10TH ANNUAL

CELL AND GENE THERAPY SYMPOSIUM

Progress Towards Clinical Reality

SOUVENIR

2025

BRIC
a DBT Organization

inStem
इनस्टेम
Institute for Stem Cell Science and Regenerative Medicine

CSCR
Centre for Stem Cell Research
(a unit of inStem, Bengaluru)
Christian Medical College Campus
Bagayam, Vellore - 632002

NOT TO BE MINISTERED UNTO BUT TO MINISTER
CHRISTIAN MEDICAL COLLEGE
VELLORE
INDIA

cscrmeet@cmcvellore.ac.in

https://www.cscr.res.in/symposium

10th Annual

CELL AND GENE THERAPY SYMPOSIUM

Progress towards Clinical Reality

Symposium : October 10th and 11th, 2025

Pre-symposium workshop: October 9th, 2025

Organized by:

CENTRE FOR STEM CELL RESEARCH

(a unit of BRIC-inStem, Bengaluru)

Christian Medical College Vellore,
Bagayam Campus, India

Supported by:

सत्यमेव जयते

DEPARTMENT OF BIOTECHNOLOGY
Ministry of Science & Technology
Government of India

सीएसआईआर
CSIR
भारत का नवाचार इंजन
The Innovation Engine of India

Human Resource Development Group, Council of Scientific & Industrial Research (CSIR – HRDG), New Delhi

Science and Engineering Research Board, Department of Science and Technology (SERB-DST), Government of India, New Delhi

Dear Colleagues,

We take immense pleasure in welcoming you to the **10th Annual Symposium on Cell and Gene Therapy.** This platform continues to bring together scientists and physicians from both academia and industry as well as all others interested in and responsible for developing this field in the country. This field itself is advancing with amazing speed with new transformational products coming to clinical care for various unmet needs. Considerable progress has also been made in India with several clinical trials initiated with gene modified cellular products including a first in human study for gene therapy of haemophilia A. It is also remarkable to note significant industry engagement in the field. These advances could provide much needed cost-effective solutions for several unmet health care needs in India.

The program this year will include topics and presentations which will capture the advances in the field. These include applications of cell and gene therapy in hemoglobin disorders, immune cell therapy, applications of iPSC technology and challenges and opportunities in Gene Therapy. We will also cover industry updates on evolving products and manufacturing along with regulatory issues related to them.

We are again fortunate to have among our speakers some of the global leaders in the field. This meeting is always structured to facilitate discussion both during formal presentations at the scientific sessions and through informal discussions and interactions during the breaks for those present in person at the venue. We also hope that we can follow-up on these deliberations after the meeting with suitable actions to move this field forward in India.

We would like to thank all of you for joining us in this endeavour.

Team CSCR for CGTS-2025

डॉ. जितेन्द्र सिंह
राज्य मंत्री (स्वतंत्र प्रभार),
विज्ञान और प्रौधोगिकी मंत्रालय,
पृथ्वी विज्ञान मंत्रालय,
राज्य मंत्री प्रधान मंत्री कार्यालय,
कार्मिक, लोक शिकायत तथा पेंशन मंत्रालय,
परमाणु उर्जा विभाग तथा अंतरिक्ष विभाग,
भारत सरकार

DR. JITENDRA SINGH
Minister of State (Independent Charge),
Ministry of Science & Technology,
Ministry of Earth Sciences,
Minister of State, Prime Minister's Office,
Ministry of Personnel, Public Grievances and Pensions,
Department of Atomic Energy & Department of Space,
Government of India

Message

I am glad that the 10th Annual Cell and Gene Therapy Symposium, organized by the Centre for Stem Cell Research (CSCR), a unit of BRIC-inStem, Bengaluru, at Christian Medical College Vellore is taking place at a time when India stands at the forefront of biomedical innovation, using groundbreaking cell and gene therapy platforms to address previously untreatable disorders and diseases.

With the constant support of Department of Biotechnology, Ministry of Science & Technology, the CSCR has achieved India's first-ever gene therapy milestone and leads in advanced technologies including CRISPR-Cas, base editing, mRNA vaccine platforms, lipid nanoparticle delivery, and lentiviral gene therapy.

I hope the CGTS 2025 symposium will serve as a forum for the exchange of transformative ideas and the forging of global partnerships among scientists and clinicians.

The Modi government, through policy initiatives like the BioE3 Policy and major investments in biotechnology infrastructure, is steadfastly committed to positioning India as a leader in cell and gene therapy. Our collaborative achievements, such as the translational gene therapy for haemophilia conducted by CSCR scientists, stand as shining examples of India's capacity for world-class translational research.

I wish the Faculty and students of CSCR and CMC Vellore, who are organizing the Cell and Gene therapy symposium, a meeting of the highest standard, which may engender to take translational science to the best and make newer therapies possible for Hereditary disorders in all spheres, Cancers and diseases genuine reality.

(Dr. Jitendra Singh)
MBBS (Stanley, Chennai)
MD Medicine, Fellowship (AIIMS, New Delhi)
MNAMS Diabetes & Endocrinology
FICP (Fellow, Indian College of Physicians)

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सत्यमेव जयते

डॉ. राजेश सु. गोखले
Dr. RAJESH S. GOKHALE

सचिव
भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
जैव प्रौद्योगिकी विभाग
ब्लॉक-2, 7वां तल, सी.जी.ओ. काम्पलेक्स
लोधी रोड, नई दिल्ली-110003

SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF SCIENCE & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY
Block-2, 7th Floor, CGO Complex,
Lodhi Road, New Delhi-110003

Message

It is with immense pride and enthusiasm that I, on behalf of the Department of Biotechnology (DBT), Ministry of Science & Technology, Government of India, extend my warmest greetings to all participants of the 10th Annual Cell and Gene Therapy Symposium, hosted by the Centre for Stem Cell Research (CSCR), a unit of BRIC-inStem, Bengaluru, at the Christian Medical College (CMC), Vellore.

DBT is taking transformative steps to shape the future of healthcare in the country by making it equitable, affordable and accessible. Spearheaded by leading research institutions and supported by initiatives from the Department of Biotechnology, India is witnessing pioneering efforts in the development of indigenous CAR-T cell therapies and gene therapies.

The Department of Biotechnology has played a key role in supporting CSCR, helping it to develop into a leading centre for advanced research and innovation in stem cell and gene therapy. Through sustained funding, policy initiatives like the BioE3 Policy, and strategic investments in biotechnology infrastructure, DBT has empowered CSCR to spearhead groundbreaking advancements in biotherapeutics. For instance, the pioneering work in translational gene therapy for haemophilia, exemplifies India's capacity to deliver world-class solutions for rare genetic disorders.

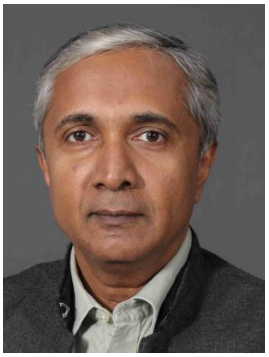
Through the BioE3 (Biotechnology for Environment, Economy and Employment) Policy, the Department of Biotechnology (DBT) is actively promoting the development and integration of futuristic precision medicine in India, aiming to revolutionize healthcare by enabling more personalized, predictive, and targeted treatment approaches.

Let us strengthen our commitment to collaboration, innovation, and inspiration for advancing impactful health solutions.

My best wishes for the grand success of CGTS 2025.

(Dr. Rajesh S. Gokhale)

Phone : 24362950/24362881, Fax : 011-24360747, E-mail : secy.dbt@nic.in



Message

Cell and gene therapies are reshaping the global landscape of medicine, offering durable and at times a one-time curative therapy for both inherited and acquired diseases such as some haemoglobinopathies, cancers and other immunological and rare genetic disorders. For India, this moment is both an opportunity and a responsibility: to translate these advances into solutions that are safe, scalable, affordable, and equitable within our health-system realities.

CMC Vellore has been privileged to lead several national firsts, including the country's first human clinical trial of gene therapy for Haemophilia A and the demonstration of cost-effective CAR-T cell therapy for blood cancers. Through the Centre for Stem Cell Research, our emphasis remains on path-breaking science that is contextually relevant for India, with a clear focus on affordability, indigenous capability, and models that can be adopted across the public and private sectors.

The 10th Annual Cell and Gene Therapy Symposium, and this accompanying 'Abstracts Book', provide a platform to share knowledge, stimulate critical debate, and catalyse collaborations across clinicians, scientists, industry, regulators, and policy-makers. I wish the programme every success in nurturing new partnerships and taking ideas from bench to bedside for the benefit of our patients.

My congratulations to the organising team, presenters, and participants. May your interactions here spark innovations that uplift care for people across India and beyond.

Warm regards,

Dr. Vikram Mathews MD.DM. FASc
Director,
CMC Vellore

Centre for Stem Cell Research

A unit of inStem, Bengaluru, in collaboration with DBT and CMC, Vellore

Dear Scientists, Clinicians, Friends and Colleagues,

It may be thought that the life of a scientist has many dimensions, challenges and that it may take an unpredictable meandering course, but it is one with nobility, greatest impetus and intention. This Cell and Gene Symposium, which is currently being conducted for the 10th successive year stands to support the realization of the future of the field.

With regards to the basic scientist and the relation to medical science, it is a vocation, that is befitting of the greatest virtue to ensure that the unsorted problems of the human body are given the attention that is required- to heal, provide solace and change the lives of many through unique and distinctive solutions.

We have been privileged in the last 2 score years; to see that coupled with the spectacular evolution of the technology of sequencing, stem cell therapy and artificial intelligence there has been a paradigm shift in thinking and approach towards many hereditary disorders, cancers and noncommunicable diseases. A significant quantum of decisions, in the coming years will involve the innovations and practical solutions that have evolved from such research.

However, medical scientists and the academic clinician need to collaborate with greater ardour and intensity with the basic scientists to ensure that this happens. There is a *figurative Quintessential quadripod* that needs to be developed with a perceptive intention involving basic scientists in government institutions, academic medical institutions, industry and funding agencies to work with an intensity, like never before to ensure that this happens.

In India, should we wait for the evolution of science and creativity to take a ballistic trajectory and fall like a rock from the top of a cliff and gain autonomous momentum from the forces of nature? Would it involve random steps at points of time that lead to a corrigendum which needs alteration from time to time? Should we conveniently piggy back with the industry that is churning out a myriad of molecules and claim ourselves merely by way of hedonism to be the sole proprietors for their usage?

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Truly speaking, the determination of our future as a country and as a community in cell and gene therapy lies in our hands. As Marcus Brutus said, and pay careful heed: *There is a tide in the affairs of men, which when taken at the flood, leads on to fortune. Omitted, all the voyage of their life is bound in shallows and in miseries. On such a full sea are we now afloat. And we must take the current when it serves, or lose our ventures.* The profundity of this Shakespearean quote is worth ingeminating.

Let us lay aside the stereotypes of current thinking and develop an engaging stratagem to outline our own unique role in this field of specialization. We must evolve *sui generis* that outlines our individuality.

At the firmament of it all let us remind ourselves that we are fundamentally one of the few specialties that encompasses that breadth and depth of internal medicine, the kaleidoscopic environment of the laboratory, the perpetuality of medical genetics and the ability to constantly innovate.

Ladies and Gentlemen welcome again to Vellore, and in the time that you spend here, be sure to explore the dimensions of our institution and spend time in cross fertilizing your ideas to ensure that the coming year is one with immense academic promise.

A Special note of thanks to our hon'ble Union minister for Science and Technology, Dr. Jitendra Singh for his presence at the meeting, Dr Rajesh Gokhale, for his constant inputs and support and Dr Maneesha, for her enduring presence.

With best wishes,
Jai Hind!

Professor (Dr) Nihal Thomas
MBBS MD MNAMS DNB(Endo)FRACP(Endo) FRCP(Edin),
FRCP(Glas), FRCP(London) FACP, FAMS, PhD (Copenhagen)
Head, Centre for Stem Cell Research (a unit of BRIC-inStem, Bengaluru),
Senior Prof, Dept of Endocrinology, Diabetes & Metabolism,
Principle Coordinator, ICMR Collaborating Centre of Excellence, Diabetes.
Christian Medical College, Vellore-632004, India

Message

It is with great pride and anticipation that we welcome you to the 10th edition of the Cell & Gene Therapy Symposium, hosted by the Centre for Stem Cell Research (CSCR), Vellore. This annual gathering brings together a vibrant community of scientists, clinicians, and students committed to advancing the frontiers of regenerative medicine.

CSCR was established as a collaborative initiative between the **Department of Biotechnology (DBT), Government of India**, and **Christian Medical College (CMC), Vellore**, under the aegis of the **Institute for Stem Cell Science and Regenerative Medicine (BRIC-inStem), Bengaluru**. As a unit of BRIC-inStem, CSCR embodies DBT's vision to foster translational research that bridges basic science with clinical application particularly for diseases of national relevance such as hemoglobinopathies and other genetic disorders.

Over the years, CSCR has made significant strides in developing gene therapy approaches, establishing a state-of-the-art cGMP facility for clinical-grade cell manufacturing, and building robust disease models to accelerate therapeutic innovation. CSCR's innovations from vector design to regulatory compliance are tailored to Indian healthcare settings, ensuring accessibility and affordability.

DBT has enabled world-class facilities at CSCR and inStem, including GMP manufacturing and BSL-3 labs for advanced therapeutic development. Technologies for hemoglobinopathies are being transferred to commercial partners, and Phase 2 trials for hemophilia are on the horizon. Equally important is its commitment to capacity building, through training programs and collaborative platforms that nurture the next generation of stem cell scientists.

This symposium reflects our shared mission: to translate scientific discovery into meaningful clinical impact. We hope the discussions, insights, and partnerships formed here will spark new ideas, deepen understanding, and catalyze breakthroughs that shape the future of regenerative medicine in India and beyond.

Warm regards,

Maneesha S Inamdar, Ph.D
Director,
iBRIC-inStem, Bangalore

Message

I am delighted to note that the faculty, staff and students at the Centre for Stem Cell Research (CSCR) are organising the 10th Annual Cell and Gene Therapy Symposium. This demonstrates their consistent commitment to high quality research and translational therapy.

The current therapies for several disease conditions are only supportive and not curative. Cell and Gene therapy provides a promising option for the treatment of several diseases and a cost-effective option when developed in India. The Scientists at CSCR, through their dedicated and excellent research, have reached the translational stage for several therapies. The successful clinical trial involving gene therapy for Haemophilia is an example of the cutting-edge translational research that is being carried out.

This symposium with illustrious speakers and presentations of current cell and gene therapy research, will definitely provide an excellent platform for valuable discussions and deliberations on the way forward. I thank all the speakers of the symposium for their willingness to share their expertise, and wish all the participants a great time of learning and networking.

I take this opportunity to congratulate the team at CSCR and their Head Professor Dr. Nihal Thomas, for the excellent translational research work that is being done, thus fulfilling the mandate for which CSCR was set up. It is indeed a time for celebration and sharing of noteworthy achievements that will impact the healthcare of our country, and the world at large.

Warm regards,

Dr. Solomon Sathishkumar, MD
Principal,
Christian Medical College, Vellor

Scientific Programme

CENTRE FOR STEM CELL RESEARCH
(A unit of BRIC-inStem, Bengaluru)
Christian Medical College Campus, Bagayam, Vellore

10TH ANNUAL CELL AND GENE THERAPY SYMPOSIUM
Progress towards Clinical Reality

PROGRAMME SCHEDULE
DAY-1: Friday, 10th October 2025

6:30AM Onwards	REGISTRATION		
8:00 to 8:45 AM	**BREAKFAST AND TEA at Scudder Auditorium**		
Hall A		**Hall B**	
Session: MANUFACTURING AND REGULATORY ASPECTS IN CELL AND GENE THERAPY **Chairs** Dr. Punam Malik Cincinnati Children's Hospital Medical Center, USA Dr. Jyothi Prasanna S Manipal Institute of Regenerative Medicine, Bengaluru, India		Session: POPULATION SCREENING & MANAGEMENT OF GENETIC DISORDERS **Chairs** Dr. Sumita Danda Christian Medical College Vellore, India Dr. VGM Naidu National Institutes of Pharmaceutical Education and Research, Guwahati, India	
India Time	**Speaker**	**India Time**	**Speaker**
8:45 to 9:10 AM	SAGES: Development and Translation of a Novel CRISPR Genome Editing Therapy to Induce Fetal Hemoglobin for Sickle Cell Disease **Jonathan Yen** St. Jude Children's Research Hospital, Memphis, TN	8:45 to 9:10 AM	Sickle Cell Anaemia: Kal, Aaj, aur Kal (Past, Present and Future) **Giriraj Chandak** Centre for Cellular and Molecular Biology Hyderabad, India

9:10 to 9:35 AM	Configuring Chimeric Antigen Receptors for safety and efficacy **Sunil Martin** BRIC-Rajiv Gandhi Centre for Biotechnology, Kerala, India	9:10 to 9:35 AM	Population based screening of Genetic Disease: A tip for prevention of hemoglobinopathies **Chinmayee Panda** Kalinga Institute of Medical Sciences, Bhubaneswar, India
9:35 to 10:00 AM	Robust Manufacturing of NK cells towards development of Allogeneic Therapies **Priyadarshini Chatterjee** Aurigene Oncology Ltd., Bangalore	9:35 to 10:00 AM	Genetic screening of pheochromocytoma 'susceptibility genes': CMC experience **Rekha Pai** Christian Medical College Vellore, India
10:00 to 10:25 AM (IST) 12:30 to 12:55 AM (EDT)	What No T Cell Has Treated Before: Advances in CAR Design and Delivery to Patients **Bruce L. Levine** University of Pennsylvania, Philadelphia, PA	10:00 to 10:25 AM	Personal Genomes are Moving the needle for Precision Medicine **Vinod Scaria** Karkinos Healthcare Private Limited, Bengaluru, India
10:25 to 11:00 AM	Tea Break		
11:00 AM to 12:00 PM	**Inaugural Ceremony By Dr. Jitendra Singh, Hon'ble Minister of State for Science & Technology (I/C), Government of India New Delhi, India at Scudder Auditorium**		
12:00 to 12:30 PM	**Break**		
12:30 to 1:00 PM	**Presentation by Dr. Rajesh S. Gokhale, Secretary, Department of Biotechnology, Ministry of Science and Technology, Govt. of India at Scudder Auditorium**		
1:00 to 2:00 PM	**Lunch at Scudder Auditorium**		

Hall A		Hall B	
SESSION: CELL AND GENE THERAPY **Chairs** Dr. Aby Abraham Christian Medical College Vellore, India Dr. Eunice Sindhuvi Christian Medical College Vellore, India		Session: ORGANOIDS AND DISEASE MODELLING **Chairs** Dr. Barun Mahata BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India Dr. Joe Varghese Christian Medical College Vellore, India	
India Time	**Speaker**	**India Time**	**Speaker**
2:00 to 2:25 PM	Current status, challenges and opportunities with CAR-T cell therapy in India **Vikram Mathews** Christian Medical College Vellore, India	2:00 to 2:25 PM	Human 3D organoids as a preclinical platform for intervention testing **Arvind Ramanathan** BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India
2:25 to 2:50 PM	Gene Therapy for Sickle Cell Disease: State of the Field and Beyond…… **Punam Malik** Cincinnati Children's Hospital Medical Center, USACellular model for haematological diseases	2:25 to 2:50 PM	Harnessing the potential of human liver organoid developed from cells isolated from healthy individuals and patients to develop therapeutics and precision medicines against non-alcoholic fatty liver disease **Ruchi Tandon** Translational Health Science and Technology Institute, Faridabad, India
2:50 to 3:15 PM	Cellular model for haematological diseases **Shaji R Velayudhan** Centre for Stem Cell Research (a unit of BRIC-inStem, Bengaluru), Christian Medical College Vellore, India	2:50 to 3:15 PM	Stem cell derived organoid models to study eye diseases and to validate newer drugs **Indumathi Mariappan** L V Prasad Eye Institute (LVPEI), Hyderabad, India

3:15 to 3:40 PM	Pancreatic Islet Cell Transplantation for the treatment of Diabetes **Balamurugan N Appakalai** University of Louisville/Norton Healthcare, Louisville, USA	3:15 to 3:40 PM	Guiding Next-Generation Therapies with Stem Cells **Maneesha S. Inamdar** BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India
3:40 to 4:00 PM	**Tea Break**		
Hall A		**Hall B**	
Session: MESENCHYMAL STEM CELLS (MSCs) AND THEIR SECRETOME **Chairs** Dr. Indumathi Mariappan L V Prasad Eye Institute (LVPEI), Hyderabad, India Dr. Jayakanthan K Post Graduate Institute of Medical Education & Research, Chandigarh, India		Session: MOLECULAR GENETICS OF INHERITED DISEASES **Chairs** Dr. Vinod Scaria Karkinos Healthcare Private Limited, Bengaluru, India Dr. Alan Mathew Punnoose SRIHER- Sri Ramachandra Institute of Higher Education and Research, Chennai, India	
India Time	**Speaker**	**India Time**	**Speaker**
4:00 to 4:25 PM	Modeling Vascular Pathophysiology in ACDC Disease Using Gene-Edited Human Aortic Endothelial Cells and Patient-Derived iPSC-based systems **Jyothi Prasanna S** Manipal Institute of Regenerative Medicine, Bengaluru, India	4:00 to 4:25 PM	Deciphering the "omics" for Alkaptonuria **Sumita Danda** Christian Medical College Vellore, India

4:25 to 4:50 PM	Articular cartilage repair and regeneration – are we there yet? **Ilyas Khan** Swansea University Medical School, Wales, UK	4:25 to 4:50 PM	Population Genomes to Precision Medicine – Impact on Public Health in India **Sridhar Sivasubbu** Karkinos Healthcare Pvt Ltd, Mumbai, India
4:50 to 5:15 PM	Potential of Wharton's Jelly Mesenchymal Stem Cell-Derived Small Extracellular Vesicles in Managing Metabolic Syndrome in an Animal Model **Yogeswaran Lokanathan** Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia	4:50 to 5:15 PM	Genetics of Insulin Secretion: Insights from massive parallel sequencing **Aaron Chapla** Christian Medical College, Vellore, India
5:15 to 5:40 PM	MSCs in the clinic – Current status & future prospects **Pawan K Gupta** Stempeutics Research, Bangalore, India	5:15 to 5:40 PM	Mission program in pediatric rare genetic disorders **Ashwin Dalal** Centre for DNA Fingerprinting and Diagnostics, Hyderabad, India
5:40 to 6:15 PM	**Poster and Industry Exhibition**		
CHAIR FOR KEYNOTE ADDRESS Dr. Vikram Mathews Christian Medical College Vellore, India			
India Time	**Speaker**		**Title of the Talk**
6:15 to 7:00 PM	**Mitchell Weiss** St. Jude Children's Research Hospital, Memphis, USA		Gene Therapy for Hemoglobinopathies: Recent Developments and Ongoing Challenges
7:00 PM onwards	**Cultural program and dinner at Eden Garden**		
	The End-Day-1		

DAY-2: Saturday, 11th October, 2025

8:00 AM to 11:00 AM		Registration	
8:00 to 9:00 AM		Breakfast at Scudder Lawn	
Hall A		Hall B	
SESSION- INDUSTRY UPDATES **Chairs** Dr. Priyadarshini Chatterjee, Aurigene Oncology Ltd., Bangalore, India Dr. Rajkumar Banerjee CSIR-Indian Institute of Chemical Technology, Hyderabad, India		Session: CELL THERAPY FOR HEMATOLOGICAL DISORDERS **Chairs** Dr. Everette J R Nelson Vellore Institute of Technology,Vellore, India Dr Poonkuzhali B. Christian Medical College, Vellore, India	
India Time	Speaker	India Time	Speaker
9.00 to 9: 20 AM	From Discovery to Cure: Bridging the gap between Innovation and Application **Prathap Naidu** Thermo Fisher Scientific	9.00 to 9: 25 AM	Looking beyond matched sibling donor transplants for hematological malignancies **Biju George** Christian Medical College Vellore, India
9:20 to 9: 40AM	Driving CAR T Cell Innovation with Agilent's Integrated Analytical Platforms **Vadiraja Bhat** Agilent Technologies India Pvt Ltd.	9:25 to 9: 50 AM	Lentiviral gene therapy for haemophilia A- an update of the clinical trial **Aby Abraham** Christian Medical College Vellore, India

9:40 to 10:00 AM	Cytokine Profiling in Cell & Gene Therapy: Bridging Mechanistic Insight and Translational Impact **Anisha Polley Sikder** Krishgen Biosystems PVT. Ltd., Mumbai, India	9: 50 to 10:15 AM	Toward Safer Therapies: Development of DNA Break-Free Genome Editing for Various Genetic Disorders **Mohankumar K M.** Centre For Stem Cell Research (a unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India
10:00 to 10:10 AM	Turning Biology for Therapy: MSc's, T cells and and 3D Cell Culture **Priti Warke** HiMedia Laboratories	10:15 to 10:40 AM	Gene-Edited Allogeneic CAR-T Cells for B-Cell Malignancies **Thiyagaraj Mayuranathan** Centre For Stem Cell Research (a unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India
10:10 to 10: 30 AM	Allogenic Off-the-shelf Natural Killer (NK) cell therapy for cancers **Renjitha Gopurappilly** NKure Therapeutics Pvt Ltd (CCAMP), Miltenyi Biotec		
10:30 to 10:40 AM	(Facilitating manufacturing of GMP grade reagents for Cell and Gene therapy in India) Kodo Lifescience Pvt Ltd		
10:40 to 11:25 AM	**Tea Break and Poster Exhibition**		

	Hall A		Hall B
Session: IMMUNE MODULATION IN THERAPY **Chairs** Dr. B. Ashokkumar Madurai Kamaraj University, Madurai, India Dr.Vijayalekshmi B Christian Medical College Vellore, India		Session: MICROBIAL INFECTIONS CHALLANGES WAY FORWARD **Chairs** Dr. Siddhardha Busi Pondicherry University, India Dr. Supraja Srivastava Christian Medical College Vellore, India	
India Time	**Speaker**	**India Time**	**Speaker**
11:25 to 11:50 AM	Gut–Lung Crosstalk: Harnessing Immunomodulation for Asthma Therapy **Kiran Kumar MN** JSS Academy of Higher Education & Research, Maysuru, India	11:25 to 11:50 AM	Newer molecular approach in infectious disease diagnosis **Balaji Veeraraghavan** Christian Medical College, Vellore, India
11:50 AM to 12:15 PM	From HIV Biology to lentiviral vectors: Insights into the mechanisms of antiviral actions **Ajit Chande** Indian Institute of Science Education and Research, Bhopal, India	11:50 AM to 12:15 PM	Neglected Tropical Diseases: Improving Diagnostics for Helminth Elimination and Control Programs **Sitara Swarna Rao Ajjampur** Christian Medical College, Vellore, India
12:15 to 12:40 PM	Targeting the Uroseptic Infection with Mesenchymal Stromal Cells and Peptides: Pilot Signals and a Path to Translation **Aruna Rakha Arora** Postgraduate Institute of Medical Education and Research,Chandigarh, India	12:15 to 12:40 PM	Uncovering the burden of Riboflavin transporter deficiency among Indians: metabolic insights and emerging strategies for gene therapy **B. Ashokkumar** Madurai Kamaraj University, Madurai, India
12:40 to 01:10 PM	**Lunch Break at Scudder Lawn**		

	Hall A		Hall B
SESSION: GENE EDITING **Chairs** Dr. Jonathan Yen St. Jude Children's Research Hospital, USA Dr. R. Vinayagamoorthi, Indira Gandhi Medical College & Research Institute, Government of Puducherry Institution Pondicherry, India		Session: TECHNOLOGY ADVANCES **Chairs** Dr. Arabinda Chaudhuri Indian Institute of Science Education and Research (IISER) Kolkata, India Dr. Ullas Kothur-Seetharam Centre for DNA Fingerprinting and Diagnostics, Hyderabad, India	
India Time	**Speaker**	**India Time**	**Speaker**
1:10 to 1:35 PM	Development of Precision Genome and Transcriptome Engineering Technologies **Tan Meng How** Nanyang Technological University, Singapore	1:10 to 1:35 PM	Large-molecule discovery platform supporting fundamental and translational research **Minhaj Sirajuddin** BRIC- Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India
1:35 to 2:00 PM	Use of precision editing, PROTACs to investigate mechanism of neurodevelopmental disorders **Pradeepa Madapura** Queen Mary University of London, UK	1:35 to 2:00 PM	Cadherin-dependent junction formation in driving metabolic reprogramming of cell clusters **Sunil Laxman** BRIC- Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India
2.00 to 2:25 PM	DYRK1A, a Down Syndrome–linked gene, regulates mTOR signaling **Manish Jaiswal** Tata Institute of Fundamental Research, Hyderabad, India	2.00 to 2:25 PM	tRNA-Derived Small RNAs: Molecular Tuners of Stem Cell State **Dasaradhi Palakodeti** BRIC- Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India
	Hall A		**Hall B**

Session- YOUNG PROMISES IN RESEARCH **Chairs** Dr. Kumar Pranav Narayan Birla Institute of Technology & Science, Pilani Hyderabad Campus, Telangana, India Dr. Sunil Laxman BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bangalore, India		Session: METABOLIC DISORDERS AND NOVEL THERAPEUTIC STRATEGIES **Chairs** Dr. Muthuraman N Christian Medical College Vellore, India Dr Diya Binoy Joseph BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India	
India Time	**Speaker**	**India Time**	**Speaker**
2:25 to 2:40 PM	Adaptive Quasi-Quiescence Induced Glioblastoma Survival on Emulsion Copolymer Matrix Surface **Subhasish Sahoo** CSIR-Indian Institute of Chemical Technology, Hyderabad, India	2:25 to 2:50 PM	Diabetes In the Young in South Asia, the Pathogenesis, Differentials and the Road to Type 5 Diabetes **Nihal Thomas** Christian Medical College and Centre For Stem Cell Research (a unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India
2:40 to 2:55 PM	Titers Up, Prices Down: Lentiviral Gene Therapy for Globinopathies at a Discount **Karthik C** Centre For Stem Cell Research (a unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India	2:50 to 3:15 PM	Metabolic Orchestration of Cellular Reprogramming: Towards Harnessing Epigenetic and Mitochondrial Networks for Next-Generation Cell and Gene Therapies **Ullas Kothur-Seetharam** Centre for DNA Fingerprinting and Diagnostics, Hyderabad, India
2:55 to 3:10 PM	Engineering Non-Viral Gene Delivery Vectors: Balancing Transfection Efficiency and Cytotoxicity for Cell-Specific Targeting **Venkatesh Ravula** Institute for Stem Cell Science and	3:15 to 3:40 PM	Boosting anti-cancer vaccine by "FORTY" fying immunity to achieve tumor free survival **Jayanta Bhattacharyya** Indian Institute of Technology Delhi, New Delhi, India

	Regenerative Medicine (BRIC-inStem), Bengaluru, Karnataka, India		
3:10 to 3: 25 PM	Targeted base editing enables safe and efficient knockout of ELANE for the treatment of ELANE-associated severe congenital neutropenia **Lokesh Panigrahi** Centre For Stem Cell Research (a unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India		
3:25 to 3: 40 PM	Engineering biomimetic bone marrow niche with gene modified Mesenchymal Stromal Cells for ex vivo culture of human Hematopoietic Stem and Progenitor cells **Sevanthy Suresh** Centre For Stem Cell Research (a unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India		
3:40 to 4:00 PM	**Tea Break and Company Exhibition**		

Hall A		Hall B	
Session: NEW FRONTIER OF CELL THERAPY **Chairs** Dr. Shaji R Velayudhan Centre for Stem Cell Research (a unit of inStem, Bengaluru), Christian Medical College Vellore, India Dr Vasanth Thamodaran Tata Institute for Genetics and Society, Bengaluru, India		Session: ADVANCES IN PRECISION THERAPEUTICS **Chairs** Dr. Tan Meng How Nanyang Technological University, Singapore Dr. Pradeepa Madapura Queen Mary University of London, London, UK	
India Time	**Speaker**	**India Time**	**Speaker**
4:00 to 4:25 PM	CAR T-cell immunotherapy of NKG2D-expressing solid tumours **John Maher** King's College,London, UK	4:00 to 4:25 PM	Glucocorticoid receptor: a potent target for drug sensitization, immuno-modulation in nano-therapeutic strategy for cancer **Rajkumar Banerjee** CSIR-Indian Institute of Chemical Technology,Hyderabad, India
4:25 to 4:50 PM	Gene therapy for sickle cell disease – current state and future directions **Akshay Sharma** St. Jude Children's Research Hospital, Memphis, USA	4:25 to 4:50 PM	Gene edited hematopoietic stem cells for the gene therapy for beta-hemoglobinopathies **Saravanabhavan Thangavel** Centre For Stem Cell Research (a Unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India
4:50 to 5:15 PM	A Lentiviral-Based Gene Modified Hematopoietic Stem Cells Approach for HIV-1 Cure Lead to Partial Protection of Uninfected Cells but also Leads to Ongoing Lentiviral RNA Expression, a Risk for Potential Persistent Inflammation **Timothy Henrich** University of California San Francisco, CA	4:50 to 5:15 PM	AAV9-WWOX gene therapy, a promising treatment for children with WOREE syndrome **Srinivasarao Repudi** BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India
5:15 to 6:00 PM	**Closing Remarks (Hall A)**		
7:00 PM onwards	**Dinner at CSCR Roof Top**		
The End-Day			

Keynote Address

Mitchell Weiss
St. Jude Children's Research Hospital, Memphis, USA

Gene Therapy for Hemoglobinopathies: Recent Developments and Ongoing Challenges

Sickle cell disease (SCD) and β-thalassemia are catastrophic, life-threatening disorders caused by mutations in the HBB gene, which encodes the β-globin subunit of adult hemoglobin tetramer (HbA, $\alpha 2\beta 2$). These autosomal recessive disorders are common in many countries with tropical regions, including India, because the heterozygous carrier state confers protection against malaria. The only proven cure for SCD and β-thalassemia is allogeneic hematopoietic stem cell (HSC) transplantation, which carries risks for graft rejection and graft versus host disease arising from immune incompatibilities between donor and patient. These problems can be circumvented by gene therapy, in which the patient's own HSCs are modified to alleviate disease pathophysiology in red blood cell progeny. Two groundbreaking scientific advances have synergized to accelerate gene therapy for β-hemoglobinopathies. First, new technologies in viral vectors and genome editing techniques have accelerated our ability to manipulate the somatic genome. Second, 50 years of research on globin gene expression have elucidated the normal perinatal switch from fetal γ-globin genes (HBG1 and HBG2) to adult β-globin (HBB), which results in a shift from fetal hemoglobin (HbF, $\alpha 2\gamma 2$) to HbA in red blood cells. Two different approaches to gene therapy for SCD and β-thalassemia have been shown to be relatively safe and effective for carefully selected individuals in clinical trials: transduction of patient HSCs with lentiviral vectors encoding an erythroid-expressed β-like globin gene and genome editing of HSCs to induce HbF expression in adult-type red blood cell progeny. Genome editing to correct β-hemoglobinopathy mutations in patient HSCs more challenging to achieve efficiently but should be possible. Despite remarkable advances in preclinical and clinical studies, safety considerations, cost, and manufacturing complexities limit the availability of gene therapy for most β-hemoglobinopathy patients. Overcoming these challenges will require innovation, persistence and long-term commitment.

Session-1: CELL AND GENE THERAPY

Balamurugan N Appakalai
University of Louisville/Norton Healthcare, Louisville,USA

Pancreatic Islet Cell Transplantation for the treatment of Diabetes

Exogenous insulin administration is currently the only treatment available for patients with type-1 diabetes, but it is not a cure. Long-term complications associated with the disease may be preventable with a treatment strategy that can provide better blood glucose control. The transplantation of isolated human islets provides the potential to restore endogenous insulin production and reestablish normoglycemia. Clinical islet transplantation can be considered one of the safest and least invasive transplant procedures. Significant progress has been made in the outcomes of clinical islet cell transplantation, reflecting improvements in non-diabetogenic immunosuppression and preparation of sufficient quantities of highly viable islets for transplantation. Islet transplantation represents a potential cure for patients with type-1 diabetes.

Shaji RV
Centre for Stem Cell Research (a unit of inStem, Bengaluru), Christian Medical College Vellore, India

Cellular Models for Haematological Diseases

Hematological diseases, particularly inherited bone marrow failure syndromes, present significant challenges for disease modelling due to their genetic heterogeneity, complex pathophysiology, and the rarity of primary patient cells. Traditional models such as patient-derived hematopoietic progenitors and fibroblasts remain valuable, especially for validating molecular defects and assessing drug sensitivity in clinically relevant contexts.

Among advanced systems, induced pluripotent stem cells (iPSCs) are widely used. Derived from patient somatic cells, iPSCs can be differentiated into hematopoietic lineages while retaining disease-causing mutations. This enables the study of genotype–phenotype correlations, bone marrow failure pathways, and disordered erythropoiesis. iPSCs also provide a renewable resource for genome editing and high-throughput drug screening, supporting the development of personalized therapies. However, generating large patient-specific iPSC banks is challenging. Recent progress in genome editing has facilitated the creation of isogenic wild-type and mutant iPSC pairs, providing more controlled platforms for mechanistic studies.

An alternative approach for modeling genetic red cell disorders is the use of immortalized erythroid progenitor cells (iEPCs), established from patient or healthy donor hematopoietic cells. iEPCs enable large-scale expansion, display genetic stability, and provide a tractable system for investigating erythroid differentiation, globin switching, and the functional impact of disease-specific mutations. They also serve as robust platforms for preclinical testing of gene correction strategies using lentiviral vectors or CRISPR-based technologies.

By integrating iPSC technology, immortalized progenitor platforms, and advanced gene editing tools, cellular models are bridging the gap between clinical observation and therapeutic innovation. These models not only deepen our understanding of hematological disease biology but also accelerate the development of novel gene therapies and precision medicine approaches.

Vikram Mathews
Christian Medical CIlege, Vellore, India

Current status, challenges and opportunities with CAR-T cell therapy in India

Chimeric antigen receptor (CAR) T-cell therapy is an effective therapeutic modality against chemo-refractory malignancies. The most progress has been made in this field in the area of C19+ B-cell malignancies and plasma cell dyscrasias. CAR-T cells are engineered fusion proteins consisting of antigen recognition and T-cell activation domains that redirect T-cells to recognize and eliminate cells that specifically express the target antigen(s). With its remarkable clinical success and FDA approval of several CAR-T cell products, this therapy has rapidly gained the standard of care status in relapsed/ refractory (r/r) B-cell leukemia, lymphoma, and myeloma. However, access to CAR-T cell therapy is limited by cost and turnaround time, even in developed countries. The current centralized model with industry-driven CAR-T cell manufacturing has challenges. Point-of-Care (POC) manufacturing has the potential to democratize this process and further drive down the costs. Moreover, the challenges faced by a clinical team treating a cohort of patients requiring urgent therapeutic decisions and experiencing rapid changes in clinical status make it difficult to work with a centralized system with an uncertain manufacturing schedule, consistently, even in developed countries. With the existing centralized manufacturing and logistics model, it is estimated that only 25% - 50% of patients registered for CAR-T cell infusion are likely to receive it. POC, in addition to potentially lowering production costs, also reduces the expenses and logistical challenges related to cryopreservation, stringent shipping, and cold chain requirements. Available data also suggests that a fresh product is likely more viable and exhibits greater and faster expansion in vivo, potentially translating to increased efficacy. Further development that one looks forward to is shorter in-vitro expansion times, or even a directly in-vivo administered vector.

Additional points that one needs to address in the context of CAR-T cell therapies are the cost beyond just the manufacturing, which includes the total cost of administering them. Managing complications where they occur, following up with an allogeneic stem cell transplant, or monitoring and managing long-term complications. There is limited data on total healthcare resource utilization (HRU) with the use of CAR-T cells.

Punam Malik
Cincinnati Children's Hospital Medical Center, USA

Gene Therapy for Sickle Cell Disease: State of the Field and Beyond……

Lentiviral vectors with internal tissue-specific promoters have had over 15 year track record of success in gene addition therapy for numerous hematopoietic stem cell defects. They have shown similar success in β-globinopathies, resulting in licensing of a mutant antisickling β-globin gene for sickle cell disease (SCD) and thalassemia. Similar success has been achieved with activating endogenous γ-globin by erythroid-specific Bcl11a knockdown. All these successes have come at the cost of myeloablative conditioning, and a very high cost, preventive their access to low- and middle-income countries, and resulting in failure of commercialization, even in USA and Europe. Hence, gene therapy needs to be simplified to be readily accessible to all. We have shown that we can achieve remarkable amelioration of SCD even with reduced intensity conditioning, if a potent antisickling globin is used. Further efforts aimed at building upon this approach can be made to further simplify and reduce costs, until in vivo gene therapy becomes a reality.

Session-2: ORGANOIDS AND DISEASE MODELLING

Maneesha S. Inamdar
BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India

Guiding Next-Generation Therapies with Stem Cells

Stem cells possess an extraordinary capacity to self-organize, differentiate, and regenerate—abilities that have ignited a revolution in therapeutic innovation. Yet, mechanisms by which stem cells make their developmental decisions and maintain tissues, remain largely elusive. Decoding the intrinsic "wisdom" of stem cells may unlock transformative strategies for healing and rebuilding tissues from embryonic blueprints. We show that early metabolic cues — particularly mitochondrial activity — play a pivotal role in steering blood-forming stem cells toward distinct lineages. During the endothelial-to-hematopoietic transition in the mouse embryo, shifts in mitochondrial activity shape the potency and fate of emerging hematopoietic stem and progenitor cells, laying the foundation for lifelong blood production. By harnessing these metabolic signatures, we may move closer to precision control over stem cell fate, setting the stage for lifelong healthy blood production. To further dissect these developmental processes and assess environmental risks, we turn to gastruloids—stem cell-derived 3D models that mimic early embryonic patterning. These models offer unprecedented access to the earliest stages of human developmental lineage specification and are emerging as powerful platforms for studying teratogenicity and embryonic development in vitro. Integrating insights from metabolism, stem cell biology, and synthetic embryology, could lead to improved regenerative therapies.

Ruchi Tandon
Translational Health Science and Technology Institute, Faridabad. India

Harnessing the potential of human liver organoid developed from cells isolated from healthy individuals and patients to develop therapeutics and precision medicines against non-alcoholic fatty liver disease

Non-alcoholic fatty liver disease (NAFLD), which has been recently renamed as metabolic dysfunctionassociated fatty liver disease (MAFLD), is a global health concern with limited treatment options. The paucity of predictive in vitro models in preclinical settings seems to be one of the limitations of identifying effective medicines. Dr. Ruchi Tandon's laboratory at BRIC-THSTI, Faridabad therefore, realized the need to develop an in vitro model which serves as the mini-organ form of liver in a threedimensional set-up to overcome these challenges. Human liver organoids were prepared from hepatocytes from liver tissues of healthy individuals and the liver tissues collected from the needle biopsy samples isolated from NAFLD patients, in collaboration with clinicians at All India Institute of Medical Sciences, New Delhi. Organoids were grown in a 3D environment using defined culture conditions including various growth factors and markers of Wnt signaling pathway. This model was characterized by gene expression analysis and confocal studies. This is the first liver organoid model reported to date which inherently shows the multilineage properties of both parenchymal and nonparenchymal cells of liver without the need of co-culturing multiple cell types.

The human liver organoid model developed at THSTI was leveraged further to established an in vitro screening platform for developing therapies against steatohepatitis using both small molecules, botanical extracts and biologics. Due to its multi-lineage architecture, this model showed the expression of all the three key hallmarks of NAFLD: such as steatosis, inflammation, and fibrosis and is therefore expected to provide a more realistic assessment of test substances for the development of therapeutics and precision medicines against NAFLD and other liver disorders.

RT is thankful to the Translational Research Program (TRP) supported by the Department of Biotechnology to carry out this work

Indumathi Mariappan
L V Prasad Eye Institute (LVPEI), Hyderabad, India

Stem cell derived organoid models to study eye diseases and to validate newer drugs

Dr Mariappan's lab has been exploring the applications of pluripotent stem cells and different genome editing tools to generate in vitro disease models to understand various retinal pathologies. The team is also engaged in translational research, with the objective of developing iPSC-based therapies for certain inherited retinal and corneal disorders.

This talk will focus on the applications of patient-specific stem cells, genome edited stem cells and stem cell derived organoid models. Such in vitro disease models are extremely useful for understanding various inherited eye diseases, for testing newer drugs and developing cell-based therapeutics.

Arvind Ramanatha
BRIC-Institute for Stem Cell Science and Regenerative Medicine
Bengaluru, India

Human 3D organoids as a preclinical platform for intervention testing

Non-Animal models (NAMs) of human tissues are important preclinical models for drug testing and studying human disease. Such models have higher pre-clinical relevance, amenable to personalized medicine and increasingly accepted by drug approval authorities including CDSCO and FDA. The skeletal muscle of small rodents do not capitulate fiber and twitch characteristics of human skeletal muscle, and therefore a necessity for NAMs. We have developed a functional 3D organoid model derived from human myoblasts that can be used for testing effects of interventions on myofusion, fiber- type, Sarcomere formation, AchR aggregation, calcium uptake and fiber contraction/ force generation. We are using both human biopsy derived myoblast and iPSC derived myoblasts. We have applied this platform to test anti-aging drug candidates including those that improve NAD levels in skeletal muscle, and for testing delivery of mRNA into organoids. We are developing models of muscle aging (sarcopenia) and rare diseases (GNE myopathy) to understand underlying mechanisms and test new interventions. We expect such models to be effective predictors of toxicity and efficacy in a human human system, that can be integrated with other cell types in the future.

Session-3: MESENCHYMAL STEM CELLS (MSCs) AND THEIR SECRETOME

Jyothi Prasanna S
Manipal Institute of Regenerative Medicine, Bengaluru, India

Modeling Vascular Pathophysiology in ACDC Disease Using Gene-Edited Human Aortic Endothelial Cells and Patient-Derived iPSC-based systems

Arterial Calcification due to Deficiency of CD73 (ACDC) is a rare autosomal recessive vascular disorder caused by mutations in NT5E, which encodes the GPI-anchored ectoenzyme CD73 responsible for converting extracellular AMP to adenosine. Patients typically present with severe vascular abnormalities, including peripheral arterial calcification and vessel tortuosity in early adulthood. Interestingly, CD73-deficient murine models do not exhibit overt phenotypes, highlighting the necessity for humanized systems to elucidate ACDC pathogenesis.

Thus, to investigate the underlying molecular mechanisms, human aortic endothelial cells (HAECs) were gene-edited to disrupt NT5E and assessed for global transcriptomic changes, pathway dysregulation, and angiogenic potential. NT5E-deficient HAECs demonstrated compromised endothelial junctional integrity and a partial endothelial-to-mesenchymal transition (EndMT)-like phenotype. Transcriptomic profiling revealed dysregulation of genes involved in angiogenesis and axon guidance, correlating with impaired angiogenic responses, particularly under inflammatory conditions. Notably, spontaneous induction of RUNX2 suggested a shift toward osteogenic fate.

Sprouting angiogenesis assays demonstrated aberrant endothelial sprout formation, likely attributable to disrupted smooth muscle cell (SMC) coverage and remodeling of extracellular matrix (ECM) components at the endothelial-SMC interface—a critical zone implicated in the intimal thickening and vascular calcification characteristic of ACDC. Downregulation of Endothelial-SMC interface proteins such as Emilin, Biglycan and P-selectin noted in NT5E-deficient HAECs further reiterated this facet.

To further explore organotypic interactions, induced pluripotent stem cells (iPSCs) were generated from NT5E-knockout and ACDC patient fibroblasts and vascular organoids (VOs) were developed to recapitulate ACDC-specific vascular pathology. These ACDC VOs represent a promising platform for mechanistic studies and therapeutic target identification.

Ilyas Khan
Swansea University Medical School, Wales, United Kingdom

Articular cartilage repair and regeneration – are we there yet?

Repair and regeneration of articular cartilage is a seemingly intractable problem; with the advent of regenerative medicine there is renewed hope that we can generate repair cartilage or reverse the course of disease. One of the overarching problems in our field is understanding how cartilage forms the Benninghoff arcade structure, which underpins the functional constitution of cartilage. The collagen network of cartilage develops this unique organisation around the time of puberty, a process termed postnatal cartilage maturation, and then this persists unchanged throughout life, unless a person is affected by disease in which case it progressively disintegrates. Therefore, knowledge of maturational mechanisms is pivotal not only for tissue engineering functional cartilage but also for either slowing or reversing the course of disease by reconstituting the correct collagen network structure of articular cartilage. Our work has shown that bone morphogenetic protein-9 (BMP9) plays a pivotal role in postnatal restructuring of articular cartilage, it induces the formation of Benninghoff arcades in immature articular cartilage and even in isolated chondrocytes. These model systems have now given us an incredible insight into not only the optimal engineering solutions for cartilage but surprisingly on disease processes. In this presentation I will highlight the remarkable properties of BMP9 in postnatal development of articular cartilage and show how our model systems have given us new insights not only into cartilage tissue engineering and regeneration but also disease processes.

Yogeswaran Lokanathan
Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

Potential of Wharton's Jelly Mesenchymal Stem Cell-Derived Small Extracellular Vesicles in Managing Metabolic Syndrome in an Animal Model

Metabolic syndrome (MetS) is a cluster of metabolic abnormalities—including abdominal obesity, atherogenic dyslipidemia, hyperglycemia, and hypertension—that is increasingly recognized as a global silent epidemic. Insulin resistance and chronic inflammation are key underlying mechanisms of MetS. Currently, no single therapy effectively addresses all components of MetS, with most treatments focusing only on symptom management. Mesenchymal stem cell (MSC)-derived extracellular vesicles (EVs), particularly small extracellular vesicles (sEVs), are gaining attention in regenerative medicine due to their immunomodulatory and anti-inflammatory properties. This study investigates the therapeutic potential of intravenously administered human Wharton's Jelly Mesenchymal Stem Cell (WJMSC)-derived sEVs in managing MetS in a rat model. Four independent fetal WJMSC samples were characterized and used to generate four corresponding sEV preparations using the tangential flow filtration method. The pooled, standardized sEVs were used in subsequent animal experiments. Safety was evaluated in healthy rats over a 90-day period, assessing both acute and chronic toxicity. A MetS model was induced in rats via a high-fat diet and fructose solution. During the efficacy phase, MetS rats received intravenous injections of the pooled fetal WJMSC-derived sEVs at two different doses for 12 weeks. The fetal WJMSC-derived sEVs were successfully isolated, concentrated, characterized, and standardized, achieving a purity of 1.0×10^8 particles/µg protein. The intravenous administration of the pooled sEVs was found to be safe, with no evidence of acute or chronic toxicity. In MetS rats, the treatment improved all MetS components except abdominal circumference, with some dose-dependent effects observed. In conclusion, fetal WJMSC-derived sEVs show promise as a novel therapeutic strategy for managing MetS and warrant further investigation in clinical settings.

Pawan K Gupta
Stempeutics Research, Bangalore, India

MSCs in the clinic – current status & future prospects

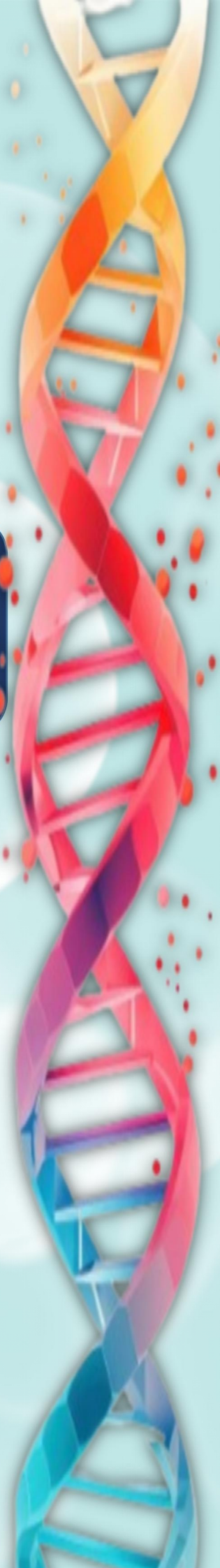
MSCs possess immunomodulatory properties & play a co-ordinating role in many of the body's mechanisms of defence, repair and regeneration. It exerts multifactorial effects like transfer of exosomes or microvesicles, has paracrine activity, it transfers organelles and apoptosis of MSCs results in the release of apoptotic extracellular vesicles that act on target cells as well as induction of IDO production in recipient phagocytes. Global interest in MSCs continues to grow as > 1500 clinical trials have been initiated.

There are significant issues with the use of MSCs which includes – significant inter-donor variability, issue of use of cryopreserved vs. fresh cells, fitness of culture expanded cells as it may reduce potency and increases senescence. To address the issue of significant inter-donor variability pooled MSCs from multiple donors may be undertaken as it maintains product consistency across batches of production without compromising safety. Thereafter, the advantages of pooling will be presented which includes both the in vitro data and the clinical data of use of pooled cells (both mononuclear cells and MSCs) in different clinical trials.

Regarding use of cryopreserved vs. fresh MSCs, it is known that cryopreservation negatively affects immunosuppressive properties of MSCs and culture recovery period of 24h may restore its function. Hence, fresh, thawed and culture re-fresh MSCs may show better efficacy as compared to fresh thawed cryo-preserved MSCs but some trials results are otherwise.

Strategies to enhance potency of MSCs (MSC version 2.0) will be discussed and the details of first gene modified MSC will be presented. To conclude, to enhance the efficacy of MSCs we must address the inherent issues of MSCs like donor heterogeneity and other issues. MSCs have the potential for treating unmet medical needs due to its anti-inflammatory, immunomodulatory, chondro-regenerative and angiogenic properties.

Session-4: MOLECULAR GENETICS OF INHERITED DISEASES



Sumita Danda
Christian Medical College Vellore, India

Deciphering the "omics" for Alkaptonuria

In 1902, British physician Archibald Garrod, demonstrated that alkaptonuria is inherited according to Mendelian rules and involves a rare recessive mutation. This is one of the first inborn error of metabolism (IEM) to be described in history of medicine. The fact that it is detectable at birth but manifestations start in adults gives us an opportunity to do in-depth study of the mechanism of disease and develop methods to alleviate the symptoms which cause considerable morbidity.

Alkaptonuria is caused by deficiency of homogentisate 1, 2-dioxygenase, and an enzyme that converts homogentisic acid (HGA) to maleylacetoacetic acid in the tyrosine degradation pathway. The three major features of alkaptonuria are dark urine or urine that turns dark on standing, ochronosis (bluish-black pigmentation in connective tissue), and arthritis of the spine and larger joints. In Tamilnadu the prevalence is more as compared to rest of the world. Indian studies from CMC Vellore have shown a prevalence of 8.4% in certain communities.

Till now the condition had no specific treatment but with recent FDA approval of Nitisinone a ray of hope has emerged for the patients. Under Medical Genetics CMC Vellore we have more than 20 patients registered an ongoing trial of nitisinone. We have been looking at the clinical features, genetic profile, accurate enzyme assay, appropriate biomarkers, epigenetic factors which will help to understand the pathogenesis in a better way. We maintain a registry of AKU patients from all over India. The multidisciplinary effort will pave the way for holistic care and also prospective research targeting the genetic error by development of better molecules for therapy or specific gene editing tools to rescue the phenotype to near normal and practice precision medicine. The talk will highlight the genomic profile and the underlying metabolomics in Indian patients with AKU – a rare IEM.

Sridhar Sivasubbu
Karkinos Healthcare Pvt Ltd, Mumbai, India

Population Genomes to Precision Medicine – Impact on Public Health in India

A major driver for biomedical science is the ability to decode the genetic blueprint of humans through whole genome sequencing, enabling predictive, preventive, and precision medicine. It is also anticipated that genomics-guided decisions supplemented by evidence other omics sciences would find its place in optimizing therapeutic interventions and minimizing adverse events.

The last two decades have been transformative in the adoption and implementation of genomics in India. From the first personal genome in 2009, human genomics in India has scaled to thousands of genomes. The availability of genomes from India has enabled understanding the genetic diversity on a population scale, make available genetic variant frequencies for clinical applications and enable genetic epidemiology of diseases. The whole genome data has also enabled the development of technologies for clinical and biomedical applications in India. This includes applications in several areas including faster and efficient diagnosis of diseases, epidemiology of genetic diseases to enable cost effective genetic tests, carrier screening applications for expectant couples, enabling efficient diagnosis of cancers and pharmacogenetic tests to prevent adverse drug reactions. The talk would focus how collaborative genomics research initiatives could accelerating the diagnosis and management of diseases.

Aaron Chapla
Christian Medical College Vellore, India

Genetics of Insulin Secretion: Insights from massive parallel sequencing

Insulin secretion defects arise from diverse genetic mechanisms with important diagnostic and therapeutic implications. Monogenic forms, often presenting in infancy or early childhood, result from highly penetrant mutations in genes regulating β-cell development, glucose sensing, or insulin biosynthesis. These can also include rare monogenic autoimmune-mediated defects. Such disorders typically manifest as severe, familial, or syndromic phenotypes, including congenital hyperinsulinism and neonatal diabetes, where precise molecular diagnosis directly informs prognosis and guides treatment. Increasingly, digenic and oligogenic inheritance is being recognized, where variants in two or more genes interact to modify phenotype, age of onset, or disease severity, challenging the traditional monogenic–polygenic dichotomy. Massive parallel sequencing has revolutionized the identification of such variants, enabling comprehensive characterization of genetic risk and paving the way for precision approaches to diabetes management.

Ashwin Dalal
Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad, India

Mission program in pediatric rare genetic disorders

India's extraordinary genetic diversity has been shaped by centuries of endogamy, consanguinity, and complex social structures, resulting in a unique genetic architecture with numerous isolated communities. This diversity has led to the accumulation of rare, population-specific variants making India a reservoir of untapped genetic information. Despite the global focus on rare genetic diseases (RGDs), the Indian subcontinent remains underrepresented with estimated 70 million affected individuals. This presents an unprecedented opportunity to study the Indian cohorts to identify novel gene-disease association, novel variants and disease mechanisms. To address this gap, the Pediatric Rare Genetic Disorders (PRaGeD) Mission was established as a nationwide, multi-centre initiative integrating genomics research, diagnostics, functional characterization and community engagement.

A total of 16 collaborating centers across India implemented standardized protocols for patient recruitment, sample collection, and metadata management over a period of 2 years (2023-2025). A total of 1,800 pediatric cases with unexplained genetic conditions were recruited, with exome sequencing completed for 1,082 cases and whole genome sequencing initiated for 171. A number of novel variants and novel gene-disease associations were detected.

Functional studies are a cornerstone of the PRaGeD mission. Putative novel genes such as SERPINA11, AIMP2, FKBP4, CD101, ADGB etc. are being characterized using cell lines, zebrafish, and mouse models, alongside in-silico structural and molecular analyses. These efforts are complemented by advanced molecular techniques, including transcriptome analysis, mini-gene splicing assays, luciferase assay and complementation assays, to unravel the pathogenicity and biological impact of newly discovered variants. These efforts are supported by the development of a comprehensive Indian genomic variant database, with data and metadata to facilitate data sharing and collaborative research.

The PRaGeD initiative also emphasizes translational impact, with over 30 awareness programs conducted across different cities of India. By integrating advanced genomics, functional studies, and community outreach, this multi-center program is transforming the landscape of pediatric rare disease research and care in India. The Mission PRaGeD not only aims to reduce the burden of pediatric RGDs and improve patient outcomes but also positions India as a critical contributor to the global understanding of rare genetic disorders

Session-5: MANUFACTURING AND REGULATORY ASPECTS IN CELL AND GENE THERAPY

Jonathan Yen
St. Jude Children's Research Hospital, Memphis, TN

SAGES: Development and Translation of a Novel CRISPR Genome Editing Therapy to Induce Fetal Hemoglobin for Sickle Cell Disease

Symptoms of sickle cell disease (SCD) can be alleviated by elevating fetal hemoglobin (HbF) expression. Our therapeutic strategy utilizes CRISPR-Cas9 to disrupt the BCL11A repressor-binding motif (-115) in the γ-globin promoters, effectively inducing HbF by mimicking a naturally occurring hereditary persistence of fetal hemoglobin (HPFH) variant. To translate this approach, we established a robust, clinical-scale manufacturing process for editing CD34+ hematopoietic stem and progenitor cells (HSPCs) using GMP-grade reagents and MaxCyte electroporation. Comprehensive preclinical pharmacology and toxicology studies demonstrated high editing efficiency and substantial, durable HbF expression in erythroid cells. In xenograft models, edited HSPCs achieved long-term, multilineage engraftment comparable to unedited controls, with stable editing across hematopoietic lineages and no detectable off-target events or toxicity.

This body of work supported our successful Investigational New Drug (IND) application with the FDA, leading to the launch of the St. Jude Autologous Genome Edited Stem Cell (SAGES1) clinical trial (NCT06506461). The SAGES1 trial is now open, and we have enrolled our first patients. Furthermore, we will present initial progress on our next-generation SAGES2 program, which employs adenosine base editors (ABEs) to create a de novo TAL1 binding site (-175) in the γ-globin promoters. This advanced editing strategy, which mimics another potent HPFH variant, has the potential to be a highly potent strategy for robustly inducing therapeutic levels of HbF, representing a promising future direction for the treatment of SCD.

Sunil Martin
BRIC-Rajiv Gandhi Centre for Biotechnology, Kerala, India

Configuring Chimeric Antigen Receptors for safety and efficacy

Although CAR therapy is a reality to treat aggressive B lineage malignancies, at least 50% of the patients eventually relapse. Re-configuring the chimeric receptor is a promising approach to optimize the safety, efficacy, and affordability of CAR T cells. Towards this end, we have interrogated the role of the hinge (H) and transmembrane (TM) domains of anti-CD19 CAR T cells with CD28 co-stimulatory domains. Anti-tumor functions of CAR T cells with hinge and transmembrane domain derived from either CD8a or CD28 or a combination of both were tested against CD19(+) cell lines. The CD28 hinge and transmembrane domain significantly enhanced surface expression, cytokine production, immunological synapse formation, and tumor-toxicity, despite reduced overall proliferation, compared to other CD28/ CD8a based HTM combinations. Supernatant transfer experiments suggest the role of the CD28-derived H or TM domain in IL-6 and IL-1β production from myeloid cells, indicating a possible role for this domain in cytokine toxicity. Overall, the data indicate a differential role of CD28 in the H or TM in the anti-tumor functions of CD19 CAR T cells. The ongoing experiments may reveal the critical residues to redesign the receptor for enhanced safety and efficacy.

Priyadarshini Chatterjee
Aurigene Oncology Ltd., Bangalore

Robust Manufacturing of NK cells towards development of Allogeneic Therapies

Allogeneic CAR (chimeric antigen receptor) therapies utilize immune cells, like NK cells, from a healthy donor to target and destroy cancer cells in the recipient. Unlike autologous CAR T-cell therapy, which uses the patient's own cells, allogeneic therapies offer potential advantages like being "off-the-shelf" readily available and also cost-effective. NK cells have obvious advantages over many other immune cells to become an off-the-shelf therapy like low incidence of graft-versus-host-disease, low cytokine derived safety concerns, ability to target cancer cells inherently using stress receptors along with CAR-mediated killing. However, development of allogeneic CAR-NK cell therapies face hurdles like low expansion of NK cells, low probability of NK cell lentiviral infection to deliver the CAR gene, poor NK cell viability and cytotoxic potency upon cryopreservation and freeze-thaw, along with poor persistence of NK cells in the patient body.

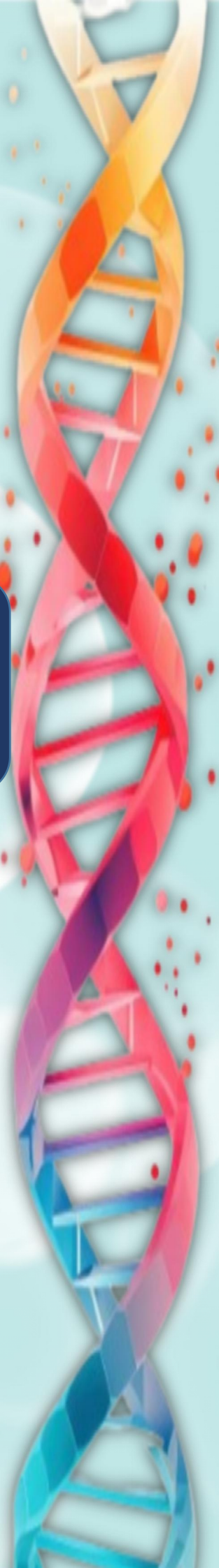
To address these challenges, we embarked on development of a process with improvements made ceaselessly using in-house feeder cells and cytokine combination. Finally, we have an optimized, scalable, closed, semi-automated CAR-NK manufacturing platform, using peripheral blood NK cells. We obtained an exceptional cell expansion (50,000-120,000-fold) within a duration of 17 days, while maintaining uncompromised potency, purity, identity, viability and activated phenotype. A specific, pseudo-typed lentiviral vector was developed that led to transduction efficiencies of > 40% CAR positivity with ~1 integration per CAR-positive cell. The manufactured cytokine armoured CAR-NK cells were subjected to stringent potency check using a chronic tumour re-challenge assay without providing any exogenous cytokine support. To have effective cryopreservation for CAR-NK cells, we used a DMSO-based solution along with a slow-freezing protocol. The final aim is to have the process Good Manufacturing Practices (GMP)-ready, with the product meeting stringent release specifications. One manufacturing batch in the current process aims to yield > 500 doses, with a promise at reducing cost and patient wait time.

Bruce L. Levine
University of Pennsylvania, Philadelphia, PA

What No T Cell Has Treated Before: Advances in CAR Design and Delivery to Patients

Since the 1990's, we have conducted clinical trials of gene modified T cells. Chimeric antigen receptor (CAR) T cells targeting CD19 on B cells leukemias and lymphomas which have induced durable complete responses in patients who are relapsed or refractory to all other available treatments. New designs for genetically modified T cells include switches and potency enhancements that will be required for targeting solid tumors. CAR T cells currently require ex vivo manipulations to manufacture, though recent progress in the development of delivery vehicles to generate CAR T cells directly in vivo offer opportunities to expand access to patients. Current and future advancements depend not only on scientific progress in targeting, gene modification and cellular manipulation, but also on meeting automation, engineering, clinical site onboarding, and health policy challenges.

Session-6: POPULATION SCREENING & MANAGEMENT OF GENETIC DISORDERS



Giriraj Chandak
Centre for Cellular and Molecular Biology, Hyderabad, India

Sickle Cell Anaemia: Kal, Aaj, aur Kal (Past, Present and Future)

India is one of the capitals of Sickle Cell Anaemia (SCA), which is an autosomal recessive genetic disorder due to point mutation in the beta-globin gene. It presents with anaemia, vaso-occlusive crisis, persistent pain, etc. Most of the work in SCD in India has focussed on screening and utility of hydroxyurea therapy in clinical management. Many lacunae still remain, such as genetic basis of variable phenotype compared to other parts of the world, genetic variants that can influence intermediate traits like fetal hemoglobin (HbF), biomarkers to predict clinical outcome and last but not the least, the need to a rapid, robust and affordable test for genetic confirmation of diagnosis.

Under the CSIR-Sickle Cell Anaemia Mission, we conceived a comprehensive strategy that included development of a program for multi-pronged screening including population-, hospital-, antenatal-, new born- and extended family-based screening and identifying the hidden burden of the disease on the society, develop a screening cum confirmatory test, and understand the genetic and proteomic markers to predict the disease onset. We have screened close to 30 lakhs individuals which provides a 10% disease frequency (9% carriers and 1% patients) in tribal populations but also in 6% of general population. This included 10% prevalence of Sickle-beta thalassemia having implications in DNA testing and genetic counselling. We developed a novel genetic test by PCR using whole blood, having a 100% specificity and 99.6% sensitivity and is being setup at various states. We have identified novel genetic variants associated with important traits including HbF, leucocyte and platelet counts, haemoglobin, etc through genome-wide association analysis (GWAS) on 3000 well-characterised patients. Further, a number of protein biomarkers (both established and novel) have been identified on high throughput proteomic analysis on 144 patients. What lends credibility to the GWAS and the proteomics results is identification of proteo-genomic signatures associated with its complications. Overall, the Mission has developed a comprehensive, multi-pronged approach to reach every section of the society for early identification of patients and carriers, developed a robust and cheap test for genetic confirmation and identified novel proteo-genomic markers to predict clinical course and treatment response.

Chinmayee Panda
Kalinga Institute of Medical Sciences, Bhubaneswar, India

Population based screening of Genetic Disease: A tip for prevention of hemoglobinopathies

Genetic diseases contribute significantly to the global burden of morbidity and mortality. Thalassemia and Sickle Cell Disease (SCD) are among the most common, severe, and globally distributed monogenic inherited blood disorders. They pose a significant public health burden, leading to substantial morbidity, mortality, and socioeconomic strain, particularly in high-prevalence regions. Population-based screening offers a proactive approach to identify individuals at risk before the onset of symptoms, enabling timely interventions and informed reproductive choices.

The critical role of systematic screening, combined with comprehensive genetic counselling and robust follow-up, in reducing the incidence of severe forms of these diseases. Screening initiatives can be implemented at various stages: newborn screening, antenatal/prenatal screening and premarital/preconception carrier screening (targeting adolescents or couples contemplating marriage/pregnancy to identify at-risk pairings).

Successful population-based programs involve:

Mass Screening: Employing cost-effective initial screening tests (e.g., RBC indices like Mean Corpuscular Hemoglobin (MCH) for thalassemia, tests for (SCD) followed by confirmatory testing (High-Performance Liquid Chromatography/molecular analysis) for identified carriers.

Genetic Counseling: Providing clear, non-directive, and culturally sensitive information to carriers and at-risk couples regarding the inheritance pattern, the potential severity of the disease in offspring, and all available reproductive options.

Community Education and Awareness: Crucial for improving uptake, addressing social stigma, and ensuring informed decision-making within the target population.

Integration into Primary Healthcare: Implementing screening within existing health systems to ensure accessibility and sustainability, especially in resource-limited settings.

While challenges remain, including ensuring universal coverage, maintaining standardized testing quality, and overcoming cultural or ethical barriers to certain reproductive choices robust population-based screening and holistic approach-based prevention program has been implemented to reduce the burden of thalassemia Major & SCD in Odisha by CSCR CMC Vellore. Continued investment and refinement of these strategies are essential to effectively reduce the global burden of these serious genetic disorders.

Rekha Pai
Christian Medical College Vellore, India

Genetic screening of pheochromocytoma 'susceptibility genes': CMC experience

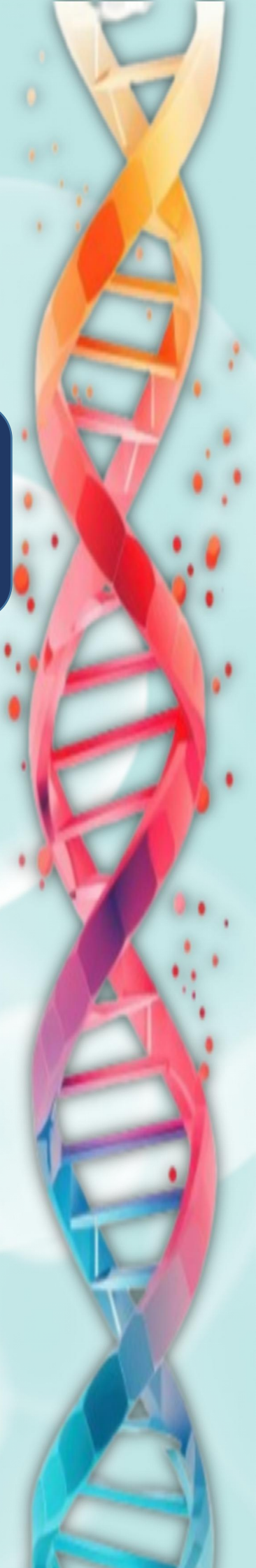
PPGLs are genetically diverse, with mutations identified across nearly 23 susceptibility genes, though only 35–40% of cases are expected to harbour mutations. Detecting these mutations is crucial for improving patient follow-up, particularly for monitoring syndromic associations and metastatic progression. In a cohort of 145 patient with histologically proven PPGLs managed at our centre from 2015-2025, the 'susceptibility genes' have been screened using a clinical exome panel by next generation sequencing (NGS) and the data collated with the clinical, biochemical, radiological, and histopathological characteristics collected using the electronic medical records. About 49.6% of PPGLs were found to harbour a germline mutations in one of reported susceptibility genes, with higher mutation positivity (88%) in those with syndromic disease than those who were apparently sporadic (44%). Mutations in the VHL and SDHx genes were the most frequent accounting for ~30% of all mutations. The high mutation positivity among apparently sporadic tumors (44%) highlights the importance of genetic testing in all patients with PPGL, regardless of family history or syndromic features. Our findings support the use of a next-generation sequencing (NGS) based approach for comprehensive genetic testing, as it allows parallel sequencing of a larger number of susceptibility genes.

Vinod Scaria
Karkinos Healthcare Private Limited, Bengaluru, India

Personal Genomes are Moving the needle for Precision Medicine

Imagine a future where the answers to complex health mysteries are within reach, not after years of searching, but often in a matter of days. That future is rapidly becoming a reality thanks to whole genome sequencing (WGS). This incredible technology offers an unprecedented look at our complete genetic blueprint, transforming how we approach health and disease. For families grappling with undiagnosed conditions, WGS offers a beacon of hope, dramatically shortening the often agonizing journey to a diagnosis. It's not just about identifying existing problems; it's about proactively understanding and preventing genetic diseases, giving individuals and their doctors the power to intervene earlier and more effectively. Beyond diagnosis, WGS is ushering in a new era of personalized medicine through pharmacogenomics. This means understanding how our unique genetic code influences our response to medications. No more trial-and-error dosing; instead, we can anticipate how a patient will react, minimizing harmful side effects and ensuring the most effective drug and dosage from the start. The speed at which WGS can deliver these insights is a game-changer for clinics, allowing for rapid and accurate diagnoses that can swiftly guide treatment. The impact extends far beyond rare diseases; data reveals a significant prevalence of underlying geneticfactors in common conditions like chronic kidney disease (CKD) in adults. Even in seemingly healthy individuals, WGS can uncover incidental and medically actionable findings - genetic predispositions that, once identified, can lead to preventative measures. In essence, whole genomes are not just a diagnostic tool; they are a powerful compass, guiding us toward a future where healthcare is truly personalized, proactive, and profoundly more effective. This is how we move the needle for precision medicine.

Session-7: CELL THERAPY FOR HEMATOLOGICAL DISORDERS



Biju George
Christian Medical College Vellore, India

Looking beyond matched sibling donor transplants for hematological malignancies

Allogeneic stem cell transplant [AlloHSCT] is the curative option for a number of patients who have hematological malignancies. The first step is to look for a matched donor within the family, usually a sibling, but this may be identified in only 20-30% of patients. What can be done for the rest of the 70-80% of patients.

Matched unrelated donor [MUD] transplants were started at CMC Vellore in 2008 for hematological malignancies and till June 2025, 236 transplants have been performed for hematological malignancies. Donor centers included DKMS in Germany, DATRI in India and the NMDP in US. However, MUD transplants are costly and importantly only 20% of patients will find a match in any of the different bone marrow registries. One of the major advances in the field of bone marrow transplantation has been the advent of Haplo-identical stem cell transplantation. Since only a 50% match is needed for BMT, in more than 95% of patients, a donor can be identified which could either be a sibling, parent of child. Since 2010, 368 haplo-identical transplants have been performed for hematological malignancies.

In this talk, I will discuss the outcomes of both these types of transplants and how they have impacted on the cure of hematological malignancies. In addition, I will talk about newer advances in haplo-identical stem cell transplantation including the use of alpha-beta depleted transplants

Aby Abraham
Christian Medical College Vellore, India

Lentiviral gene therapy for haemophilia A- an update of the clinical trial

Severe hemophilia A is conventionally treated with factor VIII replacement or haemostatic agents to control or prevent bleeding episodes. However, a curative approach through gene therapy with functional FVIII transduced hematopoietic stem cell (HSC) using lentivirus-based approach remains underexplored. To this end, we conducted a single-centre, first-in-human study involving five adult male participants (ages 22–41 years) with severe haemophilia A and no inhibitors to factor VIII. Autologous $CD34^+$ HSCs were transduced ex vivo using CD68-ET3-LV, a lentiviral vector carrying an engineered FVIII transgene (ET3) under the control of a myeloid-specific CD68 promoter. Participants were assigned to two groups: group-I received the standard transduction protocol, whereas group-II received an enhanced transduction condition. Following myeloablative conditioning, the modified HSCs were infused back into the respective participants. Safety outcomes included post-transplant engraftment and regimen-related toxicities, while efficacy was assessed by factor VIII activity levels and annualized bleeding rates.

Infused cell doses ranged from 5.0×10^6 to 6.1×10^6 $CD34^+$ HSCs per kilogram. The final vector copy numbers were 0.6–1.0 per cell for group I and 0.6–2.2 per cell for group II. Following transplantation, severe neutropenia lasted 7–11 days and severe thrombocytopenia 1–7 days. Participants in group-I achieved median factor VIII activity levels of 5.2 IU/dL (range: 3.0–8.7) and 1.7 IU/dL (range: 1.0–4.0), corresponding to 0.2 and 0.1 peripheral-blood vector copies per cell. In group-II, factor VIII levels were markedly higher—37.1 IU/dL (range: 18.3–73.6), 19.3 IU/dL (range: 6.6–34.5), and 39.9 IU/dL (range: 20.6–55.1)—with corresponding vector copy numbers of 4.4, 3.2, and 4.8. Remarkably, all five participants reported zero annualized bleeding events over a cumulative follow-up of 81 months (median: 14 months; range: 9–27).

Autologous HSC-based gene therapy using the CD68-ET3-LV lentiviral vector achieved sustained, dose-dependent factor VIII expression in patients with severe hemophilia A. The correlation between vector copy number and factor VIII activity underscores the therapeutic potential of this platform for durable correction of the bleeding phenotype.

(Funded by the Ministry of Science and Technology, Government of India, and collaborating agencies; ClinicalTrials.gov Identifier: NCT05265767; CTRI/2022/03/041304.)

Mohankumar K M
Centre For Stem Cell Research (a unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India

Toward Safer Therapies: Development of DNA Break-Free Genome Editing for Various Genetic Disorders

Recent studies have shown that base editing, even with single-strand breaks, could result in large deletions of the interstitial regions while targeting homologous regions. Several therapeutically relevant genes such as HBG, HBB, CCR5, and CD33 have homologous sites and are prone for large deletion with base editing. Although the deletion frequency and indels observed are lesser than what is obtained with Cas9, they could still diminish therapeutic efficacy. We sought to evaluate whether these deletions could be overcome while maintaining editing efficiency by using dCas9 fusion of ABE8e in the place of nickaseCas9. Using guide RNAs (gRNAs) targeting the γ-globin promoter and the β-globin exon, we evaluated the editing outcome and frequency of large deletion using nABE8e and dABE8e in human HSPCs. We show that dABE8e can edit efficiently while abolishing the formation of large interstitial deletions. Furthermore, this approach enabled efficient multiplexed base editing on complementary strands without generating insertions and deletions. Removal of nickase activity improves the precision of base editing, thus making it a safer approach for therapeutic genome editing.

Thiyagaraj Mayuranathan
Centre For Stem Cell Research (a unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India

Gene-Edited Allogeneic CAR-T Cells for B-Cell Malignancies

CAR T cell therapy has revolutionized cancer treatment, achieving remarkable success in B cell malignancies with high response rates and durable remissions. However, challenges such as manufacturing delays and antigen escape remain. To overcome these, multitargeted, "off-the-shelf" allogeneic CAR T products are under investigation. While CRISPR/Cas9 facilitates genome editing for allogeneic CAR T development, it carries risks including double-strand breaks and chromosomal rearrangements. Base editing offers a safer alternative by enabling precise nucleotide changes without inducing such breaks, thereby reducing genotoxicity and expanding therapeutic potential. This study focused on developing an "off-the-shelf" CAR T cell therapy and evaluating its efficacy against human malignant B cell lines. Antigen-specific, codon-optimized CAR constructs were cloned into lentiviral vectors, packaged in HEK293T cells, and used to transduce T cell lines and primary T cells. Primary T cells were enriched, activated, expanded, and transduced. B2M knockout was achieved in T cells using CBE mRNA and sgRNAs via electroporation or lentiviral delivery, and editing efficiency was confirmed using EditR. CAR T cells were co-cultured with antigen-expressing B cell lines to assess cytotoxicity via luciferase-based killing assays. These assays showed strong antigen-specific cytotoxicity, sparing non-target K562 cells. Cytokine analysis of supernatants revealed elevated levels of IL-6, IL-10, IFN-γ, and TNF-α, indicating T cell activation. In summary, we successfully generated antigen-specific CAR T cells, performed efficient B2M base editing, and demonstrated robust cytotoxicity and cytokine secretion in vitro. These results highlight the therapeutic potential of base-edited, allogeneic CAR T cells as a safer and scalable treatment for B cell malignancies, warranting further in vivo validation.

Session-8: IMMUNE MODULATION IN THERAPY

Kiran Kumar MN
JSS Academy of Higher Education & Research, Maysuru, India

Gut–Lung Crosstalk: Harnessing Immunomodulation for Asthma Therapy

Background: Allergic asthma, a chronic airway disorder characterized by TH2-driven inflammation, eosinophilia, and elevated IgE, remains a global health concern with limited long-term therapeutic options. Allergens derived from house dust mites, pollen, cockroach etc., are potent inducers of IgE-mediated asthma, underscoring the need for novel interventions. Recent advances highlight the gut–lung axis as a critical immunological interface, where diet- and microbiome-derived signals can reprogram host immune responses. Lactic acid bacteria (LAB), particularly from functional foods such as millets, possess immunoregulatory properties, yet their role in asthma remains poorly defined.

Objective: This study investigated millet-derived LAB strains—Lactococcus taiwanensis and Weizmannia coagulans —for their capacity to modulate gut and lung immune responses in a murine model of cockroach whole-body extract (CWE)-induced allergic asthma.

Methodology: LAB isolates (n=268) from nine millet varieties were screened for probiotic attributes including carbohydrate fermentation, citric acid assimilation, pectinolytic and phytate-degrading activity, and postbiotic metabolite production. BALB/c mice were sensitized with CWE and subsequently treated with millet-derived prebiotics, probiotic, or postbiotics formulations. Immunological endpoints included bronchoalveolar lavage fluid (BALF) cytology, serum IgE/IgG1, cytokine (IL-4, IL-5, IL-10) secretion, regulatory T cell (Treg) induction in gut-associated lymphoid tissue, and pulmonary expression of Muc5ac and TH2 cytokine genes.

Results: Oral administration of millet-based prebiotic + L. taiwanensis significantly attenuated eosinophilic infiltration, airway hyperinflammation, CWE-specific IgE/IgG1, and TH2 cytokine responses, while enhancing Treg populations and IL-10 expression, reflecting robust gut–lung immunomodulation. W. coagulans also conferred protective effects, though less pronounced in suppressing IgG1 and TH2 cytokines.

Conclusion: These findings provide the first evidence that millet-derived LAB, particularly L. taiwanensis, can mitigate allergic asthma via modulation of gut–lung crosstalk, supporting their potential as natural immune-therapeutics.

Ajit Chande
Indian Institute of Science Education and Research,Bhopal, India

From HIV Biology to lentiviral vectors: Insights into the mechanisms of antiviral actions

HIV-1-derived lentiviral vectors (LV) are widely used in cell and gene therapy for their ability to transduce both dividing and non-dividing cells. Pseudotyping with VSV-G allows them to target various cell types, but cellular restrictions can hinder post-entry steps of the viral life cycle. Therapeutically important cells, like immune and stem cells, often show low transduction efficiency due to innate antiviral mechanisms that wildtype viruses counteract more effectively.

To mitigate the loss of infectivity, higher viral titers are frequently employed, which can result in increased cytotoxicity, diminished cell viability, and a substantial rise in the costs associated with lentiviral vector production. To overcome these challenges, we conducted high-throughput chemical screens aimed at identifying cellular pathways that could enhance lentiviral transduction. These screens led to the discovery of a small molecule that increased transduction efficiency by up to 2.5-fold in an envelope-independent manner. Subsequently, we developed a targeted small-molecule cocktail that further improved transduction efficiency by approximately 4-fold across various cell types originating from different tissues.

Using this cocktail, we achieved ~ 50% transduction efficiency compared to ~28% in the control group for bone marrow-derived $CD34^+$ cells, improving LV delivery in stem cell populations relevant to clinical applications.

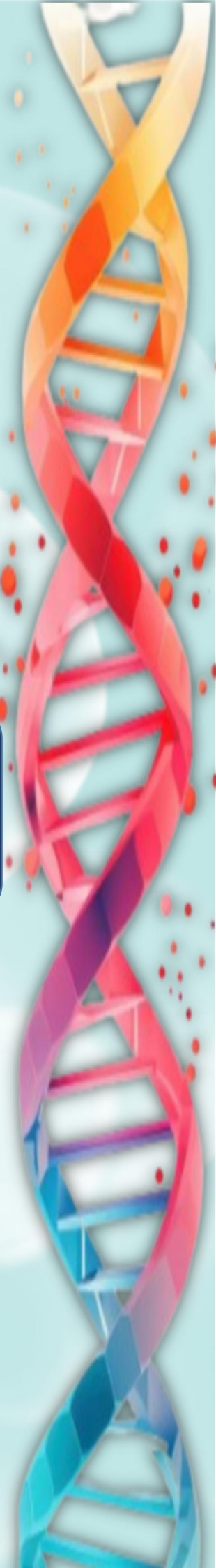
Aruna Rakha Arora
Postgraduate Institute of Medical Education and Research, Chandigarh, India

Targeting the Uroseptic Infection with Mesenchymal Stromal Cells and Peptides: Pilot Signals and a Path to Translation

UTI-causing bacteria are increasingly becoming resistant to common antibiotics, and if not treated in a proper & timely fashion UTI has all the potential to lead to, acute kidney injuries, sepsis and eventual mortality due to a lack of treatment options. Urosepsis driven by uropathogenic E.coli is getting difficult to treat due to escalating antimicrobial resistance and persistent microbial reservoirs. We hypothesized that mesenchymal stromal/stem cells (MSCs) can synergize with in silico designed, disease-specific molecules to act as two prong approach: both to reduce pathogen burden and rebalance the host immune response. We have combined in-silico docking with in-vitro infection models, where we identified peptide candidates with favourable binding affinity to HisC, suggesting pressure on histidine biosynthesis and bacterial fitness. In vitro, the MSC–peptide combination produced exploratory signals of synergy versus either of them alone, including significant reductions in colony-forming units, disruption of biofilm biomass, and suppression of inflammatory immune pathways. Early feasibility checks like cell viability, hemolysis, exposure of MSCs to peptides, support the translational aspect of the study.

Beyond this specific use case, the data generated supports a broader principle: MSCs act as a milieu-responsive platform whose effects can be escalated by coupling them with disease-specific molecules like targeted peptides, pathway modulators, or microenvironmental preconditioners. I will outline a practical roadmap aimed at moving from pilot signal to rigorous preclinical validation. Post thorough validation, this intervention could model to other infection niches and inflammatory indications where a specific control, immune recalibration, and tissue repair must be orchestrated together.

Session-9: MICROBIAL INFECTIONS CHALLANGES WAY FORWARD



Balaji Veeraraghavan
Christian Medical College Vellore, India

Newer molecular approach in infectious disease diagnosis

Recent advances in molecular diagnostics are revolutionizing infectious disease management, enabling rapid, sensitive, and comprehensive pathogen detection and antimicrobial resistance profiling.

This session will highlight cutting-edge platforms such as multiplex PCR panels, targeted and metagenomic next-generation sequencing (NGS), host response assays, and CRISPR-based enrichment, all of which deliver clinically actionable results directly from complex specimens within hours. Emerging workflows bypass traditional culture bottlenecks, offering ultrafast antimicrobial susceptibility testing (AST), syndromic panels for respiratory and CNS infections, and real-time sepsis differentiation using molecular gene expression.

Practical implementation challenges—including sample enrichment, host DNA depletion, bioinformatics pipeline integration, and validation for rare pathogen detection—will be discussed, with a special focus on dynamic technologies relevant for Indian healthcare settings. Attendees will gain insights into how these novel molecular strategies are enhancing diagnostic speed, accuracy, and therapeutic stewardship across the spectrum of infectious diseases

Sitara Swarna Rao Ajjampur
Christian Medical College Vellore, India

Neglected Tropical Diseases: Improving Diagnostics for Helminth Elimination and Control Programs

There are 21 neglected tropical diseases (NTD) that affect 2.7 billion people globally and leading to 200,000 deaths and 19 million DALYs annually. Among these 8 are due to helminth infection namely dracunculiasis, food borne trematodes and cestodes, lymphatic filariasis, soil transmitted helminths, schistosomiasis and onchocerciasis. For the preventive chemotherapy or 'PC-NTDs' have had long standing MDA campaigns either treating entire populations at risk or targeted to high-risk groups. Multiple exercises have been carried out to set diagnostic priorities & identify gaps. In this talk, population level diagnostics for human helminth infections applied to control or elimination programs will be discussed highlighting current priorities and gaps in order to meet the targets set out in the NTD 2030 road map and some of preliminary work at our laboratory on diagnostics development.

B. Ashokkumar
Madurai Kamaraj University, Madurai, India

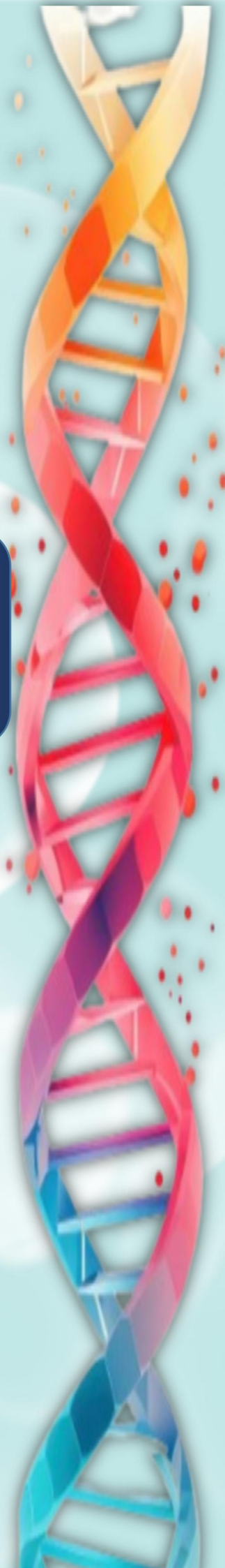
Uncovering the burden of Riboflavin transporter deficiency among Indians: metabolic insights and emerging strategies for gene therapy

Riboflavin (vitamin B2), through its active coenzyme forms flavin adenine dinucleotide (FAD) and flavin mononucleotide (FMN), is essential for energy production, antioxidant defense, and interactions with other nutrients such as iron, vitamin B6, and folate. Severe deficiency, which mainly affects populations in low-income regions, presents with clinical symptoms including cracks at the corners of the mouth (angular stomatitis), inflamed lips (cheilosis), sore tongue (glossitis), seborrheic dermatitis, and severe anemia due to reduced red blood cell production. Inadequate riboflavin levels at any stage of life can negatively impact health, contributing to conditions such as anemia and high blood pressure, thereby adding to the overall global disease burden.

Genetic disorders are inherited, non-communicable conditions that arise from mutations affecting one or multiple genes. Each year, more than 7.6 million children worldwide are born with significant genetic or congenital anomalies, with nearly 90% of these cases occurring in low- and middle-income countries. In India, as in many other developing nations, the burden of such disorders is increasing, particularly in southern regions where consanguineous marriages are more frequent. Brown-Vialetto-Van Laere syndrome (BVVLS) is a rare, progressive neurodegenerative disease caused by riboflavin transporter deficiency (RTD) that usually appears in late childhood or early adulthood, characterized by sensorimotor neuropathy, ataxia, profound muscle weakness, bulbar palsy, hearing loss, muscle wasting, and respiratory complications. The condition is linked to mutations in the SLC52A2 gene (encoding hRFVT-2) and SLC52A3 gene (encoding hRFVT-3), both of which play roles in riboflavin transport. To date, around 325 cases have been documented globally, including approximately 40 from India, suggesting a prevalence of roughly 1 per 1,000,000 individuals. Importantly, several studies show that high-dose riboflavin treatment (10–80 mg/kg/day) can significantly improve clinical symptoms and slow disease progression.

Albeit clinical studies have reported symptomatic improvement with riboflavin supplementation, a definitive cure remains unavailable. Gene therapy offers the potential for a more durable solution by directly correcting the underlying genetic defect, with the prospect of broader and more sustained recovery of neurological function. Recently, adeno-associated virus serotype 9 (AAV9) has been employed to deliver the SLC52A2 gene into patient-derived motor neurons. Follow-up in vitro studies using iPSCs from affected individuals demonstrated that this approach significantly increased neurite length in motor neurons, suggesting that gene therapy can effectively rescue cellular function and may represent a promising new treatment strategy. These discoveries have advanced research into riboflavin's therapeutic potential, extending its role beyond a traditional dietary supplement for correcting metabolic deficiencies to applications in gene therapy.

Session-10: GENE EDITING



Tan Meng How
Nanyang Technological University, Singapore

Development of Precision Genome and Transcriptome Engineering Technologies

The ability to modify genetic information in living cells holds tremendous promise for diverse biomedical and biotechnological applications. Both DNA and RNA can be targeted to affect cellular behavior. While DNA edits are enduring and thus useful for applications like permanent correction of disease-causing mutations and engineering of bespoke cell lines, RNA edits allow for applications that require tunable or transient perturbations and are also less risky since any off targets will not be fixed in the genome. In this talk, I will discuss some of our recent efforts to advance technologies to manipulate the genome and transcriptome of living cells precisely and efficiently using CRISPR-Cas and ADAR enzymes. Specifically, I will describe our endeavors to (1) develop small molecules that can enhance CRISPR-mediated homology directed repair, (2) improve existing DNA base and prime editors, and (3) engineer programmable RNA base editors that are both efficacious and specific. Our tools may enable the formulation of more effective or safer precision therapeutics for various human diseases.

Pradeepa Madapura
Queen Mary University of London, London, UK

Use of precision editing, PROTACs to investigate mechanism of neurodevelopmental disorders

Acetylation of histone lysines is one of the most prevalent modifications that alters chromatin structure and function. Gene mutations that disrupt the histone acetylation pathway result in numerous neurodevelopmental disorders, underscoring the need for further investigation to comprehend its specific role in the central nervous system. We have previously demonstrated that de novo mutations in BRD4 lead to a neurodevelopmental disorder.

We investigate the mechanism through which loss-of-function BRD4 mutations cause the neurodevelopmental phenotype. We utilise human embryonic stem cell (hESC)- derived neuronal differentiation systems and cerebral organoids, in combination with single-cell and bulk epigenomics approaches, to investigate the role of BRD4 in human brain development and function. For this purpose, we generated multiple independent hESCs with pathogenic BRD4 variants. Together, we tagged the degron tag (dTAG) to the BRD4 locus-mediated depletion and PROTAC approaches in human embryonic stem cells. I will present our findings that demonstrate how perturbation of transcriptional regulators, such as BRD4, alters chromatin structure and the gene expression programme in stem cells and the neuronal lineage.

Manish Jaiswal
Tata Institute of Fundamental Research, Hyderabad, India

DYRK1A, a Down Syndrome–linked gene, regulates mTOR signaling

DYRK1A is a kinase critical for brain development. An extra copy of DYRK1A is associated with the Down syndrome, while haploinsufficiency is linked to neurodevelopmental disorders. Through proteomic analyses, we identified an interaction between DYRK1A and the TSC complex, a key negative regulator of the mTOR pathway. We discovered that DYRK1A phosphorylates components of the TSC complex, thereby inhibiting its activity. As a result, DYRK1A promotes mTOR signaling by suppressing TSC-mediated inhibition. Although these findings were first established in cultured cells, we further validated them in vivo using Drosophila. The Drosophila homolog of DYRK1A, Minibrain (Mnb), positively regulates neuromuscular junction development via mTOR activation. Together, these results provide a mechanistic framework for understanding how DYRK1A contributes to brain development and link its dosage imbalance to neurological disorders.

Session-11: TECHNOLOGY ADVANCES

Minhaj Sirajuddin
BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India

Large-molecule discovery platform supporting fundamental and translational research

Surface display technology, combined with virtual screening, has become a powerful platform for identifying large molecules, such as scFv, nanobodies, and synthetic binders, that target diverse epitopes. This innovative approach leverages the strong genetic and metabolic capabilities of yeast cells to display a wide range of peptides and proteins on their surface, facilitating the direct selection of binding candidates against desired epitopes. In our lab, we use this large-molecule discovery platform to target various epitopes, demonstrating its advantages in producing specific binders for therapeutic and diagnostic purposes. Through multiple rounds of screening and selection, we can enhance the binding affinities and specificity to fine-tune the binding profiles of candidate molecules (scFv, nanobodies, and synthetic binders) against target epitopes. In this presentation, I will highlight the potential of our large-molecule discovery platform as a transformative tool for advancing basic science, as well as its potential in developing new therapeutic and diagnostic agents.

Sunil Laxman
BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India

Cadherin-dependent junction formation in driving metabolic reprogramming of cell clusters

Our lab works to understand the chemical logic and organizational principles of metabolic networks in cells. To understand this, we use interdisciplinary approaches – biochemical, genetic, systems level and computational - to study how cellular metabolic networks are organized, and to understand how cell states are controlled by metabolic states. An ongoing interest is to understand how cell states change as solitary cells come together to form clusters or groups. In this talk, I will present recent, unpublished work on role of adherens (Cadherin) junctions in driving early cell-state changes as cells form clusters. In particular, I will describe our recent findings on how the formation of cadherin junctions as cells form clusters drives a ubiquitous metabolic reprogramming, that controls cell states and the overall reductive capacity of cells in clusters. These findings suggest a general biochemical basis for the requirement of adherens junctions as cells form clusters in driving a reductive program, with implications for understanding multicellular organization. These also suggest how the use of controlled adhesion of cells can be used to engineer clusters of cells with specific biochemical capacity.

Dasaradhi Palakodeti
BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India

tRNA-Derived Small RNAs: Molecular Tuners of Stem Cell State

Post-transcriptional regulation by small RNAs has emerged as a key mechanism controlling stem cell maintenance and differentiation. In this talk, I will focus on a novel class of small RNAs—tRNA-derived small RNAs (tsRNAs)—that are upregulated during the differentiation of mouse embryonic stem cells. We show that tsRNAs regulate the transition from the pluripotent to the differentiated state by downregulating factors essential for stemness. Specifically, our work demonstrates that tsRNAs interact with RNA-binding proteins such as IGF2BP1 and displace ribosomes from c-myc mRNA, thereby repressing its translation and facilitating differentiation. I will also discuss how chemical modifications on tRNAs influence their cleavage into tsRNAs, and how distinct sets of tsRNAs are generated by multiple endoribonucleases to regulate both stem cell maintenance and lineage commitment. In summary, I will highlight how tsRNAs function as molecular "tuners" of stem cell fate, orchestrating critical state transitions.

Session-12: METABOLIC DISORDERS AND NOVEL THERAPEUTIC STRATEGIES

Nihal Thomas
Christian Medical College and Centre for Stem Cell Research (a unit of inStem, Bengaluru), Vellore, India

Diabetes In the Young in South Asia, the Pathogenesis, Differentials and the Road to Type 5 Diabetes

Prof Nihal Thomas MD MNAMS DNB (Endo) FRACP (Endo) FRCP (Edin) FRCP (Glasg) FRCP (London) FACP FAMS PhD (Copenhagen). Head, CSCR. Senior Professor, Department of Endocrinology, Diabetes and Metabolism,Principle Coordinator, Indian Council of Medical Research, Christian Medical College Vellore, India.
The Erstwhile condition which was termed as Malnutrition Modulated Diabetes for over 70 years was renamed Type 5 diabetes by the International Diabetes Federation in April 2025. Based on mounting epidemiological evidence over the last decade coupled with basic science related studies done the last 5 years, the disorder has now been defined with certain characteristics. It is a non-autoimmune form of diabetes, with a low BMI, which present in age groups generally less than 30-40 years of age, but uncommon in childhood. It is associated with insulinopaenia (which is significant but relatively less than Type 1 diabetes), low hepatic glucose output, potentially low incretin production, low hepatic fat content, normal pancreatic morphology and good peripheral sensitivity to insulin. An association with low protein intake both historically and from a perspective of current intake has been documented in several studies. This disorder appears to more prevalent in lower GDP regions of the world, particularly in tropical parts of Africa, Asia and South America. It appears that there is a good response to relatively smaller dosages of insulin, however around 40% of the patients have a positive response to oral antidiabetic agents. Much work remains to be done with regards to delineating the diagnostic criteria, response to diet and exercise, however, there may be suggestion that low carbohydrate intake with high protein may be of benefit. When considering the differential diagnosis, it is imperative that ruling out conditions such as Type 1 diabetes (Or slowly evolving immune mediated diabetes), structural pancreatic disorders (particularly fibrocalcific pancreatic diabetes mellitus), congenital lipodystrophy, HIV Associated lipodystrophy (in associated with HAART), certain forms of insulinopaenic MODY(MODY 5) and Wolframs like syndrome be considered. Tools for diagnosis include C peptide measurements, Type 1 related antibody measurements and Imaging of the pancreas (Particularly CT Scan) are mandated. Body composition studies (DXA or Bioimpedance) and genetic testing maybe used in further delineation of the disorder.

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Ullas Kothur-Seetharam
Centre for DNA Fingerprinting and Diagnostics, Hyderabad, India

Metabolic Orchestration of Cellular Reprogramming: Towards Harnessing Epigenetic and Mitochondrial Networks for Next-Generation Cell and Gene Therapies

Cellular reprogramming is governed by intricate metabolic circuits that integrate nutrient sensing, mitochondrial dynamics, and epigenetic control. Our research has identified key metabolic sensors that link cellular and organismal metabolism to epigenetic and mitochondrial changes. We have shown that oscillatory fed-fast cycles program anticipatory molecular responses through hepatic microRNAs, circadian regulation, and chromatin remodeling. Given this context, it is tantalizing to invoke metabolism-driven epigenetic landscapes that can be leveraged to boost stem cell potency, reprogramming efficiency, and transplant success. By integrating nutrient signaling with endogenous metabolic rhythms, we propose a next-generation framework for cell and gene therapies—one that mimics the physiological cycles to potentially enhance precision regenerative interventions.

Jayanta Bhattacharyya
Indian Institute of Technology Delhi,
New Delhi, India

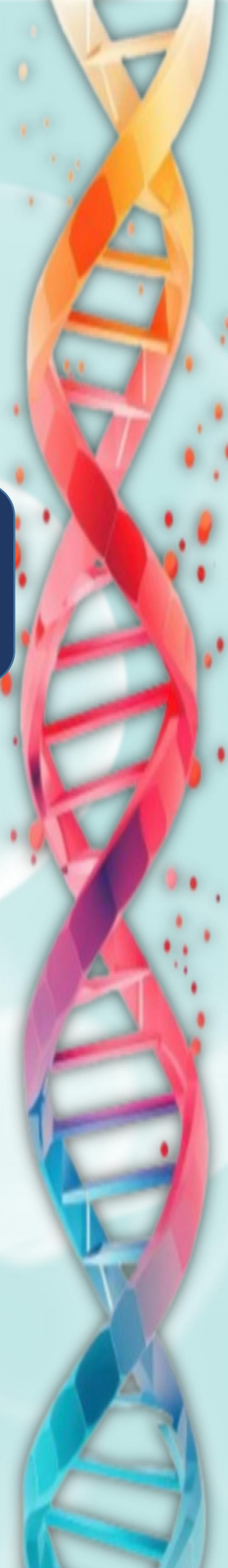
Boosting anti-cancer vaccine by "FORTY" fying immunity to achieve tumor free survival

DC-derived extracellular vesicles (DeX) present a promising alternative to traditional DC vaccines, offering enhanced anti-tumor efficacy and improved stability. DeX are naturally secreted by DCs and exhibit high levels of MHC-I and MHC-II molecules, allowing them to efficiently present tumor antigens and activate both CD8+ and CD4+ T cells. Furthermore, DC vaccines, involve the administration of live cells and face scalability and storage challenges, whereas, DeX are cell-free, more stable, and making them a practical and effective option for cancer immunotherapy. However, in tumors, the limited expression of tumor antigens and co-stimulatory molecules like CD40, CD86, and CD80 hampers the efficacy of cancer vaccines. Hence, this talk will describe a combinatorial approach of a CD40 agonist antibody (aCD40) with Dex to improve antigen presentation, and drive a strong anti-tumor immune response.

In our study, the combination treatment of aCD40 with DeX obtained from DCs pulsed with cancer cell lysates showed survival benefits in mice bearing melanoma with 40% of the treated mice remaining tumor-free. Combination treatment significantly increased the population of CD45+CD8+ T-cells and CD45+CD20+ B-cells, enhnced Th1/Th2 cytokine ratio within the tumor microenvironment while reducing PD-L1 expression compared to other groups. The treatment boosted systemic immunity in both the spleen and lymph nodes. Interestingly, mice bearing B16-F10 tumor which received the combination therapy exhibited decreased expression of metastasis-associated markers such as vimentin and fibronectin while showing elevated levels of E-cadherin, a marker of reduced metastatic potential. Furthermore, the group receiving the combination treatment showed a significantly reduced incidence of lung metastases compared to the other groups.

Together, these findings highlight the synergistic efficacy of aCD40 and DeX in enhancing anti-tumor immunity, suppressing metastatic progression, and improving overall survival. This combinatorial regime can be further investigated in clinical settings as an effective approach for the treatment of cancer.

Session-13: NEW FRONTIER OF CELL THERAPY



John Maher
King's College, London, UK

CAR T-cell immunotherapy of NKG2D-expressing solid tumours

NKG2D ligands (NKG2DL) are broadly expressed in cancer. To target these, we describe an adaptor chimeric antigen receptor (CAR) termed NKG2D/Dap10-12. Herein, T-cells are engineered to co-express NKG2D with a fusion protein that comprises Dap10 joined to a Dap12 endodomain. NKG2D/Dap10-12 T-cells elicit compelling efficacy, eradicating or controlling NKG2DL-expressing tumours in several established xenograft models. Importantly, durable responses, long-term survival and rejection of tumour re-challenge are reproducibly achieved. Efficacy is markedly superior to a clinical stage CAR analog, comprising an NKG2D-CD3z fusion. Structure function analysis using an extended CAR panel demonstrates that potency is dependent on membrane proximity of signalling units, high NKG2D cell surface expression, adaptor structure, provision of exogenous Dap10 and inclusion of one rather than three immune tyrosine activation motifs per signalling unit. Potent therapeutic impact of NKG2D/Dap10-12 T-cells is also underpinned by enhanced oxidative phosphorylation, reduced senescence and transcriptomic re-programming for increased ribosomal biogenesis.

To direct NKG2D-based adaptor CAR T-cells to solid tumour deposits, T-cells were engineered to co-express CXCR2. The resultant CAR T-cell product is termed LEU011 and is currently undergoing Phase 1 testing in patients with NKG2D-expressing solid tumours.

Akshay Sharma
St. Jude Children's Research Hospital, Memphis, USA

Gene therapy for sickle cell disease – current state and future directions

In this talk, Dr Sharma will discuss the results of recent clinical trials of autologous hematopoietic cell gene therapy for sickle cell disease. He will then share some insights from ongoing efforts to develop a gene editing technique using CRISPR-Cas9 editing of the globin locus. He will then conclude with a discussion of the current challenges in the field and efforts to address them.

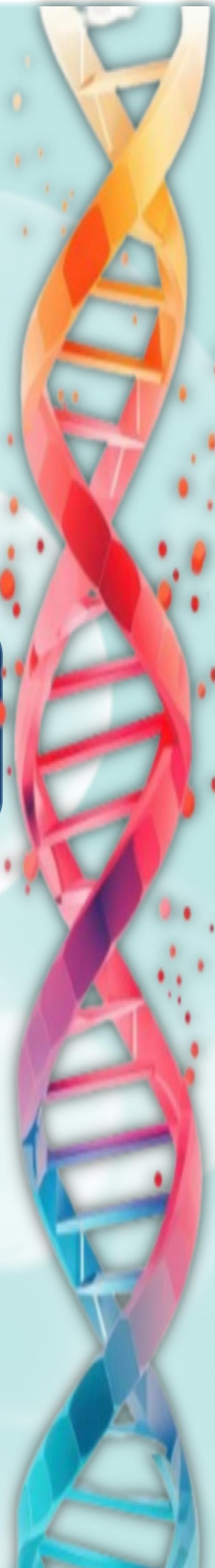
Timothy Henrich
University of California San Francisco, San Francisco, CA

A Lentiviral-Based Gene Modified Hematopoietic Stem Cells Approach for HIV-1 Cure Lead to Partial Protection of Uninfected Cells but also Leads to Ongoing Lentiviral RNA Expression, a Risk for Potential Persistent Inflammation

Approaches involving stem cell and gene therapies are on the forefront of HIV cure strategies. There is an urgent need, however, for in-vivo strategies that expand gene therapy beyond CCR5 modification to target multiple stages of HIV replication. Thus, we completed a Phase I clinical trial (AIDS Malignancy Consortium AMC-097), enrolling people with HIV on ART with lymphoma requiring an autologous transplant. Following BEAM conditioning, participants received autologous peripheral blood CD34+ stem cells transduced with a lentiviral 1TAX vector containing three HIV-resistance genes: CCR5 shRNA (block viral entry), chimeric human/macaqueTRIM5a gene (prevent capsid uncoating and reverse transcription), HIV TAR decoy (prevent transcriptional activation), CCR5 shRNA (block viral entry). Three cohorts of participants (total N=11) each receiving gene modified cells in a dose dependent ratio along with unmodified cells: 1:1, 5:1, 1:0 were enrolled. One participant underwent analytical treatment interruption for 42 months following SCT. Overall, successful and steady graphs were observed over the course of one to two years. On participant underwent ATI 42 months after gene modified autologous SCT. A transient 8-fold increase in gene marking was observed at seven weeks post-ATI. We also developed and implemented a novel single-cell-in-droplet digital PCR assay that co-quantifies 1TAX vector and HIV-1 DNA in individual CD4+ T cells and observed ~75% protection of cells with integrated vector during early (week 4) and later (week 7) ATI timepoints.

Despite promising results from this early phase clinical trial, we made several important observations that have potentially broad impact on lentiviral vector-based gene therapy approaches. First, we observed that the lentiviral vector leads to false positives in several industry/research-standard HIV-1 DNA and RNA assays necessitating the development of new viral quantitation platforms. We also observed that RNA expression of the lentiviral vector increased dramatically during ATI and also during tumor recurrence in another participants, even though this second participant was on stable ART. Lentiviral activity led to false positive HIV-1 load testing and unnecessary clinical changes. This may lead to ongoing systemic inflammation regardless of HIV-1 infection status.

Session-14: ADVANCES IN PRECISION THERAPEUTICS



Rajkumar Banerjee
CSIR-Indian Institute of Chemical Technology, Hyderabad, India

Glucocorticoid receptor: a potent target for drug sensitization, immuno-modulation in nano-therapeutic strategy for cancer

Glucocorticoid receptor (GR) is a ubiquitously expressed, cytoplasmic protein obtained in almost all cells, cancer or non-cancer. Logically, it is hence an unsuitable receptor candidate for selective targeting of cancer. The GR cognate ligands also called glucocorticoids are responsible for GR's activation/transactivation/deactivation and are well studied. GR is involved in gluconeogenesis, the alternate pathway to produce energy inducing carbohydrate, i.e., glucose, using non-carbohydrate precursors. But energetically cancer cells love glycolysis and prefers it over gluconeogenesis. Hypothetically, efficient targeting and instigation of cancer cell-associated GR could be a potential avenue to disrupt favourable energy metabolism within cancer. Using GR-targeted liposomal delivery system as a platform to carry a first generation drug, 5-FU and a GR-targeted, self-aggregating small molecule, we exhibited that drug-resistance and EMT in cancer cells as well as that in colon tumor mass, can be truly reversed to treat them efficiently with a better therapeutic index. Moreover, GR-targeted co-delivery of an antihelminthic drug, niclosamide could reengineer the fate of pro-tumorigenic myeloid derived suppressor cells (MDSC), thus reversing the immunological fate of tumor microenvironment and triggering efficient tumor regression. With a typical clinical sample data from two CLL patients, the platform technology exemplifies how personalized medicine combination against blood cancer patients can be efficiently screened, as well as how this unique platform technology repurposes multiple drugs to treat most, if not all phenotypes of cancer.

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Saravanabhavan Thangavel
Centre for Stem Cell Research (a unit of BRIC-Instem, Bengaluru), Christian Medical College Vellore, India

Gene edited hematopoietic stem cells for the gene therapy for beta-hemoglobinopathies

Gene therapy with gene-edited hematopoietic stem and progenitor cells (HSPCs) is emerging as a promising strategy for treating beta-hemoglobinopathies, including sickle cell disease (SCD) and beta-thalassemia. We have developed a dual-function gene editing approach that not only reactivates fetal hemoglobin but also suppresses the production of defective adult hemoglobin. In my talk, I will present our extensive pre-clinical characterization of this strategy and highlight its potential for future therapeutic applications. I will also discuss our methodological innovations aimed at significantly reducing the cost of generating these gene-edited stem cells.

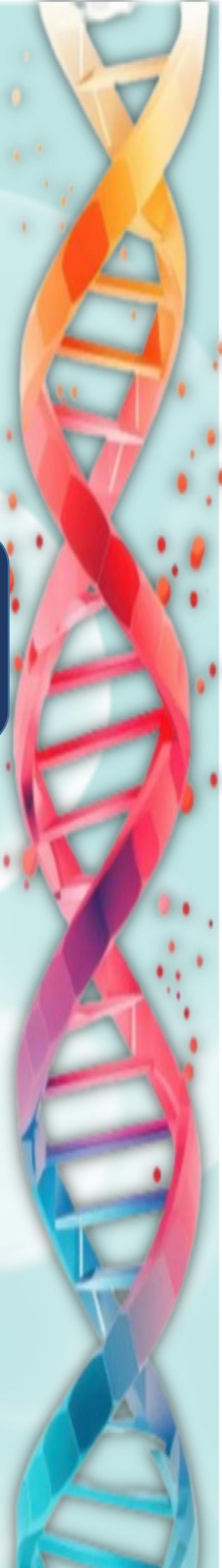
-

Srinivasarao Repudi
BRIC-Institute for Stem Cell Science and Regenerative Medicine, Bengaluru, India

AAV9-WWOX gene therapy, a promising treatment for children with WOREE syndrome

Germline biallelic mutations in WWOX cause WWOX-Related Epileptic Encephalopathy (WOREE) syndrome which is characterized by intractable epilepsy, severe developmental delay, ataxia and premature death at the age of 2-4 years. The existing epileptic drugs are refractory in children with WOREE syndrome. Targeted deletion of murine Wwox and a spontaneous Wwox mutation in rats (Lde) phenocopy the complex human neurological phenotypes including epileptic seizures, growth retardation, ataxia and post-natal lethality. However, the underlying cellular and molecular mechanisms of WWOX actions are poorly understood. I discovered that specific neuronal deletion of murine Wwox produces phenotypes typical of the Wwox-null mutation leading to brain hyperexcitability, spontaneous seizures, ataxia and postnatal lethality. Furthermore, Wwox-mutant mice exhibited reduced maturation of oligodendrocytes, reduced myelinated axons and impaired axonal conductivity. These findings provide cellular and molecular evidence for myelination defects and hyperexcitability in the WOREE syndrome linked to neuronal function of WWOX. Restoration of neuronal WWOX expression (AAV-SynI-WWOX) in neonatal Wwox-null mice, rescued brain hyperexcitability, seizures, hypomyelination, premature lethality and behavioral deficits. These proof-of-concept studies lay down the groundwork for WWOX gene therapy as a promising approach to treat children with devastating and refractory WOREE syndrome.Abstract: Germline biallelic mutations in WWOX cause WWOX-Related Epileptic Encephalopathy (WOREE) syndrome which is characterized by intractable epilepsy, severe developmental delay, ataxia and premature death at the age of 2-4 years. The existing epileptic drugs are refractory in children with WOREE syndrome. Targeted deletion of murine Wwox and a spontaneous Wwox mutation in rats (Lde) phenocopy the complex human neurological phenotypes including epileptic seizures, growth retardation, ataxia and post-natal lethality. However, the underlying cellular and molecular mechanisms of WWOX actions are poorly understood. I discovered that specific neuronal deletion of murine Wwox produces phenotypes typical of the Wwox-null mutation leading to brain hyperexcitability, spontaneous seizures, ataxia and postnatal lethality. Furthermore, Wwox-mutant mice exhibited reduced maturation of oligodendrocytes, reduced myelinated axons and impaired axonal conductivity. These findings provide cellular and molecular evidence for myelination defects and hyperexcitability in the WOREE syndrome linked to neuronal function of WWOX. Restoration of neuronal WWOX expression (AAV-SynI-WWOX) in neonatal Wwox-null mice, rescued brain hyperexcitability, seizures, hypomyelination, premature lethality and behavioral deficits. These proof-of-concept studies lay down the groundwork for WWOX gene therapy as a promising approach to treat children with devastating and refractory WOREE syndrome.

Session-15: Industry Updates



Renjitha Gopurappilly
NKure Therapeutics Pvt Ltd (CCAMP),Bengaluru,
Miltenyi Biotec

Affordable Off-the-Shelf Natural Killer cell therapies for cancers

I would like to present a brief overview of two promising cell therapy candidates in our company's pipeline. The first is an autologous activated NK cell therapy designed for minimal residual disease in colorectal cancer, for which we are awaiting approval from the Central Drugs Standard Control Organization (CDSCO), Govt of India for a Phase II trial. The second is an allogeneic and cryopreserved NK cell product, intended for use as an off-the-shelf therapy in combination with monoclonal antibodies or NK cell engagers across a range of indications.

Vadiraja Bhat
Agilent Technologies India Pvt Ltd.

Driving CAR T Cell Innovation with Agilent's Integrated Analytical Platforms

Chimeric Antigen Receptor (CAR) T cell therapies have revolutionized cancer immunotherapy, demonstrating remarkable efficacy in treating certain hematologic malignancies. However, the complexity of CAR T cell design, engineering, and manufacturing demands advanced analytical tools to ensure comprehensive characterization and stringent quality control throughout the development lifecycle. This talk highlights how Agilent's cutting-edge analytical platforms support the evaluation of CAR T cells from early discovery through to commercial manufacturing. Leveraging technologies such as flow cytometry, cell imaging, RTCA, metabolic assay platform and LC-MS, Agilent enables precise assessment of critical quality attributes (CQAs) like CAR expression, transduction efficiency, cell viability, phenotype, and potency. By integrating these powerful analytical capabilities, Agilent facilitates process optimization, comparative studies, and regulatory compliance—ultimately contributing to the safety, consistency, and therapeutic success of CAR T cell products.

Anisha Polley Sikder
Krishgen Biosystems Private Limited

Cytokine Profiling in Cell & Gene Therapy: Bridging Mechanistic Insight and Translational Impact

Cytokine monitoring is already embedded in the vocabulary of cell and gene therapy (CGT). The challenge for today's scientists is not whether to measure cytokines, but how to extract mechanistically meaningful and translationally actionable information from complex cytokine networks. As CGTs extend beyond hematological malignancies into solid tumors and CNS indications, cytokine biology is revealing layers of complexity that traditional monitoring approaches struggle to capture.

This talk will highlight three frontiers where cytokine profiling is poised to advance the CGT field. First, the role of cerebrospinal fluid (CSF) cytokine signatures in illuminating immune effector cell–associated neurotoxicity (ICANS), a bottleneck in CAR-T and other oncology therapies. CSF offers a more proximal view of CNS immune dynamics than serum, yet remains underutilized due to technical sensitivity barriers. By overcoming the limitations of serum-based monitoring, CSF-focused cytokine assays provide a distinct and innovative perspective for understanding CGT-associated neurotoxicity. Second, the importance of precise quantification of individual cytokines — such as IL-6, IL-1β, IFN-γ, TNF-α, and GM-CSF — in understanding immune cell persistence, exhaustion, and tumor microenvironment interactions. Third, the challenge of standardization across assays and laboratories, where variability in sensitivity, matrix interference, and reproducibility continues to limit the translational value of cytokine data.

We will share perspectives on how validated, high-sensitivity ELISA assays for CSF and serum/plasma can help address these bottlenecks, enabling more reliable biomarker discovery and translational consistency. Case examples will illustrate how single-analyte cytokine measurements can stratify risk of ICANS, refine safety windows in early trials, and link immune signatures to therapy persistence. This talk will address the intersection of mechanistic discovery and translational application, this session will highlight how rigorous cytokine profiling enables safer, more effective, and reproducible development of next-generation oncology CGTs.

Prathap Naidu
Thermo Fisher Scientific

From Discovery to Cure: Bridging the gap between Innovation and Application

Chimeric Antigen Receptor (CAR) technology has transformed the way we approach certain cancers, offering new hope where conventional treatments may have limited success. By harnessing the body's own immune system—specifically T cells—and equipping them with a custom-designed CAR "payload," we can enable these cells to recognize and attack cancer with remarkable precision. Over the years, innovations have addressed many of the early challenges, making CAR T cell therapy safer, more efficient, and more widely applicable.

In this session, we will walk through the latest advances in the development and manufacturing of CAR T cell therapies—from the isolation of T cells to their precise engineering, and finally to large-scale expansion. We will also explore how the workflow solutions from Thermo Fisher Scientific, such as the CTS Rotea, DynaCellect and Xenon electroporation system, can streamline and accelerate cell therapy manufacturing. The goal is to provide a practical and end-to-end view of the CAR T cell workflow, bridging cutting-edge science with real-world applications, and highlighting how these advancements can help bring life-changing therapies to patients

Priti Warke
HiMedia Laboratories

Turning Biology For Therapy : MSc's , T cells and and 3D Cell Culture

Cell and Gene therapy has revolutionized the treatment of certain blood cancers and Some solid cancers too. but faces significant challenges when it comes to import for registrations and Cost. Himedia having 50 years having experience in media production for Microbiology and 30 years in Cell culture media now stepped into CGT and Cell therapy segment. CellBiology department of Himedia is prepared to turn Basic Biology into Therapies by producing valuable indigenous media, and Cytokines for T cells, Mesenchymal Stem cells and 3D Cell culture for Drug studies. With its New CGMP manufacturing facility, Himedia is ready for Cutomised CGT media production and ready to serve the global CGT community by reducing the production cost .

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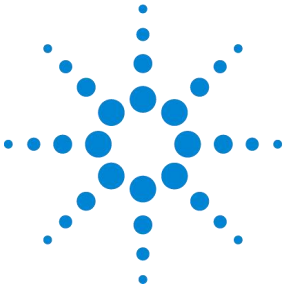

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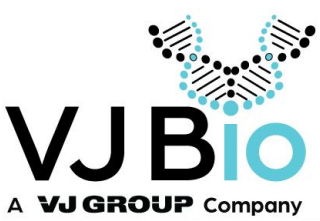

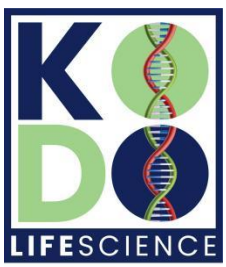

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