1856th Conference

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Annual Biotechnology Congress

July 23-24, 2018 | Vancouver, Canada

Keynote Forum

Day 1

Nathan S Bryan, J Biotechnol Biomater 2018, Volume: 8
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Nathan S Bryan

Baylor College of Medicine, USA

Nitric oxide and heart disease: New discoveries and innovations in diagnostics and therapeutics

Nitric oxide (NO) is a multifunctional signaling molecule, intricately involved with maintaining a host of physiological processes including but not limited to host defense, neuronal communication and the regulation of vascular tone. The endothelium-derived NO plays a crucial role in regulating a wide spectrum of functions in the cardiovascular system, including vasorelaxation, inhibition of leukocyte endothelial adhesion, vascular smooth muscle cell (SMC) migration and proliferation, as well as platelet aggregation. In this regard, NO is a potent vasodilator as well as a powerful antiplatelet and anti-leukocyte factor. NO is one of the most important signaling molecules in our body. Loss of NO function is one of the earliest indicators or markers of disease. Experimental and clinical studies provide evidence that defects of endothelial NO production, referred to as endothelial dysfunction, is not only associated with all major cardiovascular risk factors such as hyperlipidemia, diabetes, hypertension, erectile dysfunction, smoking and severity of atherosclerosis, but also has a profound predictive value for future atherosclerotic disease progression. Emerging published literature reveals that NO insufficiency may manifest itself differently in different patients. 30 plus years after its discovery and 20 years since a Nobel prize was awarded for its discovery, innovations into safe and effective therapeutics has been slow. The current state of the science surrounding nitric oxide in the etiology of a number of different disease states will be reviewed and also the latest technology to safely and effectively restore nitric oxide in patients will be revealed. The audience will learn the challenges and opportunities that exist in understand NO homeostasis in their patients and how this may translate into better management of their patients. New discoveries on novel compositions of matter to generate NO gas and recouple endogenous NO production may lead to new class of NO active drugs.

Biography

Nathan S Bryan has earned his undergraduate Bachelor of Science degree in Biochemistry from the University of Texas at Austin and his doctoral degree from Louisiana State University School of Medicine in Shreveport where he was the recipient of the Dean's award for Excellence in Research. He pursued his postdoctoral training as a Kirschstein Fellow at Boston University School of Medicine in the Whitaker Cardiovascular Institute. After a two-year post-doctoral fellowship, in 2006 he was recruited to join as Faculty at the University of Texas Health Science Center at Houston by Ferid Murad, MD, PhD, 1998 Nobel laureate in Medicine or Physiology. His 9 years at UT led to several discoveries which have resulted in over a dozen issued US and international patents and nine pending worldwide. He is also a successful entrepreneur who has successfully commercialized his nitric oxide technology through human. He has published a few highly cited papers and authored or edited five books. He is an international leader in molecular medicine and nitric oxide biochemistry.

Nathan.bryan@bcm.edu

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Zoya Leonenko, J Biotechnol Biomater 2018, Volume: 8
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Zoya Leonenko

University of Waterloo, Canada

Molecular mechanism of Alzheimer's disease

Alzheimer's disease (AD) is a neurodegenerative disease characterized by dementia and memory loss for which no cure or prevention is available. Amyloid toxicity is a result of the non-specific interaction of toxic amyloid oligomers with the plasma membrane. We studied amyloid aggregation and interaction of amyloid beta (1-42) peptide with lipid membrane using atomic force microscopy (AFM), Kelvin probe force microscopy and surface plasmon resonance (SPR). Using AFM-based atomic force spectroscopy (AFS) we measured the binging forces between two single amyloid peptide molecules. Using AFM imaging we showed that oligomer and fibril formation is affected by surfaces, presence of metals and inhibitors. We demonstrated that lipid membrane plays an active role in amyloid binding and toxicity: changes in membrane composition and properties increase amyloid binding and toxicity. Effect of lipid composition, the presence of cholesterol and melatonin are discussed. We discovered that membrane cholesterol creates nanoscale electrostatic domains which induce preferential binding of amyloid peptide, while membrane melatonin reduces amyloid-membrane interactions, protecting the membrane from amyloid attack. Using AFS we that novel pseudo-peptide inhibitors effectively prevent amyloid-amyloid binding on a single molecule level, to prevent amyloid toxicity. These findings contribute to better understanding of the molecular mechanisms of Alzheimer's disease and aid to the developments of novel strategies for cure and prevention of AD.

Biography

Zoya Leonenko is the Professor, Department of Physics and Astronomy, Department of Biology, Waterloo Institute for Nanotechnology, Center for Bioengineering and Biotechnology, University of Waterloo, Vice President of the Biophysical Society of Canada. She holds a PhD in Chemical Physics, 1996, Russian Academy of Sciences. She is leading a Biophysics research group at the University of Waterloo. Her current research interests include scanning probe microscopy, biophysics of lipid membrane and lipid-protein interactions, the role of structural changes and physical properties of lipid template in controlling biological processes and diseases, application of lipid films in bio- and nano- technology.

zleonenk@uwaterloo.ca

Notes:

Shyh-Dar Li, J Biotechnol Biomater 2018, Volume: 8
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Shyh-Dar Li

University of British Columbia, Canada

Targeted drug delivery and release enabled by nanobiotechnology

Prof. Li's talk will be focused on two platform nanotechnologies developed in his lab for targeted drug delivery and release. These include a polymeric-drug conjugate platform and a lipid-based nanoparticle technology that can increase drug solubility and targeting to a variety of tissues including cancer. Drug release from these nanoparticles can also be programmed or guided by tissue-specific internal or external stimuli to achieve selective therapy. He will give an overview on these two systems, including the rational design, composition development and optimization, *in vitro* characterization and *in vivo* efficacy results. Future directions and perspectives for the field of nanobiotechnology-based drug delivery will also be discussed.

Biography

Shyh-Dar Li has received PhD in Pharmaceutical Sciences from University of North Carolina at Chapel Hill. He is currently the Angiotech Professor in Drug Delivery at the Faculty of Pharmaceutical Sciences, University of British Columbia. His research focuses on developing innovative drug delivery technologies to enhance drug targeting with a particular interest in lipid and polymer based nanoparticles. His research program has been supported by federal funding including National Institutes of Health, Canadian Institutes of Health Research, and Natural Sciences and Engineering Research Council in Canada. In addition to contributing scholar publications in peer-reviewed journals, his team has successfully licensed four drug delivery technologies to industry with one in phase II trials for brain cancer therapy.

shyh-dar.li@ubc.ca

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Navneet Sharma, J Biotechnol Biomater 2018, Volume: 8
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Navneet Sharma

University of Calgary, Canada

Bacteriophage display of peptides for functional degradomics and other applications

The literature of functional degradomics is full of applications of different proteomes helping in the degradation of peptide molecules for their application in medicine, genomics and many other technologies. We have used this technique for digestion of various peptides in order to identify the proteases involved and document their proteolytic activity by confirming the degradation site by techniques such as MS. The objective was to identify the specific site for degradation of the peptides with respect to the other amino acids present in the vicinity. This specific act is able to define and classify proteases into various different classes. Also, determining the specific catalytic site and the adjoining amino acids, helps in visualizing the various proteolytic substrate molecules on which our proteases can work for digesting some macromolecules or working on a micro-molecular process. We have identified many such substrates in case of implantation serine proteases I and II, kallikrein 5/6 and classical trypsin and thrombin. The mechanism of building a phage display library for this purpose is being presented here. The objective is to use this library for the identification of many different strains of *Cannabis* (cultivated to produce various types). The hypothesis for this research was formed because of the presence of many different types of cannabinoid receptors in the different cell types in humans. By differentiating strains based on their binding to different peptide substrates bound to the phage display library, we can easily differentiate between the different types of cannabis that can also be used to-the-pointing medicinal purposes.

Biography

Navneet Sharma has been working in the academic fields of Biochemistry and Molecular Biology for more than a decade after working in a pharmaceutical company for almost another 10 years. Prior to that, he had done his Ph.D. in Molecular Biology & Biochemistry at Indian Institute of Integrative Medicine (Council of Scientific and Industrial Research). Presently, he has been working as an Adjunct Assistant Professor in the Department of Biochemistry & Molecular Biology at the Faculty of Medicine, University of Calgary (AB) Canada. The main emphasis of his recent research work is in the field of biochemistry and the role of serine proteases and protease inhibitors in the critical processes of hatching and implantation during pregnancy. Many different approaches have been developed to determine the substrate specificity of these proteases. Bacteriophage display is one of them and has been utilized a lot in the case of these proteases. His research experience during his doctorate studies was in the fields of production of secondary metabolites by microbes, characterizing the biochemical agents involved including different enzymes & co-factors, biochemical analysis and molecular biology of these microbes. He has also worked in the pharmaceutical sector in the areas of research & development, manufacturing, process development, project management, quality assurance and regulatory affairs after his Ph.D. Presently, he also runs a consulting firm named M/S Thera-Biotech (www.thera-biotech.com) that helps various organizations in Canada for regulatory submissions with Health Canada as well as Food and Drug Administration (FDA) of US. Besides work, he has been volunteering with various organizations especially related to Health like Heart & Stroke Foundation of Canada and Science like Sanofi BioGenius Challenge Canada (SBCC) regularly for more than a decade.

navsharm@ucalgary.ca

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Day 2

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Werner Lubitz

BIRD-C GmbH, Austria

Construction of biocatalytic micro-reactors with the bacterial ghost platform technology

Bacterial ghosts (BGs) are empty, non-living cell envelopes of Gram-negative bacteria, which are created by the controlled expression of gene E in bacteria and formation of a lysis-tunnel structure spanning the inner and outer membrane. Actual and potential application areas for the BG technology platform are manifold. Within the field of medicine, they include immunotherapy of cancer, human and veterinary vaccines, BGs as carrier and delivery system for drugs and other active substances. Within the area of industrial applications, the use of BGs as carrier particles for enzymes is one of the most advanced of all concepts. Commonly used enzyme immobilization agents are rather old-fashioned and show various disadvantages compared to BG-based enzyme carriers. BGs carrying enzymes could be advantageous for the catalysis of products at the interface between organic and inorganic solutions that prove often to be problematic for enzyme stability. Here, a BG would act like a bioreactor containing and thus protecting the enzymes against harsh environmental conditions while allowing for the synthesis and export of the product of interest into the exterior.

Biography

Werner Lubitz holds an MSc and a PhD in Microbiology from the Technical University of Munich, Germany. He obtained his postdoctoral training in cell- and tumor-biology at the Institute of Cell Biology, University of Munich, Germany, at the Centre Hopitalier Universitaire Vaudois (CHUV) Lausanne, Switzerland, at the Wallenberg Laboratories, University of Uppsala, Sweden, at the Biocenter, University of Basel, Switzerland, and at the Max Plank Institute of Neurobiology, Martinsried, Germany, and in Genetic Engineering and Microbiology at the Institute of Microbiology, University of Victoria, Canada. He was Associate Professor of Microbiology at the Institute of Microbiology, University of Kaiserslautern, Germany, and Associate Professor of Genetic at the Institute of Genetic, University of Munich, Germany. Since 1987, he was Full Professor of Microbiology and Biotechnology at the University of Vienna, Austria, first at the Department of Microbiology, Genetics and Immunology, later at the Department of Medicinal Chemistry, and the Center of Molecular Biology, Vienna Biocenter. He is the inventor of the Bacterial Ghost Platform Technology (BGPT) and holds an extensive patent portfolio. He is the Founder and Co-founder of three biotech companies including BIRD-C holding the position of CEO/CSO of the latter company exploring different application areas of the BGPT.

werner.lubitz@bird-c.at

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Kesen Ma, J Biotechnol Biomater 2018, Volume: 8
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Kesen Ma

University of Waterloo, Canada

Thermostable enzymes involved in alcohol fermentation at high temperatures

It is known that many hyper thermophilic microorganisms can grow on carbohydrates and peptides to produce ethanol as a product. Pyruvate is a central metabolic intermediate that can be further fermented to ethanol. There are two pathways for the alcohol production from pyruvate. One is the two-enzyme pathway, and another is the three-enzyme pathway. It was not clear which one or a novel one could be used by hyperthermophiles. Activities of alcohol dehydrogenase (ADH), pyruvate ferredoxin oxidoreductase (POR) and pyruvate decarboxylase (PDC) were detected in hyper thermophilic bacteria *(Thermotoga* species) and archaea *(Pyrococcus furiosus* and *Thermococcus* species), but no CoA-dependent aldehyde dehydrogenase (AcDH) and its homolog genes have been found, indicating the presence of a two-enzyme pathway in hyperthermophiles. Novel ADHs and PDCs were further studied. A highly active ADH from hyper thermophilic archaeon *Thermococcus guaymasensis* (Tg) was purified to homogeneity and was found to be an NADP+-dependent enzyme contained 0.9±0.03 g atom zinc per subunit. Another alcohol dehydrogenase was purified from Thermotoga hypogea (Th), and the purified enzyme contained 1.02±0.06 g-atoms of iron per subunit. Its physiological role was proposed to catalyze the reduction of aldehydes to alcohols, which is very similar to those iron-containing alcohol dehydrogenases from hyper thermophilic archaeal Thermococcus species. A novel bifunctional PDC was found to catalyze both oxidative (POR) and non-oxidative (PDC) decarboxylation of pyruvate, producing acetyl-CoA and acetaldehyde, respectively. The PDC activities were present in hyper thermophilic archaeon T. guaymasensis (Tg) and bacterial species *Thermotoga maritima* (Tm) and T. hypogea (Th). Coenzyme A or desulfo-CoA was required for the PDC activity. It is concluded that the thermostable ADH and bifunctional PDC enzyme are present in hyper thermophilic archaeon *T. guaymasensis* and bacteria T. *maritima and T. hypogea*, and there is a modified two-enzyme pathway for alcohol fermentation at high temperatures.

Biography

Kesen Ma is a Microbiologist graduated from the Department of Biology, Wuhan University. After completing graduation with an MSc degree from the Institute of Microbiology, Chinese Academy of Science (CAS), he went to Germany as a Max-Planck-Institute fellow and obtained his PhD from Philipps-University Marburg. He worked as a Research Associate at the University, and a postdoctoral fellow and then an Assistant Research Scientist at the University of Georgia, United States. He became a graduate Faculty at the Department of Biochemistry and Molecular Biology at the University of Georgia. He is an Associate Professor in the Department of Biology at the University of Waterloo, Canada. His current research has a focus on enzymology, metabolism, bio-processing and biotechnological applications of hyper thermophilic microorganisms.

kma@uwaterloo.ca

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Masahiro Onuma, J Biotechnol Biomater 2018, Volume: 8
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Masahiro Onuma

Trisguide Ltd, Japan

Electronic water can reduce oxidative stress in cancer and diabetes patients for three weeks drinking

Oxidative stress means a state there is imbalance between the oxidizing action and the reducing action due to reactive oxygen species (ROS) in a living body, resulting in the oxidizing action becoming dominant. Oxidative stress arises as the balance between production and removal is disrupted through excessive production of ROS and impairment of the antioxidant system. Oxidative stress has been reported to be involved in the onset and progress of various diseases. Characteristics of type 2 diabetes are insulin secretion failure and insulin resistance, but it seems that oxidative stress is greatly involved in insulin secretion failure. In the insulin secretion-inducing β cells of Langerhans islets in the pancreas, the amount of superoxide dismutase (SOD), which is representative of the ROS elimination system, is small and resistance to oxidative stress is weak. Regarding cancer, it is well known that chronic inflammatory conditions increase the risk of carcinogenesis. Cells such as neutrophils and macrophages are activated in the inflammation area leading to increase in production of active oxygen and nitric oxide. These free radicals cause DNA mutation and cell proliferation thereby promoting cancer development. When chronic inflammation is present, cancer develops more easily. Electronic water, which was developed to generate electron in water, was consumed for three weeks, after meals, between meals and before sleeping six times a day, and according to the test subjects' possible time periods. The amount of drinking water was 750-1000 mL, and BAP and d-ROMs checks for all cases were carried out at 4:30 pm. The results of cancer patients and diabetes patients were attached. As a result, the d-ROMs value in the degree of oxidative stress has reduced, and the BAP value, which is an indicator of plasma antioxidant capacity, has improved significantly.

Biography

Masahiro Onuma has expertise in oxidative disease prevention to use non-medical product based on GSK's experience of allopurinol which has the strongest anti-oxidant efficacy in this world. He creates new indication of allopurinol for stomatitis induced by cancer treatment which was approved by the Japanese cancer treatment committee to propose new mechanism of allopurinol for anti-oxidant. And now, there are so many new research papers of allopurinol in the world.

onuma@trisguide.com

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Anton Zilman

University of Toronto, Canada

Nanoscale organization of polymer-nanoparticle assemblies: From biological nanopores to smart polymers

Nuclear Pore Complex (NPC) is a key cellular transporter that spans the nuclear envelope and controls nucleocytoplasmic transport in eukaryotic cells. NPC is involved in large number of regulatory processes. It is a remarkable device that robustly carries highly selective and rapid macromolecular transport. NPC transport mechanism has inspired creation of selective bio-mimetic nanopores for bio-nano-technology applications. The centerpiece of the NPC transport is the assembly of polymer-like intrinsically disordered polypeptides that line its passageway. The conformational dynamics of these polymer-like molecules and their interactions cargo-carrying transport proteins underlie the NPC ability to selectively transport hundreds of cargoes per second in crowded and noisy cellular environment. I will present recent insights into the organization and function of the NPC and man-made polymer-functionalized channels and surfaces, arising from systematic comparison of computational and theoretical results with experimental data, and discuss how these results suggest strategies for creation of selective stimuli-responsive nanomaterials.

Biography

Anton Zilman was trained as a Physicist and currently his group works on a number of problems on the interface of physics, biology and engineering.

zilmana@physics.utoronto.ca

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