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Scientific Tracks & Abstracts

Day 1

HeaYeon Lee, J Biotechnol Biomater 2017, 7:4 (Suppl)
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Nanobiomedical device system for nanomedicine and innovative business

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A new paradigm of nanobiomedical devices has been exploited in areas such as combinational chemistry, biotechnology, engineering and clinical diagnostics. One of the critical issues in the nanobiomedical system is how to differentiate signal-to-noise (S/N) ratio per very small amount of signal for high sensitivity homogenous assays. Until now, we achieved high /specific detection of biomolecule using arrayed nanostructures (i.e., nanowells). The electrochemical (EC) nanowell array biosensors have significantly improved biomolecular detection by increasing sensitivity, limit of detection (LOD), S/N ratio, multi-targeting, and being label-free, compared to conventional micro sensors. The nanowell sensors have extremely low volume on the order of atto-liters (10-18 L) per well, and a total volume of approximately 32 femto-liters per sensor. Due to the geometrical constraints of nanowells, they can be designed to allow for the immobilization of only a few biomolecules. This leads to significant improvement of sensor sensitivity because it reduces potential aggregation and enhances the spatial orientation of the biomolecules compared with conventional electrodes with flat surfaces. Here I'll describe a demonstration of precious molecule recognition while maintaining the bioactivity on nanostructured space. We performed biosensing within nanowells for the EC detection of stress-induced-phosphoprotein-1 (STIP-1), a biomarker for ovarian cancer. The sensitivity of the nanowells impedimetric immunosensor was better for each analyte concentration tested when compared the sensitivity of the bare electrode sensor. The EC nanowell biosensor showed the 10 pg/mL LOD, which had 100-fold improvement compared with bare microelectrode. The developed miniaturized/integrated nanowell array-device system has shown excellent advantages over conventional instrumental systems for analysis of biomaterials in its size, cost, detection time and multiplex detection capability. I'll also present the relationship between particle uptake and distribution for TiO2 nanoparticles (NPs) and cosmeceutical-NPs modified with fatty acied (palmitoleic acid, palmitic acid, stearic acid, and oleic acids) in human fibroblast skin and adenocarcinoma lung cells for chemotherapy. Finally, I'll describe the plan to commercialize nanomedical device system for Fast, Easy-to-use, Accurate, and Low-cost (FEAL) personalized healthcare.

Biography

HeaYeon Lee, PhD, is President and CEO of Mara Nanotech New York, Inc., USA and a Visiting Professor at the Department of Pharmaceutical Sciences, Bouve College of Health Sciences, Northeastern University, Boston, MA. She received her BS (1987) and MS degrees (1990) in Chemistry from Pukyong National University, South Korea and her PhD degree (1995) in Chemistry from Osaka University, Japan. After finishing advanced degrees in nanofabrication and characterization technologies, she has been working on developing new nanobioelectronic devices and nanobiosensors. She was a Designated Professor at the Institute of Scientific and Industrial Research, Osaka University, and Research Associate Professor of Mechanical and Industrial Engineering at Northeastern University, Boston, USA. Her research work has been contributing to accelerating cutting-edge research in the emerging bio-nanoscience area.

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Hiroshi Arakawa, J Biotechnol Biomater 2017, 7:4 (Suppl)
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A method to convert mRNA into a gRNA library for CRISPR/Cas9 editing of any organism

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The clustered regularly interspersed palindromic repeats (CRISPR)/Cas9 (CRISPR-associated protein 9) system is a powerful tool for genome editing that can be used to construct a guide RNA (gRNA) library for genetic screening. For gRNA design, one must know the sequence of the 20-mer flanking the protospacer adjacent motif (PAM), which seriously impedes experimentally making gRNA. I have described a method to construct a gRNA library via molecular biology techniques without relying on bioinformatics. Briefly, one synthesizes complementary DNA from the mRNA sequence using a semi-random primer containing a PAM complementary sequence and then cuts out the 20-mer adjacent to the PAM using type IIS and type III restriction enzymes to create a gRNA library. The described approach does not require prior knowledge about the target DNA sequences, making it applicable to any species.

Biography

Hiroshi Arakawa studied at Kyoto University (Kyoto, Japan), where he obtained his diploma and Ph.D in Molecular Biology in Hideo Yamagishi's laboratory. Following post-doctoral studies in Jean-Marie Buerstedde's laboratory in Heinrich-Pette-Institut (Hamburg, Germany), he worked as a Senior Research Fellow in Jean-Marie Buerstedde's laboratory in Helmholtz Center Munich (Munich, Germany). He moved to IFOM (Milan, Italy) as a staff scientist in 2011. He has so far studied the molecular mechanism of immunoglobulin gene conversion and somatic hypermutation, and their application to artificial evolution system. He has recently invented a method to convert mRNA into a gRNA library, which can be applied to forward genetic screening in any species.

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Notes:

Noriko Uchiyama et al., J Biotechnol Biomater 2017, 7:4 (Suppl)
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AHCY inhibitors cause growth inhibition of prostate cancer via induction of mir-26a

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Most prostate cancers initially respond to androgen deprivation therapy, but then progress from androgen-dependent to androgen-independent prostate cancers. In the present study, a differential cytotoxicity screen of hormone-resistant prostate cancer LNCaP-hr cells and the parental LNCaP-FGC cells against normal MRC5 fibroblast cells, identified a small molecule compound, Aristeromycin (a derivative of 3-deazaneplanocin A (DZNeP)). The molecular target was shown to be S-adenosylhomocysteine hydrolase (AHCY), which catalyzes reversible hydrolysis of S-adenosylhomocysteine (SAH) to adenosine and L-homocysteine. DZNeP and Aristeromycin showed high inhibitory activity against AHCY. Treatment of the prostate cancer cells with DZNeP led to SAH accumulation and decreased levels of homocysteine and histone H3K27 methylation. SAH accumulation and cell growth inhibition were confirmed after siRNA-mediated AHCY knockdown. To further understand why AHCY inhibitors decreased prostate cancer cell growth, we performed microRNA expression profiling with LNCaP-hr cells. Mir-26a, which is involved in regulation of EZH2 expression, was upregulated in Aristeromycin-treated LNCaP-hr cells. A reporter assay established with the EZH2 3α-UTR confirmed that transfection of microRNA precursor molecules for miR-26a decreased the EZH2 3α-UTR luciferase activity. Meanwhile, an antisense microRNA inhibitor for miR-26a recovered the luciferase activity. The present findings suggest, at least in part, that miR-26a induced by an AHCY inhibitor can regulate oncogenic EZH2 expression, and could thus be an important mechanism of action for AHCY inhibitors in the treatment of prostate cancer.

Biography

Noriko Uchiyama is a Researcher of Investigative Toxicology of Drug Safety Research Evaluation, Takeda Pharmaceuticals International Co. Her work is devoted to the cutting-edge biotechnologies to identify, understand and de-risk toxicities in Takeda's next generation of medicines. The team develops and validates predictive *in-vitro* models of toxicology for use in early compound screening to estimate risk of a specific toxicity. Other topics of her work are the drug discovery process e.g. establishment of *in-vitro* assay system of enzyme and cell-based assay, screening and evaluation of compounds, narrowing good chemotypes in the drug discovery projects. Her expertise is cell pharmacology in the Oncology therapeutic target including kinase, protease, nuclear-receptor, channel etc. She is involved in drug discovery for novel drugs from both perspectives i.e. *in-vitro* mechanistic investigation of efficacy of targets and downstream pathways leading to toxicity to drive project to safer chemistry.

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Notes:

Sima T Tarzami, J Biotechnol Biomater 2017, 7:4 (Suppl)
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Human induced pluripotent stem cells are invaluable tools in the investigation of *in-vitro* disease modeling, drug testing, and *in-vivo* cell replacement therapies

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An adult heart has an intrinsically limited capability to regenerate damaged myocardium, regardless of the underlying etiology. Embryonic and induced pluripotent stem cell (ESC/iPSC)- based therapies offer a unique strategy for developing cell replacement therapies for numerous, varied disorders including cardiac diseases. iPSCs hold great promise in the field of regenerative medicine because of their ability to grow indefinitely and give rise to all cells of the body. Both ESC and iPSCs have been invaluable tools in the investigation of *in-vitro* disease modeling, drug testing, and *in-vivo* cell replacement therapies. The major advantages of iPSCs for cell transplantation are that these cells are patient-specific, thereby reducing the risk for graft rejection and secondly, evade the moral and ethical issues concerning ESCs. Human iPSCs have now been generated from several human tissues using a variety of approaches. Most commonly, human iPSCs are generated from dermal fibroblasts due to their accessibility and relatively high efficiency of reprogramming. Many doctors are exploring the use of stem cell therapy for many diseases including neurodegenerative, diabetes, rheumatological and hematological disease. Even though iPSCs have been used in preclinical animal models of cardiac failure with promising results, but it still has many limitations. Recently investigators shown that pluripotent stem cells produce tissue-specific lineages through the programmed acquisition of sequential gene expression patterns that function as a road map for organ formation, therefore, identifying a procardiogenic network that promotes iPSCs differentiation to favor a cardiac lineage is of great interest. Since adult human hearts have very little ability to regenerate postnatally, stem-cell-based cardiac regeneration has also been considered as a therapeutic approach to treat ischemic heart disease. Since these cells have been shown to migrate to sites of injury and inflammation in response to soluble mediators including the chemokine stromal cell derived factor-1 (SDF-1 also known as CXCL12). Here we studied the role of SDF-1 and its receptors; CXCR4 and CXCR7 in transformation of pluripotent stem cells into IPSC-derived cardiomyocytes and also in SDF-1-directed migration of IPSCs with the premise that their improved recruitment could translate to therapeutic benefits

Biography

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Julie M Fagan, J Biotechnol Biomater 2017, 7:4 (Suppl)
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Encouraging innovation in the workplace and the educational system

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Individual success and the success of a company are reliant on being on top of one's game in a competitive environment. Becoming too comfortable doing what you've always done can lead to obsolescence. How can we go about generating that next BIG idea – one that will make us rich and famous and more employable or to ensure prosperity of the company in the future? Our current educational system and most workplaces stress convergent thinking with the completion of specific tasks and relatively shallow comprehension of a wide range of subjects. Such an environment does not foster creativity. This is not to say, however, that we should eliminate accumulating knowledge in the given field and unrelated fields as this form the basis for the divergent thinking prior to the creative insight needed to solve a problem. Frequently, the initiation of the new idea comes from one individual – and after they bounce their idea off others is when the idea takes shape; when others provide their feedback and modifications to the idea. For this sort of group brainstorming to work effectively, the group needs to trust one another. Discussed will be how to shift the attitude from protecting an individual's ownership of an idea to disclosing and sharing what the individual perceives to be a new idea. Ideas need to "incubate" for innovative insight to discover solutions to a problem sometimes in an unrelated environment (when driving, in the shower, during a walk) to allow for the idea to formulate and coalesce. The new idea then needs to be refined to address what's workable and what's not. Specifically identifying what won't work – essentially what will cause the project to fail is often more important than seeking a successful outcome. We have long been taught to be afraid of failure. Innovation, on the other hand, requires that we accept failure as a good thing and as a path to success. In fact, deliberately trying to fail may aid in figuring out that next billion-dollar product. Giving the freedom for students and employees to pursue their long-term goals with passion and persistence provides a driving force to take projects to successful completion. This is sometimes referred to as "grit" where individuals aggressively pursue a line of thinking needed to successfully produce a new idea for a product or new way of doing something. Although there is no formula for teaching grit, curiosity or imagination in the classroom or workplace, rewarding what is perceived as grit, will make some employees and students grittier. Techniques to foster innovation, which differ in the educational system and the workplace, will be presented. Ironically, teaching methods used to promote students' divergent thinking are not mainstream and not in line with our archaic educational system. For the most part, higher educational institutions have failed to arm graduates with analytical reasoning and problem-solving skills. Hopefully, change is afoot to move toward a more engaging "active learning" environment with programs that may incorporate, for example, "maker spaces", and investigational and entrepreneurial activities that practice analytical reasoning and problem-solving skills where the student or employee's creative potential can be unleashed.

Biography

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Heiko Rischer, J Biotechnol Biomater 2017, 7:4 (Suppl)
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Food without fields -plant cell technology for a sustainable food supply

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Despite enormous intensification, food production methods have basically not changed for hundreds of years. Plants are farmed in fields, harvested at the end of the season and transported to factories for further processing or straight to the markets or grocery stores where consumers buy them. Alternative approaches are desperately needed due to the huge challenges ahead. The global population will need 60% more food by 2050 but global warming and exhaustion of the soil will render agriculture more difficult in many current agricultural areas. At the same time, the production of materials and energy will compete with food production for land use. Agriculture accounts for 20–25% of all global greenhouse gas emissions and relies on chemical fertilizers from fossil resources, and harmful agrochemicals. Urbanization drives food production into cities in order to reduce transport costs and waste. There is a need to produce larger quantities of healthier food, with less resources and land, closer to urban consumers. Plant cell cultures (PCCs) are totipotent and cultures of almost any species can be grown in bioreactors instead of fields, enabling contained and fully controlled year-round biotechnological production. PCCs are used for the commercial production of phytochemicals for pharmaceuticals, pigments, cosmetics and additives. The biomass is usually extracted for single components, but the value of the whole material as food has been neglected. PCCs contain nutritionally promising combinations of proteins, carbohydrates and lipids, enriched with vitamins and health-promoting compounds. Additionally, they exhibit technological process ability relevant for the food industry as well as suitable sensory qualities. The presentation aims at highlighting the great potential of PCCs for a sustainable, secure and healthy food supply and the state-of-art in research and development.

Biography

Heiko Rischer is heading the VTT Plant Biotechnology team and teaches as Docent of Pharmaceutical Biology at the University of Helsinki, Finland. His expertise is in Plant Biotechnology covering plant cell and tissue culture techniques including industrial upscaling in bioreactors, plant metabolism and metabolic engineering. In various functions, he has been involved in interdisciplinary projects either as Scientist or Manager. He has supervised students at all career levels and has authored more than 60 peer-reviewed scientific articles.

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Stefano Ciurli, J Biotechnol Biomater 2017, 7:4 (Suppl)
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Urease inhibitors: Structure and function

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The enzymatic activity of urease, a Ni (II)-dependent enzyme that catalyzes the hydrolysis of urea in the last step of organic nitrogen mineralization, has been the focus of intense research for several decades. The activity of urease has negative consequences for both human health and environment. In particular, urease plays an essential role for the colonization and survival of several deadly ureolytic human pathogens. On the other hand, the large and widespread use of urea as a soil fertilizer for crop production, combined with the high efficiency of soil urease, leads to damage to germinating seedlings and young plants, and gaseous loss of urea N as ammonia, with consequent atmospheric pollution, increase of the green house effects, and decreased efficiency of soil fertilization. The development of potent urease inhibitors, necessary to modulate the catalytic activity of this enzyme, requires the knowledge, at the molecular level, of the mechanism of catalysis and inhibition. In addition, understanding of the assembly mechanisms through which the inorganic Ni(II) ion is taken into the enzyme active site, would provide additional targets for the development of drugs to fight these ureolytic organisms. This approach is even more important considering the increasing number of human pathogens that are becoming resistant to known antibiotics. This lecture will describe how an integrated approach using X-ray crystallography, NMR spectroscopy, calorimetry and light scattering, as well as computer modeling, can provide information for the design of drugs to modulate the enzymatic activity of urease. The fallout of these discoveries has several implications in the economic, social, environmental and medical aspects of everyday life.

Biography

Stefano Ciurli has received his Laurea degree in Chemistry from the University of Pisa (Italy) in 1986, with a thesis carried out at the Dept. of Chemistry of Columbia University (NY), and the PhD degree in Chemistry from Harvard University (Cambridge, MA) in 1990. After two years of postdoctoral studies at the University of Bologna (Italy), investigating the structure and function of Fe, Cu, and Ni metallo-proteins, he became Associate Professor in 1992 and Professor of General and Inorganic Chemistry in 2001. Since then, in addition to pursuing structural investigations on urease, he became interested in the molecular basis of nickel trafficking, approaching, in the most recent years, the metal-mediated protein−DNA interactions involved in nickel-sensing and nickel-dependent gene regulation.

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Franz E Weber, J Biotechnol Biomater 2017, 7:4 (Suppl)
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Osteoconductive bone substitutes by additive manufacturing

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The current gold standard bone substitute is still autologous bone, despite the fact that its harvest demands for a second operation site, causes additional pain, discomfort, potential destruction of the grafting site, and is limited in supply. Since newly developed clinical approaches like transplantation of cells are invasive and costly, and osteoinduction by bone morphogenetic proteins is expensive and is associated with mild to severe side effects, the optimization of osteoconduction appears as promising option to realize bone substitute based on bone tissue engineering. In the nineties of the last century, the holy grail of pore size for scaffolds in bone tissue engineering was set between 300 and 500 micrometers. These values appeared reasonable since they fall in line with the diameter of osteons. More recently, 2 papers showed that pores even bigger than 1000 micrometers perform equally well. Therefore, the optimal microarchitecture for bone tissue engineering scaffolds in terms of pore size, constrictions, rod thickness, or rod distance is still unknown. Additive manufacturing appears as an ideal tool to study those diverse microarchitecture options since it can generate scaffolds where size and location of pores and connections between pores can repetitively be reproduced. For the production of our test scaffolds, we use the lithography-based additive manufacturing machine CeraFab 7500 from Lithoz (Vienna, Austria) and reach a layer-thickness of 25 micrometres. Moreover, this machine can generate scaffolds from the identical STL-file with different materials ranging from aluminium oxide, to zirconium, to calcium-phosphates and Bioglass. As *in-vivo* test model, we used calvarial defects in rabbits and evaluated calcium-phosphate and Bioglass based scaffolds of diverse microarchitectures. Analysis by µCT and histomorphometry revealed that all generatively produced structures were well osseointegrated into the surrounding bone. The histomorphometric analysis, based solely on the middle section, showed that bone formation was significantly increased in all implant treated groups compared to untreated defects, and confirmed that pores exceeding 500 micrometers are osteoconductive and promote bone regeneration. In the critical size defect, the scaffolds alone were sufficient to yield defect bridging after 16 weeks. Thus, osteoconductive calcium-phosphate based and Bioglass based scaffolds produced by lithography based additive manufacturing are a promising tool for the production of personalized bone tissue engineering scaffolds to be used in cranio-maxillofacial surgery, dentistry, and orthopaedics

Biography

Franz E Weber is currently the Associate Professor in University Zurich- Center for Dental Medicine, Switzerland.

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Study of biodiesel and PUFA potential of oleaginous microalgae biomasses by NMR and IR spectroscopic techniques

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Microalgae biomasses are potential sources of biodiesel and food supplements as their lipids are comprised of both saturated and unsaturated fatty acids in the range of C14 to 22 including PUFA (ω -3). Algae biomasses are comprised of neutral lipids (Triacylglycerides, TAG; free fatty acids, FFA), polar lipids (glyceroglyco+phospho lipids), proteins, sugars, vitamins etc. Microalgae are unicellular photosynthetic organisms with 1-50 μm in size, that require primarily three components to produce biomass, i.e., water, CO2 and sunlight with relatively higher photosynthetic efficiency of 3–8% against 0.5% for terrestrial plants. The microalgae grow in aquatic environment of diverse sources of water such as sea, brackish, ponds and industrial waste water. The neutral lipids of microalgae biomasses are important components of interest to energy sector because of their high ability to produce biodiesel with high oil productivity and growth rate of more than 30 times the traditional food crops. The content of important health ingredients such as ω -3 fatty acids containing TGA (C18:3, C20:5 (EPA) and C22:6 (DHA) of algal oil is much higher than vegetable oils. In the present study multipulse 1D and 2D NMR techniques have been used to characterise algal oils obtained by ultrasonic extraction of solid biomasses for fatty acid composition, particularly ω -3PUFA. The effect of cultivation parameters such as nutrients (N, P) on the quality and neutral lipid productivity in order to enhance the biodiesel and nutritional properties have been specifically demonstrated to highlight the potential of NMR and IR techniques

Biography

Amarjit S Sarpal completed his PhD degree in Analytical Chemistry in 1980 from GNDU, Amritsar, India and worked in the Indian Oil Corporation Ltd. (R&D), India, from 1977 to 2011. He has 40 years of rich experience in characterization of petroleum and related products, bio-fuels, polymers and catalyst by the applications of analytical techniques such as FT NMR, FTIR, MS, GC-MS etc. He has published 135 research papers and presented 180 research papers at national and international conferences, seminars and tutorials. He has also worked at University of Illinois in 2011 on a project on biofuels from algae biomasses. He has completed his project on "Biodiesel potential of microalgae biomasses and national sources of Brazil" in the capacity of Team Leader at INMTRO, Rio de Janeiro, Brazil from April 2012 to October 2015. He is recipient of many awards including recent Wolff Kishner Research Award in Analytical Chemistry for the year 2015, Award of Excellence, by International Agency for Standards and Rating, USA.

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Silencing the mutant Huntington's disease gene using CRISPR-Cas9

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Huntington's disease (HD) is a hereditary, fatal neurodegenerative disorder that is most prominently characterized by death of striatal neurons, chorea, as well as cognitive and emotional dysfunction. The mutant Huntington's gene (mHTT) contains extra 'CAG' codon repeats in the exon1 from which the translated huntingtin protein (HTT) gains an elongated glutamine tract that prevents the protein from undergoing normal post-translational modifications. In addition to its non-functional property, this mutant protein confers a toxic gain of function, which is responsible for the pathophysiology of the HD. Although several studies have shown behavioral sparing in the animal models of HD through the use of allogeneic and autologous stem-cell transplantation, the existence of the mutant HTT prevents long-term functional recovery. For this reason, various gene silencing techniques, such as RNA interference mechanisms, have been extensively studied during the past decade. However, these RNA interference strategies are less efficient and require multiple treatments at approximately six-month intervals. As a promising alternative approach, we propose that the most efficient way to treat HD may be to curb the production of the mutant HTT itself, through the use of the gene editing tool, the CRISPR-Cas9 system. We have constructed two CRISPR (clustered regularly interspaced short palindromic repeat)-Cas9 (CRISPR associate protein) plasmids, among which one nicks the DNA at untranslated region upstream to the open reading frame (uORF), and the other nicks the DNA at exon1-intron boundary. The primary goal of this study was to apply this plasmid into mesenchymal stem cells (MSCs) extracted from the bone-marrow of YAC128 mice, which carries the transgene for HD. Our results suggested that the disruption of uORF through CRISPR-Cas9 influences the translation of mHTT negatively and, to a lesser extent, disrupts the exon1-intron boundary, which affects the translation of the mHTT. These findings also revealed the pattern of the nucleotide addition or deletion at the site of the DNA-nick in this model

Biography

Nivya Kolli is a doctoral candidate in the program of Neuroscience at Central Michigan University, USA. She received her Doctor of Pharmacy degree from Manipal University, India and has multiple research experiences, both, at national and international level. Her research seeks to understand molecular and cellular aspects related to the pathology associated with mutant Huntingtin protein. She is currently investigating the potential of CRISPR-Cas9 mediated gene-silencing and gene-correction to treat Huntington's disease. She also work with the team at Field Neurosciences Institute, Michigan, to investigate the downstream autophagic pathway involved in traumatic brain injury and the use of curcumin as a potential therapeutic treatment for Alzheimer's disease and glioblastoma. Her expertise is in studying gene expression, gene-editing, toxicology, cell pharmacology and pharmacokinetics.

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Day 2

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The impact of plant biotechnology on agriculture in a changing world: Present achievements and challenges ahead

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[2]University of Galati, Romania

Plants are the key of life on earth and since the beginning of agriculture humans used the plants that nature provided and modified them through selective breeding to have desirable characteristics and to increase their productivity. Empirical at the beginning, the natural and human-directed selection continued, due to scientific progress, with the tremendous achievements of the green revolution. At present, in conditions of a population growth that is outstripping food production, more than ever agriculture is fundamental to the economies and environments of the entire world. The modern agriculture must meet the needs of the increased population and the expectations of improved living standards, in the conditions of alarming deleterious effects of environmental pollution and declining arable land. Biotechnology became a major source of innovation for agriculture, offering a key to more effective utilization of the world's limited resources that can help to achieve sustainable development, though still remains a challenging objective the overcoming of some significant barriers to largely adoption of these new and powerful technologies. Such a barrier is the common misconception that is reducing plant biotechnology to only genetic engineering and transgenics. In fact plant biotechnology is a broad collection of tools that together with genetic engineering are parts of the biotech-driven revolution in agriculture. A wide range of crop biotechnologies are available and are increasingly used worldwide, such as micropropagation based on cell and tissue culture techniques, mutagenesis, interspecific and intergeneric hybridization, marker-assisted selection, disease diagnostics and bioprotection, biofertilization, cryopreservation, somatic embryogenesis, artificial seed production, exploiting apomixis, male sterility and others. Biotechnology programmes will become effective in creating the „evergreen revolution" only by complementing the well-structured conventional plant breeding and well-managed agronomy research and development programmes

Biography

Ana Rosu is a graduate of the Faculty of Biology, University of Bucharest and had her expertise as Scientific Researcher in the field of Cell Biology and Plant Biotechnology at the Institute of Biology, Romanian Academy of Sciences, obtaining her PhD in Biology in 1987. Over the years, she worked both as Scientific Research Coordinator and was responsible for professional formation of young specialists as Professor of Plant Biology and Biotechnology at the Faculty of Biotechnologies, University of Agronomic Sciences and Veterinary Medicine of Bucharest. She has more than 70 articles published in scientific journals and 25 scientific presentations at national and international scientific events

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Gaston Hui Bon Hoa et al., J Biotechnol Biomater 2017, 7:4 (Suppl)
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Impacts of the extremes conditions of environments on the RNA' flexibility and self-catalytic activity of the *Avocado sunblotch* viroid: Application of NIR Raman spectroscopy and a bio-reactor with sampling in and out, at constant pressure and perturbation agents for the study

Gaston Hui Bon Hoa
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The typical environment for biomolecules *in-vivo* is highly crowded. In such conditions, conformational changes, structural flexibility as well as chemical activity of biomolecules may be affected by molecular crowding effects. To mimic *in-vitro*, the crowding effects, high pressure, D2O solvent and crowding agents are excellent tools for the study. In such a propose, we have recently developed two innovating techniques to follow the alteration of bio-molecular structure and function submitted to extremes conditions of environments *in-vitro*. This approach is applied to the study of the structure and function of the Avsunviroidae *Avocado sunblotch* viroid's. They are non-encapsulated RNA plant pathogens. They are able to infect dramatically a broad range of plants. The *Avocado sunblotch* viroid minus strand (ASBVd (-)) is a compact rod-like circular RNA which possess a catalytic hammerhead ribozyme (HHR) motif responsible for crucial cleavage step during viroid replication. To date little is known regarding the structure and conformation of ASBVd (-) viroid, the catalytic role of Mg2+ and the ways by which such viroid induce diseases. This prompts us to develop a NIR Raman spectroscopy which is a sensitive technique for monitoring RNA's molecular structure and a bio-reactor designed to allow rapid injections of effectors and sampling out products under constant pressure and perturbation agents, for activity measurements. ASBVd (-) viroid exhibits a typical A-type RNA conformation with ordered double helical content and a C3'-endo/anti sugar pucker configuration. Deuteration and temperature perturbed differently the RNA's phosphodiester conformation. Mg2+ activated self-cleavage does not significantly alter the secondary RNA's structure but noticeable Raman frequency downshifts were observed, suggesting that several phosphodioxy structure, internal loops and hairpins of the cleaved viroids have changed. RNA self-cleavage activity decreased upon deuteration indicating some accessibility of H-bonding network and a rigidity of RNA's structure. A pressure-induced RNA's self- cleavage obtained pH-profile is interpreted as a consequence of some compaction of the structure and a release of catalytic water molecules during catalysis. All these data will constitute the basis for further studies of the interactions of such viroid with therapeutic agents and cell membranes

Biography

Gaston Hui Bon Hoa has completed his PhD in 1974 from the University of Paris XI and obtained his positions in INSERM since 1975. He is an Emeritus Director of Research, since 2000, in the Hospital Kremlin Bicêtre Center, France. His expertise and focus is on the studies of cryo- enzymology and enzyme intermediates (1978-1980), cytochrome P450's structure and function (1981-1992), pressure-induced protein's stability, compressibility and dynamics as well as osmotic stress study (1992-2015). In 2012, he started his study on plant viroid's structure, conformation and function. He has published more than 90 papers in reputed international journals and has been serving as an Editorial Board Member

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Development and application of new primer sets for rapid and specific detection of *Blumeria graminis f. sp. tritici* using PCR

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Wheat powdery mildew caused by *Blumeria graminis f. sp. tritici* (Bgt) is one of the most destructive and reemerging foliar diseases worldwide. Despite its significance, the ability to detect and identify this fungal pathogen at its early asymptomatic developmental stages is still limited. In this study, we developed new primer sets targeting beta-tubulin (*Tub2*) and 14 alpha-demethylase (*Cyp51*) genes and used them for the species-specific identification of Bgt, which occurs on common wheat (*Triticum aestivum L.*). Using DNA fungi sequences available in the NCBI (Nacional Center for Biotechnology Information) GenBank database we developed a simplex and duplex PCR assays. Primer pairs were evaluated on environmental samples of infected wheat leaves with visual symptoms caused by Bgt, collected during the 2015/16 growing season across Poland. The PCR assays using the primer pairs LidBg17/18 and LidBg21/22 strongly generated products for all 67 tested samples compared with the primer set LidBg13/14, which failed to amplify seven samples. Primer specificity was confirmed with field samples of *Zymoseptoria tritici, Puccinia triticina* (*syn. Puccinia recondita f. sp. tritici*), *P. striiformis f. sp. tritici* and *Pyrenophora tritici-repentis*. The detection limit for LidBg13/14, LidBg17/18 and LidBg21/22 was determined to be 0.1 pg, 10 pg and 1 pg of fungal DNA (no host DNA added), respectively. The addition of 100 ng of host DNA decreased the sensitivity of the tests by an average of ten times

Biography

Hubert Szczerba has his expertise in design and evaluation of new PCR assays for species-specific identification of plant pathogens. Presently, as a member of research team supervised by Dr. Adam Kuzdraliński, he conducts study to develop new molecular diagnostic tests to identify key fungal pathogens of common wheat (*Triticum aestivum L.*) that have potential application in targeted plant protection. The main objective of his research is to introduce a monitoring system for species composition of fungal pathogens based on molecular tests. This approach would reduce the preventive use of spraying and contribute to a better environmental condition

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Janet U Itelima, J Biotechnol Biomater 2017, 7:4 (Suppl)
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Phytochemical, antimicrobial and anti-diabetic properties of *Artemisia annua* L. (sage wort) and *Plectranthus neochilus Schltr*. (blue coleus)

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Statement of problem: The rising of incidence in multidrug resistance amongst pathogenic microbes is no longer matched by the expansion in the arsenal of agents available to treat infections. Ethno-botanical records suggest that plants are sleeping giant of pharmaceutical industry. Thus, they may provide natural source of antimicrobial drugs that will serve as novel or lead compounds that may be employed in controlling some infections globally. The purpose of this study is to evaluate the phytochemical, antimicrobial and anti-diabetic properties of *Artemisia annua* and *Plectranthus neochilus*.

Methodology & Theoretical Orientation: Phytochemical analysis of the aqueous and hexane extracts of the plant species were conducted using standard methods. The antimicrobial activity of the crude extracts and gentamicin (control) against pathogenic microorganisms namely; *Escherichia coli, Klebsiella Pneumonia, Pseudomanas aeruginosa, Staphylococcus aureus, Salmonella typhi* and *Candida albicans* was determined by using agar well diffusion method. The Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of the plants against the microorganisms were also determined. The anti-diabetic effects of the plant species were investigated by oral administration of 100 mg/ml of alloxan monohydrate to produce diabetic condition in normal albino rats, before being treated with the extracts. The phytochemical screening of the extracts indicated the presence of tannins, steroids, saponins, cardiac glycosides, carbohydrates, free reducing sugar, alkaloids and flavonoids. The largest zone of inhibition (26 mm) was obtained from *A. annua* hexane extract against *C. albicans* and the smallest zone of inhibition (5 mm) was obtained from *P. neochilus* hexane extract against *P. aeruginosa*. The MIC of the aqueous and hexane extracts of the plants against the test organisms ranged from 0.6 mg/ml to 37.5 mg/ml, while the MBC ranged from 2.4 mg/ml to 18.8 mg/ml. The leaf extracts of the two plants had lowering effects on the blood glucose levels of the alloxan-induced diabetic rats.

Conclusion & Significance: The results of this study support the medicinal use of the leaf extracts of *A. annua* and *P. neochillus* as antimicrobial and antidiabetic agents; hence they can serve as important therapeutic aids for alleviating ailments of human kind

Biography

Janet U Itelima has her expertise in Applied Microbiology and passion in research related to Applied Microbiology, Biotechnology, and Plant Science, Lecturing, and Community Services. She has obtained her PhD and currently is an Associate Professor of Applied Microbiology. She is an Academic Staff of the Department of Plant Science and Technology, Faculty of Natural Sciences, University of Jos. She has published so many papers both nationally and internationally. She has also written two books. She is deeply involved in motivating students on how to obtain academic excellence. She has attended workshops and conferences both nationally and internationally where she presented papers, chaired sessions and served in advisory committee

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Michelle R Dawson, J Biotechnol Biomater 2017, 7:4 (Suppl)
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Biophysical interactions of stromal cells with invasive breast cancer cells

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The progression of cancer from a benign mass of abnormal cells to a malignant tumor requires the development of a tumor-promoting microenvironment. MSCs are recruited to the tumor microenvironment from nearby tissue and bone marrow in response to tumor-secreted soluble factors. Within the tumor, MSCs can differentiate into carcinoma associated fibroblasts that promote tumor growth, invasion, and angiogenesis. Though stromal cell recruitment in response to soluble factors has been well-documented, the involvement of cell adhesion is not fully understood. Cell adhesion molecules, including cadherins and integrins, play a critical role in cancer progression. Alterations in cell adhesion molecules are associated with the epithelial-mesenchymal transition, a mechanism by which cancer cells become more invasive. We sought to understand if changes in cell adhesion molecules during cancer progression affected the engraftment of stromal cells such as fibroblasts and MSCs. We show that stromal cells are less likely to spread and adhere to non-invasive MCF7 breast cancer cells (Fig. 1A-B) than to more invasive MDA-MB-231 breast cancer cells (Fig 1A, C). Cadherin 11 and 2 were co-localized at sites of adhesion and blockade of cadherin 11 on stromal cells reversed this adhesive response, providing insight into stromal cell engraftment in invasive tumors. Within the tumor cells encounter 3D heterogeneous networks of collagen-rich extracellular matrix (ECM). To model the 3D tumor microenvironment, MSCs and breast cancer cells were embedded in 3D collagen matrices, and time-lapsed cell and particle tracking were used to analyze cell migration and matrix remodeling. We showed that co-culture with MSCs does not alter the migration of less invasive MCF7 (Fig. 1D) but causes MDA-MB-231 invasive breast cancer cells to elongate and directionally migrate (Fig. 1E). Small molecule inhibitor studies revealed MSC-induced directional migration is mediated by TGF-b1. This work provides insight into MSC interactions with invasive breast cancer cells within the tumor microenvironment and potential therapeutic targets to halt invasion and metastasis

Biography

Michelle R Dawson is an Assistant Professor of Molecular Pharmacology, Physiology, and Biotechnology and Biomedical Engineering at Brown University. She has served as ad-hoc reviewer for 20+ journals along editorial board member for 2 journals. She's an active member in the Biomedical Engineering Society and American Institute of Chemical Engineers. Her lab is actively investigating the complex and dynamic intracellular signaling cascades that control cytoskeletal stiffening, force transmission, and directed motility in normal tissues and tumors. Cells undergo rapid changes in shape and organization during migration, which is dynamically controlled by cytoplasmic polymers that mechanically support the cell structure and spatially organize the contents of the cell. These studies will increase our understanding of (i) stem cell homing, (ii) tumor cell metastasis, and (iii) chemotaxis

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Onwuliri F C et al., J Biotechnol Biomater 2017, 7:4 (Suppl)
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Utility of Faco's medium in the isolation and identification of gastro intestinal tracts bacteria

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Statement of problem: Based on the fact that most conventional Laboratory media are usually very expensive and sometimes unaffordable in some developing countries like Nigeria, Faco's medium was formulated as an alternative medium to argument the very expensive ones. Faco's medium is an extract of Acha (Digitaria exilis and Digitaria iburua) and pooled human urine which was formulated to facilitate the isolation and identification of some important bacterial isolates from clinical samples.

Methodology & Theoretical Orientation: The microbiological performance and efficacy of Faco's medium was compared to that of blood and MacConkey agar for the isolation and identification of bacteria responsible for gastrointestinal tract infections. This study included consecutively collected freshly voided stool samples obtained from patients. All stool samples were inoculated on Blood agar, MacConkey agar, and Faco's medium and incubated overnight aerobically at 37 OC for 18-24 hrs and then examined for the presence of pathogenic bacteria using standard bacteriological analyses and biochemical tests.

Findings: Of the 2700 stool samples tested, 69.3% produced significant growth on the test media and about 14 potentially identified organisms were recovered on at least one of the three media. 743 (95.8%) of the organisms identified were uni-microbial, while 32 (4.12%) were poly microbial.

Conclusion & Significance: The newly developed medium can serve as an alternative medium for the isolation of some bacterial species from clinical samples, as it compared favorably with conventional laboratory media

Biography

Onwuliri F C has completed his PhD from University of Jos. He has completed his BSc, MSc and AIMLS from the University of Nigeria NSUKKA, University of Jos and Medical Laboratory College Vom Nigeria respectively. He was promoted to the rank of Professor in 2009. He was the Head of Department of Plant Science and Technology, University of Jos and the Director of Victory Medical Laboratory Jos, Nigeria. He has published about 70 papers in both national and international journals. He has several memberships including Association of Medical Laboratory Scientist of Nigeria, Nigerian Society for Microbiology, Nigerian Mycological Society, Botanical Society of Nigeria, Society for Parasitology and Public health, Biotechnology Society of Nigeria, International Biotechnology and International Virology

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Aniruddha Datta, J Biotechnol Biomater 2017, 7:4 (Suppl)
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Cancer therapy design based on pathway logic

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Cancer encompasses various diseases associated with loss of cell-cycle control, leading to uncontrolled cell proliferation and/or reduced apoptosis. Cancer is usually caused by malfunction(s) in the cellular signaling pathways. Malfunctions occur in different ways and at different locations in a pathway. Consequently, therapy design should first identify the location and type of malfunction and then arrive at a suitable drug combination. We consider the growth factor (GF) signaling pathways, widely studied in the context of cancer. Interactions between different pathway components are modeled using Boolean logic gates. All possible single malfunctions in the resulting circuit are enumerated and responses of the different malfunctioning circuits to a 'test' input are used to group the malfunctions into classes. Effects of different drugs, targeting different parts of the Boolean circuit, are taken into account in deciding drug efficacy, thereby mapping each malfunction to an appropriate set of drugs

Biography

Aniruddha Datta received his PhD degree from the University of Southern California in 1991. In August 1991, he joined the Department of Electrical and Computer Engineering at Texas A&M University where he is currently the J. W. Runyon, Jr. '35 Professor II. His areas of interest include adaptive control, robust control, PID control and genomic signal processing

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Biosurfactant production by lactic acid bacteria and its possible use in microbial fuel cells

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A microbial fuel cell (MFC) generates electrical current from the metabolism of living cells. In a MFC, a microorganism degrades organic matter transferring its electrons to an anode. Biosurfactants are surface active molecules produced by microorganisms, with the ability to disrupt the plasma membrane, thereby reducing the resistance to electron transfer. In this work, the biosurfactant production of Lactic Acid Bacteria (LAB) was screened and evaluated in order to apply it to an MFC. The blood agar method and MRS broth were used for the screening of biosurfactant production in two LAB strains. LAB was grown in MRS medium for 72h (30°C-120 rpm). Biosurfactant was extracted using a PBS buffer after centrifugation and washing of the cells. The MRS medium was modified so that the effect of carbon and nitrogen sources could be studied. Surface tension (ST) was measured using the ring method at room temperature (reference PBS buffer: 70.6 ±0.6 mNm-1). The critical micelle concentration (CMC) of the freeze dried biosurfactant was also determined. The degradation halo in the blood agar and the reduction in ST of the PBS cell extract indicated the ability of *Lactobacillus plantarum* and *Lactobacillus* sp to produce cell bound biosurfactant. *L. plantarum* showed better biosurfactant production, giving a decrease in ST of 7.7±1.3 mNm-1. The use of MRS-lac promoted bacterial growth and biosurfactant production (10.7 ±1.3 mNm-1 reduction of ST). The presence of at least two complex nitrogen sources out of peptone, yeast extract and beef extract was required to obtain the maximum growth rate of 0.090±0.003 h-1. The kinetic study indicates that the maximum production occurred at 48h under stationary conditions. The CMC of the biosurfactant was found to be 100mgL-1. Characterization of the biosurfactant obtained will allow it to be used in MFCs and in other pharmaceutical or food applications

Biography

Carolina Montoya Vallejo is a Biological Engineer from National University of Colombia, with a Master's degree in Chemical Engineering from the University of Antioquia. Nowadays, she is studying PhD in Chemical Engineering at the same university. Her experience in research has focused on microalgal, environmental and plant biotechnology. She has participated in several research projects, for example; microalgae and zooplankton culture at pilot scale for the production of live food in the Explora Aquarium, *in-vitro* culture of *Canavalia ensiformis* to control ants and black sigatoka, and cadmium bioremediation using native microalgae.

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Determination of PUFA content in microalgae through Nile red fluorescence method

Ruben Darío Múnera-Soto, Mauricio López Trejos, Juan Martin Delgado Naranjo and **Mariana Peñuela Vásquez**
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Polyunsaturated Fatty Acids (PUFA's) are essential in children development and healthy diets. Among them Docosahexaenoic Acid (DHA) is linked to brain/eye development in children along heart disease prevention. DHA is usually obtained from fish-capture oil. But, due to depletion of its natural sources, seasonal variability in its composition, and potential chemical contamination alternative sources are becoming more relevant. Microalgae are some of the most suitable candidates to supply PUFA's. One problem is quantifying the amount of oils after fermentation. Currently, from the methods to measure PUFA's within microalgae cultures, the most popular are gravimetric and dying methods., Gravimetric methods are time-consuming, require larger samples, several steps, and solvents, therefore, they become impractical. On the contrary, dying methods, though more complex analysis-wise, are a good option when the samples are small and frequent. Nile Red Fluorescence (NRF) have proven to be successful to determine the content of PUFA's in microalgae, though it is not effective for microalgae with thick, rigid cell wall. NRF is a lipophilic dye, which properties are determined by the polarity of the surroundings. The method is based on dying the cell in the presence of a transporting carrier to make the membrane permeable to the Nile Red molecules. Dimethyl-Sulfoxide (DMSO) was our carrier. A spectrophotometer with the capacity to read microplates allowed the development of the protocols with an enhanced performance towards the qualitative analysis of lipid content. Excitation and emission wave lengths were measured as 535 nm, 660 nm respectively. After defining the excitation and emission characteristics, we built a calibration curve for determining lipids. The results were validated by comparing results from Bligh and Dyer method. NRF is a viable way to determine the content of lipid after the microalgae has reach the maximum oil production, this way quantifying PUFA yield will not be so time-consuming

Biography

Ruben Darío Múnera-Soto is a Chemical Engineer graduated from Universidad de Antioquia, the education field has been his passion ever since he has been graduated from college and he has worked with several Universities in his country in the areas of engineering and basic sciences. Currently, he is a student in the Chemical Engineering Master's Program at Universidad de Antioquia as in the field Biotechnology as a Member of the Bioprocess Research Group in the same university. As part of his forming activities he has been participated in a project aiming to solve malnutrition issues in Colombian children, and improve dietary problems in the population at large.

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Effect of carbon to nitrogen ratio in the growth of *Schizochytrium limacinum* towards DHA production

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Docosahexaenoic Acid (DHA) is linked to brain and sight development in children. Many children in Colombia do not have access to diets containing these essential nutrients. To improve this condition, it is necessary to explore different sources for DHA. In recent years, Schizochytrium limacinum SR21 has emerged as an alternative to the production of DHA; nevertheless, this way of productions is still underdeveloped. To cope up with this necessity, we are studying the conditions under which SR21 yields increase by varying carbon to nitrogen ratio, as well as, lowering production costs for this technology. Varying the carbon to nitrogen ratio allows finding the best conditions under which biomass and lipid induction happen, this is important given that S. limacinum is not endemic to Colombia; therefore, it is necessary to establishing the optimum conditions for the region. Initially, we evaluated a constant carbon (glucose) concentration of 50g/L varying nitrogen (yeast extract) concentrations in C:N rations of 5:1, 15:1, 25:1, and 35:1 respectively in a 6 day fermentation at 23°C and 160 rpm. After analyzing the data, we found that the 5:1 ratio yielded 38g/L DCW although the growth was slow and we did not reach the stationary phase, 25:1 ratio showed the overall best conditions with 26g/L DCW in 120 hours. The next step in the study will be to optimize the conditions for lipid induction and profiling the oil to characterize the DHA produced in the fermentation process. These results are very promising for further up scaling and production of a nutraceutical food for children enriched with DHA. Microalgae are a great candidate to shift the production of DHA from fish capture to renewable sources; moreover, new biotechnological sources for producing DHA will facilitate the access of these nutrients to children in Colombia

Biography

Juan Martin Delgado is a Food Engineer and did his MSc in Engineering from Universidad de Antioquia, Colombia. He is part of Bioprocess Research Group. At this moment, he is leading the development of Biotechnology applied to Food Science. He has experience as a Food Safety Consultor, as well as in the fields of alternative uses of fish wastes, fish silage, bromatological analysis, and microalgae culture. His passion is to find new ways to use biotechnology to solve the alimentary needs of children in Colombia.

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