

analytica Anacon India 2018

Conference on

Advances in Analytical

Solutions for

Life Science Research

Analytica Anacon India 2018 Conference on

Advances in and Analytical Solutions for Life Science Research

September 6, 2018 | Hall 4, HITEX, Hyderabad

Time	Topic	Speakers
10.00 - 10.30		Registration
		Invocation and Lighting of Lamp
10.30 - 10.45		Welcome by President - IAIA
		Address by Conference Convenor
10.45 - 11.15	Discovery and Characterization of The Binding of A DNA-binding Protein to Bacterial Endotoxin	Dr. Purnananda Guptasarma, IISER, Mohali
11.15 - 11.45	Evolution of Life Sciences: Past, Present and the Future	Dr. Rajeev Soni, RAS Life Sciences, Hyderabad
11.45 - 12.15	Simple to Complex Genetic Disorders: An Enchanting Journey between Bed to Bench	Dr. Giriraj Chandak, CCMB, Hyderabad
12.15 - 12.45	Role of Advanced Analytics- mAb Stability Studies	Dr. Ravi Krovidi, Syngene International, Bangalore
12.45 - 13.00		PANEL DISCUSSION
13.00 - 14.00		Lunch
14.00 - 14.30	Seeing is Believing: New Methods for Bio-Molecular Imaging	Dr. Abhijit De, ACTREC, Mumbai
14.30 - 15.00	Advanced Analytics for Biosimilar Development: Addressing Safety and Efficacy Concerns	Dr. Susobhan Das, Bioneds Pharma, Bangalore
15.00 - 15.30	Building on The Best: Humans and Robots in Drug Discovery	Dr. Debarati Mazumder, Syngene International, Bangalore
15.30 - 15.45		PANEL DISCUSSION
		Vote of Thanks
		Tea

Mr. Gautam Rajan

President

Indian Analytical Instruments Association



WELCOME ADDRESS:

Respected Dignitaries, Our esteemed speakers, delegates, exhibitors, our partners from MMI, colleagues from the Industry and the association, welcome to Hyderabad and to the Analytica Anacon India Conference on Advances in and Analytical Solutions for Life Science Research.

The last decade has been eventful for our instrumentation industry – both, in terms of business challenges and in terms of technology changes. Many companies and brands have merged and new entities created. Increased applications of nanotechnology, automation and artificial intelligence has led to a new generation of technology making instruments smaller, faster and more accurate than ever. For us, manufacturers and suppliers of these instruments, the challenge is to meet our customer need for better solutions to application complexities, technical support and quality. All this comes at a cost and companies need to address this paradox – better instrumentation at lower cost. Another area which we need to address is the issue of data access, integrity and fragmentation.

India specific challenges include pricing, procurement processes, support and funding for research. Recently, the Department of Science and Technology has come out with a draft policy for optimisation of purchase and use of research instruments. This has the potential to impact the instrumentation business and the association has taken issues related to this with the Department. I am happy to state that the Department has taken note of our concerns in their response to us.

The global market for life sciences and analytical instruments is expected to increase from about \$35 billion in 2016 to between \$55 to \$75 billion in 2022 according to various market surveys and estimates. A proportionate growth in India would mean the market size here in 2022 could be of the order of about

\$2.5 billion- still a fraction of the global market. This is being driven by pharmaceutical R&D, increasing life science R&D expenditure and emerging applications in diagnostics. The increase in number of biotechnology firms worldwide, advances in life science research, technology innovations with human genome mapping, and emergence of proteomics have enabled industry growth; as such high-end research projects require quality instruments with high throughput capacity and are fuelling the life Science and analytical instrumentation market further.

The Analytical Instruments industry and specifically the Indian Analytical Instruments Association, works to meet these needs and we also try to bring together all stakeholders to see how we all can work together to change the future. As Dr. K. Vijayraghavan, Principal Scientific Adviser to the Government of India, so succinctly put it in a recent interview “We need a coffee shop where basic and applied sciences meet”. We in the industry hope that Analytica Anacon India can be the most prominent of these coffee shops and that we can open such coffee shops all over the country so that industry, academia and instrumentation can work together as partners to better the future of science and technology in this country.

I welcome you all once again I hope that you have a rewarding conference and exhibition!

Dr. Purnananda Guptasarma

Professor

IISER, Mohali



Profile:

Prof. Purnananda Guptasarma is a biophysical chemist, genetic engineer, microbiologist and cell & molecular biologist. His areas of interest cover all things to do with proteins. His main preoccupation lies in exploring different aspects of protein structural biochemistry and function through the perturbational approaches of protein engineering, design and redesign.

His association with academic and research institutions ranges over the Kendriya Vidyalaya Uppal, Hyderabad; BITS, Pilani, Rajasthan; CCMB, Hyderabad; the University of Cambridge, UK, where he was a postdoctoral fellow on an International Traveling Research Fellowship from the Wellcome Trust, working in the area of protein engineering; IMTECH, Chandigarh, where he led scientific groups in various capacities, over fourteen years and four different ranks, in protein science, design and engineering; and the Indian Institute of Science Education and Research (IISER), Mohali, where he has been a full Professor since the year 2010.

At IISER Mohali, he handles teaching, research and administration, including being the founder head of the Department of Biological Sciences, the Dean of Research & Development, the Coordinator of a Technology Business Incubator, the Director of a Centre of Excellence in protein science, design and engineering, and a member of IISER's Board of Governors. He was also the ideator responsible for the setting up of a new start-up company called RECDESPROT PVT LTD dealing with specialty protein-based research reagents and protein related consultancy and contract research services.

His work has been widely recognized and he has published about seventy research papers, graduated 14 Ph.D students, and been responsible for a few seminal discoveries, including peptide-bond derived fluorescence, and inventions, including protein surface transplantation techniques for beta sheet-based proteins.

Discovery and Characterization of the Building of A DNA-binding Protein to Bacterial Endotoxin

Bacteria like to form biofilms, and remain embedded in them. Bacterial surfaces tend to be negatively-charged, owing to the presence of the endotoxin known as lipopolysaccharide (LPS). Biofilms tend to contain extracellular polymeric substances, and one of these which is present in copious amounts is extracellular DNA, which is also negatively-charged. We have recently discovered that the repulsion between DNA and bacteria is neutralized by DNA binding proteins like 'HU'. To prove whether HU does indeed act as a glue between biofilms and bacteria, by binding to both LPS and DNA, we used seven or eight different analytical techniques, in qualitative or quantitative modes. These includes, fluorescence-based cytometry, fluorescence microscopy, difference absorption spectroscopy, microthermophoresis, microcalorimetry, surface plasmon-based methods, and some other methods. The talk will describe these methods and their use in confirming that HU binds to LPS to mediate biofilm formation.

Dr. Rajeev Soni

Head R&D

RAS Life Sciences, Hyderabad



Profile:

Offering a career chronicled by well-earned success in Molecular Biology and Biotechnology, Drug Discovery, Protein expression and Business Development.

Awarded prestigious Cambridge Nehru and Schlumberger scholarship to read for Ph.D. degree in Molecular Biology at the University of Cambridge, U.K.

Pioneer in the discovery of G1 cyclins from plants during my Ph.D. at the University of Cambridge, U.K. using Molecular Biology and Functional Genomics.

Pioneer in the discovery of small molecule inhibitor of CDK4 kinase, a cancer target.

Proficient in driving innovative collaborations with academia, Pharma industry and governmental organizations and developing relationships with key decision makers in target organizations.

Successfully launched Illumina (PCR/qPCR and NGS) business in India and grew sales up to USD 7 million.

Successful in raising USD 6 million from Angel Investors and served as President and COO for Biological Contract Research Organization focusing on Molecular Biology (PCR, qPCR, NGS) and Contract Manufacturing.

Leadership positions held at major Pharma companies and proficiency in managing people across geographies and cultural backgrounds.

Understanding of the drug discovery and development process and excellent organization and communication skills.

Evolution of Life Sciences : Past, Present and the Future

The field of Life Sciences has undergone tremendous progress and advancement in the past 50 years or so as compared to before. This has been made possible by the advances in analytical technologies and instrumentation have revolutionized the field of Life Sciences and brought us much closer to the understanding of biological systems. The talk will focus on the evolution of Life Sciences over the past decades, where we are at present in our understanding of the field and the opportunity it provides for the future.

Dr. Giriraj Chandak

Group Leader

Centre for Cellular And Molecular Biology, Hyderabad



Profile:

Dr G R Chandak is the former director of Centre for DNA Fingerprinting and Diagnostics and currently a Group Leader at the Centre for Cellular and Molecular Biology, Hyderabad. He received his MD in Biochemistry from Institute of Medical Sciences at Banaras Hindu University and PhD in Biochemistry from Osmania University. His research interests include understanding the genetic and epigenetic basis of complex disorders of pancreas including chronic pancreatitis, type 2 diabetes and intermediate traits associated with them with a focus on fetal origins of adult common diseases.

His group has identified novel genes associated with chronic pancreatitis and showed its genetic basis to be different in Indians from that in the Europeans. His research suggests that genetic susceptibility to type 2 diabetes and associated intermediate traits such as obesity and insulin resistance may be differently regulated in Indians and could be related to their micronutrient status. His recent work provides proof of the principle by identification of a microRNA that regulates the type 2 diabetes risk genes through a micronutrient, vitamin B12. He has closely interacted with various NGOs and patient support groups in creating awareness about preventing monogenic genetic disorders by prenatal diagnosis and genetic counselling using cost-effective protocols. He has published close to 100 articles in peer-reviewed journals including Nature, Nature Genetics, Lancet, Gut, Human Molecular Genetics, Diabetes, Diabetologia, J Medical Genetics, Epigenomics, etc. and authored a number of book chapters on diverse topics.

Simple to Complex Genetic Disorders: An Enchanting Journey Between Bed to Bench

Every disease is said to have a genetic basis; some are simple, caused by variations in a single gene while others occur due to perturbations in several genes. Another class of genetic disorders called complex disorders occur due to the influence of environment on single or a number of genes. Unfortunately, complex diseases are quite common and diseases like diabetes, cardiovascular diseases belong to this category. Since it is yet to difficult to alter the genetic constitution of an individual once born, identification of various risk factors and prevention of such diseases is the only option available. While this is relatively easy for single gene disorders like beta thalassemia, sickle cell anaemia, spinal muscular atrophy, etc. through genetic testing, carrier detection, prenatal diagnosis and genetic counselling, the same for complex disorders is an arduous task for obvious reasons.

During the last decade, various technological developments have allowed investigating the genome at a scale never imagined before. From analyzing a single variant in one gene to large number of variants in several genes to exome to whole genome and epigenome seems a fairy, yet believable story. During this talk, I will share a clinician's enchanting journey of this evolution and how the genomic research can help reduce the risk of simple diseases like hemoglobinopathies and complex diseases like diabetes. I will specifically focus on the gene-nutrient interaction in influencing the risk of a common disease like diabetes and related consequences and project a possible future scenario.



Dr. Ravi Krovidi

Lead Investigator, Biopharmaceutical Development

Syngene International, Bangalore

Profile:

Roles and responsibilities: Head Advanced Analytics

Education: Ph. D. in Mass Spectrometry and Proteomics – Max Planck institute, Germany

Industrial Experience: 16 years of industrial experience (USA, India)

Relevant Experience:

- a. Led teams in creating biosimilarity assessment sections of dossiers for several biosimilars
- b. Expertise in advanced protein analytics as per ICH Q6B guidelines, scientific partnering from early inception to completion
- c. Expertise in developing and validating client specific methods

Published and presented at various Indian and international conferences

LC-MS/MS Assessment of Monoclonal Antibody Stability: Monitoring Tryptophan and Methionine Oxidation

Introduction

Monoclonal antibodies (mAbs) are highly complex biomolecules comprising of a long chain of amino acids maintained in their desired conformation over a defined period of time to retain stability, efficacy, and to comply with regulatory requirements. Protein oxidation is a deleterious and irreversible post translational modification known to occur on multiple residues including methionine, tryptophan, lysine, cysteine, or histidine. Methionine or tryptophan oxidation in the complementarity-determining regions (CDR) can reduce the antigen binding and potency of mAbs¹. Here we report a rapid digestion assisted LC-MS/MS based method to identify site-specific mAb oxidation located in the CDR domain.

Methods:

A canine monoclonal antibody was used in this study. Reference mAb, 100 ug, was subjected to forced oxidation treatment conditions involving 10% AAPH and 0.075% H₂O₂ for tryptophan and methionine residues, respectively. Our rapid digestion approach involved the denaturation of oxidised mAb using freshly prepared 8 M urea, reduction with 10 mM DTT, followed by proteolytic digestion with trypsin at 37°C for 15 minutes. Resulting proteolytic peptides were desalted using 3M Empore® C18 discs. Mass spectrometry analysis was performed using a reverse-phase analytical column (Waters CSH C18, 2.1mm x 150mm, 1.7um) for 140 minutes with liquid chromatographic separation on an Agilent 1200 LC system coupled in-line with a Xevo-QTOF MS (Waters) equipped with a standard microflow source.

Preliminary Data:

A method was developed to accurately identify site-specific oxidation using state-of-the-art LC-MS/MS. A 140minute RP-HPLC linear gradient was developed to resolve the reference mAb tryptic peptide mixture. Tandem mass-spectrometry (MS/MS) analysis was performed, and CID-fragmented peptides were identified by using UNIFI software. Preliminary data analysis confirms the standard reference mAb protein sequence yielding 100% sequence coverage with a mass accuracy of 10 ppm. Identified protein sequence includes two unique peptides confined to CDR domains, one of which contains methionine, and one which contains tryptophan. The extent of oxidation on methionine and tryptophan were determined by selected ion chromatogram analysis of the oxidised peptides. We observed a mass shift of 16 Da corresponding to oxygen addition.

Novel Aspect:

Our analytical method of oxidized CDR could potentially be utilised to assess mAb stability for regulatory submissions.



Dr. Abhijit De

Principal Investigator on Molecular Imaging

ACTREC, Tata Memorial Centre, Navi Mumbai

Profile:

Dr. Abhijit De, PhD completed from Banaras Hindu University in 1993, is currently a Principal Investigator leading research on Molecular Imaging at ACTREC, Tata Memorial Centre, Navi Mumbai. He has established molecular optical imaging core facility at ACTREC. His laboratory is primarily engaged in multidisciplinary research involving pre-clinical molecular imaging for evaluation of a variety of anti-cancer therapy including cancer Nano medicine for clinical translation. He has published over 75 original research articles, book chapters, review articles and holds two US patents and three Indian patents filed to his credit. He is on Editorial Boards for several International journals like PLoS One, Scientific Reports (NPG), Breast Cancer (Dove Press) and American J Nuclear Medicine and Molecular Imaging. He is an avid fan of photography and cricket.

Seeing is Believing: New Methods for Bio-Molecular Imaging:

Modern biology involves simultaneous qualitative and quantitative assessments of molecular events in living model systems. Analytical interpretations' using quantitative molecular imaging is a relatively recent field supported by a variety of miniaturized medical imaging equipments. While imaging instruments such as fMRI, PET or SPECT are ideally suitable for objects higher than 1mm spatial resolution, various forms of microscopes, such as AFM, TEM are ideally suitable to resolve matters in micron to nanometer size range. In comparison, photon counting based in vivo imaging systems add a special flavour in terms of covering both tissue scale and single cell (size range typically spans from 5-20 microns) size resolution. This talk will focus primarily on *optical imaging guidance that are being used and the various optical imaging sensors that are being developed to report cellular events directly from live cell and/or experimental model organisms. I will also touch upon newer strategies, suitably matched with the equipment parameters, devised for screening drug molecules aimed at blocking cellular signalling cascades.* Protein-protein interactions, protein activation which are fundamental gaits of understanding the normal and deregulated cellular activities, require rapid development of an integrated platform that shuttles between single cells to tissue scale imaging. Bioluminescence resonance energy transfer (BRET) assay has been adopted as an effective platform for determining protein-protein interactions from both in vitro as well as in vivo conditions. Overall, the validated approaches provide simultaneous visual representation and quantification ability of various biological processes involved in cellular signalling, which has an important implication on a wide variety of biological research endeavours including drug discovery and molecular medicine.

Dr. Susobhan Das

Chief Scientific Officer

Bionneeds Pharma, Bangalore



Profile:

PhD (Biotechnology)- IIT Kharagpur

M.Tech (Biotechnology & Engineering) IIT Kharagpur

Postdoctoral:

UNT Health Science Centre (UNTHSC), Fort Worth, TX , USA

University of Nebraska Medical Centre (UNMC), Omaha, NE, USA

Research Associate: *Centre for Cellular & Molecular Biology (CCMB), Hyderabad, India*

Member : Asian Federation of Biotechnology (AFOB)

Past Member: American Association for Cancer Research (AACR), Expert Committee on Biologicals and DNA products Indian Pharmacopeia Commission (IPC), Govt. of India & Expert Panel on therapeutic proteins, United States Pharmacopeia (USP), Maryland, USA

Founder-CEO-2018 Amthera Life Sciences Pvt Ltd., Bangalore

Chief Scientific Officer (CSO), Biopharma-2015 Bionneeds India Pvt Ltd., Bangalore

Head – Early Stage R&D 2012 – Intas Pharmaceutical Ltd. Ahmedabad

Director – Biotherapeutics – 2011 USP India pvt Ltd. Hyderabad

Principal Scientist -2010 – Intas Pharmaceuticals Ltd. Ahmedabad

Research Scientist – 2005 – UNT Health Science Centre (UNTHSC), Fort Worth, TX , USA

Advanced Analytics for Biosimilar: Addressing Safety and Efficacy Concerns:

It is known that (small) changes in the **production** and **purification** processes of biological can have (major) implications on their **efficacy** and **safety** profile, which will be mainly be reflected in an altered **PK, PD and Immunogenicity** profile.

Clinical efficacy and immunogenicity are critical contributor to the totality of the evidence for demonstration of **Biosimilarity** and application of advanced analytical technologies are an integral part of it. Moreover, deep and robust analyses also cater to building the foundation to **interchangeability** for these biosimilars.

In this talk, discussion on the current scenario of the experiences we have with various marketed biosimilars will be undertaken along with the role of present day technological advancement in the elucidation of efficacy and safety concerns.

Dr. Debarati Majumder

Lead Investigator - In Vitro Pharmacology Group

Syngene International, Bangalore



Profile :

Dr. Debarati Mazumder is currently a Lead Investigator in the In Vitro Pharmacology Group in the Department of Discovery Biology and Translational Sciences (DBTS) at BBRC. She has been at Biocon-Bristol Myers Squibb Research Centre (BBRC) for the past 8+ years and holds a PhD degree in Chemistry. She has 11+ years of research experience that spans basic research to drug discovery.

She completed her PhD from Yale University, USA in 2007 and was awarded a post-doctoral fellowship at Harvard University, Boston, USA wherein she worked on the identification of novel substrates of enzymes by quantitative nano LC-MS/MS. She joined BBRC in 2009 as an Associate Scientific Manager and over the course of 8 years has handled projects in Immunology, Virology, Metabolic Diseases, Neuroscience, Oncology/Immuno-oncology and Fibrosis as a part of interdisciplinary teams. Her expertise lies in in vitro pharmacology and she has worked closely with different groups at BBRC and BMS to enable early stage discovery programs. She also leads Technology Platforms at BBRC to enable high throughput testing of compounds. She has several awards to her credit which includes the BMS Excellence Award as well as the first Innovation Grant award in BBRC.

She leads a team of highly motivated and talented scientists who work on assay development, mechanistic biochemistry and addressing target biology related questions. Her group has also established a platform to study stem cell differentiation into cardiomyocytes as well as nanoLC-based proteomics. She is currently building a Translational Biology team to effectively bridge the gap between pre-clinical and translational data through the use of relevant in vitro models of disease. She has 11 publications in internationally reputed journals along with a first author publication in Nature Chemical Biology.

Building On The Best: Humans and Robots in Drug Discovery

The traditional paradigm of drug discovery relies on the ability of humans to multi task experiments, analyse data and interpret the observations to fit hypotheses. There is an inherent limitation on the volume of experimental data from preclinical models that can be put in context of the full understanding of the larger biology to derive unintuitive insights. While robotic process automation and miniaturization provide opportunities for scientists to increase their throughput and generate large datasets, the integration of interdisciplinary datasets and their biological relevance needs to be adapted for a cohesive model of the disease-drug biology. Recent advances in machine learning are paving the way for life sciences to improve the quality of data driven predictions through sophisticated pattern recognitions ultimately leading to informed decision making both in early and late stages of drug discovery.

Dr. Uma Raghuram

Conference Co-ordinator

Indian Analytical Instruments Association



Proceedings Summary

“On a spectacular growth trajectory is the global market for life sciences and analytical instruments which is estimated to increase from \$35 billion in 2016 to \$55 billion by 2022”, beamed proudly, Gautam Rajan, President IAIA.

Emphasizing on the importance of regulatory control in this sector combined with increase in the number of Biotech firms, advances in LS research, technology innovations with human genome mapping, Proteomics and Cellular Imaging, he described how these factors fuelled LS and analytical instrumentation. However hinting at a gap between academia, industry, clinicians and the technology providers he suggested that some sort of coffee clubs would be needed where such cross- functional discussions could be initiated and taken forward fruitfully in a synergistic manner.

It is interesting to trace the long journey of Science starting with Slab gels for Sequencing, Manual Goniometers for measuring scattered light to the present era of NGS, third generation and Membrane potential based sequencing and the automated MALS all packaged with compliant SW to address regulatory demands. It is a reflection of the giant advances in technology that today the Mass detector literally is coming to the masses as even Chip Fryers would need it to ensure quality of oil and farmers to check for residual pesticides.

We were privileged to have our speakers - an impressive array from Academia as well as the industry - steer this wonderful journey of knowledge and insight.

Dr. G.Chandak, Former Director CDFD and presently Group Leader at CCMB. Dr. Chandak reiterated the genetic basis of diseases while also explaining that complex disorders wherein the environment affected the gene/genes responsible made it even more difficult to assess the risk factors. However the technological advancements have allowed genomes at scales unimaginable to be analysed addressing this need to a certain extent thereby paving an enchanting path between bed and bench.

To come up next was Prof. Purnananda Guptasarma - Dean of R&D and co-ordinator of Technology Business incubator IISER, Mohali who explained the interesting phenomenon of neutralization of charges by DNA binding proteins such as HU on the surface of bacteria which facilitated the

formation of Biofilms. He concluded his talk explaining how the conventional saline water gargling not only soothes the throat but probably helps reduce the bacterial biofilm formation.

Reviewing the evolution of Life sciences through the past, present and the future was Dr. Rajeev Head, R&D at RAS life sciences. Tracing the discoveries in various omics field he presented an overview of the advancements in Science and analytical solutions and the opportunities these presented to the scientific fraternity.

Elaborating on the inherent variability of monoclonal antibodies and how protein oxidation could be deleterious was the next speaker Dr. Ravi Krovidi who is presently the Lead investigator – Biopharma development at Syngene. He went on to share his experience working on a method that involved rapid digestion assisted LC-MS/MS technique to identify site-specific mAb oxidation located in the CDR domain of monoclonal antibodies.

Moving on from Genomics and Proteomics to Optical imaging was Dr. Abhijit De, Principal Investigator on Molecular Imaging at ACTREC, TMC. His was a talk primarily focusing on present optical imaging guidance being used and the various optical imaging sensors that are being developed to report cellular events directly from live cell and/or experimental model organisms.

Shifting gears onto addressing safety and efficacy concerns in Biosimilars was the next speaker –Dr. Susobhan Das CSO- Bioneds Pharma and Founder CEO of Amthera Lifesciences. Stressing on "Process is Product", he explained how changes in the process could impact the efficacy and safety of the biotherapeutic and outlined the need of sophisticated and robust analytical techniques for characterization and assessing biosimilarity.

Expressing the inherent limitations of humans to multi task experiments, analyse un-biasedly huge data sets and interpret the observations to fit hypotheses, the next Speaker Dr. Debarati Mazumder, the Lead Investigator of the Invitro Pharmacology group at BBRC, Syngene switched to Artificial intelligence and how this was making inroads in improving the quality of data driven predictions through sophisticated pattern recognitions ultimately leading to informed decision making both in early and late stages of drug discovery.

The conference concluded with interactions between the audience and the speakers with questions and stimulating thoughts. Overall it was an enriching session encompassing the journey of the analytical solutions in Life Science instrumentation and present trends in Biology and Drug discovery.