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GAVIN CONFERENCES

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Muhammad Mukhtar
American University of Ras Al Khaimah, United Arab Emirates

Biochemical aspects of Human Immunodeficiency Virus entry into the brain

The blood-brain barrier in humans shields the brain from various infectious agents and injurious elements. Several studies in the past show that viruses enter into the brain and protect themselves from immune surveillance as well as antiviral treatments. Worth mentioning here is that most of the antivirals cannot penetrate into the brain and thus viruses hiding in the brain sometimes act like silent reservoirs of infections. The passage of viruses into the brain is an active area of investigation and each virus uses different strategies for getting access to the brain. Our laboratory developed human blood-brain barrier and utilized it to understand the passage of human immunodeficiency virus type 1 (HIV-1) into the brain. In general, HIV-1 entry into the permissive cells involves interactions between gp120 expressed on viral envelope and CD4 on the cells acquiring viral infections. Intriguingly, brain cells lacks CD4 receptor, however, HIV-1 enters into the brain. For over a decade, our laboratory evaluated molecular moieties involved in the passage of HIV-1 entry into the brain. A strong support from the US National Institutes of Health and the Pfizer Pharmaceuticals allowed us to utilize state of the art human blood-brain barrier model in deciphering the passage of HIV-1 virus into the brain.

We observed that HIV-1 infected immune cells transfer viral particles into the brain through secreting membrane damaging metalloproteinase thus providing an opportunity for infected cells entry into the brain. In our in vitro blood, brain barrier model monocytes upon viral infection exhibited a substantial increase in secretion of active metalloproteinase MMP-2 and MMP-9, and these increases were reversed by cholesterol depleting drugs statins. Because none of these MMPs were detectable in T-cell conditioned media, regardless of infection, we performed gene array studies focused on mRNAs relevant to cell interactions. HIV-1 infection of T cells increased the mRNA of MMP-17, which is a membrane-type metalloproteinase, and suppressed the mRNA expression of tissue inhibitor type-1 (TIMP-1). Furthermore, supplementation of infected monocytes and T-cells with exogenous TIMP-1 substantially suppressed transmigration, indicating a functional role for MMP over-expression supporting virus entry into the brain.

Based on these findings from our laboratory Phase IV clinical trial entitled "Modulation of Monocyte Activation by Atorvastatin in HIV Infection" were initiated by one of our collaborating laboratories." Of note, HIV-1 entry into the brain leads to acquired immunodeficiency syndrome (AIDS) dementia. The finding of clinical trials is mainly observing a reduction in AIDS dementia by statin treatment still needs to be deciphered thus proving our scientific discovery journey.

Biography:

Muhammad Mukhtar has over 25 years teaching experience in biochemistry/microbiology/biotechnology both molecular and cellular levels. He stayed involved in teaching and clinical research for over a decade at the Thomas Jefferson University Medical College of Philadelphia, USA. Besides teaching, he has a very strong portfolio of academic administration. He had a unique experience of serving as a member of Institutional Review Board (IRB) for five years and reviewed hundreds of clinical protocols. He was awarded United States Agency for International Development Scholarship to complete his Ph.D. from the Drexel University of Philadelphia, PA, USA. Additionally, the US government bestowed on him the Outstanding Scientist (O-1) visa award during the years 1995- 2006 for conducting research, training students and young scientists pursuing their careers in medicine and biomedical field in the USA. His contributions were acknowledged with UNESCO Award, a recognition by Sigma Xi in the area of Science and Technology and a most recent fellowship honor by the Pakistani Academy of Medical Sciences.

muhammad.mukhtar@aurak.ac.ae

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Martin Mandl
Masaryk University, Czech Republic

Defining the oxygen limitation and optimum aeration conditions in bioreactors

The intensity of aeration has multiple consequences at the biochemical, biotechnological and economical bioprocess control levels. Oxygen limitation has adverse effects on biological activities, varying with different organisms and substrates. Defining the conditions of oxygen supply and oxygen limitation is subject to the biochemical and physiological requirements of all biological systems in bioreactors.

In this study on the bioleaching bacteria Acidithiobacillus ferrooxidans, the critical values of the volumetric oxygen transfer coefficient (kLa) crit and oxygen concentration Ccrit (which is dependent on the Michaelis constant Km for oxygen) were used to define the conditions for the minimum aeration that still avoids oxygen limitation during substrate oxidation. One of the key indications of oxygen limitation is the linearity of growth and substrate oxidation. This effect has been predicted from the Monod kinetics. The Km and Ccrit values were determined in respirometric studies. Steady-state and static gassing-out techniques were used for the (kLa)crit determination. The values of the three parameters were different for the two fundamental substrates tested, ferrous iron and elemental sulfur. By comparison to elemental sulfur, the oxidation of ferrous iron required a slightly higher intensity of aeration to maintain oxygen-unlimited substrate oxidation. A continuously stirred bioreactor was used for long-term confirmation of oxygen-unlimited substrate oxidation at Ccrit. Although the results were obtained under laboratory-scale conditions, the approaches and the (kLa)crit and Ccrit values can be used universally as guidelines to develop minimum aeration criteria for pilot- and commercial-scale bioreactor processes.

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Biography:

Martin Mandl is an Associate Professor and the Head of the Department of Biochemistry, Faculty of Science, Masaryk University, Brno, Czech Republic. He is a board member of the Czech Biotechnology Society which is a member of the European Federation of Biotechnology. His teaching activities have been focused predominantly on microbial and enzyme biotechnology and applied statistics. He has published more than 60 research articles (including book chapters), 40 of which have been published in prominent journals. He was a co-editor of an Elsevier book. Most of his research activity has been related to biotechnology and biochemistry of acidophilic bacteria that are connected with biomining and environmental acidification. A part of his activity was devoted to cellulolytic fungi and industrial production of bacterial vaccines. He has dealt with several projects supported by the national and European Union science foundations.

mandl@chemi.muni

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Abdul Gafoor Puthiaveetil
American University of Ras Al Khaimah, UAE

Novel Strategies for Treating Autoimmune Diseases

Many human diseases are caused by altered regulation of genes by various cellular changes, including DNA methylation/acetylation, histone acetylation and histone deacetylation. Histone modification can significantly alter the function of gene by regulating its expression, causing drastic changes in the behavior of cells. This can result in abnormal multiplication of cells, altered cellular responses or changes in cell cycle. Recent studies suggest that histone modifications are directly involved in the development and progression of multiple diseases including cancer and autoimmune diseases.

Targeting histone deacetylases using inhibitors to treat such conditions have been tried in both animal models and in human clinical trials with partial success. Among the different classes of HDAC, HDAC6 is gaining more attention for therapeutic purposes due to their putative role in causing cancer and autoimmune diseases by altering HSP90 pathway. Our study using specific inhibition of HDAC6 showed improved development of lymphocyte differentiation and alleviation of symptoms in a mouse model for Systemic Lupus Erythematous. The study highlights the relevance of specific HDAC inhibition as a future therapeutic strategy for different disease conditions.

Biography

Abdul Gafoor Puthiyaveetil is the Chair and Program Coordinator of Biotechnology Department at American University of Ras Al Khaimah. Dr. Puthiyaveetil completed his PhD at Virginia Polytechnic Institute and State University. He did internship training at National Institutes of Health (NIH), United States and got postdoctoral training at Virginia Tech USA. He has published six international publications, holds two international patents and presented his research findings at multiple international conferences including American Society of Hematology annual meetings, USA and National Cancer Research Institute symposium, United Kingdom.

abdul.gafoor@aurak.ac.ae

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Christoph Herwig
Vienna University of Technology, Vienna Austria

Elucidating the potential of bio-processes on industrial waste streams

Worldwide bio-economy concepts foster the sustainable production and conversion of biomass into a range of food, health, fiber, industrial products, and energy. However, there is a risk that the diversion of farmland or crops for the production biofuels and bio-based products compromises the food supply - the food versus fuel dilemma. One way to circumvent this dilemma is the use of spent liquors from the pulping industry in terms of a wood biorefinery. The economic success of the utilization of these liquid fractions largely depends on an efficient separation and conversion of the organic compounds - predominantly the carbohydrates. Integrating biotechnological processes into existing pulp mills is expected to achieve those requirements. Employing extremophilic microorganisms in the bioprocesses could lead to further process intensifications by saving chemicals, cooling energy and sterilization steps.

Regarding a future integration of bioprocesses, better understanding and quantification are required. The improvement of those biological systems for biofuels production implies the study of different physiological key parameters in the developing bio-systems, using on-line signal monitoring and off-line analyses.

This contribution tries to elucidate the potential of bioprocesses utilizing spent sulfite liquor on the example of four very different processes employing an anaerobe thermophile, an anaerobe mesophile and an aerobe halophile for producing different base chemicals. Fortunately, the general methodology, finding the right strains, investigating inhibiting substances and pretreatment or investigation of physiological key parameters is the same for all the investigated cases.

Biography:

Christoph Herwig, bioprocess engineer from RWTH Aachen, worked in industry in the design and commissioning of large chemical facilities prior to enter his interdisciplinary PhD studies at EPFL, Switzerland in bioprocess identification. Subsequently he positioned himself at the interface between bioprocess development and facility design of biopharmaceutical facilities. Since 2008, he is full professor for biochemical engineering at the Vienna University of Technology. The research area focuses on the development of methods for integrated, science-based and efficient bioprocess development along PAT and QbD principles. The product fields are circular economy and biopharmaceuticals within industry driven projects.

christoph.herwig@tuwien.ac.at

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Ronda Srinivasa Reddy
KL University, Andhra Pradesh, India

Sequential separation of high value products from microalgae

Algal biomass is a repository for multiple high value products. A wide diversity of microalgal members viz., *Spirulina platensis*,*Dunaliella salina*, *Phaedodactylum tricornatum*, Isochrysis galbana,*Haematococcus pluvialis*, *Crypthecodinium cohnii*, *Nannochloropsis salina* accumulate intracellular products such as pigments, polysaccharides,carotenoids, poly-unsaturated fatty acids and triglycerides in abundance. However, in a typical algal bioprocess, a predominant product is targeted while other less concentrated value added products are left unexploited. Therefore, designing a viable process for value added products require sequential processes to be adopted with either a single or a consortium of algal species. Selective solvent extraction processes are practiced in the recovery of the aforesaid products with high initial purity. Some of the key issues to be resolved in the design of sequential processes include biomass selection; biomass fortification; reconstitution of biomass surface area and cross-contamination of desired products. The present work highlights various micro algal products, their abundance, recovery methods and design criteria for purification of products. Also, the work validates few process examples that can be adopted in prospective algal bio-refineries.

Biographpy

Ronda Srinivasa Reddy is a group head for Center for Bioprocess Technology at KL University, Andhra Pradesh, India. He did his doctoral research at Institute of Chemical Technology, Mumbai, India. He has published more than 50 papers in reputed journals and has been serving as an editorial board member for reputed journals. He is a recipient of SERC Young Investigator award, UGC Research Award and he is a principal investigator for DST, DBT sponsored projects.

rsr@kluniversity.in

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Ammani Kandru
Acharya Nagarjuna University, India

Arbuscular mycorrhizae - A natural biofertilizer

Arbuscular mycorrhizal fungi (AMF), a group of obligate biotrophs, belonging to phylum Glomeromycota, represent a vital link between plant and soil mineral nutrients. These fungi form a mutualistic symbiosis with higher plants including agricultural and medicinal plants. These fungi play a crucial role in nutrient acquisition, particularly phosphorus and also water uptake. The extra matrical mycelium that extends several centimeters in the soil can acquire nutrient and water from the soil that are inaccessible to roots. Thus, this is the only fungal system that acts as a natural biofertilizer, thereby improving the ability of plants to utilize the natural resources in a sustained manner. In addition to these nutritional benefits these AM fungi play a pivotal role in preventing soil erosion, alleviating plant stress, drought and disease resistance and hence can be considered as a bioprotector also. Also they improve the soil structure and aggregation by producing a soil protein, glomalin. Further these fungi play a critical role in the mitigation of climate change by reducing N_2O emissions, an important green house gas.. Hence research on Arbuscular mycorrhizae led to a gaint step forward in Agricultural Microbiology as this association is improving the production of agricultural crops with minimum inputs, improving the soil structure, aggregation and soil health and also targeting environmental pollution.

Working on AM fungi for the past 33 years on several agricultural and medicinal crops and established their positive role as a biofertilizer. The nature, occurrence, distribution and identity of these fungi was studied in detail. The present lecture summarizes the uses of AMF, the biofertilization experiments and also focuses on the economic and environmental benefits.

Biography

Ammani Kandru is the Coordinator for the department of Botany & Microbiology,Acharya Nagarjuna University. She has published 74 articles in reputed National & International journals and presented more than 140 research papers in national & international conferences. Presented research articles at John Hopkins University, Maryland USA, SriLanka and gave an invited lecture at Nepal and chaired sessions. Produced 12 Ph.D's & 9 M.Phil's in the fields of Botany, Biotechnology, Biochemistry, Microbiology & Nutrition. Life member for more than 15 reputed Scientific societies and Fellow member of Indian Botanical society, International society of Biotechnology and Eurasian Academy of Environmental Sciences. Also she has been serving as editorial board member for 4 reputed journals.

ammani1960@gmail.com