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EURO-GLOBAL CONFERENCE ON

BIOTECHNOLOGY AND BIOENGINEERING

SEPTEMBER 06-07, 2021

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ECBB 2021

BOOK OF ABSTRACTS

EURO-GLOBAL CONFERENCE ON

BIOTECHNOLOGY AND BIOENGINEERING

SEPTEMBER 06-07, 2021

Theme:

Addressing Current Challenges in Biotechnology and Bioengineering

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About MAGNUS GROUP

Magnus Group (MG) is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conference and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 90 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.

About ECBB 2021

Magnus Group with gratification and privilege announcing its "Euro-Global Conference on Biotechnology and Bioengineering"(ECBB 2021), an Online Event scheduled during September 06-07, 2021 with the theme "Addressing Current Challenges in Biotechnology and Bioengineering" The main aim of ECBB-2021 provides interaction between Biotechnology experts, Bioengineering professionals, R&D department, Young Researchers, Ph.D. scholars, and other professionals in the areas of pharmaceutics, Drug delivery, Nanomedicine, Biotechnology, and Nanotechnology around the world to share about their research studies and new innovations in the field of Biotechnology and Bioengineering. You can increase your professional skills in this free time and discuss the practical challenges encountered and the solutions adopted.

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KEYNOTE FORUM

DAY 1

EURO-GLOBAL CONFERENCE ON

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ECBB 2021

Jose M Dominguez Vera

Department of Inorganic Chemistry, Institute of Biotechnology, University of Granada, 18071 Granada, Spain

Probiotic cellulose: A new biomaterial for antibiotic-free therapy of bacterial infections

A recent WHO report warns of the dramatic increase in the emergence of antibiotic-resistant bacteria and concludes that this is one of the biggest threats to global health. In a scenario where antibiotics are no longer effective, common infections become much more dangerous and could kill once again. A hopeful free-antibiotic alternative to address infections is the use of probiotics. We have developed an approach to develop a new biomaterial that combines the extraordinary properties of bacterial cellulose as a matrix plus the biomedical activity of probiotic bacteria. We interchange the cellulose-producing bacteria by the probiotics following an elegant strategy. The resulting probiotic cellulose exhibit antibacterial activity against relevant strains involved in most topical infections.

Audience Take Away:

- We have produced probiotic cellulose: a bacterial cellulose that contains probiotics instead native bacteria
- The probiotics remain alive and active inside the cellulose network
- Probiotic cellulose exhibits activity against relevant pathogenic strains, including methicillin-resistant
- Probiotic cellulose, in contrast to bacterial cellulose, is obtained under mild conditions.

Biography:

Dr. Jose M Dominguez-Vera studied Chemistry at the Universidad de Granada (Spain) and graduated as MS in 1988. He received his PhD degree in 1993 at the LCC-CNRS (Toulouse, France). After two years postdoctoral fellowship working on biomineralization he obtained the position of an Associate Professor at the Universidad de Granada. He is professor of the same university from 2010. He is leader of the BIONanoMet group. He has published more than 100 research articles and six patents, two of them exploited.

Tony Hadibarata

Environmental Engineering Program, Curtin University Malaysia, Miri, Sarawak, Malaysia

The potential of laccase produced from fungi for biotransformation of polycyclic aromatic hydrocarbons

A total of 804 fungi isolate were subjected to the screening of high laccase activity by four different indicators test, Poly R-478, RBBR, guaiacol, and syringaldazine. The results presented the diversity of 6 order, belonging to 17 families, 25 genera and 29 species, and most of the isolated strain was reacted with laccase chemical indicators and categorized as saprophytic, parasitic and ectomycorrhizal. Three fungi (Coriolopsis caperata, Fomes fomentarius, Pluteus chysophaeus) that isolated from Niah National Park and Lambir Hill National Park were selected for further experiment due to their high positive reaction on all tested indicators. The maximum level on the laccase production during fungi exponential growth was impacted by the addition of carbon source. Diphenic acid, 1-hydroxy-2napthoic acid, catechol, and salicylic acid, anthraquinone, benzoic acid, and phthalic acid were detected as metabolites of phenanthrene, anthracene, and pyrene.

Audience Take Away:

- Ability of high producer laccse from fungi isolated from Borneo Island
- The transformation pathway of PAHs by the fungi

Biography:

Dr. Tony Hadibarata is Associate Professor in Environmental Engineering Program, Department Civil and Construction Engineering, Faculty of Engineering and Science, Curtin University, Malaysia. He is also the Head of Bio-Process and Technology Research Cluster, Curtin University Malaysia. Dr. Tony Hadibarata obtained his PhD in Environmental Chemistry and Microbiology from Ehime University, Japan. He is the author or coauthor of more than 130 papers in international refereed journals and more than 110 conference contributions. He has given several invited/plenary talks at international conferences. His research interests cover monitoring of pollutant in environment and the bioremediation approach of hazardous pollutant using microorganism and nanotechnology. He has been involved in many international collaborations, including the ASEAN University Network Seed JICA Japan, ASEAN India Collaborative Research Grant, Nagao Environmental Foundation, TWAS-Comstech, and many national grants.

Hector M. Alvarez

Instituto de Biociencias de la Patagonia (INBIOP), FCNyCS, UNPSJB, CONICET, Comodoro Rivadavia, Chubut, Argentina

Bioengineering oleaginous Rhodococcus as bacterial biofactories for oil-related compounds production

Global oils, wax esters and biofuels demand is forecasted to increase in the next years. In order to meet this growing demand, the exploration of new ways of obtaining these products is required. In this context, microorganisms (bacteria, yeasts, fungi and microalgae) are now seriously considered as alternative oils and wax ester sources. Among bacteria, the oleaginous property is limited to a few specific species identified mainly from the genus Rhodococcus, such as R. opacus and R. jostii. These rhodococcal species are able to use a wide diversity of substrates for oil production, including industrial wastes such as glycerine, olive mill wastes, carob and orange residues, lignocellulosic material, whey, among others. Cell engineering to increase lipid production provides a good opportunity for designing a scalable and commercially viable oil-producing system. In addition, metabolic engineering allows expanding the capacity of the biochemical platform of rhodococci towards the synthesis of new bioproducts. Oleaginous rhodococci accumulate significant amounts of triacylglycerols (TAG) from gluconate or other carbon sources, but they are not able to produce detectable amounts of wax esters (WE) due to their inability to produce a significant pool of fatty alcohols in cell metabolism. In order to provide a pool of fatty alcohol moieties available for WE synthesis, we performed the heterologous expression of a gene encoding a fatty acyl-CoA reductase from the marine Gram-negative Marinobacter hydrocarbonoclasticus VT8 into the oleaginous R. opacus PD630. Recombinant cells produced ca. 46% of WE and 54% of TAG (of total WE + TAG) from gluconate compared to the wild type strain which produced 100% of TAG. Moreover, the cultivation of engineered R. opacus on residual whey, an inexpensive waste material from dairy industries, also resulted in the production of WE in addition to TAG, without affecting cell growth. These results demonstrated that the metabolism of oleaginous rhodococci is robust enough to successfully incorporate heterologous reactions and pathways to expand the range of lipids with commercial interest. On the other hand, the manipulation of rhodococcal genetics and biochemistry also allows expanding the lipogenesis ability to new growing conditions. We identified an interesting regulatory mechanism in R. jostii and R. opacus that couples the expression of several genes of lipogenesis to the activation of a regulatory system that provides alternative sources of nitrogen, when cells are cultivated under nitrogen-limiting conditions. This response is mediated by a protein called NlpR, which is a global regulator that provides a strong redirection of carbon flux toward lipid metabolism. NlpR is able to activate the expression of some genes involved in fatty acid biosynthesis (FASI) and the Kennedy pathway for TAG synthesis, including genes encoding AGPAT, PAP2 and DGAT enzymes, in addition to those encoding nitrate/nitrite reductase systems. Overexpression of nlpR gene improves TAG synthesis in oleaginous rhodococci under nitrogen-rich conditions. Thus, NlpR provides a new target for engineering single-cell oil production by rhodococci using nitrogen-rich industrial wastes. These results demonstrate that the application of molecular engineering to oleaginous rhodococci to improve lipid production and enlarge their application spectrum is possible.

Audience Take Away:

- The presentation will provide the audience with a comprehensive overview on single-cell oil production by oleaginous Rhodococcus spp. bacteria
- The audience will learn about concrete molecular engineering strategies applied to oleaginous bacteria for improving oil production

- The audience will learn about molecular procedures applied to oleaginous bacteria to enlarge their range of applications
- This research will be of interest for all colleagues working on biofuels, biolubricants and oleochemical production

Biography:

Hector M Alvarez studied Biochemistry at the University of Patagonia San Juan Bosco (Argentina) and graduated in 1993. He received his PhD degree in 1998 at the same institution. Between 1993 and 1997 he performed doctoral research at the Institute of Microbiology, Georg-August University of Göttingen, and the Institute for Molecular Microbiology and Biotechnology (IMMyB), Westfälischen Wilhelms University in Münster, Germany supervised by Prof. Alexander Steinbüchel. Between 2000 and 2001 he conducted postdoctoral research at the IMMyB, WWU Münster, Germany. He obtained the position of an Full Professor at the UNPSJB. He has published more than 57 research articles in SCI(E) journals.

Rosalinda Mazzei

Institute on Membrane Technology, National Research Council, ITM-CNR, via P. Bucci, 17/C, I-87030 Rende (Cosenza), Italy

Biocatalytic membrane reactors towards process intensification in biocatalysis and biorefinery

Artificial membranes functionalized with biomolecules are very suitable for the development of biohybrid and biomimetic systems which find application in various fields. The system simulates the biological membrane compartmentalization, where the biological system can be heterogenized inside/on the membrane or simply retained by it and the substrate passage can be regulated by controlled fluid dynamic conditions. Despite the advantages of nature simulation these systems suffer of some issues, which need to be better studied in order to achieve a development on a large scale. The main problems are related to both biomolecule stability as well as membrane cleaning and re-use. In this keynote, an overview of the main application of biocatalytic membrane reactor in biocatalysis and biorefinery will be given together with the main drawbacks, which limits the development of this technology on larger scale. Innovative strategies to solve main problems related to membrane stability/enzyme re-use will be described (eg. the use of biofunctionalized nanoparticles integrated with membrane for enzyme reuse). A deep understanding of biomolecule immobilization on membrane will be illustrated by using different biomolecule and functionalized membranes, to proof the concept of membrane versatility. Besides, a biocatalytic multiphasic intensified membrane system, able produce and stabilize in a single step phytotherapics will be also described, with the aim to provide alternative strategies for process intensification.

Biography:

Rosalinda Mazzei is a researcher at CNR-ITM since 2011, degree in biology and PhD in vegetal physiology. Since 2003 she participated in various research projects funded by the EU, MIUR, CNR and private companies in the field of biorefinery, integrated membrane processes and membrane bioreactors. She serves as scientific and/or technical evaluator of research for funding institutions such as FONDECYT (Chile). She is co-author of 60 scientific papers published in international journals, more than 20 book chapters, various invited lectures and more than 100 contributions at scientific conferences on membrane science and engineering.

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POSTERS DAY 1

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Shunsuke Masuo*, Kurumi Usui, Chisa Saga and Naoki Takaya
Faculty of Life and Environmental Sciences, Microbiology Research Center for Sustainability, University of Tsukuba, Tsukuba, Ibaraki, Japan

Raspberry ketone production from glucose by metabolic engineered Escherichia coli

Raspberry ketone is in great demand as a plant-based natural flavor agent. The berry flavor of raspberry ketone with a low odor threshold is used as a food additive to create various aromas such as cherry, strawberry, kiwi and other fruits. However, natural raspberry ketone is one of the most expensive flavor compounds due to the limited raspberry ketone contents in plants. Microbial fermentation should be an alternative strategy that allows inexpensive mass production of raspberry ketone without the need for extraction from plants. Here, we demonstrate de novo production of raspberry ketone from simple carbon sources in Escherichia coli. To increase the precursor production, we generated p-coumaric acid overproducing E. coli by metabolic engineering. The resulting E. coli produced 1.9 g/l of p-coumaric acid from glucose. The p-coumaric acid CoA ligase and amino acid substituted benzalacetone synthase, derived from Agrobacterium tumefaciens and Rhemu palmatum (commonly known as Chinese rhubarb), respectively, were expressed in p-coumaric acid-overproducing E. coli. Overexpression of fabF, coding -Ketoacyl-acyl carrier protein (ACP) synthetase II, combined with the addition of fatty acid elongation inhibitor cerulenin increased intracellular malonyl-CoA, the precursor of benzalacetone synthase in raspberry ketone biosynthesis, and improved raspberry production. After optimizing the culture conditions, the fed-batch cultured engineered E. coli produced 62 mg/L of raspberry ketone from glucose. Our production system would be a great contribution to the flavor and fragrance industries as an inexpensive method that does not rely on plant extraction.

Audience Take Away:

- A microbial platform for de novo production of raspberry ketone
- Genetic and chemical approach increased intracellular malonyl-CoA and improved raspberry production in E. coli
- Our strategy can apply for the de novo biosynthesis of valuable plant-derived compounds such as stilbenoids, flavonoids, curcuminoids, and so on

Biography:

Dr. Shunsuke Masuo studied Agriculture Science at the University of Tsukuba, Japan and graduated as MS in 2008. He joined the research group of Prof. Takaya at the Graduate School of Life and Environmental Sciences, University of Tsukuba. He received her PhD degree in 2011 at the same institution. After four years' postdoctoral fellow, he obtained the position of an Assistant Professor at the University of Tsukuba. He has published more than 20 research articles in SCI(E) journals.

Nozomi Katsuki*, Shunsuke Masuo and Naoki Takaya
Faculty of Life and Environmental Sciences, Microbiology Research Center for Sustainability, University of Tsukuba, Ibaraki, Japan

Identification of non-conventional p-hydroxybenzoate hydroxylase family proteins

p-Hydroxybenzoate (pHBA) hydroxylase (PobA) is a model flavin-containing hydroxylase that oxidizes NADPH and pHBA to produce protocatechuic acid (PCA). This study identified a series of PobA-like proteins that form a novel subfamily of proteins in the PobA family. We searched published databases for PobA-like proteins with less than 50% amino acid sequence homology to known PobAs. These proteins were distributed among bacteria, and phylogenetic analysis found that PobA from *Xylophilus ampelinus* (XaPobA) and other bacterial PobA-like proteins with > 70% homology to XaPobA forms a new subfamily, and was distinct from well-known PobAs. The PobA-like proteins lack the conserved tyrosine residues at the active center of the known PobAs. They contain conserved tryptophan and phenylalanine residues that are predicted to constitute the active center. Recombinant XaPobA was prepared and investigated for reaction properties. Reactions of XaPobA with pHBA and PCA were analyzed by HPLC, and determined to be PCA and gallic acid, respectively. Steady-state kinetics for substrate-dependent NADPH oxidation showed that kcat and Km values were 170 μM and 0.079 s-1 for pHBA, and were 290 μM and 1.6 s-1 for PCA, indicating that XaPobA prefers PCA as a substrate than pHBA. This observation was essentially similar for other proteins in this subfamily from *Ottowia thiooxydans, Pigmentiphaga kullae*. These results indicate that the newly identified PobA subfamily comprises enzymes that hydroxylate PCA rather than pHBA, unlike conventional PobA.

Audience Take Away:

- The phylogenetic analysis discovered a new subfamily within the popular PobA family
- XaPobA in this subfamily prefers PCA to pHBA, unlike conventional PobA
- Proteins in this subfamily will develop novel biocatalysts for aromatic hydroxylation

Biography:

Mr. Nozomi Katsuki studied Agriculture Science at the University of Tsukuba, Japan, and graduated as MS in 2021. He joins the research group of Prof. Takaya at the Faculty of Life and Environmental Sciences, University of Tsukuba. He is participating in a project on the microbial production of aromatic compounds.

Poonam Kumari[1*], Sanjay K Banerjee[1], Upadhyayula Surayanaryana Murty[1], Velayutham Ravichandiran[2] and Utpal Mohan[2]

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[2]Department of Medicinal Chemistry, National Institute of Pharmaceutical Education & Research (NIPER), Kolkata-700054, India

Sortase A mediated peptide recruitment as a potential anti-virulence = treatment for Staphylococcus aureus infection

Sortase A is a transpeptidase enzyme that is majorly present onto the cell wall of Gram-positive bacteria. It recognized and displays proteins on the cell wall via a conserved motif LPXTG at C- terminal. These proteins plays a major role in the virulence of the bacteria. Cell surface proteins not only helps bacteria to enter the host cells but also helps the bacteria to evade the immune systems using various mechanisms. In this study we have used a foreign peptide having LPETG motif at the C-terminal to redecorate the cell wall of the bacteria. Here, we used the approach to study the bacterial response after the recruitment of Foreign peptide onto the fibronectin binding, complement system activations and the pathogenesis of the bacteria. Here, we have observed a significant decrease in the binding of the Staphylococcus aureus to fibronectin by which bacteria enter in the host cells. As well as we have also observed a increase in the phagocytosis of the bacteria after the peptide treatment in-vitro. The present work provides a novel method to combat the Gram-positive infection by attenuating its virulence.

Biography:

Miss Poonam Kumari completed here Master in technology and currently pursuing her PhD from NIPER Guwahati, India. Her Ph.D. work is on "Sortase based biomolecular engineering". During the last one year, she was able to develop a method for the generation of novel protein coding gene libraries, for which an Indian Patent application has been filed. She has screened the surface of S. aureus for evolving novel peptides that bind its surface with high affinity. Apart from her expertise in molecular biology tools set, she also has learned solid phase peptide synthesis, which is an asset for a Biology student. She has synthesized her peptides and analysed them for antibacterial activity. Her work has generated enough results, on which we are about to file a patent and communicate a manuscript from her last one-year work. She has published one research paper also from her thesis work and few are in communication.

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SPEAKERS DAY 1

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Shuhei Yoshida*, Tomohiro Fukui And Koji Morinishi
Department of Mechanical Engineering, Kyoto Institute of Technology,
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Numerical simulation on the effects of fish's body thickness and head swing motion on its swimming performance

In recent years, there have been many efforts to design highly efficient underwater robots inspired by aquatic organisms. To design more efficient ones, it is very important to understand swimming mechanism of fish. One of the interesting aspects of fish swimming is that many fish swim with their heads swinging in accordance with their kinematic situations. Therefore, we focused on swing motion at the head of the fish and considered the effects of amplitude of the head swing on its swimming performance. In this study, the swimming performance with different swing motions at the head was analysed and compared by two-dimensional numerical simulation using the regularized lattice Boltzmann method. Three types of symmetrical wings, NACA0006, NACA0012, and NACA0018, were used as base models to discuss the effects of their thickness. Amplitude of the head swing was varied from 0% to 8% of the body length, and the effects were mainly investigated using five evaluation parameters: swimming speed, acceleration, required power, thrust, and swimming efficiency. As a result, under low Reynolds number conditions (Re = 500 and 1000), when amplitude of the head swing was increased regardless of body thickness, a large pressure difference was generated on the left and right sides of the body during acceleration, which produced a large thrust force, increasing rate of acceleration and a faster transition to the steady swimming state. However, during steady-state swimming, large-amplitude caused more power to be required, and swimming efficiency consequently decreased. On the other hand, when amplitude was small, the swimmer cannot generate a large thrust during the acceleration period and could not swim with a large acceleration. During steady-state swimming, however, the model with small amplitude was able to swim with less power and showed better swimming efficiency than when the amplitude was large. In addition, when the body thickness was larger, the rate of change in swimming efficiency due to changes in amplitude of the head swing was more prominent. This is similar to the tendency of anguilliform swimmers such as eels with large amplitude, or thunniform swimmers such as tuna with small amplitude during swimming. This study suggests that highly efficient underwater robots would be produced by appropriate control of amplitude of the head swing.

Audience Take Away:

- For all body thicknesses, the large head amplitude can generate a large thrust immediately after the start of swimming, and swimming with a large acceleration can shorten the time required to reach a steady swimming state. However, the swimming efficiency decreased because the required power became larger
- In the steady-state swimming state, the small amplitude of the head swing decreased swimming speed and thrust, on the other hand, the small amplitude greatly reduced the required power and enabled fish to swim with high efficiency
- Although swing motion at the head is a biological feature of fish swimming, this study suggests that amplitude of the head swing should be changed in accordance with the stage of swimming situations for better performance. This indicates that by controlling amplitude of the head swing of the fish-like robot, it is possible to optimize their performance depending on the environment.

Biography:

Shuhei Yoshida studied Mechanical Engineering at the Kyoto Institute of Technology and received Bachelor in 2019. He is currently a master's student at the same university, doing research on fish in biomimetics.

Mako UCHIO[1*], Tomohiro FUKUI[1], Misa KAWAGUCHI[1], Kanako KUROYANAGI[2], Yurie SETO[3], Yoshiko KANEKO[3] and Koichi TAKAYAMA[3]

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[2]Department of Design and Architecture, Kyoto Institute of Technology, Matsugasaki, Goshokaido-cho, Sakyo-ku, Kyoto, 606-8585 Japan
[3]Department of Pulmonary Medicine, Kyoto Prefectural University of Medicine, 465 Kajii-cho, Kawaramachi-Hirokoji, Kamigyo-ku, Kyoto, 602-8566 Japan

Fundamental study on the airflow in the patient-specific lung models by AcuSolve

In recent years, number of deaths due to chronic obstructive pulmonary disease (COPD) has been increasing all over the world. COPD is an inflammatory disease of the lungs caused in part by long-term inhalation and exposure to harmful substances such as tobacco smoke, and its general pathological symptoms are airflow limitations. Inhaled medication is one of the well-known pharmacological treatments for COPD. In order to consider the pharmaceutical particles deposition in the lungs numerical simulations have been conducted to analyze the macroscopic flows in the airways. Most of these lung models were constructed based on the geometrical similarity of the airways, such as the Weibel's model, which is divided 0th order to 23rd order for simplicity. Therefore, it is important to consider airflows in the lung using patient-specific models. In this study, we created airway models from medical image data and analyzed airflows using CFD solver AcuSolve. As a fundamental study, the airway models up to third generations were used for the airflow analysis. The governing equations are the continuity equation and the incompressible Navier-Stokes equation in fully three dimensions. The working fluid was assumed to be a single-phase gas, and the airway wall was set rigid. In addition, no gravity effects were taken into consideration. Then, the physical quantity of the flow field (i.e., velocity profiles, secondary flow, flow rate distribution etc.) was evaluated and compared among the models. In addition, pulmonary airway models were classified according to the severity of COPD and relationship between their geometric features and internal flow was investigated in detail.

Biography:

Mako Uchio studied Mechanical Engineering at Kagawa University and received Bachelor in 2019. She is currently a master's student at the Kyoto Institute of Technology, doing research on pulmonary airway flow analysis.

Jia Min Lee[1*], Guo Liang Goh[2], Andreas Alvin Purnomo Soetedjo[3,4], Hwee Hui Lau[3,5], Jia An[2], Ye Xin Koh[6], Adrian Kee Keong Teo[3,7], and Wai Yee Yeong[1,2]

[1]School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore
[2]Singapore Centre for 3D Printing (SC3DP), School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore
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[4]Integrative Sciences and Engineering Programme, NUS Graduate School, National University of Singapore, Singapore
[5]School of Biological Sciences, Nanyang Technological University, Singapore
[6]Department of Hepatopancreatobiliary and Transplant Surgery, Singapore General Hospital, Singapore
[7]Department of Biochemistry and Department of Medicine, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

The role of 3D printing and bioprinting in engineering a bioartificial pancreas for regenerative medicine in diabetes

The global rise in diabetes along with the current lack of sufficient donor human islets for cell replacement therapy motivates the making of a bioartificial pancreas to replace pancreas' function. Technological advances in tissue engineering revolutionize diabetes treatment. One such technology is 3D printing and bioprinting. This computer-based fabrication process encourages innovation in bioengineering a bioartificial pancreas using a tri-factor approach – design, material, and processes. First, we highlight and compare different technologies available in 3D printing and bioprinting. The selection of suitable printing technology will enhance the fabrication process of bioartificial pancreas. Next, we identify key components of pancreas and clinical considerations for engineering a bioartificial pancreas. To recapitulate the pancreas' function in insulin secretion and glycaemic control, the bioartificial pancreas will consist of three components 1. Cells (beta cells and supplementary cells) 2. Scaffold (for cell delivery) and 3. System (the housing of cells with scaffold). Thereafter, we match these needs and identify engineering solutions using 3D printing and bioprinting to mimic pancreas' functionality. Lastly, we highlight challenges and potential directions towards an implantable bioartificial pancreas fabricated using 3D printing and bioprinting.

Audience Take Away:

- What is 3D printing and bioprinting?
- What are the considerations for bioengineering a bioartificial pancreas?
- How would 3D printing and bioprinting assist in creating a bioartificial pancreas?

Biography:

Dr Lee Jia Min is currently a research fellow under the School of Mechanical & Aerospace Engineering, NTU. She is currently working on bioprinting and 3D printing for tissue engineering applications and alternative testing models. She has published over 18 articles, with 884 citations and has a H-index of 10. She has also filed 3 patent applications (2 SG provisional patent and 1 Non-drafted SG provisional patent) and 1 Know-how based on her Bioprinting and 3D Printing work. Her research interest includes, 3D Bioprinting, 3D Printing, Biosensors and Biotechnology.

Santanu Dasgupta* and Bhaskar Bhadra
Synthetic Biology, Reliance R&D, Reliance Industries Ltd., Navi Mumbai, Maharashtra, India

Green Synthetic Biology for sustainable production of food, feed, advance biomaterials, and personal care ingredients

Innovation in life sciences and engineering is creating opportunities to resolve the challenges human life and civilization facing today and what is upcoming in the future. Human population is growing throughout the world alarmingly resulting a continued increase in demand for food, health solution and nutrition. Existing manufacturing principles and processes is also posing huge sustainability challenges. With the onset of fourth industrial revolution, amalgamation of physical, digital and biological systems is accelerating innovations with dramatic societal and environmental impact. Synthetic biology is leading this revolution by employing living micro-organisms to produce products useful for human life and civilization in previously unthought-of markets. Manufacturers choose biology as the method of choice to efficiently produce high-performance, sustainable products and thereby, synthetic biology is at leading edge of this $4 trillion gold rush. We at Reliance Industries Limited (RIL) have developed cutting edge tools and technologies for synthetic biology to utilize the fullest potential of this opportunity. Over a decade we have developed our capability in improving photosynthetic efficiency of algae and have established a robust round-the-year algae cultivation capability. We have also made significant advances in synthetic biology, gene editing technology, bioinformatics and availability of different high-throughput technologies to increases productivity of microorganism including algae. We have leveraged this platform for making next-gen biomaterials, feed and food ingredients, and several value-added products for home and personal care industries. Some of these developments at RIL will be discussed during the presentation.

Audience Take Away:

- How to leverage photosynthesis to make molecules for future; Large-scale cultivation of algae; Entrepreneurship and networking opportunities in green synthetic biology
- How will this help the audience in their job? This will help audience to gain knowledge on application of algae to solve some of the grand challenges in future. Is this research that other faculty could use to expand their research or teaching? Yes, the untapped potential of green – cell factory need attention for building future-technology. Does this provide a practical solution to a problem that could simplify or make a designer's job more efficient? Both, designing novel cell factory and develop knowledge how green cell factory could be used in future. Will it improve the accuracy of a design, or provide new information to assist in a design problem? Yes, especially the approach of developing a synthetic biology platform with algae will add new dimension on the way we do biology today.

Biography:

Dr. Santanu Dasgupta spent more than 30 years in Biotechnology research in various key leadership roles and contributed significantly to the discovery of various biotech traits and led many breakthrough global agriculture biotechnology programs. Dr. Dasgupta is the inventor of numerous patents across various countries. In addition to many technical and leadership roles, Dr. Dasgupta also worked as Director, Regulatory policy and Scientific Affairs at Monsanto company, St. Louis and India. He is currently heading the Biology/Biotech R&D at Reliance Industries with a focus on biofuel, food, feed, nutrition and biomaterials produced through synthetic biology route.

Mohammed Amine Serghini*, Mohamed Lachheb, Soumaya El Merzougui, Imane Boudadi, Yassine Ouhassoune And Khadija Lachguer

Laboratory of Biotechnologies and Valorization of Natural Resources, Faculty of Sciences, Ibn Zohr University, Agadir, Morocco

Improvement of saffron 'Crocus sativus L.' by plant biotechnology

Saffron is a spice constituted by the dried stigmas of the flower of Crocus sativus L. This iridacea is a corm plant undemanding at the edaphic level and which supports harsh winters (up to -10 °C) and hot summers (over 40 °C) with a biological cycle where its corms are at state of dormancy in the soil half the year. Saffron is considered as "red gold" and is among the world's most expensive and valuable spices by weight. It is credited with color, flavor, and fragrance due to more than 150 volatile and aroma-yielding compounds. The exorbitant price of saffron of up to $30/g frequently exposes the saffron to fraud and requires the use of effective controlling methods to guarantee its authentication. World saffron production amounts to some 400 tonnes/year. The main producing countries are: Iran (94%), Greece (2.2%), Morocco (1.5%), India (1%), Spain (0.5%) and other countries (0.7%). Morocco is the largest African producer of saffron that constitutes a flagship local product and which strongly contributes to the income of local people. If aspects related to saffron, such as the structuring of producers, the cultural management, the packaging, and the marketing have marked a significant progression, the in-depth knowledge of the biology of the plant, the chemical component of its spice, and the Molecular identity of accessions represent a continuous challenge to scientific research and plant biotechnologies are currently being used intensively in order to improve the production of saffron and protect its authenticity. The conference will focus on the contributions of scientific research to saffron starting with the agro-morpho-physiological aspects of C. sativus different accessions by the study and comparison of various parameters related to the underground part and the aerial part in order to achieve a clonal selection. The chemical part will focus on the main metabolites of saffron (crocins, picrocrocins and safranal) in the context of the ISO standard. The chemical study of saffron is able to evaluate the content of its three main metabolites, to control the authenticity and to distinguish different geographical origins of this spice using UV-Vis, HPLC, GC, IR and colorimetric techniques. The molecular aspect will deal with the use of molecular markers such as microsatellites (SSR), inter-microsatellites (ISSR) and barcoding to characterize different accessions of saffron, assigning their molecular identities able to counter fraud attempts linked to the high cost of this spice. The application of plant biotechnologies to saffron, such as plant tissue culture is undertaken with the aim of accelerating seed production of elite accessions and producing the secondary metabolites of this plant. Finally, the research conducted on the recovery of saffron flower waste will be described in the context of production of bio-dyes.

Audience Take Away:

- In-depth knowledge of the spice of saffron and the plant that produces it
- Different biotechnologies used for the improvement of this plant species
- Use of sophisticated techniques for establishing the chemical and molecular identity of different accessions of this species
- How to control the authenticity and to distinguish different geographical origins of this spice using UV-Vis, HPLC, GC, IR and colorimetric techniques
- Recovery of saffron flower waste by bio-dyes

Biography:

Mohammed Amine SERGHINI, born in 1964, holds a thesis from the Louis Pasteur University of Strasbourg, France and a PhD from Ibn Zohr Univesity of Agadir, Morocco in molecular plant virology. Currently, he is a professor of higher education and director of biotechnology and genetic resources team in the faculty of sciences – Ibn Zohr University, Agadir. In terms of research activities, Prof. M.A. SERGHINI carries out several national and international research programs in the field of plant biotechnologies. He has supervised more than twelve doctoral theses and has published around forty publications in national and international journals.

Hana Dostalova[1*], Jan Blumenstein[1,2], Robert Radisch[1,2], Václav Stepanek[1], Michal Grulich[1], Miroslav Patek[1]

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Assignment of sigma factors of RNA polymerase to promoters by *in vivo* and *in vitro* systems in *Rhodococcus* sp

Many *Rhodococcus* strains are able to transform and metabolize a wide range of toxic organic compounds, which contaminate various environments. Thanks to their diverse metabolic activities, rhodococci are promising microorganisms for biotechnological applications in biodegradations, bioremediations, and enzymatic biotransformations. *Rhodococcus* strains are distinguished by their cell wall which contains mycolic acids. These compounds are also present in the cell wall of other bacteria of the Mycolata group, such as *Corynebacterium* and Mycobacterium species. Many *Rhodococcus* strains were classified as extremophiles, which are able to cope with various types of stresses, e.g. desiccation, heat, cold and osmotic stress. In most cases, severe stresses cause decrease in biodegradation efficiency. In contrast, stresses have in some cases positive effects on production of the desired compounds (e.g. desiccation stress on the production of triacylglycerols, osmotic stress on the synthesis of fatty acids). Most stress responses, and particularly their mechanisms, have been described in rhodococci in much less detail than their enzymatic machinery and their use for biotechnological processes. Global, genome-wide studies, which can describe complex stress response mechanisms and impact of stresses on the biotechnological processes, are still rare in rhodococci. We developed in vitro and in vivo assays to examine the connection between alternative sigma factors of RNA polymerase and genes activated by various stress conditions. These assays are based on the procedures designed for the related species, *Corynebacterium glutamicum*. We showed that the *R. erythropolis* CCM2595 genes frmB1 and frmB2 which encode S-formylglutathione hydrolases (named corynomycolyl transferases in *C. glutamicum*) are controlled by SigD, just like the homologous genes cmt1 and cmt2 in *C. glutamicum*. The new protocol of the in vivo and in vitro assays will enable us to classify promoters of *Rhodococcus* stress genes according to their connection to sigma factors and to assign the genes to the corresponding sigma regulons. The complex stress responses could thus be analyzed in terms of regulation of gene expression by sigma factors.

Audience Take Away:

- A unique method for in vitro and in vivo assignment an alternative sigma factors of RNA polymerase to genes activated by various stress conditions
- The complex stress responses can be analyzed in terms of regulation of gene expression by sigma factors
- The developed techniques provide tools for classification of sigma regulons which contribute to the construction of transcriptional regulation network in Rhodococcus erythropolis

Biography:

Dr. Dostalova studied Microbiology at the Charles University, The Czech Republic and graduated as MSc. in 2009. She joined the research group of Dr. Patek at the Institute of Microbiology of the Czech Academy of Sciences (CAS). She received her Ph.D. degree in 2020 at the same institution. She is now on a postdoctoral fellowship supervised by Dr. Cappelletti at the Molecular and Applied Microbiology Laboratory at the University of Bologna, Italy. She has published 4 articles in SCI(E) journals and 1 book chapter.

Carla C.C.R. de Carvalho*, Carlos J.C. Rodrigues
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Using Rhodococcus adaptive mechanisms to improve bioprocesses

Rhodococcus cells have a cell envelope characterized by the presence of long chain -alkyl- -hydroxy fatty acids, called mycolic acids. They are characteristic of the taxon mycolata which includes the genera Mycobacterium and Nocardia. The mycolic acids increase the tolerance of Rhodococcus cells to the presence of toxic compounds and challenging environmental conditions [1]. These cells are also able to modulate the composition of the fatty acids of the phospholipids of the cellular membrane as response to stressful conditions [2] and to produce specialized lipids [3]. R. erythropolis may be adapted to survive high osmotic stress and conditions that are usually considered extreme [2, 4]. Additionally, Rhodococcus cells contain efflux systems able to extrude toxic compounds [5]. These features, together with the large set of enzymes that Rhodococcus cells contain, make the cells very interesting for biocatalysis and bioremediation processes [6, 7]. Furthermore, the cells may survive when placed at 16ºC and at 100ºC for up to 15 min by adjusting the fluidity of the cellular membrane. These properties may be used to improve bioprocesses using toxic compounds such as the bioremediation of petroleum hydrocarbons under saline conditions. In this presentation, several adaptive mechanisms of Rhodococcus cells, and how they may be exploited to improve biotechnological processes, will be discussed.

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Audience Take Away:

- Insights on phenotypic adaptation of Rhodococcus cells to toxic compounds and challenging environmental conditions
- How to use bacterial survival mechanisms to improve the efficiency of bioprocesses
- The impact of bacterial adaptation to human activities

Biography:

Carla C.C.R. de Carvalho graduated in Chemical Engineering in 1998 and did a Master in Biotechnology (Biochemical Engineering) in 1999 at Instituto Superior Técnico (IST), Universidade Técnica de Lisboa (UTL). She completed a PhD in Biotechnology at UTL in 2003. She was awarded 2 Post-doctoral grants, with work being conducted in Portugal (IST) and Germany (UFZ-Leipzig). In 2008, she was awarded a FCT 'Ciencia2007' 5-year contract and in 2014 she received a 'FCT Investigator 2013' 5-year contract as Principal Investigator. Since 2019, she is Assistant Professor at IST, Universidade de Lisboa. She published ca. 100 research papers in international peer reviewed journals and wrote 13 book chapters.

Cristiano Jose de Andrade*, William Rogoski, Gabriela N Pereira, Karina Cesca, Débora de Oliveira

Department of Chemical Engineering and Food Engineering, Federal University of Santa Catarina (UFSC), Florianópolis, Santa Catarina, Brazil

Cassava peel an unexplored lignocellulosic residue for the Xyloooligosaccharides production: Potential pretreatments

Cassava (Manihot esculenta Crantz) belongs to the Euphorbiaceae family, originally from South America. The global production of cassava in the years 2015/16 was 280 million tons. Nigeria, Thailand and Brazil are the three world's largest producers of cassava, representing approximately 40% of the total produced worldwide. The State of Santa Catarina/Brazil is among the largest producers of cassava. Cassava flour is a product with low added-value that generates residues, mainly cassava wastewater and peels. Cassava wastewater can be used for the production of mannosileritritol lipids (biosurfactant with high added-value) - biotechnological process relatively consolidated at laboratory scale; whereas cassava peels can be used for the production of xylooligosaccharides (a compound with high added-value) - concept of green chemistry for cassava chain. Therefore, the aims of this project are (I) to produce biosurfactants using a culture medium composed of cassava wastewater and biosurfactant inducers, (II) to synthesize membranes that are efficient produced biosurfactants, (III) to produce xylooligosaccharides from cassava peels, in particular alternative pretreatments as non-thermal plasma; and (IV) starced-based materials, in particular adsorbents (stabilizers) of bioactives compounds. Therefore, these approaches can lead to the concept of green chemistry for cassava flour chain.

Audience Take Away:

- Contextualization of the cassava flour industry, highlighting the biotechnological potential of wastes;
- The biosurfactant production using cassava wastewater as low-cost culture medium;
- The production of cassava-based xyloooligosaccharides.

Biography:

Dr. Cristiano Jose de Andrade studied Food Engineering at Federal University of Lavras in 2008. He received his PhD degree in 2016 at UNICAMP. After two years postdoctoral fellowship supervised by Dr. Oller at Mass Spectrometry Laboratory/Dempster USP, he obtained the position of an Associate Professor at the Federal University of Santa Catarina (UFSC) also in Graduate Program in Chemical Engineering at UFSC (PósEnq). Dr. Andrade has plenty of experience on biotechnological processes, in particular fermentation, bacterial metabolism, bioproducts with high surfactant activity, purification processes (ultrafiltration), algae cultivation and green-based extraction methods, and identification of biomolecules by mass spectrometry. He has published 35 scientific articles, 14 book chapters, and 2 patent deposits.

Olajumoke Oyebode*, Nicolette Nadene Houreld
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Influence of photobiomodulation at 830 nm on proliferation and differentiation in diabetic wounded human skin fibroblast cells

This study investigated the effect of photobiomodulation (PBM) using near infra-red light (830 nm) on cell proliferation and differentiation in two human fibroblast cell models namely, normal wounded (NW) and diabetic wounded (DW). The cells were irradiated at a wavelength of 830 nm with a fluence of 5 J/cm2 which resulted in an irradiation time of 430 s. Control cells were not irradiated (0 J/cm2). Thereafter, cell was incubated for 24 and 48 h and cellular viability was assessed by the trypan blue exclusion test and Apotox-glo triplex assay. Cell proliferation was investigated using bromodeoxyuridine (BrdU) proliferation assay. The release of transforming growth factor beta-1 (TGF-β1; TGF-β1 is a growth factor released during the process of wound repair and it is involved in the activation of fibroblasts in the process of trans-differentiation, a precursor to differentiation while α-SMA is also involved in the differentiation process) and p-Smad2/3 was ascertained using ELISA, while immunofluorescence was also used to observe the presence of the myofibroblast marker alpha smooth muscle actin (α-SMA). In comparison with the control groups, PBM significantly increased cell viability and proliferation. Although there were no significant changes in p-Smad2/3 over time, DW cells showed a moderate increase in TGF-β1. As incubation time increased, there was an increase in fluorescence of α-SMA in DW cells. This study shows that NW and DW cells responded positively to PBM at 830 nm, and PBM produced a stimulatory effect on cell viability, proliferation and differentiation to initiate wound healing in DW cells *in vitro*.

Audience Take Away:

- The audience will understand the effect and advantages of photobiomodulation therapy in the healing of diabetic wounds
- The audience will learn about the effect of laser application at 830 nm on the differentiation of fibroblasts into myofibroblasts to aid effective wound healing
- This research will enlighten and provide new information to academics or people working in the health sector on the effectiveness of laser technology in diabetic wound healing

Biography:

Dr. Olajumoke Oyebode attended the University of Ibadan, Nigeria where she graduated with an MSc degree in Biochemistry. She then proceeded to the University of KwaZulu-Natal, South Africa where she graduated in 2019 with a PhD degree in Biochemistry under the supervision of Prof. MS Islam. In 2020, she joined the research group of Prof. Abrahamse at the Laser Research Centre of the University of Johannesburg, South Africa as a postdoctoral fellow under the supervision of Prof. Houreld. She has published extensively in internationally accredited high impact factor journals.

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POSTERS

DAY 1

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Marzena Mazurek*, Aleksandra Siekierzynska and Wojciech Litwinczuk

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Monitoring of clonal fidelity of highbush blueberry cultures propagated by axillary and adventitious shoots

Plant tissue culture technology is being widely used for large scale highbush blueberry plant multiplication. The main aim of micropropagation is the clonal production of 'true-to-type' plants. However, in vitro conditions induce somaclonal variations which can affect the undesired morphological and genetic changes of regenerated plants. Somaclonal variation, either genetic and epigenetic or combination of both, is influenced by the genotype, explant type, culture medium or age of the donor plants. The occurrence of callus and adventitious shoots during the in vitro culture of blueberries is mainly considered as a source of somaclonal variation. In blueberry in vitro cultures, adventitious shoots occur spontaneously and are common. To monitor clonal fidelity the differences between the in vitro cultures of the highbush blueberry 'Brigitta blue' plants derived from axillary (Ax) and adventitious shoots (Ad) using as an explant, were investigated. The two types of culture: the axillary shoots derived cultures (Ax-TC) and the adventitious shoots derived cultures of highbush blueberries plants (Ax-TC) were analysed during 3 subsequent passage. The analyses were carried out in the determination of morphological and molecular differences between Ax-TC and Ax-TC cultures. On the morphological level, the frequency and the length of the axillary shoots and adventitious ones were determined. Molecular studies were based on the methylation-sensitive amplification polymorphism (MSAP) technique. We indicated significant differences in studied traits like the ratio of Ax shoots in culture and the number of cultures that developed exclusively Ax shoots. Additionally, short adventitious shoots (< 1,5 cm in length) in Ad-TC cultures occurred more frequently in comparison to Ax-TC. What is more, different DNA methylation status among studied plants was revealed.

Audience Take Away:

- The type of explants have an impact on the growth and development of highbush blueberries culture
- The adventitious shoot originated in vitro cultures are consider to be a source of somaclonal variation and should be eliminated from clonal propagation process of highbush blueberries
- Adventitious shoot originated cultures and axillary shoot originated cultures differ in some level and the differences can be detected by morphological and molecular analysis

Biography:

Marzena Mazurek studied Biotechnology at the University of Silesia in Katowice (Poland) and graduated as MS in 2008. Then She has started work at the University of Rzeszów in the assistant position. She is concluding a Ph.D. thesis entitled "Somaclonal changes of highbush blueberries plants propagated traditionally and in vitro method. She has published 2 research articles in SCI(E) journals and took part in two conferences.

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Post-transcriptional control in the regulation of bioplastics synthesis

Biotechnological research on natural polymers strives for manufacturing biopolymers using renewable resources1,2. The main representatives of bioplastics are polyhydroxyalkanoates (PHAs) with polyhydroxybutyrate (PHB) being the shortest side chain polyester. Although several kinds of PHAs are produced in industrial scales2, the amount produced is still low for the demand and the costs for production are high and non-competitive, when compared to plastics based on crude oil1,2. The bacterium Sinorhizobium meliloti fixes nitrogen symbiotically within legume root nodules, and as a contingency against carbon limitation, accumulates PHB1,3. The soil bacterium Pseudomonas putida is able to produce different kinds of PHAs1,4. Based on their safe status and the inherent ability to grow in fermenters and on a wide range of economical substrates, these two organisms represent excellent candidates to be virtually "domesticated" as bacterial factories of bioplastics1,5,6. Small non-coding RNAs (sRNAs) and ribonucleases (RNases) are important cellular regulators that make them promising candidates for improving PHAs production. A major class of bacterial regulatory sRNAs acts on target mRNAs through base-pairing, leading either to their stabilization or to translational repression followed by their degradation through RNases1,7. While RNases process and degrade all types of RNA, the RNA chaperone Hfq protects sRNAs from their nucleolytic cleavage1,7. The role of riboregulation along the PHA accumulation has been clarified through the analysis of production and quality of these polymers in both organisms1. Herein, the scl/mcl-PHAs synthetized in RNases and chaperones mutants were extracted from the culture's biomass, analyzed and compared to the wild type strains. This study provides a resource to dissect the regulatory mechanisms underlying riboregulation activity in the post-transcriptional control of scl/mcl-PHAs accumulation in microorganisms, that to date have been almost exclusively viewed from the perception of transcriptional regulation. Moreover, in a long-term perspective this work aims at contributing to an improved production and quality of PHAs in industrial scale. Work at ITQB NOVA was financially supported by the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie ID: 867437, and projects UIDB/04612/2020 and UIDP/04612/2020 (Molecular, Structural and Cellular Microbiology), funded by FEDER through COMPETE 2020—Programa Operacional Competitividadee Internacionalização (POCI) and by national funds through FCT—Fundação para a Ciência e a Tecnologia; Work at NOVA School of Science and Technology FCT I.P., was funded by national funds from FCT—Fundação para a Ciência e a Tecnologia, I.P., in the scope of the project UIDP/04378/2020 and UIDB/04378/2020 of the Research Unit on Applied Molecular Biosciences—UCIBIO and the project LA/P/0140/2020 of the Associate Laboratory Institute for Health and Bioeconomy-i4HB. This work has received funding from the European Union's Horizon 2020 research and innovation programme, ID: 867437.

Biography:

Alexandra Peregrina Lavín holds a doctoral degree in Fundamental and Systems Biology obtained from the University of Granada (Spain) in 2017. Currently, she is a postdoctoral researcher at ITQB NOVA (Oeiras, Portugal) working in the areas of Natural Sciences and Engineering & Technology, with emphasis on Microbiology, Molecular Biology, Synthetic Biology, Environmental Biotechnology and Bioplastics. During her professional activities, she interacted with many collaborators, being co-author of 6 scientific papers, and published in prestigious peer-reviewed journals of high impact. She reached a very good citation index (h-index 5, 138 citations), promoting the extension of skills for the study of Sinorhizobium meliloti, small non-coding RNAs (sRNAs), RNA chaperones and ribonucleases. As a Postdoc, she was awarded or participated in a large number of competitive research grants and projects such as the EmPowerPutida consortium in the frame of H2020. This resulted in the gain of new knowledge for a new microorganism, Pseudomonas putida, that has been translated in a research article in the emerging field of Synthetic Biology. In 2019, she was awarded with an individual fellowship of the Marie Sklodowska-Curie Actions (MSCA-IF-EF-ST) for the production of bioplastics from microorganisms, as sustainable alternative to petrol-based plastics. Currently, she continues developing her scientific career and skills through the teaching in a Master and PhD program with international students from different scientific educational backgrounds, in addition to the supervision of a MSc Student. She has been Jury member of Master thesis, and took part in International events with scientific relevance as participant and/or organizer. To this day, she was able to communicate and share her projects to a broad audience but also to other scientists, specialized on the same or different topics, raising awareness of science-related topics.

Timea Ottilia Kobori*[1], Agnes Dergez[1], Laszlo Ardo[2], Sai Divya Kanna[3], Sarolta Nagyapati[3], Kinga Bode[3], Viktoria Toth[3], Ildiko Domonkos[3], Attila Komoczi[1], Peter Portoro, Gabriella Urban[1], Nora Hatvani[1], Akos Koos[1], Zsuzsanna J. Sandor[2], Bettina Ughy[3]

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Newly isolated microalgae as immunostimulants for rainbow trout (Oncorhynchus mykiss)

In the intensive fish farming, use of specific feeds with immunostimulant compounds is rising. Application of immunostimulant agent can reduce the need of antibiotics. Disease prevention is highly important for maintaining healthy offspring. Microalgae contain potential sources of natural immunostimulant agents therefore they can serve as alternative, immunostimulants and protective agents against fish diseases. In order to investigate their possible use in fish feed, multiple strains of microalgae were isolated from Hungarian freshwater samples. The strains were selected and characterized based on their growth capacity and content of potential immunostimulant agents (like PUFA, carotenoids, beta glucan, etc.) against diseases specific to early-stage fish cultures. Based on our results the isolated alga strain has favorable growth parameters and is rich in the investigated bioactive compounds. The immunostimulant potential of the algae strains were also tested in vivo in feeding tests using juveniles of rainbow trout (Oncorhynchus mykiss). The feeding experiments with algae were performed in intensive recirculation fish rearing system where different levels of algae inclusion in fish diets were tested. During the in vivo trial the production parameters and nutrient utilization of the feeds were evaluated. There was no significant difference in growth and production parameters of fish in the treated and control groups. Beside these parameters the following non-specific immunological parameters were tested: lysozyme, total protein and immunoglobulin levels of blood plasma. The alga treatment had a slightly positive effect on the immune status. This work was supported by the Hungarian National Research, Development and Innovation Office GINOP-2.3.2-15-2016-00058.

Audience Take Away:

- Our work presents results about a new algal isolate which has beneficial immunostimulant effect in rainbow trout
- We characterize the isolates growth parameters and high value compounds production, also its effects on fish immuno- and production parameters
- Use of this isolate as feed additive might be an appropriate tool for an economical and environmentally friendly fish farming. It might contribute to the reduction of antibiotic overuse in intensive aquacultures

Biography:

Ms. Timea Ottilia Kobori studied Biology at the Babeş-Bolyai University, Cluj-Napoca, Romania, and got her MSc degree in Terrestrial and Water Ecology at the same university in 2007. She joined the study of cyanobacteria in 2010 in the research group of Dr. Zoltán Gombos, Biological Research Center, Szeged, Hungary, as an International Training Course student. She continued in the same group as a PhD student under the guidance of Dr. Bettina Ughy. In 2015 she joined the Bay Zoltán Nonprofit Ltd. for Applied Research, Szeged, Hungary, where she works as a research fellow ever since. She has several publications in the topics of ecology, cyanobacterial and green algae molecular biology and biotechnology.

I.E. Sarris[1]*, N.K. Lampropoulos[2] and E.G. Karvelas[1]

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Optimum magnetic navigation of nanoparticles inside the human carotid

Chemotherapy is used against tumors cells, where drug is injected into the body from arteries and results in general systemic distribution through blood that may result in toxic side-effects as the drug attacks both healthy and cancer cells. Researchers in the late 70s have proposed navigation of drug-loaded magnetic particles through arteries towards the tumors by using external magnetic fields in order to reduce the side effects of chemotherapy. Since the healthy tissue is spared, the side effects of this method are minimized, while at the same time the therapeutic efficiency is enhanced through the increased quantity of drug that may reach the area of interest in the human body. The magnetic navigation of particles depends on the material from which the particles are made, as well as the magnitude of the magnetic field. In addition, a large number of parameters can be found that influence the performance of the magnetic navigation of particles in the desired areas. Although driving magnetic nanoparticles is critical for the drug delivery method, so far there is a lack of methodologies that have been developed and achieve it for each type of flow so quickly that it can be used in practice. For this reason, optimization algorithms can be used to control the magnetic field along with the computational models of particle motion in blood flows in tumour cells. A numerical model for optimum magnetic navigation of nanoparticles in five feature flow velocity points that occurs in cardiac cycle inside a carotid artery is used in this study. The present method combines Computational Fluid Dynamics (CFD) as well as Discrete Element Method (DEM) techniques. In addition, the optimum gradient magnetic field each time is evaluated by using the Covariance Matrix Adaptation (CMA) evolution strategy. Under the influence of five feature blood flow velocities in cardiac cycle the computational model evaluates the effect of different values of the gradient magnetic field in a way to minimize the distance of the nanoparticles from a desired trajectory. Results indicate that as the blood flow is decreased, the particles are moving closer to the desired trajectory. On the other hand, higher values of the gradient magnetic field are needed as the blood flow is increased. The imposed gradient magnetic values are strongly connected with the position of the nanoparticles and the blood flow velocity. This work was supported by Greece and the European Union (European Social Fund- ESF) through the Operational programme < Development, Education and Lifelong Learning>> in the context of the project Reinforcement of Postdoctoral Researchers - 2nd Cycle (MIS-5033021), implemented by the State Scholarships Foundation (IKY)

Audience Take Away:

- The magnitudes of the gradient magnetic field that are needed for an effective navigation of nanoparticles inside a human carotid
- The effect of the blood flow in the magnetic navigation process
- The way that the magnitudes of the gradient magnetic field are evaluated by the computational method

Biography:

Ioannis E. Sarris holds a diploma in mechanical engineering (1995) from the Dept. of Mechanical Engineering, School of Engineering, University of Patras (Greece) and a PhD in Engineering (2001) from the Dept. of Mechanical (and Industrial) Engineering, School of Engineering, University of Thessaly (Greece). He elected as a Professor of Fluids Mechanics and Magnetohydrodtynamics at the Mechanical Engineering Department of University of West Attica at 2020. He has published in peer-reviewed scientific journals, in conference proceedings and presented his research achievements in several conferences and workshops. He is a reviewer in several scientific journals and conferences.

Chika I. Chukwuma[*1], Eunice A. Akuru[2], Boitumelo Mashile[1,3], Reaotshepa Setlhodi[1,3], Samson S. Mashele[1,3], Tshepiso J. Makhafola[1], Thando C. Mpendulo[2]

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Nutritional and phytochemical profile of pomegranate ("Wonderful variety") peel and its effects on hepatic oxidative stress and metabolic alterations

Pomegranate is a healthy fruit. The peel contains antioxidant phytochemicals that may potentiate health benefits but remains under-explored. We evaluated the antioxidant, nutritional and phytochemical profiles of the peel of the "Wonderful" variety pomegranate and its influence on oxidative and metabolic alterations in hepatic tissues. The peel contained appreciable amounts of some beneficial trace minerals and both essential and non-essential amino acids. Mostly Omega 3 and 6 fatty acids were found. The peel extracts exhibited in vitro radical scavenging and Fe3+ reducing antioxidant activities and dose-dependently prevented oxidative stress-induced lipid peroxidation and GSH depletion in both Chang liver cells (IC50 = 18.0 ± 1.46 and 11.2 ± 0.99 µg/ mL, respectively) and isolated rat liver tissues (IC50 = 96.7 ± 3.34 and 19.4 ± 3.36 µg/mL, respectively). The antioxidant effects were comparable to that of ascorbic and correlated with their phenolic profile. HPLC analysis identified antioxidant phenolic acids (gallic acid, syringic acid ferulic acid p-coumaric acid, etc.). The peel did not cause notable cytotoxicity in liver and kidney cells, which suggests minimal safety concerns. Metabolomics analysis revealed alterations in hepatic fatty acid, amino acid, and nucleic acid metabolisms following the induction of oxidative stress. These alterations were improved in the acetone extract-treated hepatic tissues, with concomitant activation of vitamin and selonocompound metabolisms. The data suggest that the fruit peel of "Wonderful" variety pomegranate may be an underutilized source of functional nutrients and antioxidants phenolic acids for optimum body function and mitigation of hepatic oxidative damage and associated metabolic alterations.

Audience Take Away:

- The study exposes bioactivity assay techniques and in silico metabolomics expertise that students can learn from
- The presents new findings on the fruit wastes from "Wonderful" pomegranate variety that will instigate further research ideas that student can explore
- The data presents medicinal potentials of pomegranate fruit peel, which will foster utilization of underutilized fruit wastes, increase the value of the fruit and benefit the bioeconomy

Biography:

Dr Chukwuma CI (PhD) holds a PhD in Biochemistry from the University of KwaZulu-Natal and has more than 4 years postdoctoral research experience. He has more than 44 publications in ISI journals and has conducted many research on medicinal plants and functional foods for managing diabetes and related metabolic ailments. He has also won several competitive research grants and scholarships and presented in both local and international conferences. He is currently a researcher at the Central University of Technology, Bloemfontein.

Cappelletti Martina[1*], Donini Eva[1], Stefania Di Silvestro[1], Firrincieli Andrea[1], Presentato Alessandro[2], Piacenza Elena[2], de Carvalho Carla CCR[3], Hana Dostálová[4], Miroslav Pátek[4], Turner Raymond J[5]

[1]Department of Pharmacy and Biotechnology, University of Bologna, Bologna, Italy
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[3]iBB-Institute for Bioengineering and Biosciences, Department of Bioengineering, Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal
[4]Institute of Microbiology, Academy of Sciences of the Czech Republic, Prague, Czech Republic,
[5]Department of Biological Sciences, University of Calgary, Calgary, Canada

Rhodococcus spp. interactions with metals: resistance mechanisms and bioconversion into metal-based nanomaterials

Members of *Rhodococcus* genus are widely distributed in terrestrial and marine environments due to their outstanding metabolic diversity and strong persistence. In relation to this, *Rhodococcus* spp. strains possess a variety of enzymatic activities involved in biodegradation of toxic organic pollutants, and are also able to withstand various stress conditions, such as metal toxicity, desiccation, and high concentration of organic solvents. Although numerous studies have described stress response to toxic organics, little is still known on the response of *Rhodococcus* strains to metal toxicity and, in particular, on the molecular and physiological mechanisms supporting their tolerance and/or resistance. This study is focused on the ability of *Rhodococcus aetherivorans* BCP1 to tolerate high concentrations of different toxic metal(loid)s including Selenium, Tellurium, Arsenic, and Thallium. In particular, functional studies indicated that BCP1 resistance mechanism towards Tellurium and Selenium oxyanions (i.e. tellurite and selenite, respectively) is associated with their bioconversion into elemental forms of Se0 and Te0 that precipitate producing nanostructures. Molecular and biochemical studies indicated that BCP1 resistance to arsenate was related to its bioconversion into arsenite and to the expression of a specific chromosomal ars gene operon, whereas BCP1 resistance to Thallium seems to involve genetic determinants harboured by one of the endogenous plasmids. Recent metabolomics and lipidomics studies have pointed out that specific modifications occur in the metabolite profiles and in the fatty acid composition of BCP1 cells due to the exposition to toxic metals. Besides this, specific morphological rearrangements were microscopically observed in BCP1 cells in response to metal interaction under both planktonic and biofilm growth conditions. In conclusion, the present work highlights the biotechnological relevance of *Rhodococcus* genus in relation to its ability to interact with and resist to metal(loid)s in the context of both bioremediation and bionanotechnology fields.

Audience Take Away:

- biotechnological relevance of the Rhodococcus genus regarding their interaction with toxic metal(loid)s
- our present understanding of the bioprocesses elicited by these microorganisms in handling metal(loid)s' toxicity
- importance of Rhodococcus strains in the context of the bioremediation and bionanotechnology fields

Biography:

Dr. Martina Cappelletti studied Industrial Biotechnology at the University of Bologna (UNIBO), Italy and graduated as MS in 2006. She then joined the research group of Prof. Davide Zannoni at the Department of Evolutionary and Experimental Biology, UNIBO, where she got a Ph.D. in 2010 in Industrial, Molecular and Cellular Biology working on the biodegradation of chlorinated compounds and the hydrocarbon metabolism by Rhodococcus strains. As Post-Doctoral Fellow, she carried out research on bio-hydrogen production, bacterial motility, naphthenic acids biodegradation and bacterial interactions with metals. During her academic formation, she has spent research periods at i) the Centre of Ecology and Hydrology (in 2006) in Oxford (UK), ii) the University of Osaka (Japan) (in 2009), iii) the University of Calgary (Canada) (in 2009-2010 and 2014). She is presently a Tenure Track Assistant Professor (RTD-B) (since Jan 2016) at the Department of Pharmacy and Biotechnology (UNIBO) leading research on genetics, genomics and physiology of bacteria involved in biomineralization, biodegradation and bioconversion processes. She has published 45 research articles in SCI(E) journals and 5 book chapters.

Monika Stanciauskaite[1*], Mindaugas Marksa[2], Liudas Ivanauskas[2] and Kristina Ramanauskiene[1]

[1]Department of Clinical Pharmacy, Faculty of Pharmacy, Lithuanian University of Health Sciences, Su-kileliai Avenue 13, Kaunas LT-50161, Lithuania;
[2]Department of Analytical & Toxicological Chemistry, Faculty of Pharmacy, Lithuanian University of Health Sciences. Sukileliai Avenue 13, Kaunas LT-50161, Lithuania

Ophthalmic in situ gels with balsam poplar buds extract: formulation, rheological characterisation and quality evaluation

Introduction: Inflammatory eye diseases are one of the most common diseases in contemporary societies. Polyphenolic additives in artificial tears have antioxidative, antibacterial and anti-inflammatory properties, which are important in seeking a positive treatment effect. Poplar buds, same as propolis, are the source of polyphenols [1]. Poplar buds due to their antibacterial, antioxidant and anti-inflammatory action are potential active material in the production of eye drops. Therefore, it is actual to present new data on application of poplar bud extract in the modelling of ophthalmological preparations. The aim of this research is to adapt the balsam poplar bud extract for use in the production of ophthalmic gels in situ and to evaluate their quality by making tests of their chemical composition, rheological properties and biological activity in vitro. Promising results of these tests can serve as a basis for further research.

Methods: Purified water was chosen as the extractant for the extraction of balsam poplar buds. Extraction was performed in an ultrasonic bath. After receiving the aqueous balsam poplar buds extract, the extract was lyophilizated. 1% aqueous solution was prepared from the freeze-dried balsam poplar buds extract powder, which was then used in experimental ophthalmic formulations. The total content of phenolic compounds and flavonoids was determined by spectrofotometrical methods. The identification of the predominant active compounds performed by high performance liquid chromatography – HPLC. Poloxamer 407, Hydroxypropyl Methylcellulose (HPMC), Propane-1,2-diol, purified water and a 1% solution were used to form the experimental in situ gels. In situ gels physical characterisations were evaluated by pH-meter and viscosimeter. Antioxidant activity evaluaterd by ABTS and FRAP methods. A rabbit corneal cell line (SIRC) was used to evaluate the irritation of in situ gels. Results were expressed as the mean and standard deviation of three measurements. Results considered as statistically significant at $p<0.05$.

Results: The research confirmed that lyophilization was an effective method. P-coumaric acid dominates in poplar buds extracts. The formulations with poplar bud extract had pH from 6.07 to 6.7. The data of research showed that viscosity of the produced gels was varying from 11.3 to 170.8 mPa•s. The total phenolic compounds content of in situ gels was in the range of 94.81-98.37% from the theoretical amount of phenolic compounds. The results of antioxidative activity test showed, that the gels produced with poplar bud extract had antioxidant activity. The results of the research showed that the release of phenolic compounds from in situ gels formulations directly depended on the concentration of gelifying polymers. After 5 and 30 minutes exposition and incubation time, which is counted as drug contact with the eye, all tested gels did not have irritating effect on SIRC cell viability.

Conclusions: The results of the research showed that the extract of Populus balsamifera buds is rich in polyphenols, of which p-coumaric acid predominates. The results of this study indicate that the polymers combinations will be expected to be an excellent polyphenols carrier for the prolonged delivery to the surface of the eye.

Audience Take Away:

- The audience will learn about possible sources of polyphenols close to the propolis composition but extracted from the plant raw material that is most readily available. The audience will also learn about the possibilities of this plant raw material extract use for pharmaceutical purposes
- The audience will be able to expand research with the use of balsam poplar buds extracts for therapeutic purposes. These results of our research can provide new knowledges about the chemical composition, biological activity and application of poplar buds in pharmaceutical products, this information can be applied both in new research and for training purposes These are the new studies examining the application of balsam poplar buds growing in Lithuania as a primary source of propolis in pharmaceutical products.

Biography:

Monika Stanciauskaite is a second year phD student studing in Pharmacy field at the Lithuanian University of Health Sciences in Lithuania. She joined the research group of Prof. Kristina Ramanauskiene at Lithuanian University of Health Sciences, Pharmacy faculty. She received her master degree at medicinal chemistry in 2019 in united study program at Kaunas University of Technology and Lithuanian University of Health Sciences. Her area of interest is isolation of biologically active compounds from plant raw materials and their application in ocular drops delivery system.

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KEYNOTE FORUM

DAY 2

EURO-GLOBAL CONFERENCE ON

BIOTECHNOLOGY AND BIOENGINEERING

SEP 06-07, 2021

ECBB 2021

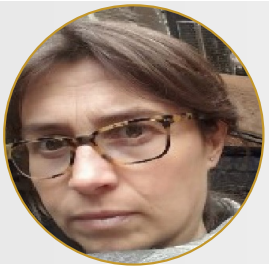
Marino Nebuloni
Parma University, Italy

Strategy in crystallization process to ensure solid state stability of drug substance

Crystallization of pharmaceutical ingredients, primarily those that possess several polymorphic forms, particle size and morphology critical properties, are among the most serious and least understood manufacturing procedure. Many processes and product failures can be traced to a poor understanding or lack control of the crystallization procedures. Clearly the pharmaceutical industry requires to getting more competitive and robust process by the knowledge of molecular complexity and solid form challenges, due to the impact of material properties for production efficiency related to the solid implication on drug product formulation.The content of this presentation is focused on reporting real case examples from the lab and development scale to production, throughout in-process crystallization measurements and control by means also of PAT approaches. Process understanding using in-process techniques in development scale, such as automated batch reactor vessels equipped with Reaction Calorimetry, ATR/FT-IR Spectroscopy, Focus Beam Reflectance (FBRM) probes plus temperature and pH sensors, were suitable methods to reach the desired active ingredient requirements, and then define a suitable tool in control the Critical Quality Attributes with as well benefits in process cycle time reduction. A variety of in situ analytical methods applied, combined with chemometric tools for the analysis of multivariate process information, have provided a basis for future improvement in modelling, simulation and control of crystallization procedures. These on-line recorded data together with chemical properties parameters assessed by off-line controlling techniques, are the starting point for intended processes for high quality products.

Biography:

In 1974, received Doctor Degree in Pharmaceutical Sciences- Milan University, From 1984-1995, worked as Senior Research Scientist at the Analytical Res. Dept., Lepetit Research Center, Milan DOW Chemical Pharmaceutical Group (European sites)(The research activity involved the study of chemical and physical properties of organic compounds during the formulation development and safety aspects in the industrial processes). During 1996-2012, he was Senior Director for Testing Lab (CRO) at REDOX snc in Monza (Italy) (Consultant for international and national pharmaceutical companies for physical pharmacy of drug products development. Development of analytical methods in support to physical pharmacy troubleshooting in manufacturing plants). Currently, he is a Professor (annual assignment) at Milan and Parma Universities, Faculty of Pharmacy and Pharmaceutical Chemical Technology. - Course on Physical Pharmacy and Safety on Pharmaceutical Practice. Author of several publications on national and international journals concerning Physical Pharmacy subjects.



Francesca Selmin

Department of Pharmaceutical Sciences, Università degli Studi di Milano, via G. Colombo 71, Milano, Italy

Drying techniques to stabilize nanotechnology

The research and development of various nanotechnology platforms have received notable attention in the field of drug delivery, including diagnostics and therapy. However, there are numerous hurdles hindering their clinical translation and one, among them, is related to instability under storage. When selection of components or process conditions cannot mitigate this issue, the removal of water is unavoidable. Two are the most common and popular techniques for the stabilization of nanocarriers: spray drying and lyophilization. The first is based on the evaporation of water from droplets created by an atomizer. The contact time between droplets and hot air is very short (a few seconds), which makes it possible to dehydrate thermosensitive materials. The second includes three steps: freezing of colloidal system, primary drying (sublimation) and secondary drying (desorption). Freezing is a key step determining the ice nucleation process and the morphology of the frozen materials. Primary drying removes most free water by sublimation, whereas secondary drying gets rid of the bound water and results in a low residual water content of the freeze-dried cakes. Nevertheless, due to the complexity of both techniques and thermal and mechanical stresses occurring upon drying, nanocarriers can be damaged. Hence, the choice of less-than-optimal composition of materials to be dried and critical process parameters, can result in failure in the final dried product. In this context, the talk will analyze the impact on spray-drying and lyophilization of the stability of polymeric nanoparticles and liposomes keeping in mind that only the rational cooperation between the right operative parameters and optimal formulation needs to be built in attempt to preserve features of nanocarriers. In particular, the discussion of case studies will introduce possible solutions which could help the audience to solve some challenges in the design of a final dried dosage form.

Audience Take Away:

- The major obstacle that limits the use of nanoparticulate drug delivery systems is the physical instability frequently noticed when such systems are stored for an extended time period. To overcome this problem water must be removed.
- This lecture will outline process and formulation strategies and illustrate critical factors which must be considered when freeze-drying or spray-drying nanoparticulate formulations
- This talk will cover the intricate relation between process and formulation in the attempt to help the audience to rationalize the selection of excipient from a qualitative and quantitative point of view and to control the process
- Both freeze-drying and spray-drying are an effective approach to improve the storage stability of nanomedicines. The optimal freeze-drying process and protectants for different types of nanoparticles will be discussed since various nanoparticle platforms have different behaviors in the drying process and require appropriate approaches to cope with
- Outlining fundamentals and critical factors of both the technologies, the presentation will help the audience to have a better control in process parameters and in the selection of excipients. Indeed, the link between critical process parameters (CPP) and critical quality attributes (CQA) is required to implement the design of experiments approach and to identify an optimal operating space to obtain a product with predictable characteristics. In this context, case studies will be presented
- The protocol employed for drying have an effect on the quality of the resultant product and should be optimized in conjunction with the chosen excipient(s). Hence, this presentation will help the audience to define these variables in order to minimize mechanical and thermal stresses and to preserve the integrity of nanocarriers

Biography:

Francesca Selmin received her Ph.D. in "Chimica del Farmaco" at Università degli Studi di Milano in 2004. She was invited at the College of Pharmacy at the University of Kentucky (USA) as visiting scientist in Dr. DeLuca's Lab where she improved her knowledge on the design and characterization of biodegradable drug delivery systems. After a position as Assistant Professor and Research Fellow at the Department of Pharmaceutical Sciences at the Università degli Studi di Milano, in 2018 she became assistant Professor in Pharmaceutical Technology at the same institution. She possesses specific expertise in parenteral drug delivery systems and development of not-compendial assay to characterize controlled release delivery systems. She is authored more than 70 publications in international peer-review journals and two book chapters.

Zoltan Banoczi

Department of Organic Chemistry, Institute of Chemistry, Eotvos Lorand University, Budapest, Hungary

Modification of peptides to increase their cellular uptake

Cell-penetrating peptides may be useful tools in drug delivery, however they have some limitations. These limitations; low stability, endosomatic internalisation and thus the vesicular entrapment reduce their applicability. Thus there is high effort to improve their biochemical properties. In this presentation some chemical modifications will be shown which can be applied to increase the direct translocation of peptides through the cell membrane, thus enhance the effectiveness of peptides as delivery agent. We described that 4–((4–(dimethylamino)phenyl)azo)benzoyl) (Dabcyl) group, a well-known chromophore used in FRET system, may enhance the internalisation of positively charged non cell-permeable peptides. This new derivative was more efficient than octaarginine a well-known cell-penetrating peptide. Its increased internalisation resulted in higher accumulation in the cytosol. Its conjugates with antitumor drugs showed the same or better activity than the same conjugates of octaarginine. While the octaarginine could not deliver efficiently the methotrexate our new construct could and this conjugates was active on resistant breast cancer cells. Using Dabcyl group and the introduction of Arg residues we could increase the cellular uptake of a peptide without losing the biological activity. This peptide can bind to the Mitogen-Activated Protein Kinase (MAPK) docking groove and thus inhibit the protein-protein interaction of MAPK and their substrate or kinases. Further optimisation decreased its size and its stability might be enhanced by cyclisation. Its cyclic or bicyclic derivatives showed good or better binding to the MAPK. The presented examples highlight the possibility of chemical modification of peptides to increase their activity and/or stability.

Audience Take Away:

- The presented examples may give solutions to particular problems with peptide based drugs
- The audience can learn about the cyclisation as useful chemical modification
- They will get information how the internalization can be enhanced by chemical modification

Biography:

Dr. Banoczi studied Chemistry at the Eötvös Loránd University (ELTE), Budapest, Hungary and graduated in 2003. In the same year he started his PhD studies in the Research Group of Peptide Chemsitry, at ELTE, HAS, Budapest supervised by Prof. Hudecz. He received his PhD degree in 2007. Now he is an Assistant Professor at the Institute of Chemistry, ELTE. He has published 22 research articles in SCI(E) journals.

Abhishek Gupta

Institute of Health, Faculty of Education, Health and Wellbeing (FEHW), University of Wolverhampton, Jerome K Jerome Building, Walsall Campus, Walsall, WS1 3BD, UK

Synthesis and characterization of biosynthetic cellulose based hydrogels with the potential wound dressing applications to tackle chronic wounds

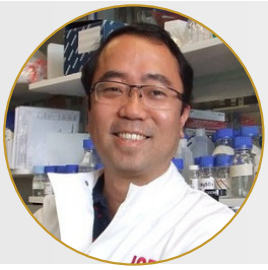
Wound healing is a complex physiological process and can fail to progress through the timely sequence of healing stages due to many underlying factors, including the invasion of various bacterial and fungal pathogens. Despite an improved understanding of the wound healing process, as well as a plethora of proprietary wound care products, the management of such wounds is still a challenge. There are cases reported in literature where patients have been living with chronic wounds for several months, due to the patients' unresponsiveness to the treatment regimens. In the current project, advanced hydrogels with wound healing properties were developed for such wounds. Bacterial cellulose (BC), a biosynthetic cellulose based hydrogel, was produced as a matrix and loaded with natural antimicrobial agents to produce dressings. Silver is well-known for its broad-spectrum antimicrobial properties. In this project, with the aim of prolonged and controlled release, a set of hydrogels were produced by loading silver zeolites, as an antimicrobial agent, into the BC matrix. These hydrogels demonstrated broad-spectrum antimicrobial activity over a prolonged period, compared to silver nitrate-loaded BC hydrogels. The study was extended by using curcumin, a natural healing agent with antimicrobial, antioxidant and anti-inflammatory properties. Water soluble curcumin-cyclodextrin complex was synthesized and loaded in the BC matrix to produce a new set of hydrogels with potential wound healing applications. Curcumin-loaded BC hydrogels displayed favorable qualities as part of a biocompatible system. With the aim of adding benefits of silver and curcumin, while making use of the nanotherapeutics platform, the novel green chemistry technique of silver nanoparticle synthesis was developed using silver and water-soluble curcumin-cyclodextrin complex. These curcumin-reduced silver nanoparticles were characterized and loaded in the BC matrix to produce hydrogels with wound management applications. All the hydrogels were characterized based around their potential wound dressing applications. These hydrogels exhibited promising antimicrobial and in vitro physiochemical properties. The findings are published in peer-reviewed journals enabling the scientific and clinical community globally to evaluate the clinical applications of these hydrogels for wound management.

Audience Take Away:

- Production of hydrogels with wound healing properties
- Physiochemical and in vitro characterization of hydrogel with the potential wound dressing applications
- Production and characterization of metal nanoparticles following the Green chemistry approach
- The topic of the keynote presentation would provide the information on the production of the biosynthetic hydrogel matrix and the pharmaceutical application of natural healing agents for wound management. Moreover, the novel Green chemistry approach to produce metal nanoparticles and their application in wound management would be discussed

Biography:

Dr Abhishek Gupta has been working at the University of Wolverhampton (UoW) since 2008. He joined the teaching and research team at the School of Pharmacy before taking a role as a Lecturer in Anatomy and Physiology in the Institute of Health, Faculty of Education, Health and Wellbeing in 2021. Dr Gupta completed his PhD on the Production and characterization of biosynthetic hydrogel wound dressings from the UoW. He has presented his research findings in several national and international conferences and published his research findings in high impact factor journals. Moreover, Abhishek has authored a book on Poroscopy in personal identification.



Leo Kei Iwai

Special Laboratory of Applied Toxinology and Center of Toxins, Immune-Response and Cell Signaling (LETA/CeTICS), Butantan Institute, São Paulo, Brazil

Snake and scorpion venom as a source for drugs to treat cancer and central nervous system diseases

Toxic substances and secretions of animals such as snakes, spiders and scorpions have been used in traditional medicine for the treatment of several diseases. Despite of the inherent difficulty and high economic risk in the discovery and development of new drugs from natural products, the development and rapid advancement of new technologies such as mass spectrometry-based proteomic analysis has allowed researchers to advance in a more focused characterization for the determination of key molecular targets in several diseases. In order to characterize and find potential key molecular species in cancer or disease linked to central nervous system (CNS) that may be targets in snake venom therapeutics, we have tested the *Bothrops jararaca* snake venom and *Tityus serrulatus* scorpion venom on several cancer cell lines and *Crotalus durissus terrificus* rattle snake venom on mice cerebellum and screened for proteome differences with and without the venom treatment. We have observed several up- and down-regulated proteins that play important roles related to cancer, such as cell proliferation, invasion, metastasis, apoptosis and stress response and proteins related to synapses inhibition and oxidative stress that are key processes in some CNS-related diseases. These data show that venom or some of their components may have potential usage for cancer or CNS-related disease therapy.

Audience Take Away:

- Snake and scorpion venom are natural sources of drugs against cancer and CNS-related diseases
- Mass spectrometry-based proteomics is an efficient tool to screen cells and tissues and map protein abundance changes
- Snake and scorpion venom are able to change specific key-disease related protein abundances

Biography:

Leo Iwai received his BSc in Chemistry from São Paulo University and his MSc and PhD in Molecular Biology from Federal University of São Paulo. He developed his postdoctoral studies at Harvard Medical School, Massachusetts Institute of Technology and later at The Institute of Cancer Research in London, UK. Today, he is a research associate at the Instituto Butantan in Brazil applying his expertise in Mass Spectrometry analyzing the effect of snake and scorpion venoms on cancer cells and brain tissues to find specific target or pathways that can be modulated in cancer and neuronal disease using the snake venom.

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SPEAKERS DAY 2

EURO-GLOBAL CONFERENCE ON

BIOTECHNOLOGY AND BIOENGINEERING

SEP 06-07, 2021

ECBB 2021

Janice Mani*, Joel Johnson, Holly Hosking, Kerry Walsh, Paul Neilsen, and Mani Naiker

School of Health, Medical and Applied Sciences, CQUniversity, Bruce Hwy, North Rockhampton, QLD

In vitro anticancer screening of crude plant polar extracts

Numerous commercial pharmaceuticals – including anticancer, antiviral, and antidiabetic drugs have been developed from traditional plant-derived medicines. With approximately 25,000 species of flora occurring in Australia that are adapted to the harsh environment, there is a plethora of novel compounds awaiting research in the context of their medicinal properties. The current study therefore aimed to develop a systematic protocol of screening plants with potential anticancer activity. Many studies have found polar compounds such as caffeic acid, coumaric acid, chlorogenic acid, quercetin, anthocyanins, hesperidin, kaempferol, catechin, ellagic acid and saponins to be the bioactive components responsible for the therapeutic effects. Hence, in this study the total phenolic content (TPC) and antioxidant capacity (FRAP) of methanolic extracts of selected plants was first determined. A high correlation between the TPC values and FRAP values of the plant polar extracts were evident. Subsequently, plants presenting high TPC values (Murrya koenigii (leaves), Murrya koenigii (flower) and Pittosporum angustifolium (leaves)) were selected for anticancer bioassay. Two species with comparatively lower TPC values (Citrus hystrix (leaves) and Syzygium australe (stamen)) were selected as negative controls. P. angustifolium and S. australe are native Australian species while the rest are Indian species. The polar methanolic extracts were subjected to rotary evaporation and reconstituted in distilled deionised water prior to freeze-drying to obtain concentrated crystal products which were tested on cervical carcinoma cells (HeLa cell lines). Cell viability of the cancer cell line were assessed using the MTS ((3-(4,5-dimethylthiazol-2-yl)-5-(3- carboxymethoxyphenyll-2-(4-sulfophenyl)-2 H-tetrazolium, inner salt)/ phenazine methosulfate) assay. Cells subjected to P. angustifolium extracts at concentration of 250 µg/mL evidently showed no viable cells, comparable to cisplatin (a chemotherapy medication) used as a positive control. Some promising inhibitory effects were also seen with M. koenigii flower and leaves at concentration of 250 µg/mL, with only 43.46% and 63.88% cell viability, respectively. In contrast, the negative controls of C. hystrix (leaves) and S. australe (stamen) showed high cancer cell viabilities (around 82-93%) at the same concentrations. In this preliminary study, the Australian species P. angustifolium was found to be the most potent extract and a HPLC profile of the extract also showed an array of promising therapeutic phenolic compounds. Henceforth, further fractionation and isolation of novel compounds from this species is the future direction of this study.

Audience Take Away:

- This presentation may prompt more targeted research with bioassay guided fractionation of polar compounds. It may also lead to greater more extensive drug discovery ventures of the diverse Australian flora which have not been investigated.
- It will provide an efficient method of screening plants with potential therapeutic effects
- It will provide a bioassay guided fractionation protocol design for the future directive of this study, which may be of interest to researchers in drug discovery
- It may potentially provide a practical solution to the treatment of cancer(s) with less adverse side effects compared to synthetically derived chemotherapy drugs

Biography:

Janice Mani studied at the University of the South Pacific, Fiji and graduated as MSc in 2018. She is currently pursuing her PhD in Chemistry at the Central Queensland University (Australia) and her thesis title is "Antioxidative and anticancer potential of phytochemicals in Australian plants". At present she has 2 research article publications and 1 conference paper as first author and 8 publications as co-author.

Md Abdur Rashid

Department of Pharmaceutics, College of Pharmacy, King Khalid University, Abha, Saudi Arabia

Crystallization Process of API (Active Pharmaceutical Ingredients) for Dosage form Design

Crystallization is a widely used purification and a unit operation in pharma and chemical industries. Ibuprofen will be used as a model API in this presentation which is an analgesic. However commercial ibuprofen particles are irregular shape and size with rough surfaces. And show poor mechanical properties such as flowability, compaction etc. To overcome these problems desirable size shape of ibuprofen particle is needed which could offer direct compression with fewer operational steps but still having good product stability and therapeutic efficacy. So design a crystallization operation for producing desire size ibuprofen particle, the following information (data) is needed:

1) Solubility diagram
2) Metstable zone width
3) Crystal growth rate
4) Nucleation rates

The methods used, the results achieved and the data to design an industrial crystallizer will be presented.

Audience Take Away:

- Will be presented.
- Will gain knowledge to design industrial crystallizer
- Very useful
- Cost will be reduced

Biography:

Dr Abdur Rashid has published 18 peer-reviewed research articles and conference papers so far. He has had 7 poster presentations in national and international conferences. Dr Abdur Rashid enjoys crystallizing active pharmaceutical ingredients (API) with a desired size, developing new formulations and making new dosage forms. He became more interested in this area because of his PhD crystallization research project, which represents a fundamental link between chemical engineering, pharmaceutics and the pharmaceutical industry. This will be helpful to open a window for multi-disciplinary researchers and to undertake state-of-the-art research for the development and formulation of different cost effective and therapeutically effective dosage forms.

Armorel van Eyk*, Jessica Elonga
Division of Pharmacology, Department of Pharmacy and Pharmacology, University of the Witwatersrand, Johannesburg, Gauteng, South Africa

In vitro pharmacokinetics of topically applied compounds from various formulations across porcine skin

Introduction and aim: Topical application delivers active compounds directly to the site of affliction on the skin, circumventing first-pass metabolism that occurs with oral delivery. In this study, the in vitro diffusion parameters of various compounds in liquid, gel and cream formulations, topically applied on excised porcine skin, were determined so as to investigate the efficacy of penetration into and accumulation within the skin.

Methods: HPLC method validation (Kinetex RP- C18 (5µm, 150 x 4.6mm) column) was performed for each active compound (caffeine, theophylline, retinol, co-enzyme Q10 and L-carnitine). A PermeGear 7-in-line flow-through system was used for the in vitro diffusion studies across porcine skin: 1ml Caffeine (2.5%), Theophylline (2%), Retinol (0,3%), Coenzyme Q10 (0.5%) or L-carnitine (2%) within either a cream, gel or liquid formulation was loaded in each donor compartment. PBS (pH 7.4) was pumped through the receptor compartments at 1.5ml/h (32oC). Samples were collected every 30min or 2h (4h or 24h) and analyzed via HPLC. Skin accumulation (%) was performed as follows: excess residue was removed from the skin after experiments, skin was homogenized (10min in 2ml methanol), homogenate centrifuged and the supernatant analyzed.

Results: Steady state FluxSS (ng.cm-2min-1) and Papp (cm.min-1): Caffeine: cream≈liquid≈gel; Theophylline: liquid>cream≈gel; L-carnitine: liquid>gel>cream. Co-enzyme Q10 and retinol did not diffuse across skin. Skin accumulation (%): Caffeine: gel>cream≈liquid; Theophylline: liquid>cream>gel; L-carnitine: liquid>gel>cream; Retinol: cream≈liquid>gel; Co-enzyme Q10: liquid>gel>>cream.

Conclusion: Caffeine indicated the highest diffusion rates across the skin and formulation did not seem to effect penetration. Skin accumulation was also highest (>12%). Theophylline (hydrophilic) indicated variable diffusion rates (very low→high), but much lower than caffeine. Skin accumulation was much lower than caffeine (<1%). L- Carnitine (zwitterion) indicated much lower diffusion rates than the xanthines (caffeine and Theophylline), but skin accumulation (x%) was higher than theophylline (1%<x<2.5%). The two lipophilic compounds (retinol & co-enzyme Q10) did not show any diffusion across the skin but skin accumulation did occur (co-enzyme Q10<0.05% and retinol<0.12%).

Audience Take Away:

- Whether compounds like xanthines, retinol, L-carnitine and coenzyme Q10, when applied topically, penetrate intact skin significantly to have an effect within the tissue
- Whether these topically applied agents have any systemic effect (do they diffuse across skin or only accumulate within the skin)
- Which formulations are the most effective for these agents to show greater penetration into the skin
- The audience will have a greater understanding of how the chemistry of these compounds affect their penetration behavior into intact skin and which formulation in each case would be the better option to deliver the compounds to the site requiring treatment

- The audience, when they are designing topical products, would be able to decide which formulations would be the better option to deliver these types of compounds to the site where treatment is needed, circumventing first-pass metabolism of oral drug delivery and decreasing the probability of systemic effects. The information provided will help improve formulation choice

Biography:

Dr. Armorel van Eyk obtained her BSc degree in Chemistry and Biochemistry at the University of Port Elizabeth, South Africa (1984). She completed a BSc(Honours) (1986) and MSc (1987) and graduated with a PhD in Biochemistry in 1992 at the same University. Post doctoral studies were completed at UCT and Stellenbosch University, Cape Town. She obtained a BCom in Marketing Management and Economics at UNISA (2002) and a BSc(Honours) in Pharmacology at Stellenbosch University (2004). She is currently a Senior Lecturer at the University of the Witwatersrand, Johannesburg in the Pharmacology Division. She has published 54 articles in SCI(E) journals.

Ozge Esim[1*], Merve Eylul Kiymaci[2], Canan Hascicek[3]

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Experimental design of ciprofloxacin HCl-loaded nanoparticle formulation for an enhanced antimicrobial activity

Ciprofloxacin HCL is a second generation fluoroqinolone antibiotic, the most commonly used for the treatment of various infectious diseases like urinary tract infections against a wide range of Gram-positive and Gram-negative bacteria. However, many studies revealed that ciprofloxacin HCl has some disadvantages because of their poor intracellular accumulation and increasing resistance rate. Ciprofloxacin HCl entrapped nano-drug delivery systems may overcome these problems by decreasing the efflux of the antibiotic and increasing the antibiotic concentration on the target side. The aim of this study was to develop and optimize ciprofloxacin HCl-loaded bovine serum albumin (BSA) nanoparticles utilizing full factorial design and to investigate the antimicrobial activity of the optimized formulation against urinary tract infections. Ciprofloxacin HCl-loaded BSA nanoparticles were fabricated using desolvation method and optimized utilizing 23 full factorial design (Design Expert 7.0 software). BSA concentration (%) (X1) and pH of aqueous BSA solution (X2) were selected as independent variables while particle size (nm) (Y1), zeta potential (mV) (Y2) and encapsulation efficiency (%) (Y3) were selected as dependent variables. During the optimization studies the formulation prepared at pH 8.60 by using 2% BSA concentration was determined as optimum formulation. The properties of the optimized ciprofloxacin HCl-loaded BSA nanoparticles predicted by the 23 factorial design approach correlated very well with the experimental determined particle size of 238.2 nm, zeta potential of -27,6 mV and encapsulation efficiency of 38.11%. The antimicrobial activity of the optimized formulation and unloaded nanoparticles was determined using conventional agar diffusion method against Escherichia coli ATCC 25922, Enterococcus faecalis ATCC 29212, Staphylococcus aureus ATCC 29213 and Pseudomonas aeruginosa ATCC 27853, as a zone of inhibition and results were evaluated according to European Committee on Antimicrobial Susceptibility Testing standards. In addition, the minimal inhibition concentration of the optimum formulation was evaluated by broth microdilution method. The antimicrobial activity studies demonstrated that the optimized ciprofloxacin HCl-loaded albumin nanoparticle formulation had an enhanced antimicrobial activity against the bacteria.

Audience Take Away:

- In the presentation, application of the experimental design to nanoparticular drug delivery systems will be discussed
- In the presentation, enhancement of the effectiveness of a traditional antibiotic through nanoparticular drug delivery systems will be discussed
- In the presentation, preparation methods of protein-based nanosized drug delivery systems will be discussed

Biography:

Dr. Ozge Esim studied pharmacy and graduated from Hacettepe University in 2013. She received her PhD degree in 2020 at Pharmaceutical Technology program at Ankara University. She works as a research assistant at Ankara University Faculty of Pharmacy since 2014. Her main research area is lipid and polymer based drug delivery systems and she has some articles about this area in scientific journals.

Luciana Lehuede* and Oriana Salazar

Centre for Biotechnology and Bioengineering, Department of Chemical Engineering, Biotechnology and Materials, University of Chile, Santiago, Chile

Enzymatic production of xylooligosacharides (XOS) from Nothofagus pumilio sawdust

Xylo-oligosaccharides, produced from lignocellulosic materials (LCB), are short-chain polymers with prebiotic activity who, in the last decades, have gained commercial interest due to its potential applications as an ingredient to the nutraceutical industry. In this work xylan extraction at different conditions was evaluated from sawdust from four different Chilean native trees. Among them, the highest xylan recovery yields (over 60%) was obtained employing Nothofagus pumilio, selecting this hardwood as the best raw material. On the other hand, to select the best enzyme for XOS production, a commercial and a novel recombinant xylanase were characterized in terms of endoxyanase activity and thermal stability. The selected biocatalyst was employed in the hydrolysis of pre-extracted xylan from Nothofagus pumilio for the enzymatic production of XOS.

Audience Take Away:

- We will review relevant topics to consider when researching XOS productive process such as the selection of raw materials and strategies for XOS production from lignocellulosic biomass. Purification will also be discussed
- For the most employed strategy we will deep in to their main challenges and opportunities
- Also, this presentation will provide information regarding the evaluation of new raw material (sawdust from Chilean native trees), and enzymatic hydrolysis of their pre-extracted xylan employing a novel recombinant enzyme

Biography:

Dr. Luciana Lehuede studied Biochemical Engineer at the Pontificia Universidad Católica de Valparaíso (PUCV) between 2005 and 2011, graduating with distinction. After working as a project engineer, in an energy efficiency project at the Curauma Biotechnology Center, in 2013, she won a CONICYT scholarship to study at the doctorate program of Engineering Sciences with biochemical engineering mention. Obtaining her PhD degree in 2017 with the highest honors. Then in 2020, Dr. Lehuedé adjudicate a FONDECYT project to work as a postdoctoral researcher supervised by Dr. Oriana Salazar at the Centre for Biotechnology and Bioengineering (CEBIB) in the University of Chile.

Onelia Gagliano[1,2,3*], Camilla Luni[4,5], Yan Li[3], Silvia Angilillo[1,2], Wei Qin[1,2], Francesco Panariello[6,7], Davide Cacchiarelli[6,7], Joseph S. Takahashi[3,8], Nicola Elvassore[1,2,9]

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Synchronization between peripheral circadian clock and feeding-fasting cycles in microfluidic device sustains oscillatory pattern of transcriptome

Many processes of mammalian behavior and physiology, such as sleeping and feeding, are cyclically regulated during the 24h solar day by the circadian clock system. Desynchronization between physiological and behavioural rhythms increases the risk of developing some, including metabolic, disorders1. Although there is a lot of scientific evidence about the link between circadian clock and metabolism, the design of an experimental strategy for investigating and dissecting the contribution of specific oscillatory metabolic pattern on circadian clock is a challenge. In this work, we start to rationally investigate how the dynamic oscillatory nature of metabolic signals, resembling daily feeding-fasting cycle, alter or, even profoundly reset, the cell autonomous circadian clock in peripheral tissues. We hypothesize that frequency-encoded metabolic stimulations affect the cell-autonomous circadian clock and alter the rhythmicity of the cellular transcriptome. We also explore whether mismatch of cell-autonomous circadian clock and phases of 24h metabolic cycles could affect circadian rhythms. Here, we specifically develop a microfluidic approach to perform periodic cyclic stimulations under controlled microenvironmental conditions2,3,4, while continuously monitoring circadian oscillations. Long-term circadian study of mammalian microfluidic cell culture shows the unexpected importance of frequency-encoded metabolic perturbations for resetting the circadian clock. Furthermore, through cyclic temporal stimulations, we dissect the contributions of the feeding and fasting phases on clock resetting with oscillatory stimulation synchronous and asynchronous with cellautonomous circadian clock. We show that the circadian Per2 expression is better sustained via a 24h period and 12h:12h frequency-encoded metabolic stimulation applied for 3 daily cycles, aligned to the cell-autonomous clock, entraining the expression of hundreds of genes mostly belonging to circadian rhythms and cell cycle pathways. On the contrary misaligned feedingfasting cycles synchronize and amplify the expression of extracellular matrix-associated genes, aligned during the lightphase. This study underlines the role of the synchronicity between life-style-associated metabolic signals and peripheral clocks on the circadian entrainment.

Audience Take Away:

- A new approach based on microfluidic technology to study the cross-talk between the circadian clock and the metabolism
- The effect that metabolic patterns mimicking feeding-fasting cycles, which resemble good healthy and diseased life-styles provides on the internal circadian system
- How different feeding-fasting cycles synchronize the entire transcriptome and which pathways are enriched. Long term analysis (24 hours) of RNA-seq

Biography:

Dr. Gagliano is a Bioengineer with a PhD in Industrial Engineering at University of Padova (Italy). During her PhD, she joined the research group of Prof. Elvassore and in collaboration with Takahashi's Lab (UTSW, USA) worked on developing different automated microfluidic platforms for temporarally controlling oscillatory patterns of metabolites and hormones, to investigate how metabolic cycles can influence biological rhythms (Gagliano et al, in press Nature Communication). She also developed an automated microfluidic platform to temporarily modulate the delivery of mRNAs during the reprogramming process (Luni L et al 2016) reaching efficiencies never reported before in generating both human (Gagliano O et al, 2019) and naïve (Giulitti S et al, 2018) iPSCs. In 2019 she won the Talent@UniPDSTARS Starting Grant (180.000 €) of 2 years, to build her own lab. She is also coordinating the GICOVID grant from Fondazione Cariparo, aims at using organoids as a model for COVID-19 infection.

Bhupendra G. Prajapati
Ganpat University, Shree S.K.Patel College of Pharmaceutical Education and Research, Mahesana, Gujarat, India

Boosting Oral Bioavailability Though Solid Lipid Nanoparticle Approach

More than 60 percentage of new drugs synthesized suffered from poor water solubility limitation. Water poor solubility consequently leads poor oral bioavailability in many new molecules. Selection of appropriate formulation for such drugs is creating a lot many challenges to the formulation experts. Lipid based drug delivery is once of conceptual approaches to improve oral bioavailability of such drugs. One of such formulation is solid lipid nanoparticles, which can further improve the bioavailability, therapeutic efficacy and can reduce overall dose to be delivered. Solid lipid nanoparticles (SLNs) are the effective lipid based colloidal carriers which were introduced as an alternative to the conventional carriers. Typically they enhance the oral bioavailability of the low aqueous soluble drugs due to their potential to enhance gastrointestinal solubilization and absorption via selective lymphatic uptake. SLNs can be prepared by High shear homogenization, Hot homogenization, Cold homogenization, Ultra sonication or high speed homogenization, Solvent emulsification/evaporation, Supercritical fluid techniques, Spray drying method or Double emulsion method. There are basically three different models for the incorporation of active ingredients into SLN that are Homogeneous matrix model, Drug-enriched shell model and Drug-enriched core model. Characterization of SLN is a serious challenge due to the colloidal size of the particles and the complexity and dynamic nature of the delivery system. The important parameters which need to be evaluated for the SLNs are, particle size, size distribution kinetics (zeta potential), degree of crystallinity and lipid modification (polymorphism), coexistence of additional colloidal structures (micelles, liposome, super cooled, melts, drug nanoparticles), time scale of distribution processes, drug content, in vitro drug release and surface morphology. In current research SLNs of Exemestane is prepared by homogenization technique. Preliminary process optimization and screening is performed for drug to lipid ratio, amount of organic and aqueous phase, amount of surfactant, homogenization speed, homogenization time and sonication time. Prepared SLNs evaluated for particle size, percentage entrapment efficiency, percentage drug loading, zeta potential analysis, in-vitro dissolution study, scanning electron microscopy, stability studies, in vitro cytotoxicity screening and in vivo bioavailability studies.

Audience Take Away:

- Importance of SLNs with reference to water poor soluble drugs
- Formulation approaches as well as characterization of SLNs
- SLN based Research case study using anticancer molecular

Biography:

Dr.Bhupendra works as Professor in Department of Pharmaceutics, Shree S.K.Patel College of Pharmaceutical Education and Research, Ganpat University, North Gujarat, India. He did his Ph.D. from Hemchandracharya North Gujarat University, Patan. He did his PG and UG from M.S.University, Baroda. He has 19 years of experience in academic/industry (17+2). He awarded with Carrier Award for Young Teacher by AICTE, New Delhi in 2013. He also awarded for Distinguished Associate Professor by in TechNExt India 2017 by CSI, Mumbai. He claims on his name more than fifty national and international publication. He fetched grant for Research Projects, Staff Development Programs, Seminars, Conferences and Travel Grants from National and State Government agencies. He is also given his guidance in few industrial consultancy projects conducted at institute. Currently he is working in the field of lipid-based drug delivery and nanotech formulations. He guided 7 Ph.D. and 45 PG research scholars supervised. 5 Ph.D and 3 PG research scholars are currently working under his guidance in the field of Nanoparticulate Drug Delivery and Bioavailability Enhancement.

Mansureh Ghavam

Department of Range and Watershed Management, Faculty of Natural Resources and Earth Sciences, University of Kashan, Kashan, Iran

Application of Camellia sinensis (L.) Kuntze in traditional medicine and virus control

Green tea is made from the unfermented leaves of Camellia sinensis (L.) Kuntze and is grown in Asia and parts of Africa. This plant is in the form of shrub or tree and has evergreen leaves that reach a height of 2 to 10 meters. Black tea brew is one of the most popular drinks in Iran. The usable part of the green tea plant is its leaves, which are used in traditional medicine for heart disease, jaundice and urinary incontinence (Higashi-Okai et al., 2001) and in modern medicine, it is used to nervous headaches, treat amoebic and bacterial diarrhea and hepatitis, reduce fat and blood sugar due to its antimicrobial, antioxidant, anti-cancer and antiviral properties (Bastianetto et al., 2006). Catechins and theaflavins are two natural groups of polyphenols found in green tea and black tea, respectively (Leung et al., 2001). Studies found that Black tea crude extract powder had antiviral properties against HSV-1 (Oliveira et al., 2015 and Cantatore et al., 2013) and influenza virus (Zu et al., 2012) which was caused by theaflavins. Black tea crude extract powder has also been shown to have antiviral properties against HIV-1. Factors influencing include a mixture of theaflavin derivatives (TF1, TF2A, TF2B and TF3) (Yang et al., 2012) and Theaflavin derivatives in black tea and catechin derivatives in green tea (Liu et al., 2005).

Audience Take Away:

- Green and black tea have many uses in modern and traditional medicine
- The ingredients in this plant have antiviral properties and could be an option for future research

Biography:

Mansureh Ghavam graduated from Isfahan University of Technology in Iran in 2004 with a degree in Natural Resources Engineering. She completed a PhD in field of medicinal plants at University of Tehran in 2013. Her doctoral dissertation was in the field of genetics, cytogenetics and phytochemistry of medicinal plants, which was accepted with honors. She has been officially employed by University of Kashan since 2013 and is researching the antioxidant and antimicrobial properties of medicinal plants, nanotechnology of medicinal plants, and cultivation and propagation of medicinal plants. Her first research was accepted entitled "Effects of ecological factors on the antioxidant potential and total phenol content of Scrophularia striata Boiss." in Scientific Reports in November 2019. Due to his research skills, he now has a partnership agreement with the University of Cagliari.

Reem Alshaman[1], Abdullah Alattar[1], Ahmed R. Gardoh[2,3], Rabie E. Elshaer[4], Amany Y. Elkazaz[5,6], Mohamed Ahmed Eladl[7], Rehab M. El-sayed[8], Sawsan A. Zaitone*

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Design and formulation of doxycycline polymeric nanoparticles and testing antitumor and antiangiogenic activity in mouse colon cancer model

Nanotherapeutics is a rapidly progressing area in the field of Nanomedicine, which is being utilized to overcome several limitations of conventional drug, including poor aqueous solubility, lack of site-specific targeting, rapid systemic clearance, intestinal metabolism and systemic toxicities. Polymeric nanoparticles (PNPs) consist of the drug dispersed in an amorphous form within a polymer matrix. PNPs are promising vehicles for drug delivery by easy manipulation to prepare carriers with the objective of delivering the drugs to specific targets; such an advantage improves the drug safety. The main objective of our study is to formulate pH-sensitive polymeric nanoparticles loaded with Doxycycline using Nanoprecipitation technique using Eudragit S100 (ES100) and Hydroxypropyl methyl cellulose phthalate HP55 (HPMCP HP55) as polymers. Sixty male albino mice were divided into 6 experimental groups. Experimental colon cancer was induced by chemical injection of 1,2,-dimethylhydrazine once weekly for 16 weeks. Doxycycline polymeric nanoparticles (DOX-PNPs) were administered orally in 5 and 10 mg/kg doses and compared to free doxycycline. The results of the biological study demonstrated greater antitumor activity for DOX-PNPs as demonstrated by the improved histopathological picture for colon specimens stained with hematoxylin and eosin and lessening of the tumor score. Further, the DOX- PNPs significantly lowered the angiogenesis markers, VEGD and CD31, compared to free DOX. Overall, the current results highlighted greater antitumor action for DOX-PNPs and their promise for use in clinical trials to show their efficacy in treating human colon cancer.

Katarina Kores[1*], Janez Konc[1,2] and Urban Bren[1,3]

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Mechanistic Insights into Side Effects of Troglitazone and Rosiglitazone Using a Novel Inverse Molecular Docking Approach

Thiazolidinediones form drugs that treat insulin resistance in type 2 diabetes mellitus. Troglitazone represents the first drug from this family, which was removed from use by the FDA due to its hepatotoxicity. As an alternative, rosiglitazone was developed, but it was under the careful FDA watch for a long time. It was suspected that it causes cardiovascular diseases, such as heart failure and stroke. We applied a novel inverse molecular docking approach to discern potential protein targets of both drugs. Troglitazone and rosiglitazone were docked into predicted binding sites of >38.000 protein structures from the Protein Data Bank and examined. Several new potential protein targets with successfully docked troglitazone and rosiglitazone were identified. The focus was devoted to human proteins so that existing or new potential side effects could be explained or proposed. Specific targets of troglitazone like 3-oxo-5-beta-steroid 4-dehydrogenase, neutrophil collagenase, stromelysin-1, and VLCAD were pinpointed, which could explain its hepatoxicity, with additional ones indicating that its application could lead to treatment/development of cancer. Results for rosiglitazone discerned its interaction with members of the matrix metalloproteinase family, which could lead to cancer and neurodegenerative disorders. The concerning cardiovascular side effects of rosiglitazone could also be explained. We firmly believe that our results deepen the mechanistic understanding of the side effects of both drugs, and potentially with further development and research, maybe even help to minimize them. The novel inverse molecular docking approach, on the other hand, carries the potential to develop into a standard tool to predict possible cross-interactions of drug candidates potentially leading to adverse side effects.

Audience Take Away:

- The audience will learn how to apply advanced and modern docking methodology
- The presented inverse molecular docking approach can be developed into a tool for the prediction of cross-interactions of drugs or natural compounds potentially leading to side effects
- The presented results can be used directly in the development of new and safer type 2 diabetes mellitus drugs

Biography:

Katarina Kores studied Chemistry at the Faculty for Chemistry and Chemical Technology and graduated as M.S. in 2018. She then joined the research group of Prof. Dr. Urban Bren at the same institution, where she started as a research assistant. In 2019, she began with her Ph.D. Currently, she works as a research and pedagogical assistant. She has been focusing on the usage of the molecular docking approach to study the potential effects and use of drugs and natural compounds.

Nada F. Abo El-Magd[1*], Mohamed El-Mesery[1], Amro El-Karef[2], Mamdouh M. El-Shishtawy[1]

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[2]Department of Pathology, Faculty of Medicine, Mansoura University, Mansoura, Egypt

Amelioration effect of black seed oil against high-fat diet-induced obesity in rats through Nrf2/HO-1 pathway

Obesity is a chronic inflammatory disease that represents a risk factor for number of diseases including diabetes, steatohepatitis, and cancer. Using safe natural compounds to ameliorate obesity and its related metabolic syndrome is an interesting spot for research. We investigated the regulatory role and the underlying mechanism of black seed oil (BSO) on high-fat diet (HFD)-induced obesity in rats. The study included two models: the first one aimed to study the prophylactic effect of BSO (BSO administration for 10 weeks along with HFD) while the second one aimed to study the treatment role of BSO (BSO administration starting from the 10th week for 4 weeks along with HFD). BSO significantly decreased insulin resistance and body weight characteristics in both models. It also normalized lipid profile. Moreover, histopathological examination confirmed these results as BSO significantly decreased adipocyte size and hepatic lipid deposition. Besides, BSO alleviated HFD-induced oxidative stress as indicated by significant increase in the total antioxidant capacity and significant decrease in liver malondialdehyde. Moreover, BSO decreased significantly liver gluconeogenic enzymes mRNA expressions (phosphoenolpyruvate carboxykinase and glucose-6-phosphatase) and significantly increased heme oxygenase-1 (HO-1), nuclear factor erythroid-2-related factor-2 (Nrf2) and insulin receptor mRNA expressions. In conclusion, BSO represents a natural therapy that can prevent and treat HFD-induced obesity in rats that may be mediated through Nrf2/HO-1 pathway's activation and insulin receptor expression's increase. To our best knowledge, this study represents a novel study that investigates the regulatory role of BSO on Nrf2 pathway in preventing and treating HFD-induced obesity.

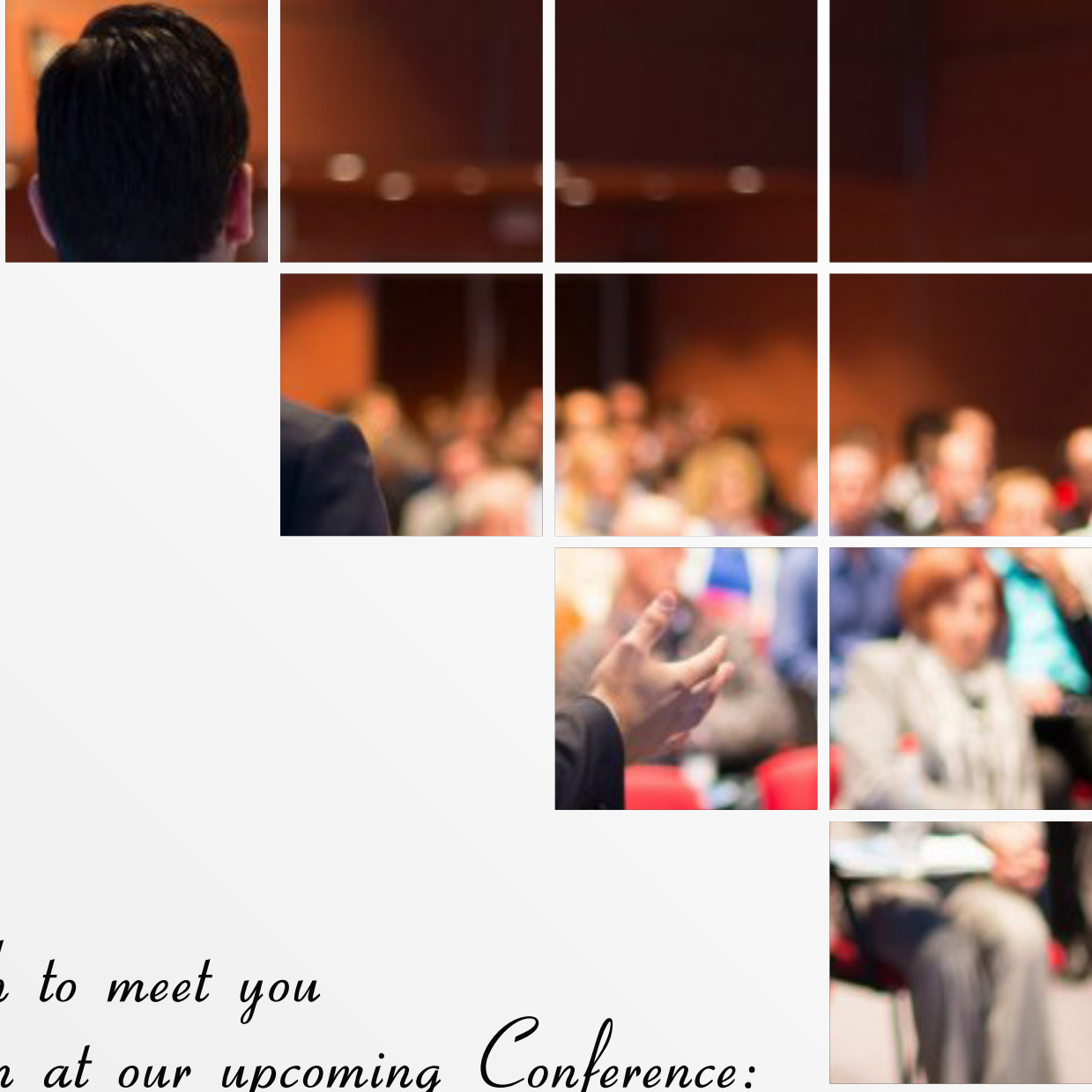
Audience Take Away:

- Black seed oil is a natural available safe supplement; thus it can be used for prevention from obesity and even treatment of obesity and obesity related complications. Introducing of black seed oil in the treatment regimen of obese patients may be promising

Biography:

Nada Ghazy, lecturer of clinical biochemistry at Mansoura University, Egypt for 3 years. She worked as a post-doctoral fellowship visitor at Robert Gordon University, Aberdeen, the UK for 6 months starting from Jan 2019. She got my B.Sc., M.Sc. and Ph.D of pharmaceutical sciences from Mansoura University, 2012, 2015 and 2018 respectively. She has a good experience in animal models and cell culture in addition to a good experience in several techniques like ELISA technique, colorimetric assay, RNA extraction, PCR work, gel electrophoresis, real-time PCR work, protein array, PCR array, and immunohistochemistry. She published 10 manuscripts in addition to 3 conference abstracts.

PARTICIPANTS LIST



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