract, atherosclerosis, neuropathy, nephropathy and impaired wound healing. Current treatments of diabetes are largely ineffective. Among different therapeutic interventions, the discovery of effective *α*-glucosidase inhibitors and antiglycating agents are considered to be the most important one. Primary focus of these studies has been to discover lead molecules by using appropriate mechanism-based biological screening techniques. As a result, a large number of potent antiglycation agents, and ·-glucosidase inhibitors of natural origin were discovered.

C4. 3D digital pathology by quantitative multimodal imaging

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Abstract

The '3D-digital-pathology' project aims at developing the first 3D multimodal imaging solution able to perform a microscopic analysis of tissue contents. The aim is to create the complete pipeline for 3D pathology, from multimodal acquisition using a common imaging contrast agent (Au-NPs, developed in Singapore[1]), to treatments and visualization. IR microscopy will be developed as a 3D chemical analysis method (developed in France[2]) and X-ray tomography allows a large-scale anatomical visualization of tissue structures (developed in Taiwan[3]). The quantitative approaches achieved with these techniques are critical for 3D reconstruction methods and for merging anatomical and chemical data into overlaid 3D images. Another major advance is provided by the global chemical information extracted from IR spectra and translated into biological and chemical/molecular data, which has never been developed before for 3D imaging of biological objects. It allows an automated comparison of samples by using bioinformatics and biostatistics solutions in a HPC datacenter with web-access to further enlarge our collaboration network. This project is thus anticipating on the development of e-diagnostic solutions, notably by merging conventional histological analyses with non-supervised chemical analyses. With different levels of pre-treatment of 3D image contents, the aim will be finally to develop manipulation tools allowing to visualize fine details of tissues within the large dataset defined by its chemical contents. The benefit for French and Asian research units will be to develop a new technological resource with large image databanks for a multidisciplinary biological research. This research project will also lead to the development of a pre-industrial technological chain for diagnostic routines and medical research in hospitals.

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C5. The Rise of Mobile Lab - The Use of SmartPhone Apps in Biomedical Research

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Abstract

Mobile apps have invaded almost every aspect of life, yet there remains very few that are relevant for biomedical experimental research. The entry of the few mobile app directly targeted at experimental processes have already promised to revolutionize biomedical research. This revolution can come strongly increasing the convenience associated with analyzing experiments in the laboratory, and potentially displacing certain lab equipment with the smartphone. In the progress towards a mobile experimental lab, we created a number of biomedical apps and made them available in popular mobile app stores - Google Play Store and Apple App Store. Apps created include DNAApp, GelApp, DNA2App, and PsychVey.

In DNAApp and DNA2App, the process of analysis of sequences were made into Android and iOS apps. Previously a process predominantly done by laptops and desktops, analysis of sequences and ab1 files can now be easily be carried out on the smartphone. To reduce estimation errors on gel electrophoresis bands, GelApp, an app on Android and iOS incorporating image analysis technologies such as Garbor filter, now allows better automated detection of gel and SDS-PAGE electrophoresis bands. Together with the generation of a standard curve from the known standards, estimation to band sizes are now more accurate, allowing more accurate reporting and a spring towards quantitative biology for electrophoresis.

To stimulate research in this area in harnessing the potential of such app developments for a true incorporation of the smartphone as biomedical lab equipment, we have thus launched the first journal of this field – Scientific Phone Apps and Mobile Devices (SPAMD).

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C6. Preclinical Models of Chikungunya Disease

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Abstract

Chikungunya virus (CHIKV) is an old world alphavirus that provokes persistent myalgia/arthritis in humans. Since the 2005-2006 outbreaks of the ECSA CHIKV strain in the Indian Ocean Islands, several countries in Asia have reported outbreaks that involved millions of cases. Since late 2013, the Asian CHIKV strains have spread to the Americas where ongoing transmission continues to occur. CHIKV chronicity was observed in up to 30% of the cases that could become a public health emergency.

In France, using a non-human primate (NHP) CHIKV infection model, we investigated alphavirus pathogenesis in order to identify potential key events involved in the disease persistence and to provide a pre-clinical model in which we tested therapeutic and vaccination strategies. Evaluation of cytokines and antibody responses during acute and chronic phase in NHP was compared to data from Singapore patients. Mouse models were developed in Singapore to assess disease mechanisms.

The clinical picture of CHIKV disease in immune competent adult macaques recapitulated the fever, rash, arthritis found in humans. Persistent CHIKV infection in macrophages for months is associated to the chronic disease. CHIKV infection was associated with a substantial increase in pro-inflammatory cytokines, chemokines and macrophage infiltrations. Neutralizing antibody response in human and macaque is mainly directed against a single E2EP3 epitope both in humans and macaques that provided clues to improve vaccination strategy against CHIKV.

Demonstration of the role of specific antibody response performed in Singapore and patient population allowed for better disease description that is now used in the evaluation of vaccine candidates funded by the EU that involved the two groups.

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D1. Data mining and evolutionary approaches for infrared spectroscopy chemometrics

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Abstract

Infrared spectroscopy provides useful information of the molecular composition of biological systems. MIR reflects fundamental molecular vibrations and NIR overtones and combinations of fundamental vibrations and bonds. Being sensitive to organic and inorganic components, these techniques have a growing interest for various applications.

Due to their complementary nature, an important challenge is to combine MIR/NIR information. Since not all spectral information is worthy, especially for high-dimensional (combined) spectra, another important challenge is to identify discriminating wavenumbers. We present here two approaches: outer product combination of spectral information, which allows to highlight mutual information between fundamental vibrations and their combinations; wavenumbers selection by a genetic algorithm (search heuristic approach) and a sequential quadratic programming method (nonlinearly constrained optimizer), allowing to discriminate samples within an objective function.

We show for a specific application, the evaluation of the degradation of lignocellulosic biomasses with different kinetics (hours for enzymatic conversion and days for soil decomposition), that the outer product allows a better discrimination of the biodegradation kinetic as compared with the simple concatenation or the use of MIR/NIR spectral information separately. Imposing as objective function a measure of the clustering of samples within the biodegradation process, both genetic and constrained nonlinear algorithms allow identifying the most discriminant wavenumbers which, in addition, correspond to the main chemical functional groups of compounds which undergo degradation of the lignocellulosic biomass [1]. The choice of preprocessing methods can be also done by data mining methods [2], including bootstrapping if the number of samples is limited.

Such data mining and evolutionary approaches can be adapted in other domains, especially biomedical, health and food sciences, for a wide range of applications as for example to analyze (peri)tumoral areas [3,4], as well as to other acquisition methods including Raman, mass spectroscopy, etc. They may be of potential interest for developing new research collaborations with other academics and industry partners.

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D2. Co-grafting of rhamnolipids and antimicrobial compounds from Chinese Herbs on patterned gold surfaces: test for antifouling and antibacterial activities

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Abstract

The adaptation of modern scientific approach to the research on Traditional Chinese Medicine (TCM) herbs without losing its experience-based merit is the challenging objective of this project. Screening of TCM plants extracts has been extensively performed and has led to the discovery of a number of biologically active compounds that are likely to provide important clues for developing drugs adapted to targeted antibacterial treatments for local use. In that context, we propose to develop innovative patterned surfaces allowing subsequent spatially controlled grafting of antimicrobial compounds from TCM. Antibacterial activity of these engineered biomaterials would be based on the combination of the antibiofilm activity of glycolipids, either from microorganisms or from plants, and the ability of smaller molecules such as baicalein from Scutellaria baicalensis (黃芩[1]) or berberine from Coptidis chinensis (黃芩), known to interact with bacterial membranes[2]. Preliminary experiments have shown the efficiency of rhamnolipids produced by *Pseudomonas aeruginosa* and berberin covalently immobilized on functionalized gold surfaces via self-assembled monolayers (SAM) of thiols. The functionalization was characterized at each step by reflection absorption IR spectroscopy (RAIRS) and XPS[3]. Functionalized surfaces were then tested against both Gram positive (*Staphylococcus. aureus* and *Listeria ivanovii*) and Gram negative bacteria. Further experiments will aim at testing combination of these molecules on patterned surfaces. Targeted medical devices are materials to be implanted in body.

The French and Hong Kong partners have established joint research within an International Associated Laboratory (LIA) - Laboratory of Molecules from Traditional Medicine, a joint project between the CNRS and CUHK since January 2009. LIA aims at providing a scientific basis for clinical usage of traditional Chinese medicine (TCM) and the identification of new potential compounds allowing the development of safe and effective drugs in combating microbial infections.

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D3. Bioactive compounds of *Sargassum* species from Indonesia : potential application as antibacterial, antioxydant, antifouling and biofuel

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Abstract

As an archipelagic country with 95.181 km long coastline, Indonesia has great potential as the producer of seaweeds. The marine brown macroalgae (Sargassum) are known to produce molecules which are attractive for diverse industries and spreading along Indonesian coasts.

The purpose of this study is to analyze the antibacterial (Villareal-Gomez *et al.;* 2010); antioxidant activity (Matanjun, 2008) ; antifouling (Bazes *et al.* ,2009) and biofuels (Horn, et.al, 2000) of *Sargassum*. The research was held by Integrated Lab-Diponegoro University (UNDIP), Indonesia in cooperation with LCBM lab-University of South Brittany (UBS) and LEMAR lab-University of Western Brittany (UBO), France.

Results indicated the most effective antibacterial activity against *S. aureous* was from *S. echinocarpum*; *S. duplicatum* was most effective against *E. coli*. These two species showed radical scavenging activity. Extract of Sargassum added in moisturizer cream inhibit the development of bacteria even after one (1) year of storage. *S . polycystum* showed the best antifouling activity. The bacterial symbionts of *S. duplicatum* were active against microfouling isolates. *S. crassifolium* was the best potentiality produces biofuel as it contains highest glucose.

In conclusion, the Sargassum from Indonesia contains antibacterial and radical scavenging, antifouling and biofuel potentiality properties. This genus was potential to be developed for pharmaceutical or cosmetics industry.

The on going SALINA project aims to establish a collaborative research program between UNDIP, MMS Lab-University of Maine and UBS, France.

The objectives is to bioprospect Indonesian microalgae to verify their potential biological activities in vitro in the lab, and in vivo, in realistic aquaculture set-up. The analysis of different physiological markers is also planned within the tissues of the crustaceans/bivalves. The aim of this collaboration is to reinforce the scientific and education France-Indonesian network in Marine Sciences and dissemination of knowledge through international publications.

D4. Temporal gene expression patterns of dental pulp stem cells from carious tooth upon differentiation toward hepatocyte-like cells

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Abstract

Introduction

The discovery of dental pulp stem cells (DPSCs) has opened up an array of possibilities in regenerative medicine [1, 2]. These cells, which can either originate from deciduous (SHED) or permanent tooth, have shown to have stem-cell-like qualities, including self-renewal and multi-lineage differentiation capability. Apart from healthy DPSC, the next most viable source worth exploring are those that originate from carious teeth (DPSC-CT). However, there is a huge void in terms of understanding the mechanisms behind these disadvantages. We have previously shown the capacity of these cells to differentiate towards hepatocyte-like cells upon exposure to induction media. To understand the temporal changes in terms of gene expression that took place during the differentiation process, we have employed epithelial-mesenchymal transition (EMT) PCR array and observed for distinct patterns.

Methods

Pulp tissues from healthy and carious teeth were isolated (n=3) and processed as described previously [3]. At passage three (P3), these cells were exposed to chemically-defined induction media to differentiate them toward hepatocyte-like cells for 21 days. At the end of differentiation period, RNA from both cell lines were harvested, reverse-transcribed and were checked for gene expression using EMT PCR array.

Results

Since we used an EMT based PCR array, we categorized the genes into eight categories and further divided each category into 3 sections. The sections containing markedly expressed genes (CT value < 30) were further analyzed using DPSC as control. In all of these eight categories, at least 50% of genes involved were down-regulated signifying the mesenchymal-epithelial transition (MET) process taking place during the course of differentiation.

Potential benefits from co-operation with Asian or French research units

The potential of DPSC-CT can be enhanced and further explored for regenerative medicine purposes.

Conclusion

Gene expression profile of DPSC-CT during the differentiation toward hepatocyte-like cells were described and highlights their potential to serve as an alternative cell source for liver regeneration.

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E1. Assessment and rehabilitation of Philippine reef biodiversity: Towards improved coastal productivity and resilience to climate change

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Abstract

The Philippines occupy one of the highest coral[1]and reef fish diversity[2]in Southeast Asia. Coastal areas offer a lot of ecosystem services including economic prosperity and food security due to high fish production and diversity, but are threatened by overfishing (including destructive fishing), coral mining, siltation, pollution, and climate change-related disturbances (i.e., super-typhoons and ocean acidification)[2,3]. The country hosts about 10% (over 500) of the world's total MPAs although only a quarter of this is properly enforced[4]. Country-wide quantitative assessment of reef fish species diversity, abundance and distributions was made in 97 marine reserve (MR)sites from March 2012-August 2013.Total species richness and abundance were recorded and potential effects of MRs tested then mapped. Three national reef status categories were estimated from transect-based abundance and distribution then related to life-history information. Results show that the country still holds a high number of non-cryptic reef fish species (367) but at low abundance and restricted distribution. Most species are small (<30cm) with a depletion of large-sized (>30cm) fishes. The state of reef fish abundance is poor and shows signs of risk of local extirpation. Rehabilitation, enforcement of existing MRs and management of fishing grounds are needed to ensure continued productivity of coastal biodiversity. There is a need for multi-stakeholder cooperation that aims to improve state assessment and monitoring of Philippines and Southeast Asian coastal ecosystems for better conservation and management. Systematic regional-scale evaluations of abundance and distribution can be useful for broad-scale MR implementation as countermeasures against over-exploitation and climate change. Effective MRs needs an understanding of organisms' interconnectivity among different habitats[2] and consideration of on site-specific factors[5].It seems that fish abundance and biodiversity tends to improve in long-term enforced no-take MRs and healthier reef habitats[6,7,8] - thus, further research is needed to achieve such for many parts of the Philippines and SE Asia.

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E2. Diversity, Bioactivity, and Secondary Metabolite Profiles of Bacteria Isolated from Different Tissue of the Mollusk Gastropod Truncatella sp.

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Abstract

The emergence of drug resistance for many diseases has been for decades the driving force behind the pursuit of naturally-occurring bioactive compounds. Among the candidate drug leads, marine sources are one of the most promising, owing to the vast biodiversity of marine organisms. However, marine gastropods with shells are an overlooked source of bioactive secondary metabolites because they are well-protected by their shell covering and some produce venoms. *Truncatella* is a genus of small gastropod mollusks that are found on land that is very close to seawater. Indeed, like many other shell-mollusks, no prior studies on bacteria that are associated with *Truncatella* sp. have been reported. Thus, in this study, bacteria were isolated from different tissues of *Truncatella* to assess the diversity of cultivable bacterial communities that are associated with this mollusk using 16S rRNA gene sequence analyses. Further, secondary metabolites from the isolated microorganisms were tested for selective antimicrobial activity using a panel of different types of microorganisms including a gram positive pathogen, *Staphylococcus aureus*; gram negative pathogens, *Pseudomonas aeruginosa, Klebsiella pneumoniae*; and commensal *Lactobacillus* sp. Their selective anti-cancer activities were also evaluated by MTT cytotoxicity assay using different human cancer cell lines of different origins including MCF-7 (breast), A549 (lung), and HCT116 (colorectal). A non-cancer cell line, MDCK (kidney), from *Canis familiaris*, was used as a normal cell control. Importantly, the chemical profiles of methanolic extracts from microorganisms that exhibit significant bioactivity were determined by reverse-phase high performance liquid chromatography. Results from this study will be presented as they provide valuable insights on the diversity of resident microbial communities associated with *Truncatella*, and their potentials as source of bioactive compounds with narrow spectrum antimicrobial activity or selective cytotoxic activity.

E3. Applying research developments and methodologies to monitor planktonic communities. Examples from Harmful Algae Blooms and Ballast Water activities

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Abstract

Singapore lies in a biodiversity hotspot and is considered very rich in species due to its geographic position and climate. To understand Singapore's aquatic ecosystems, it is essential to first determine the composition of planktonic assemblages and assess their functional diversity. Phytoplankton organisms are at the base of the aquatic food web in marine and estuarine ecosystems, they are fed by zooplankton which themselves are predated by larger organisms. Therefore plankton, reflects how productive and ecosystem can be. However, they are also responsible for many invasions across ecosystems partly due to shipping activities and some species occasionally create blooms which may kill entirely other species in the ecosystems such as naturally occurring fish species but also raised organisms (affecting aquaculture productions of example).

Two examples where DHI group scientists have applied research and development skills will be presented:

1- Harmful Algae Blooms (HABs) affect local and transnational business by generating fish kills and visible "biological pollution". Local farms in the coastal region of Singapore have suffered from repeated major losses, with the latest incident claiming almost 600 tonnes of fish from 55 farms in March 2015 (AVA, 2015). Most of the phytoplankton involved in these recent fish kills were composed of dinoflagellate producing cysts. These cysts may stay in the sediment for long periods and eventually re-suspended and generate blooms if conditions are optimal. Sampling, enumeration and metagenomic tools have been used for identification.

2- Ballast waters (BW) are thought to be responsible for approximately 30 % of the aquatic invasions. In order to limit the introduction rates of alien species, the International Maritime Organization (IMO) adopted the International Convention for the Control and Management of the Ships' Ballast Water and Sediments (IMO 2004). This convention should enter into force in the near future and BW treatment systems will need to be used to reduce drastically the number of organisms transferred across ecosystems. The link between science and policy lies in that treatment system accreditation is mandatory and scientific skills are required to evaluate the efficiency of such treatments. This approval scheme has raised a lot of scientific questions and generated new developments such as the use of stains and cytometry to support the evaluation of organism's viability which is traditionally done by optical microscopy.

E4. National Cambodian Pharmacopoeia: a new tool for the quality control of the medicinal plants, the plant extracts and the plant-based medicines

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Abstract

The medicinal plant is a drug: it has biologic activities, it can show toxicity, and it is intended for a fragile population. In the light of this, the medicinal plant needs scientific expertise (both botanical, chemical, pharmacological, clinical and toxicological) and its distribution should be supervised. Traditional plant-based medicine takes up an important place in Cambodian primary health care system. Several hundreds of plants are indeed known for their prophylactic and healing properties. Yet, as for today, Cambodia has a poor legislation toward traditional medicine. The authorities have then recently decided the creation of a national Pharmacopoeia as a tool to ensure the quality, the efficiency and the safety of plant-based medicines. This project is supported by Institut de Recherche Pierre Fabre (IRPF), World Bank and Ministry of Health of Cambodia. The appointed plants have been selected through rigorous criteria, their monographs set up according to international standards and a regulatory framework is shaped. Today, the first monographs of raw plants have been established at the Laboratory of Phytochemistry of the University of Health Sciences of Cambodia (*Herba cum radice Andrographidis* and *Curcumae longae rhizome*) and new monographs are currently being developed.

F1. Use of insects as animal feed - the Insect biorefinery

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Abstract

One of the greatest challenges that faces the food industry is the global increase in population and the difficulty of feeding and generating sufficient protein to feed an anticipated nine billion people in 2050. The production of protein is rising but will not be sufficient to meet the needs of both humans and animals. United Nations recommendations in this respect include upgrading biomass residues to proteins. Since 2010, it has been assessing the potential of insects as food and feed in order to assure food security. Insects have been identified as suitable candidates to supplement other animal-based proteins (van Huis et al., 2013), alongside new/existing plant-based protein sources. Insects have indeed numerous qualities, which notably include their nutritional value, protein content and amino-acid and fat composition (Rumpold and Schlüter, 2013).

This presentation offers a brief overview of the potential the societal, regulatory and technical barriers that need to be overcome in order to develop a new insect industry based on the rearing of insects on byproduct and biowaste, their transformation and the formulation of animal meals, in particular for chicken and fish. This technology is gathered under the concept of insect biorefineries, in the frame of other plant-based biorefineries (Shakeel and Rashmi, 2010).

This industry relies entirely on sustainable development, by recycling and upgrading of biomass, use of very small land for insect production, and valorization of all insect compounds, not only for feed, but also for health, cosmetics, fertilizers, bio-based material and green chemicals, through co-valorization.

As Europe and Asia are each more than 75% dependent on protein importation (FAO, 2011), local production of protein could improve agro-industry environmental balances and create local jobs.

This field represent thus tremendous opportunities of collaborations between European and Asian companies and research centers.

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F2. Eco-friendly Zeolite Nanoparticles as Effective Antioxidant in Halting Palm Oil Oxidation

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Abstract

Low thermal and oxidative stability of vegetable oils limit its applications at high temperature conditions. Thermally stable, low cost and safe antioxidants are desired to substitute the traditional antioxidants in inhibiting vegetable oil oxidation. The goal of this project is to investigate the possible use of nanosized molecular sieves (zeolites) as environmental friendly alternative to traditional antioxidant additives for palm oil. The oil and zeolite, prior and after heating, were subjected to physicochemical characterizations. The effect of the zeolite nanoparticles (NPs) on the oil oxidation was studied. The oxidation experiments with palm oil in the presence of zeolite NPs were carried out in the Universiti Sains Malaysia (USM). The zeolite NPs with various chemical compositions and porous frameworks were prepared in Laboratoire Catalyse & Spectrochimie (LCS), France. The oxidation of the palm oil has been followed by colorimetry, total acid number (TAN) analysis, FT-IR spectroscopy, etc; these experiments were performed in USM, Institut Teknologi Bandung (ITB), Indonesia and Nanyang Technological University (NTU), Singapore. The results show that the performance and efficiency of the zeolite NPs in slowing down the oil oxidation rate are associated to the ionic radii of the extra-framework cations, their basicity, Lennard Jones potential between cations and charge density. Besides that, the study also reveals that the Na-FAU zeolite NPs exchanged with monovalent and divalent cations are following two different antioxidation mechanism pathways. Overall, the study shows that the zeolite NPs are able to reduce the oxidation rate and thus, manage to increase the lifetime of palm oil. Throughout this project, the team members have presented the findings at international conferences; graduate students from the Asian and French partners were able to visit each other's institutes, perform experiments together, and exchange idea. A new memorandum of agreement between USM and LCS is under progress.

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F3. HTMS BioAsie project - Bioprocess intensification: challenges related to transfer limitation.

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Abstract

Lignocellulose biomass is one of the most abundant renewable resources and certainly one of the least expensive. It is considered as a glucose source to obtain energetic or chemical molecules by bioconversion. This enzymatic conversion is so complicate therefore a better scientific understanding and, ultimately, good technical control of these critical biocatalytic reactions, which involve complex matrices at high solid contents, is currently a major challenge if biorefining operations are to become commonplace. Amongst the main physical parameters to be studied, the rheological behaviour of the hydrolysis suspension and the fiber particle size and morphology, stand out as a major determinants of process efficiency guiding the technical choices for equipment to be used and the substrate feeding strategies to be applied.

HTMS BioAsie project investigates physical mechanisms during deconstruction of pretreated lignocellulosic matrices and its ability to bio-converse substrate to fermentable sugar with an overarching aim is to control microbial cultures. It investigates transfer limitation into intensive bioprocess under high dry matter content. Scientific work combines physical and biochemical analyses to scrutinize liquefaction and saccharification of complex lignocellulose materials.

BioAsie scientific partners (LISBP-INSAT FR, EBTA-IPH VN and FESTL, UP, PHI) actively contribute to a larger and international scientific network implying 5 countries (FR, VN, PH, CAN, JAP) and 8 partners (LCPO Bordeaux FR, IMF Toulouse FR, DCE Waterloo CAN, DAES Kyushu JPN, DFES Miyazaki JPN) since 2010. Our presentation will overview the successive projects associated to HTMS BioAsie project and will describe the main scientific stakes. Research strategy will be highlighted; its original approach and interest will be pointed out in relation with the consortium competences. In an ending step, the emerging scientific questions resulting from our research activity will be browse and will drive our consortium for the next period.

F4. Carbon neutral, low pollution extraction and chromatography

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Abstract

Many chemical processes require solvents, however the user has to pay for them twice; once to buy them and then again to dispose of them. A sustainable and green approach of reducing solvent use will then greatly affect efficiency as well as benefiting the environment. Singapore alone has 50,000l of spent solvent collected through licensed collectors[1].

Carbon dioxide, in a super critical fluid state, is a good solvent for many less polar compounds. It is far cheaper than organic solvents, but also does not require disposal. If the carbon dioxide is a by-product of another process, for example brewing, then the process becomes carbon neutral. These advantages have already driven large scale industrial extraction processes, for example the decaffeination of coffee. Now there is an increasing interest in small scale extraction of high value compounds from natural sources, and laboratory scale Super-critical Fluid Extraction (SFE) now offers small scale users the opportunity to “go green” with better efficiency.

Aside from extraction, many industries employ analytical techniques that require organic solvents, mostly notably Normal Phase (NP) chromatography. Typically this is for the analysis of less polar molecules, but also is required for the separation of chiral compounds. Super critical CO2 can also be used as a solvent in these cases by the utilization of Super-critical Fluid Chromatography (SFC), which has developed into a high performance method known as Ultra Performance Convergence Chromatography (UPCC). This allows analytical divisions to decrease their organic solvent waste without reducing analytical performance.

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ABSTRACTS – POSTERS

P1. Preferential Exclusion Chromatography of IgG on Magnetic Nanoparticles

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Abstract

The low capacity on protein A affinity chromatography is a challenge for IgG purification [1]. We reported a method that supersedes protein A's capacity - steric exclusion chromatography (SXC) [2]. This emerging technique of SXC with magnetic nanoparticles has been shown to achieve IgG purification similar to protein A, but with 1000 times higher capacity per unit volume of chromatography media. Steric exclusion is mediated by organic polymers such as polyethylene glycol (PEG). We hypothesise that the use of precipitating salts like sodium citrate would achieve similar results as SXC mediated by PEG, as precipitating salts work through the different but related mechanism of preferential exclusion [3].

Presenting data from experiments designed to evaluate the potential of preferential exclusion chromatography mediated by sodium citrate, we have compared the use of positive, negative and neutral charged magnetic nanoparticles on capture efficiency and host cell contaminant removal. Studies include capture capacity comparison with conventional precipitation methods, effects of experimental conditions on protein recovery (i.e. size and number of nanoparticles used), contaminant clearance (i.e. pH and concentration of salt), microscopic images of accreted proteins to further elucidate its capture process, and finally, 2 step purification process from cell culture harvest to obtaining purified IgG proteins.

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P2. Physical fitness factors of school badminton players in kandy district

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Abstract

The aims of the study was to measure physical fitness parameters of school badminton players in the Kandy district and determine the factors contributing to improve the physical fitness. Height, weight, handgrip was measured and sit and reach test, shoulder flexibility test, standing long jump test, 20m sprint speed test, agility T-test and 20m multistage shuttle run test were performed on 183 school badminton players. Linear regression and correlation tests were performed using body mass index, practiced duration, age category, level of performance, additional sports involvement as independent variables and physical fitness parameter as dependent variables.

Results: The present study showed that the upper body power, upper body strength and endurance and speed depended on body mass index both in male and female school badminton players. Speed, agility, flexibility of shoulders, explosive power of shoulder and aerobic endurance depended on the duration of practiced. Furthermore, involvement in additional sports other than badminton did not enhance the performance of badminton players. But it decreased player's performance by decreasing agility and speed. Age had an effect on the upper body power, explosive power of lower limb, agility and speed both in both males and females.

Conclusions: The performance of badminton players could be enhanced by maintaining a proper body mass index. Badminton specific parameter could be improved by increasing the duration of practiced. Involvement in other sports does not give an added advantage to badminton players to improve their performance.

P3. Evaluation of Genotoxicity and Cytotoxicity: A Promising Approach for Environmental Monitoring and Cancer Research

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Abstract

The pathogens and harmful chemicals daily released into the environment cause bioaccumulation, biomagnification, DNA damage, disorders of cellular metabolism, and potential risk of tumor and cancer formation for exposed people. Thus, early detection of those hazardous agents is of great interest in food safety control, environmental monitoring, and foodborne and waterborne disease outbreak investigation. In our group, we developed biosensors to detect harmful substances, such as carcinogens and procarcinogens, and to access genotoxic and cytotoxic effects of contaminants and their potential short- or long-term impact on the ecosystem and organisms. Furthermore, phenolic compounds were obtained from plant extracts by using response surface methodology for optimal extraction and column chromatography for purification. Interestingly, those compounds showed high antioxidant and anticancer activities on many human cancer cell lines. Concurrently, DNA-microarrays were also developed to identify protozoan parasites, bacterial pathogens, and to detect extended-spectrum β-lactam antibiotic resistant bacteria by analysis of single nucleotide polymorphisms.

Recently, micro-arrays have been also reported to be useful tools for ecological researches, including those conducted in marine and terrestrial ecosystems. Our new research direction is now targeted to take advantage of this innovative approach in order to assess the composition of coral-associated bacterial communities and to screen bioactive compounds in reef biomes. Although prokaryotes have been long demonstrated to be strongly involved in coral health, we still lack of clear information about their community structure. Finally, this approach is of great current interest in drug development as well as in pharmaceutical industry, but also constitutes a promising methodology in coral microbiology and the protection of reefs ecosystems.

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P4. Development of embryogenic regeneration system and its successful utilization for *Agrobacterium* - mediated transformation of *cry8Db* gene into selected cultivated sweet potato *(Ipomoea batatas L.)* of Vietnam

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Abstract

Sweet potato [*Ipomoea batatas* (L.) Lam.] is an important food crop in the world as well as in Vietnam. It is well known as a recalcitrant crop for gene transformation and tissue culture because of its genotype dependent *invitro* responses. In this study, an efficient regeneration system via multiple shoot induction from a callus has been established for Vietnam's sweet potato varieties KB1 and Chiem Dau) and successfully used for *Agrobacterium tumefaciens*-mediated transformation. The *Agrobacterium tumefaciens* Strain C58 carrying a pBI121 backbone which contained *cry8Db* delta-endo toxin gene regulated under 35S CaMV promoter and selection marker gene – neomycin phosphotransferase (*npt*II) gene was subjected for plant transformation. Callus induced from shoot tips and leaf explants were inoculated and cocultured with *A. tumefaciens* C58. The selection occured on callus producing medium (CP) containing 0.5 g/L picloram, 100 mg/L kanamycin and 500 mg/L cefotaxime. Survival embryogenic callus were then transferred to embryo producing medium (EP) supplied with 1.0 mg/L ABA and 1.0 mg/L GA_3 after 3 weeks. Putative transgenic shoots regenerated on medium supplying 0.5 mg/L kinetin and 1.0 mg/L BAP were rooted on root producing medium (RP). The rooted plantlets were transferred into soiled pots in greenhouse. The tentative transgenic lines were proved positively by PCR and finalized by Southern and Western blots. Four putative transgenic lines were proved positively in Southern hybridization, confirming that the transgenic lines of KB1 and Chiem Dau cultivars obtain a single copy of the *cry8Db* gene. Biotests against sweetpotato weevil (*Cylas formicarius*) of these transgenic lines were also performed and resulted that the level of infestation by weevils in untransformed control plants was higher than that of transgenic lines.

Keywords: Sweetpotato; *Agrobacterium tumefaciens*; plant transformation; *Bacillus thuringiensis Bt51*; Sweet potato weevil resistance

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P5. Gold nanoparticles as a surface modifier for sensitive piezoelectric detection of diclofenac

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Abstract

Quartz crystal microbalance (QCM) is one of the most useful techniques to design label-free piezoelectric biosensors. However, considering that the target molecules are always in trace concentration in the samples to be analyzed, the sensitivity of piezoelectric biosensors requires further enhancement. It can be improved by coupling gold nanoparticles (GNPs) to the QCM sensors [1-4].

In the present work, we investigated the nanostructuration of Gold and Silicon sensors by GNPs with the final objective to build up a piezoelectric immunosensor for the anti-inflammatory drug diclofenac. New surface chemistries were devised to generate a layer of GNPs on gold and silicon planar substrates. They rely on the strong electrostatic interaction between GNPs and amines and the well-known non-biofouling properties of PEG–coated surfaces. Amine-terminated PEG layers were built up in two steps according to a previously published procedure [5]. Surfaces were submitted to contact angle measurements and surface IR analysis after each functionalization step to assess the quality of the organic layers.

Grafting of nanoparticles was quantified by scanning electron microscopy (SEM) to determine the coverage of GNPs on the various surfaces. The nanostructured Si and Au sensors with the optimal coverage and dispersion in GNPs were post-functionalized with amine groups so as to further anchor the diclofenac ligand. We show that GNPs led to a higher response of the biosensor to anti-diclofenac antibody by about 60 % with respect to the flat, non-nanotructured sensors.

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P6. Fluorescence of Stilbene Derivative for Photochrome Aptamer Switch Assay (PHASA)

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Abstract

Introduction

Stilbene is known to be a promising molecule in biosensing and biological diagnosis due to its unique properties in fluorescence and fluorescence decay. In particular, Isomerization induced controllable switch of this kind of light sensitive substance attracts attentions from scientists. On the other hand, aptamers have been proven to be promising materials for biosensing[1]. Thus, it is purposed that a photochrome aptamer switch assay (PHASA) can be realized by combing the advantages of aptamer and stilbene.

For use as a biosensor, stilbene needs to be conjugated to a molecular recognition element (i.e. aptamer) or the target. Methods of bioconjugation with high reaction efficiency are favorable in this conjugation. However, it was found that the fluorescence intensity of the stilbene compound decreased sharply after being functionalized by the maleimide group, which may probably decrease the sensitivity of the sensor a lot in PHASA. Methods of restoring stilbene's fluorescence intensity and its effect on aptamer conjugation will be presented.

Methods

The fluorescence intensity and fluorescence decay of 4-Maleimide-4'-(N,N-dimethylamino)stilbene (DMS) were recorded in the presence and absence of small thiol molecule 6-Mercapto-1-hexanol (MCH). HPLC was also used to monitor the reaction.

Results

The fluorescence decay property of stilbene was retained after modified by maleimide group. However, fluorescence of stilbene decreased after the introduction of maleimide group, which might potentially affect the sensitivity of the sensor. A simple solution has been discovered. By reacting with MCH, the fluorescence emission of stilbene recovered. Additionally, the product also remained the property of fluorescence decay. This result indicates the reserve of fluorescence properties of the stilbene after conjugation to aptamer.

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P7. The role of nutrient supply on biological properties dental pulp stem cells

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Abstract

Background: The fetal bovine serum (FBS) is a de facto media nutrient for all cell culture medium. In practice, the amount of FBS used in preparation is 10%. Despite, the usual amount, the fate of cell growth is determined when reduced amount of serum applied in the cell culture system. On the other hand, dental pulp stem cells (DPSCs) are emerging as one of the alternative source replacing bone marrow mesenchymal stem cells in regenerative medicine. Despite this, very little studies are available on the effect of culturing DPSCs in low nutrient supply.

Objectives: This study was conducted to determine the biologic properties of DPSCs cultured up cultured low concentration of FBS.

Methodology: DPSCs were cultured for four passages in Dulbecco's modified Eagle's medium-KO (DMEM-KO), containing two different concentration of FBS viz 10% FBS which acted as the control and 2% FBS. At the end of the experiment, growth kinetics and senescence assay were conducted to ascertain the biological properties of DPSCs cultured in low serum. Further, expression of certain cytokines and growth factors are also studied.

Results: There was no significant difference ($p>0.05$) in the growth kinetics and senescencelevel of control and test group. The time taken for cell growth is higher in 2% FBS compared to 10%. However, at lower serum concentration the expression of growth factors and cytokines were higher with significance difference ($p<0.05$).The overall expression of genes namely IL1B, IL2, IL4, IFNG, CXCL5, CD40LG and CCL7 had shown increased expression in passage four cultured DPSCs. **Conclusion:** Despite the low mitogenic, DPSCs cultured in depreciate serum secrete a wide range of growth factors and cytokines.

P8. Development and application of the GEANT4 Monte Carlo simulation toolkit for the prediction of radiation-induced biological damages at the cellular level

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Abstract

The GEANT4 Monte Carlo simulation toolkit [1] was initially developed for the simulation of particle-matter interactions in high-energy physics. GEANT4 has been recently extended to handle microdosimetry applications by the inclusion of new physics processes in the framework of the "GEANT4-DNA" project (http://geant4-dna.org). As a part of the GEANT4 electromagnetic physics working group, GEANT4-DNA currently simulates the dominant physical interactions of electrons, hydrogen and helium atoms with charge states (H^0, H^+, He^0, He^+, He^{2+}) in liquid water down to very low energies [2]. The physico-chemistry and chemistry module in GEANT4-DNA has been first released in Geant4.10. This module is intended for the simulation of radiolytic products diffusion and mutual interactions [3] in liquid water following the modeling of physical interactions. As member of the GEANT4 and GEANT4-DNA collaborations, I have participated with Dr. Sebastien INCERTI, director of research at CNRS/IN2P3 and University of Bordeaux (UMR 5797), to the development and validation of a new model for GEANT4-DNA. In the presented work, I report on theoretical differential and integrated cross sections of the elastic scattering process for 100 eV - 1 MeV protons and 1 keV - 1 MeV alpha-particles in liquid water [4]. The calculations are performed within the classical framework described in Everhart *et al.* [5], in Ziegler *et al.* [6] and in the ICRU 1993 report [7]. Then, I proposed an implementation of dedicated classes in GEANT4-DNA for the modelling of elastic scattering. These classes will be released soon in the GEANT4 toolkit.

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P9. A Novel Robotic Walker for Over-Ground Gait Rehabilitation

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Abstract

With neurological disabilities gaining epidemic proportions and limitation of conventional therapies, gait rehabilitation is a major area of unmet need. Robotics based gait rehabilitation provides many advantages over conventional physiotherapy. However, most current robotic devices, providing gait training on the sagittal plane on pre-determined reference trajectories and ignoring the pelvis and trunk support, are of limited value to recover normal gait pattern, and the clinical effectiveness of these devices have been questioned.

We are developing a novel robotic walker for over-ground gait training with pelvic support. The system consists of an omni-directional mobility platform, an active body weight support (BWS) unit, and a pelvic and trunk support and assist module. The omni-directional motion coupled with the pelvic support allows unrestricted natural trunk posture and pelvic motion. The adaptive shared controller enables several control modes depending on the patient condition. The system can provide stability, balance, and gait training. It can also provide perturbation, resistance, and error augmentation training methods to enhance training efficacy. We are in collaboration with Prof. Viviane Pasqui at UPMC under the Merlion Grant to develop various control techniques and conduct patient trials.

Preliminary gait experiments showed that gait with pelvic motion facilitation strongly resembled free over-ground walking without alteration of the normal gait dynamics, while gait with pelvic restriction led to gait performances with reduction in the range of motion of lower limb. The findings of this research revealed that the pelvic motion facilitation with the robotics walker can elicit correct afferent input and could possibly provide better functional outcomes after gait rehabilitation.

P10. Development and evaluation of a portable knee-ankle-foot robot for gait rehabilitation

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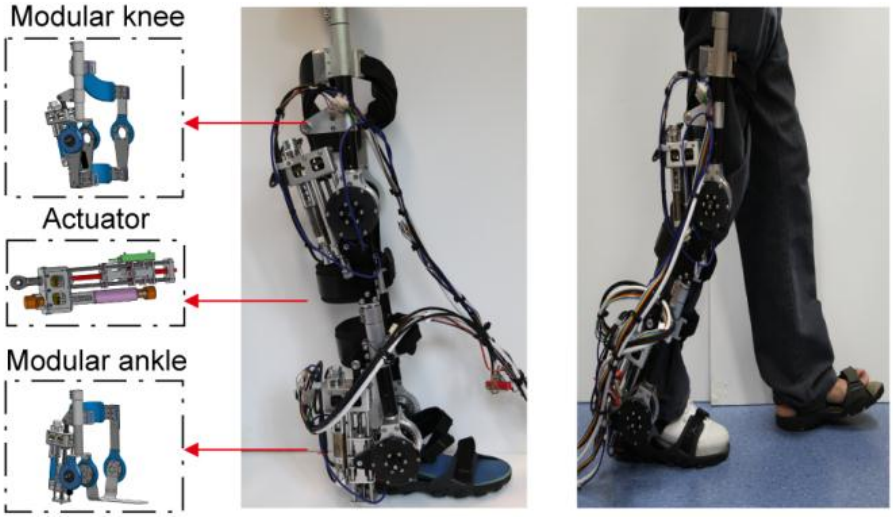
Abstract

Robotic devices have significant potential to aid stroke patients by delivering lower limb rehabilitation therapies. This paper presents the mechanical design and evaluation of a knee-ankle-foot robot, which is compact, modular, and portable for stroke patients to carry out overground gait training at outpatient and home settings. The robot is driven by a novel series elastic actuator (SEA) for safe human-robot interaction. As a solution to the limitation of conventional SEA design [1], the SEA innovatively employs one soft translational spring in series with a stiff torsion spring for force transmission. The former spring increases the intrinsic compliance of the actuator, and the latter one extends the force output into a large range. The spring constants were selected based on gait biomechanics to achieve high intrinsic compliance for the most of a gait cycle, while retaining the capacity to provide peak force [2]. The robotic joint mechanism and the selection of the actuator springs are optimized based on gait biomechanics to achieve portability and capability. The motion range of both robotic joints ensures adequate space for normal gait and prevents the joints from moving into excessive motion. Lightweight carbon fiber and composite material were adopted and the total weight of the mechanical module was limited to 3.5kg. The robot demonstrated stable and accuracy force control in experiments conducted on healthy subjects with overground walking. Major leg muscles of the subjects showed reduced level of activations (Electromyography, EMG) while maintaining normal gait patterns with robotic assistances, indicating the robot's capability of providing effective gait assistance. We are collaborating with Prof. Philippe Bidaud at UPMC to develop virtual human biomechanics models and wearable sensors for control and experimental study of the exoskeleton under the STIC-ASIE program from Campus-France.



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P11. Exposure of the human colon cancer cell line (HCT116) to various light wavelengths

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Abstract

Exposure of biological cells to different light parameters could result to diverse changes in the cell, such as physical, chemical, and physiological modifications [1]. These changes, however, vary depending on a number of factors, such as the type of cell, the wavelength, λ, to which the cell is exposed, and the duration of exposure. Here, we investigate the effect of 543 nm, 594 nm, and 633 nm light with irradiance of 51 W/m2 on the number of human colon cancer cells (HCT116) at varying exposure times. We used the MTT assay to estimate the effect of light exposure on the proliferation of the HCT116 cells. The number of cells decreased after exposure to 633 nm light for 120 s. Prolonged exposure (4-5 min) to 543 nm caused a drop in the number of HCT116 cells. The results thus present a possible independent use of light at 543 nm and 633 nm for cancer therapy.

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P12. Cytotoxicity of the Semi-pure Extract from *Garcinia rubra* Merr.

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Abstract

Chemotherapy is based on killing cancer cells that have gone out of the proliferation and differentiation controls. Many chemotherapeutic drugs are derived from cytotoxic compounds isolated from plant sources. In an attempt to explore Philippine endemic plants for anticancer property, the extract from the leaves of *Garcinia rubra* Merr. (Clusiaseae) was fractionated using solvent partitioning and 2 gravity column chromatography techniques. The cytotoxicity of the first 7 fractions isolated using gradient column chromatography (Gar 4a to 4g) were tested against human colorectal (HCT-116), lung (A549), breast (MCF7) and liver (HepG2) cancer cell lines using the MTT cytotoxicity assay. The selectivity against cancer cells of active fractions were also tested using Chinese hamster ovarian cell line (AA8). Gar 4g is the most active fraction, exhibiting cytotoxicity against all 4 cancer cell lines but is also highly cytotoxic against AA8. No other fraction is active against A549. Gar 4a is cytotoxic against HCT-116, MCF7 and HepG2 but is relatively less active against AA8 with specificity indices of 2.44, 2.05 and 1.68 for HCT-116, MCF7 and HepG2, respectively. This makes Gar4a a good candidate for further purification and ultimately isolation of the active compound/s. The pro-apoptotic activity of Gar4a was also assessed using TUNEL assay on HCT-116. Results suggest that Gar4a exerts its cytotoxicity by inducing apoptosis. This further highlights the potential of Gar4a to be purified into active anticancer compounds.

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P13. Safety and Health Parameters of the Genetically Modified Foods- Developing Countries Perspective.

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A rapid increase in investment by rich countries and private MNC/TNC's, in the quick turn-over fields, like biotechnology / GM Foods, along with the application of emerging new multidisciplinary sciences and technologies, has substantially increased the pace of global scientific discoveries. It has reduced the gestation period of the S & T innovations. The innovations are becoming so rapid that it is forcing some of the 2nd Generation discoveries to be kept on hold, because the consumer driven economies may not have matching capacity to absorb these innovations. The race for competition in biotechnology is getting so intense & fast that it is competing most other recent technologies, to prove as next engine of growth for the global economies.

The new developments in gene technology and their rampant practical applications to the food and food products, is leaving the testing methods, food regulations and standards far behind. In a regulatory system the compliance and its assessment follow the installation of a precise safety methodologies and parameters. Application of testing method and compliance assessments depend upon the precision & efficiency of the standardized analytical parameters, the setting up of legal limits / ranges, and the techno-economic ease in carrying out the methodologies.

In case of GMO's the initial standard use of "Substantial Equivalence" has helped the introduction, promotion and the marketability of GM Foods. However, it is neither a scientifically precise nor a completely safe description of testing the GM foods. There is strong need for concerted efforts to evolve foolproof safety testing & standards for such foods, especially for cost-effective & easy adoption in the developing countries where the resource constraints inhibit their capacities. In this field so much is becoming possible whereas not all of it is ethically, socially or religiously acceptable. No doubt the application of gene technology in foods is opening new avenues for the comfort and betterment of mankind, yet it is also raising doubts and issues. It is, therefore, equally pertinent to take these perceptions into account in devising testing techniques for GM foods which lead to foolproof safety, better compliance and their all round acceptability.

In their testing methods, safety, human & animal health, and the environmental factors must prevail & override in all assessments and application of scientifically authentic testing methods The food regulations for GM Foods should convincingly conform to all round standards of generalized bio-safety principles, mentioning critical legal limits/ranges covering possible allergen, environment polluting genes etc. and fully safeguard against the undesirable implications of GM Foods for the present and future generations of human kinds and animals.

The presentation discusses and elaborates further possible testing methods which, if used, may further strengthen the concept of "Substantial Equivalence" in GMOs.

P14. Organic fruits and vegetables: sustainability in certain parameters of environment and health

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Abstract

Organic agriculture is a holistic production system which promotes and enhances sustainable agro-ecosystem health. Though known from ancient times, India now lags behind in organic agriculture which is the best alternative towards ecological and agricultural sustainability. In the last century, green revolution movement has changed the farming techniques in India with increased use of chemicals. Only a meager 0.03% of the total cultivated area in India is now under organic farming. Total production of organized organic farms is about 14,000 tonnes and about 85% of it is exported. Domestic consumption is insignificant and is concentrated only in the big cities.

Organic farming enhances the livelihood of small and marginal farmers by reducing input and energy cost and utilizing locally available natural resources. Apart from economic point of view, there are many environmental benefits like vibrant biodiversity, increased pollination, top-soil preservation, synthetic fertilizer and pesticide free produce.

To evaluate the organic fruits and vegetables in comparison with conventional type from farm of West Bengal (India), certain environmental and nutritional parameters were studied. Apart from lower level of chemicals due to lesser or no use of chemical fertilizers and pesticides, there are other health benefits in organic crops. Analyses of organic fruits and vegetables show 5-17% higher content of healthy antioxidants like phenolic compounds and ascorbate (Vitamin C) in organic crops. Increased sugar and protein content make the produce more healthy and appealing.

Environmentally undesirable contents like nitrate or heavy-metals were low in organic produce. Nitrate content become 7-13 % lower in organic produce. Toxic Heavy metals like lead, chromium were found to be lower in general. But generally microbial load was higher in organically grown vegetables. A holistic sustainable development with betterment of environment and health would thus be possible through properly managed organic farming.

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P15. From characterization of guava (Psidium Guajava L.) cells walls to production of pure juice

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Abstract

The objective of our study is to develop novel processes which make it possible to produce pure pulpy tropical fruit juices which retain the nutritional components of the original fruit. Guava purees have a high viscosity and the presence of stone cells, confer a sandy mouthfeel on commercially-available products. In order to address our technological problem which consists in reducing the thickness of the puree by enzymatic means, we carried out a fundamental study of the structure and organization of the polysaccharides of cell walls and middle lamella. We followed the progress of the hydrolysis of the parietal polysaccharides and colloids of the serum for varying incubation times and quantities of enzymatic proteins, and we estimated the percentage hydrolysis of these polymers and determined the enzyme dose/incubation time relationship for obtaining a defined puree consistency. The enzyme detaches the parietal rhamnogalacturonans, and the methylated homogalacturonic zones are broken down to oligogalacturonides while the highly acetylated rhamnogalacturonic regions remain in the liquid phase. Simultaneously, the pectic polymers initially present in the serum are fractionated into smaller size molecules. It is evident from our work that the parietal framework is slightly broken down and that the enzymatic action is therefore analogous to a maceration. The enzyme addition parameters which make it possible to obtain a pure guava juice were defined and applied at the laboratory, pilot and industrial stages. In the novel industrial process developed, a step for the differential centrifugation of the puree makes it possible to remove the stone cells, unmasked from the parietal framework by the enzymatic treatment. The pure guava juice obtained is free of stone cells and thus the unpleasant « sandy » sensation during consumption disappears, while retaining physicochemical, nutritional and sensory characteristics similar to those of the original fruit.

P16. Use of Plant Resources for Climate Resilience in the Agroecological Systems of the Alangan Mangyan Indigenous Communities in the Philippines

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Abstract

This study provides an integrated assessment of the climate change resilience of the traditional land-use systems of the Mangyan indigenous communities living at the lowland-upland environs of Mt. Halcon, a critical protected area in the island-province of Oriental Mindoro, Philippines. With the limited studies in Asia that analyze potential climate change impacts on marginal sectors such as the indigenous peoples many of whom continue to live in critical upland ecosystems, this study explores the utility of principal component analysis (PCA) and canonical correspondence analysis (CCA) in determining the specific socio-economic and biophysical component variables of climate change resilience both at the households and community levels while also aiming to provide bases for specific policy options to enhance indigenous community's capability in dealing with climate change. Utilizing the location-specific assessment indices formulated in the study, it is shown that the degree of resilience is differentiated even between and among the perceived homogenous Mangyan indigenous communities. While weather extremes such as typhoons and droughts that are projected to increase in the coming years will have direct impacts on the Mangyans' subsistent farming systems, the value of their vast yet untapped indigenous knowledge systems (IKS) on the utilization of plant resources is indispensible in explaining their seemingly inherent high adaptive capacity. The importance of plant resources among the Alangan-Mangyans' agroecological systems totaling to about 130 species accounting to about 1,255 individuals belonging to a total of 44 families, provide support mechanisms as food, medicines, indigenous infrastructure, weaving and adornments purposes. Thus, the designing of adaptation program must capitalize on the indigenous knowledge systems on plant resources to improve resilience to weather extremes and hazards related to climate change.

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P17. The viral signature in coral ecosystems: an ongoing BioAsia project conducted in three contrasted reefs systems in South East Asia

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Abstract

Coral reefs are amongst the most vulnerable marine environments and have declined dramatically over the last 30 years owing to the combined effect of global warming and increasing anthropogenic pressure. The first signs of this decline are coral bleaching and the emergence of new pathologies which now affect coral reefs throughout the world. A recent hypothesis, considers that such diseases might be the result of viral-mediated mortality of coral-associated bacterial symbionts in response to environmental disturbance (increase in temperature, but also changes in nutrients, acidification, etc). However still little is known about the ecological and physiological mechanisms that lead to the effective viral control of bacteria in coral mucus layer. Also, little research has been carried out into the possible pathogenic or mutualistic relationships that they may have with the host coral animal. In the ongoing project EIRINA funded recently by the BioAsia program, we are currently trying to characterize the main ecological traits of bacterial and viral epibionts of corals, in three contrasted reefs ecosystems of South East Asia: Phu Quoc Island (Vietnam), the Perhentian Islands (Malaysia), Panay Island (the Philippines). Corals in these different sites are subjected to specific chemical and mechanical threats including eutrophication and destructive fishing and farming practices (cyanide, dynamite, antibiotics, careless boating and diving, etc.). In this communication, we show the results of preliminary *in situ* and experimental studies conducted in Vietnam, in the Nha Trang Bay and the Ha Long Bay, during the period 2011-2014. The main expected results were (i) the quantitative, phenotypic, and genetic characterisation of coral viruses, (ii) the understanding of their influence on bacterial community structure, (iii) their capacity to control the emergence of pathogenic populations and (iv) their sensitivity to water temperature variations. The forthcoming results should help to better understand the role of viruses in coral diseases and suggest lines of research for finding remedies.

P18. Microbial Fuel Cells (MFC): A novel way for generating electricity and treating wastewater

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Abstract

One man's trash is another man's treasure. Wastewater from local landfills contains high organic pollutants with no economic value. It is a trove if we know how to harvest it for generating electricity using bacteria. Our group has intensified the search for practical and novel technology that could address energy scarcity and water pollution problems simultaneously.

Microbial fuel cells (MFC) that address two major issues at the same time-wastewater treatment and sustainable energy production-fits the United Nations' current mission in developing affordable and clean energy. Producing electricity using MFC would add economic value to wastewater and represent an attempt to fight environmental pollution against limited fossil fuels. The interests in MFC stem from its ability to operate at all weather conditions and pressure using inexpensive bacteria *Geobacter sulphurreducens* that form biofilms onto electrodes surface. MFC could produce electricity directly from organic contaminants within the wastewater without consuming conventional energy resources.

Unlike activated sludge, MFC is practical for wastewater treatment. As wastewater has high organic concentrations, MFC will generate massive energy potentials. Organic matter in the wastewater has chemical energy that can fuel MFC when its bioreactor releases electricity in electrons flow from anode to cathode in an external circuit, generating power as by-product.

Our studies demonstrated that MFC could generate 3 Watts/m^2 of electrode surface area as power outputs, while its continuous flow reaches 15 Watts/m^3 of wastewater flowing through it. If an MFC is installed at a water treatment plant (WTP) for 10,000 inhabitants, it can produce about 0.8 MW, sufficient to power 500 homes. The MFC potentially reduces treatment cost by generating electricity on-site to power plants' operations. Based on France's experience of smart cities, MFC may also be linked to municipal waste streams, providing a sustainable system for waste treatment and energy production in developing world.

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P19. Copper and Arsenic Plant Accumulators to Clean up Mining Areas

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Abstract

The Philippines has unique geological history, which made our country rich in mineral resources and at the same time evolved a significant number of endemic flora and fauna. The country is considered to be one of the top producers of gold, copper, nickel that fuels industrialization globally. Even before World War II, mining industry has prospered as well as small-scale mining.

Mining areas are characterized by nutrient-poor soils and can have acidic pH. Plants that can thrive in such conditions are called metallophytes, which is a unique assemblage of plants found in such areas. Plants that can concentrate significant amounts of metals in their structures are called plant accumulators or hyperaccumulators. The research is focused on the identification of plants that are potential accumulators of Copper (Cu) collected in mining areas of the Philippines (Benguet and Surigao) namely: *Solanum nigrum, Alternathera sessilis, Pteris melanocaulon,* and *Pityrograma calomelanos*. Furthermore, potential Arsenic (As) accumulators that were identified are *Pteris vitata, Pteris melanocaulon,* and *Pityrograma calomelanos*. The corresponding bioconcentration factors of these plants were calculated, in which the ratio of the heavy metal absorbed relative to the amount of metal in the soil is determined. These types of plants can help clean up contaminated soils, rehabilitate abandoned mines, and for *phytomining* as an alternative post-mining activity for the local communities.

This work addresses the challenges in responsible mining and is an example of Green Technology that promotes cleaner and efficient mining.

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