

Proceedings of the CBSL Symposium on "Crossroads of Biochemistry: Current Trends and Insights"

24th January 2025

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Welcome Message by the President, College of Biochemists of Sri Lanka

Professor Usha Hettiaratchi
President, College of Biochemists of Sri Lanka
Professor, Department of Biochemistry
Faculty of Medical Sciences
University of Sri Jayewardanepura, Sri Lanka

It is my great honor and privilege to welcome you to the symposium on "Crossroads of Biochemistry: Current Trends and Insights" a distinguished gathering dedicated to advancing the field of Biochemistry organized by College of Biochemists of Sri Lanka (CBSL) and the Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jayewardenepura, CBSL, the primier organization of Biochemists and Molecular Biologists in the country is a constituent member of the Federation of Asian and Oceanian Biochemists and Molecular Biologists (FAOBMB). As the President of the College of Biochemists of Sri Lanka, I am delighted to have the Executive Committee members of the Federation of Asian and Oceanian Biochemists and Molecular Biologists (FAOBMB) and esteemed researchers in Sri Lanka come together to share their latest findings, exchange ideas, and foster collaborations that will drive innovation and discovery in our field. This symposium offers a unique platform for presenting a diverse array of research that spans the breadth of Biochemistry. From uncovering the molecular mechanisms that underpin cellular processes to developing groundbreaking therapeutic strategies, the work showcased here reflects the dynamic and interdisciplinary nature of our discipline. I would like to extend my heartfelt thanks to all the speakers, participants and council members of CBSL who have contributed to the success of this symposium. We are also deeply grateful to our sponsors and partners, whose generous support has made this symposium possible. Their commitment to advancing scientific knowledge and fostering innovation is greatly appreciated. Finally, I hope this symposium will not only be a platform for scientific exchange but also an opportunity to build lasting connections and collaborations. I encourage you to take full advantage of the networking opportunities available and to engage in meaningful discussions that will shape the future of Biochemistry.

Thank you for your participation, and I wish you a productive and enjoyable symposium.

Scientific session 1

Speaker profile: Professor Joon Kim



President, Federation of Asian and Oceanian Biochemists and Molecular Biologists Professor, Division of Life Sciences, Korea University, Seoul 02841, Republic of Korea Joonkim@korea.ac.kr

Professor Joon is a distinguished biochemist currently serving as the President of the Federation of Asian and Oceanian Biochemists and Molecular Biologists (FAOBMB).

He is a faculty member in the Division of Life Sciences at Korea University, Republic of Korea. Prof. Joon's research expertise lies in ribosome biogenesis, DNA repair, and cancer in human and yeast. He has made significant contributions to the field, evidenced by his extensive publication record of over 200 research papers and 20 patents. Prof. Joon received his B.S. and M.S. in Microbiology from Seoul National University. He furthered his studies at the University of California, Berkeley, where he earned his Ph.D. in Biochemistry under the guidance of Prof. Stuart Linn. He subsequently pursued postdoctoral research at Harvard Medical School with Prof. Kevin Struhl. Prof. Joon's exceptional research and academic contributions have garnered numerous accolades. He is the recipient of the 2022 Presidential Award from the Korean Government and the 2022 Distinguished Achievement Award from the Microbiological Society of Korea. Other notable awards include the 2022 1st Grand International Cooperation Award from Korea University, the 2015 Minister's Award from the Korean Ministry of Science & Technology, and the 2012 1st Grand Academic Award from the Microbiological Society of Korea. Prof. Joon has held several key leadership positions in academic and professional organizations. He currently chairs the Organizing Committee for the "FAOBMB 2025 Conference" in Busan, Korea. He previously served as the KSBMB Korean Delegate to the FAOBMB General Assembly from 2009 to 2016. He has also served as President of the Microbiological Society of Korea and President of the Federation of Korean Microbiological Societies. Throughout his career, Prof. Joon has dedicated himself to mentoring and guiding the next generation of scientists. He has successfully supervised 41 Ph.D. and 86 Master's students, contributing to the growth of the scientific community.

Abstract: Cellular ribosomal stress response with respect to cancer, human diseases and drug developments

Our lab has identified that ribosome heterogeneity determines the function of the ribosome. Eukaryotic ribosomal protein S3 (rpS3) which switches its function as a DNA repair endonuclease activity for damaged DNA when modified under various cellular stress conditions. The function of rpS3 in the DNA repair processing is connected with cell damage repair and inhibition of cancer development. We have confirmed the DNA repair domain of rpS3 which can independently repair the damage DNA and cells from skin. This could be applied for the development of not only cancer drugs but also cosmeceuticals for wrinkle improvement and anti-aging.

Candida albicans is a human opportunistic fungal pathogen causing various inflammatory conditions including candidiasis such as vaginitis, oral thrush and fatal candidemia. *C. albicans* undergoes hyphal morphogenesis under ribosomal stress conditions by developing pathogenic hyphae from non-pathogenic yeast forms. Recently, we have discovered anti-fungal drugs blocking hyphal morphogenesis. This could be also used not only as anti-fungal drugs against various fungal diseases such as candidiasis and candidemia but also as cosmeceuticals for the prevention of vaginitis, and anti-fungal agents for various personal care products and household uses.

Speaker profile: Professor Pulani Lanerolle



Senior Professor in Nutrition,

Chair, Department of Biochemistry and Molecular Biology,

Faculty of Medicine, University of Colombo

pulani@bmb.cmb.ac.lk

Pulani Lanerolle is a Senior Professor in Nutrition and the Chair, Department of Biochemistry and Molecular Biology, Faculty of Medicine, University of Colombo with over 25 years of teaching experience. She holds a BSc in Biochemistry with Nutrition from the University of Southampton and a PhD from the University of Colombo. She serves on consultative and expert groups nationally and internationally working on nutrition. She served on the WHO Nutrient Guideline Expert Advisory Group working on the guidelines for carbohydrate, total fat, saturated fatty acids and trans fatty acid intakes for adults and children and is currently on the WHO guideline group working on optimal intake of animal-source foods. She was a member of the FAO/ WHO joint expert consultation developing the guiding principles on sustainable healthy diets and was invited to review the publication on sustainable food systems published by the Global Panel on Agriculture and Food Systems for Nutrition. Her research interests are in body composition, energy expenditure and diet-disease relationships.

Abstract: Evidence informed nutrient intake goals: a basis for sustainable healthy diets

Food and nutrient intakes are largely determined by the food environment, which is driven by consumer demand and market forces. A significant proportion of the global burden of disease is driven by suboptimal diets. Inequality is observed across countries in dietary quality indicated by the healthy eating index and consumption of animal source foods, with food systems largely unable to bridge the gap. Nutrient guidelines are an important step towards the drive for improving health and are supported by a strong evidence base on nutrients, diets and health outcomes. Several key systematic reviews and meta-analyses of randomized controlled trials and reviews of prospective observational studies have shown that replacing saturated fat and trans-fat with polyunsaturated fatty acids and plant monounsaturated fatty acids result in favourable non communicable disease (NCD) outcomes. The evidence for increased consumption of fruit and vegetables as well as fiber and whole grain in reducing the risk of NCD is compelling, with clear dose response being observed in each case. Hence the importance of carbohydrate quality in NCD risk reduction is apparent. This strong evidence supports the most recent nutrient guidelines for NCD risk reduction. This coupled with the requirements for sustainable production paves the way for improvements in enabling environments for healthy eating and sustainable food systems globally and in Sri Lanka.

Speaker profile: Professor Phillip Nagley, PhD, DSc, AM



Emeritus Professor of Biochemistry and Molecular Biology,
Monash University,
Victoria, Australia
phillip.nagley@monash.edu

Phillip Nagley undertook his Ph.D. (awarded in 1972) at Monash University in Melbourne, on the molecular genetics of yeast mitochondria. Most of his professional life was at the Department of Biochemistry and Molecular Biology at Monash University, where he now holds the title of Emeritus Professor. His research field is the molecular biology of mitochondria, in both yeast and mammalian cells, and more recently the role of mitochondria in cell death. He has published more than 210 research publications internationally. He was awarded the Boehringer-Mannheim Medal (Australian Biochemical Society) in 1978, and the Lemberg Medal (Australian Society for Biochemistry and Molecular Biology) in 2001. He was Appointed Member of the Order of Australia (AM) in 2014, for significant service to education in the field of biochemistry and molecular biology. He was Director of Education, School of Biomedical Sciences, Monash University (2009-12). A former President of the Australian Society for Biochemistry and Molecular Biology (2005-6), he served as Secretary General of FAOBMB (2012-7). He is presently the Archivist of FAOBMB (since 2018).

Abstract: Mitochondria and me: Allotopic expression

Allotopic expression of a mitochondrial gene is the deliberate functional relocation of that mitochondrial gene into the nucleus followed by import of the geneencoded polypeptide from the cytoplasm into the mitochondria. This technique was first introduced by my laboratory in the mid-1980s using bakers' yeast, to enable systematic structure-function studies of a small protein of the ATP synthase enzyme complex (subunit 8, normally encoded by mtDNA). The entry into mitochondria of subunit 8 specified by the novel nucleus-located gene required subunit 8 to be furnished with a mitochondrial targeting sequence (MTS). Such allotopic expression led to the genetic defect in a strain of yeast (Saccharomyces cerevisiae) carrying a mutation in its mtDNA, preventing it from producing subunit 8, being rescued by a chimaeric nuclear gene expressing subunit 8 furnished with the MTS. Allotopic expression was taken up by others who sought to use this technique in mammalian and human cells to correct genetic defects in mtDNA that cause mitochondrial disease. Research on human allotopic expression has met with limited success. In one case, however, results were promising enough for clinical trials to be commenced of allotopic expression of the ND4 protein of NADHdehydrogenase to treat Leber's Hereditary Optic Neuropathy that arises from specific mutations in human mtDNA.

Scientific Session 2

Speaker profile: Professor Chun-Hung Lin, Ph.D.



President elect, Federation of Asian and Oceanian
Biochemists and Molecular Biologists
Institute of Biological Chemistry, Academia Sinica,
Taipei, Taiwan
chunhung@gate.sinica.edu.tw

Chun-Hung Lin (Hans) received his B.S. from National Taiwan University in 1990 and Ph.D. in Chemistry in 1995 from Scripps Res Institute (Advisor: Dr. Chi-Huey Wong). He then joined Prof. Christopher T. Walsh's lab for postdoctoral training at Harvard Medical School in 1995-97. Dr. Lin started his independent career in 1998 at Academia Sinica. He received several awards and honors, including Young Affiliate of TWAS (The Academy of Sciences for the Developing World), and Outstanding Research Award from National Science and Technology Council in Taiwan. His research interest is to develop enzyme inhibitors and probes, which is related to host-microbe interplay and drug discovery.

Abstract: Glycosidase Inhibitors: From optimization to therapeutic promise

Glycosidases are the enzymes catalyzing the hydrolytic cleavage of glycosidic bond. These enzymes represent important targets for therapeutic intervention. This talk will cover our past and ongoing efforts to develop potent inhibitors for α -fucosidase and β -glucuronidase by combining the rational and combinatorial approaches. Particularly, a special emphasis is placed on the glycosidase-associated drug toxicity. Irinotecan inhibits cell proliferation and thus is used for the primary treatment of colorectal cancer. Metabolism of irinotecan involves incorporation of β -glucuronic acid (a carboxylic acid-containing monosaccharide) to facilitate excretion. During transit of the glucuronidated product through the gastrointestinal tract, an induced up-regulation of gut microbial β -glucuronidase (GUS) activity may cause severe diarrhea and thus force many patients to stop treatment. We completed the synthesis and evaluation of uronic isofagomine derivatives as potent and selective inhibitors of bacterial GUSs that were shown to effectively reduce irinotecan-induced diarrhea in mice without damaging intestinal epithelial cells.

Speaker profile: Professor Terrence Piva, BSc, BSc(Hons), PhD (JCU)



Secretary General FAOBMB

School of Health & Biomedical Science, RMIT University,

Australia

terry.piva@rmit.edu.au

Professor Terry Piva is a cellular biochemist who obtained his Ph.D. in 1989 from James Cook University (Australia) before undertaking post-doctoral research at the University of Oxford, Australian National University and Queensland Institute of Medical Research. In 1999 he was appointed as a lecturer at Central Queensland University. In 2003, he moved to RMIT University in Melbourne. His research interests are on melanoma cell signalling pathways, using natural products to enhance the killing of cytotoxic drugs on cancer cells, as well as the cytotoxic effect of FLASH radiation on cancer cells. Terry has published >85 papers (H index = 31) and has delivered >120 conference abstracts/invited lectures and has 3 patents. He has successfully supervised 20 Ph.D., 1 MSc and 19 Honours students. In 2006 he established the Biomedical Science degree program, and in 2023 received a Vice Chancellor's Teaching award. He has been a member of ASBMB since 1980, the Biochemical Society since 1988. He was the ASBMB Treasurer from 2013-18, ASBMB delegate to FAOBMB 2018-22, and from 2023 the IUBMB Ambassador to FAOBMB. He has just commenced his tenure as the FAOBMB Secretary General.

Abstract: Effect of natural products on melanoma cell function

Melanoma, characterized by its high metastatic rate and resistance to traditional treatments, is the leading cause of death in skin cancer patients. While representing ~6% of skin cancer diagnoses, it accounts for >80% of related fatalities. Surgery remains the best method of treatment, and although a range of therapies (chemotherapy, radiation and immunotherapy) are in use, melanoma survival rates remain low. Natural products such as cannabinoids, and other plant extracts are emerging as a new line of natural therapy for various debilitating diseases, such as melanoma. Using melanoma cell lines, the effect of these extracts on cellular function have been examined. The most promising results have been obtained using the cannabinoid extract PHEC-66. The significance of which will be discussed.

Speaker profile: Professor Shiromi Perera



Department of Biochemistry, Faculty of Medicine
University of Kelaniya
shiromip@kln.ac.lk

Professor Shiromi Perera is a Professor in the Department of Biochemistry and Clinical Chemistry, Faculty of Medicine, University of Kelaniya. She also serves as a post-

doctoral research fellow under Prof. Anuja Premawardhana at the Adult and Adolescent Thalassemia Care Centre, which is part of the professorial medical unit at the Faculty of Medicine, University of Kelaniya. Additionally, she is the in charge of the newly established Red Cell Disorders Diagnostic Laboratory at the Adult and Adolescent Thalassemia Care Centre, located at the National Cancer Teaching Hospital (NCTH) in Ragama. Prof. Perera earned her B.Sc. Special Degree in Molecular Biology and Biochemistry from the University of Colombo and later completed her Ph.D. in Molecular Hematology at the University of Kelaniya. She has received extensive training and gained significant experience in molecular hematology at prestigious national and international institutions, including the International Centre for Genetic Engineering and Biotechnology (ICGEB) in Italy, the Weatherall Institute of Molecular Medicine in the UK, and the Hematogenetic Laboratory at the National Institute of Immunohematology in India. Her primary research interests focus on hemoglobinopathies, iron metabolism disorders, and rare red cell disorders. Prof. Perera has published her research findings in both local and international indexed journals and has presented her work at numerous conferences.

Abstract: Advances in the diagnosis of Hemoglobinopathies, Red Cell Enzymopathies, and Membranopathies in Sri Lanka

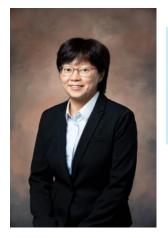
Intrinsic red blood cell disorders, including hemoglobinopathies, enzymopathies, and membranopathies, are common causes of hemolytic anemia in both children and adults. Accurate diagnosis is important for effective management and treatment. In Sri Lanka, traditional diagnostic methods rely on clinical features, family history, and preliminary tests such as full blood count (FBC), peripheral blood smear, reticulocyte count, Coombs' test, biochemical analysis, osmotic fragility (OF) test, and cryohemolysis test. However, screening tests like OF and cryohemolysis often lack the sensitivity and specificity needed for borderline or atypical cases.

The integration of EMA binding assays and enzyme activity tests into routine diagnostics marks significant progress in diagnosis of membranopathies and enzymopathies in Sri Lanka. These methods provide a reliable link between traditional and advanced diagnostic techniques, ensuring accurate detection of red blood cell disorders. This will enhance the patient care, reduce misdiagnoses, and align Sri Lankan diagnostic practices with international standards, ultimately enhancing treatment outcomes.

In Sri Lanka, the standard procedure for diagnosing hemoglobinopathy includes a hemoglobin typing (hemoglobin electrophoresis and/or chromatography) and a red blood cell (RBC) count with erythrocyte indices. However, in patients with an ambiguous diagnosis, advance genetic testing is needed for accurate diagnosis.

Scientific Session 3

Speaker profile: Professor AU Wing Ngor Shannon, B.Sc., Ph.D.



Professor, The Chinese University of Hong Kong
Treasurer, Federation of Asian and Oceanian Biochemists
and Molecular Biologists
shannon-au@cuhk.edu.hk

Prof. Shannon Au received her Ph.D. degree in Biochemistry at The University of Hong Kong under the supervision of Dr. Veronica Lam. She then pursued her postdoctoral trainings in protein x-ray crystallography at the University of Hong Kong, the University of Oxford and the Institute of Cancer Research, UK. She is currently a professor in School of Life Science, The Chinese University of Hong Kong. Her research interests focus on structure-function studies of macromolecular assemblies, especially protein complexes important in microbial infection and pathogenesis. On-going projects include different secretion systems and their effectors, such as flagellar T3SS, CagT4SS and VacA secreted by T5SS in *H. pylori*, and PE/PPEs secreted by T7SS in *M. tuberculosis*. Her team aims to elucidate the function, logic and dynamic behind different molecular structures/nanodevices through application of a combination of techniques in biochemistry, biophysics and molecular genetics.

Abstract: Structures of C-terminal protease CtpA from H. pylori reveal insights into mechanistic basis of self-activation and proteolytic processing

C-terminal processing proteases (CTPs) modulate the maturation and activities of different proteins and are associated with many fundamental pathways. While the protein sequences of bacterial CTPs share some extent of similarities, they are in different oligomeric forms, and are activated by substrate binding or a membrane bound adaptor protein. However, the rationale underlying the molecular assembly and activation of CTPs remains unclear. Here, we present the structural basis and molecular dynamic of Helicobacter pylori CtpA (HpCtpA). We have determined the crystal structure and cryo-EM structures of HpCtpA. By combining the HDX-MS data, we found that the hexameric HpCtpA undergoes transition between resting and active states independently of substrate binding. Each dimer in the trimer of dimer shows a spontaneous asymmetric conformational change triggering the formation of one self-contained functional protease unit with processive activity. Interestingly, HpCtpA is intrinsically autoactivated. Structural comparison of CTPs further highlighted the importance of maintaining the stability of the functional states in the hexamer. Taken together, the findings open a new avenue in unveiling the molecular assembly and activation mechanism of CTP proteases.

Speaker profile : A/Professor Nirma Samarawickrema, BSc, MSc (ANU), PhD (UQ)



Chair Education, FAOBMB

Monash University, Australia

nirma.samarawickrema@monash.edu

Nirma Samarawickrema is a teaching-intensive

academic and a co-head of Teaching (undergraduates) in the Department of Biochemistry and Molecular Biology. She teaches Biochemistry to students enrolled in the Bachelor of Medical Science and Doctor of Medicine, Bachelor of Biomedical Science, Bachelor of Science and Bachelor of Nutritional Science. As an educator, she has made major contributions to curriculum design, developing innovative teaching practices and pedagogical investigations to improve student learning. In recognition of her teaching excellence, she was awarded the ASBMB (2020) and FAOBMB (2022), Education Awards.

Nirma demonstrates impactful national, Australasia-wide and international leadership through her engagement with professional bodies. As Chair of Education, FAOBMB she leads several high-impact initiatives to share practice and showcase the work of Biochemistry educators within the region. She is an active member of the Higher Education Research and Development Society of Australasia (HERDSA) and mentors colleagues to formulate their Fellowship applications. In recognition of her leadership and excellence in teaching and learning, she was made a Fellow of HERDSA and a Senior Fellow of the UK Higher Education Academy.

Abstract: Using case studies to build biochemical literacy

As careers become increasingly complex and uncertain there is a demand for graduates who can problem-solve, think critically, co-construct knowledge and communicate effectively. To foster these attributes, we adopted authentic learning designs and student-centric teaching approaches. Using an engaging narrative, we presented authentic case studies that were contemporary, real-world problems, contextualised within discipline-specific scenarios. We scaffolded learning by presenting the case study in stages and gradually revealing information. Students in small groups interrogated the case studies in the workshops and the laboratory. This learning design purposefully combined the power of case studies and active learning facilitated in the workshops and laboratory. The approach forced students to examine incomplete data sets to form tentative hypotheses thus exposing them to uncertainty and ambiguity experienced in professional practice. Interrogating case studies on real-world issues required students to take on different roles and perspectives giving them insight into potential career possibilities. Student evaluation of teaching indicated our learning designs to be a powerful learning strategy. They confirmed that case studies demonstrated the relevance of Biochemistry in their lives and influenced the development of discipline-specific skills, including critical thinking, problem-solving, collaboration and communication - all attributes that make a student biochemically literate and capable of thriving in a complex and uncertain future.

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FAOBMB Executive Committee members and observers of CBSL who attended the Executive Committee meeting on 23rd January 2025



Professor Joon Kim presenting the token of appreciation for hosting the Executive Committee meeting of FAOBMB on 23rd January 2025 to Professor Usha Hettiaratchi, President, CBSL, Dr. Maduka de Lanerolle Dias, joint-Secretary CBSL and Dr. Niroshima Withanage, Treasurer CBSL.

Acknowledgment

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- Senior Professor Pathmalal M. Manage, Vice Chancellor of University of Sri
 Jayewardenepura for accepting our invitation as the Chief guest
- All the invited speakers of the symposium for their insightful presentations and contributions
- Chairpersons of the three Scientific sessions for their excellent moderation
- Sponsors of the event
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- All participants for their active engagement and valuable contributions to the success of the symposium