The George and Angelina Kostas Research Center for Cardiovascular Nanomedicine Symposium

and

8th Annual NIH PCTC CARDIOVASCULAR BIOENGINEERING Symposium

May 22-25, 2024

Houston Methodist Research Institute

6670 Bertner, 2nd Floor John F. Bookout Auditorium (R2-306) Houston, TX 77030



8th Annual NIH PCTC CARDIOVASCULAR BIOENGINEERING SYMPOSIUM

In partnership with The George and Angelina Kostas Research Center for Cardiovascular Nanomedicine Symposium

WEDNESDAY, MAY 22, 2024 | 7:30 a.m. - 6:30 p.m.

AGENDA

7:30 - 8:15 a.m. Registration and Breakfast Reception
8:15 - 8:45 a.m. Welcome Remarks

H. Dirk Sostman, MD, FACR

Ernest Cockrell, Jr. Presidential Distinguished Chair EVP & Chief Academic Officer President & CEO Houston Methodist Academic Institute



Jianyi (Jay) Zhang, MD, PhD, FAHA

T. Michael and Gillian Goodrich Endowed Chair of Engineering Leadership Chair, Department of Biomedical Engineering Professor of Medicine and Engineering School of Medicine, School of Engineering The University of Alabama at Birmingham



John P. Cooke, MD, PhD

Joseph C. Walter and Carole Walter Looke Presidential Distinguished Chair Professor and Chair, Department of Cardiovascular Sciences Director, Center for Cardiovascular Regeneration Medical Director, Center for RNA Therapeutics Chief Translational Officer, Houston Methodist Research Institute

WEDNESDAY, MAY 22, 2024

SESSION 1: Keynote Speakers

8:45 – 9:15 a.m.	The Martha and D. Gibson Walton Lecture in Translational Research RNA Therapeutics in Cardiovascular Medicine Victor J. Dzau, MD
	President, U.S. National Academy of Medicine
	Vice Chair, U.S. National Research Council
	Chancellor Emeritus and James B. Duke Distinguished Professor of Medicine
	Professor, Pathology, Duke University School of Medicine
9:15 – 9:45 a.m.	Engineering Human Cardiovascular Tissues for Medical Impact Gordana Vunjak-Novakovic, PhD
	University Professor Mikati Foundation Professor of Biomedical Engineering and Medical Sciences Professor, Dental Medicine, Columbia University
9:45 a.m.	Coffee Break
SESSION 2:	Bioengineered Translational Model Systems
	Session Chairs: Francisco Altamirano, PhD and Xander Wehrens, MD, PhD
9:55 a.m.	Engineering 3D Microvasculature for Disease Modeling Ying Zheng, PhD
	Associate Professor, Bioengineering, University of Washington
10:20 a.m.	Artificial Intelligence-Enabled Vascularized Biological Systems Abhishek Jain, PhD
	Associate Professor, Biomedical Engineering, Affiliated Faculty, Medical Physiology Texas A&M University
10:45 a.m.	Multi-laminar Tissue Constructs to Evaluate Aortic Valve Pathophysiology K. Jane Grande-Allen, PhD
	Isabel C. Cameron Professor of Bioengineering, Rice University
11:10 a.m.	Vascularized Tumor Microenvironments for Drug Testing Christopher C. W. Hughes, PhD
	Chancellor's Professor, Molecular Biology and Biochemistry School of Biological Sciences Professor, Biomedical Engineering, Henry Samueli School of Engineering, University of California, Irvine
11:35 a.m.	Versatility of Extracellular Matrix Cues for Regulating Both Endothelial Differentiation and De-differentiation Ngan Huang, PhD
	Associate Professor, Cardiothoraic Surgery, Stanford University

WEDNESDAY, MAY 22, 2024

Luncheon Seminar: Satellite Symposium NovoNordisk

Welcome and Introduction: Miguel Valderrabano, MD, PhD

12:05–12:20 p.m. Gene Editing Strategy to Prevent Engraftment Arrhythmia Following Cardiac Remuscularization Therapy Silvia Marchiano, PhD Acting Instructor, University of Washington

12:20 – 12:35 p.m. Manipulating Cell Product Before and After Engraftment to Solve Engraftment Arrhythmias James Chong, PhD, FRACP, MBBS Co-director Centre, Heart Research and Head Cardiac Regeneration Laboratory, Westmead Institute for Medical Research Professor, Cardiovascular Medicine, University of Sydney Cardiologist, Westmead Hospital

12:20 – 12:35 p.m. How Big a Barrier is Engraftment Arrhythmia to Clinical Translation of Cell Therapies? An Electrophysiologist's Perspective Miguel Valderrabano, MD, PhD Lois and Carl Davis Centennial Chair I, DeBakey Heart & Vascular Center Program Director, Clinical Cardiac Electrophysiology Fellowship, Department of Cardiology Professor, Cardiology Houston Methodist

12:20 – 12:35 p.m. Panel Discussion and Q&A Facilitator: Miguel Valderrabano, MD, PhD

Junior Faculty and Trainee Symposium: Research Highlights

Chairs: **Anahita Mojiri, PhD** and **Li Lai, PhD** Talks selected from meritorious abstracts (10 min. presentation, 5 min. discussion)

1 – 1:15 p.m.	Epigenetic Factors as Drivers of Cardiac Reprogramming Glynnis Garry, MD UT Southwestern Medical Center
1:15 – 1:30 p.m.	New Cell-Cycle-Specific Autoencoding Defines Cycling Cardiomyocy

- 1:15 1:30 p.m. New Cell-Cycle-Specific Autoencoding Defines Cycling Cardiomyocyte Clusters in Non-Human Models snRNA-seq Data Yuji Nakada, PhD University of Alabama at Birmingham
- 1:30 1:45 p.m. Lymphangiogenesis on Chip James Tronolone, MS Texas A&M University
- 1:45 2 p.m. CD36-Retinoic Acid-FABP5-PPARō Signaling Axis Modulates Cardiomyocytes' Ability to Proliferate in Non-Human Models Abou Bakr Salama, PhD Baylor College of Medicine

WEDNESDAY, MAY 22, 2024

SESSION 3:	Cardiovascular Physiology and Bioengineering in Space Session Chairs: Alessandro Grattoni, PhD and Abishek Jain, PhD
2 p.m.	Overview of the Opportunities for Discovery in Space Dorit Donoviel, PhD
	Director, Translational Research Institute for Space Health Associate Professor, Center for Space Medicine, Baylor College of Medicine
	Associate Professor, Center for Space Medicine, Baylor College of Medicine
2:25 p.m.	Challenges of the Cardiovascular System in Space Jennifer Fogarty, PhD
	Chief Scientist, Translational Research Institute for Space Health
	Asistant Professor, Center for Space Medicine
	Baylor College of Medicine
2:50 p.m.	Exosomes in Space and Cardiovascular Risk
	David Goukassian, MD, PhD
	Professor, Medicine, Cardiovascular Research Institute
	Icahn School of Medicine, Mount Sinai
3:15 p.m.	Rgenerative Medicine Using Space
	Alessandro Grattoni, PhD
	Chair, Department of Nanomedicine, Houston Methodist Research Institute
	Professor of Nanomedicine, Houston Methodist Academic Institute
3:40 p.m.	Bioengineering in Space
	Lynn Harrison, PhD
	Deputy Program Scientist, Space Biology, Biological and Physical Sciences Division
	Science Mission Directorate
	NASA
4:05 – 6:30 p.m.	Poster Presentations
	Refreshments Served
	Beverages and Snacks
7 – 10 p.m.	Faculty Dinner for Speakers and Moderators

THURSDAY, MAY 23, 2024

7:30 – 8:30 a.m.	Breakfast Reception
SESSION 4:	Update on Clinical Trials Session Chairs: Jianyi (Jay) Zhang, MD, PhD and Ali Marian, MD
8:30 a.m.	The POSEIDON-DCM Trial Josh M. Hare, MD, FAAC, FAHADirector, Donald Soffer Endowed Program in Regenerative Medicine Chief Science OfficerSenior Associate Dean for Experimental & Cellular Therapeutics Louis Lemberg Professor of Medicine (Cardiology)
8:55 a.m.	Heart Repair with Tissue Engineered Biological Ventricular Assist Tissue Wolfram-Hubertus Zimmermann, MD Director, Institute of Pharmacology and Toxicology Professor, Pharmacology University Medical Center Göttingen
9:20 a.m.	The CATO Trial: A Phase IIA, Randomized, Double-Blind, Placebo-Controlled, Multicenter Study Roberto Bolli, MD, FAHA, FACC Professor, Medicine, Physiology and Biophysics University of Louisville School of Medicine
9:45 a.m.	Coffee Break
SESSION 5:	Computational Modeling & Simulations for Cardiovascular Architecture and Regeneration

Session Chairs: Guangyu Wang, PhD and Longhou Fang, PhD

10:25 a.m.	Stem Cells, Genomics, and Clinical Trial in Dish Joseph C. Wu, MD, PhD Simon H. Stertzer, MD, Professor of Cardiovascular Medicine and Radiology Director, Stanford Cardiovascular Institute Standford Medicine
10:50 a.m.	Molecular Control of Cardiac Regeneration: Insights from Evolution Guo Huang, PhD Associate Professor, Cardiovascular Research Institute, University of California Department of Physiology, Cardiovascular Research Institute, University of California San Francisco

11:15 a.m.Engineering the microvasculature
Shayn M. Peirce-Cottler, PhD
Professor and Chairman, Department of Biomedical Engineering, University of Virginia

THURSDAY, MAY 23, 2024

11:40 a.m.	Transfer Learning to Enable Predictions in Network Biology Christina V. Theodoris, MD, PhD Assistant Professor, Gladstone Institute of Cardiovascular Disease and Gladstone Institute of Data Science and Biotechnology, University of California San Francisco
12:05 p.m.	RNA Velocity and RNA Landscape: Insights into the Etiology and Novel Therapeutic Avenues for Heart Failure Guangyu Wang, PhD Assistant Professor, Cardiovascular Sciences, Houston Methodist
12:30 p.m.	Computational Modeling & Simulations for Cardiovascular Architecture and Regeneration Ken Chen, PhD Professor, Bioinformatics and Computational Biology The University of Texas MD Anderson Cancer Center
12:55 – 2:30 p.m.	Lunch Break

Luncheon Seminars:

Meet The FDA - Strengthening Regulatory Science to Advance Medical Countermeasure Development Tracy MacGill, PhD, CAPT, USPHS
Director, MCM Regulatory Science, Office of Counterterrorism and Emerging Threats, Office of the Chief Scientist, Office of the Commissioner U.S. Food and Drug Administration
Meet The Dean
Training a diverse and innovative generation of "Physicianeers" Roderic I. Pettigrew, MD, PhD
Inaugural Dean of the School of Engineering Medicine
Texas A&M University in collaboration with Houston Methodist
HumanN Symposium
The Role of Nitric Oxide in Cardiovascular Regeneration John P. Cooke, MD, PhD
Joseph C. Walter and Carole Walter Looke Presidential Distinguished Chair
Professor and Chair, Department of Cardiovascular Sciences
Director, Center for Cardiovascular Regeneration
Medical Director, Center for RNA Therapeutics
Chief Translational Officer, Houston Methodist Academic Institute

THURSDAY, MAY 23, 2024

SESSION 6:	Metabolite, Epigenetics, and Cardiovascular Regeneration Session Chairs: Reza Ardehali, MD, PhD and Keith Youker, PhD
2:15 p.m.	Cells and Cell-Products for Myocardial Repair in Large Animal Models Jianyi (Jay) Zhang, MD, PhD, FAHA T. Michael and Gillian Goodrich Endowed Chair of Engineering Leadership Chair, Department of Biomedical Engineering Professor of Medicine and Engineering School of Medicine School of Engineering The University of Alabama at Birmingham
2:40 p.m.	Protein Translation Control in Cardiac Hypertrophy Yibin Wang, PhD Professor, Medicine, Duke University, Duke NUS: Medical School, Singapore
3:05 p.m.	HFpEF: Metabolism and Meta-inflammation Joseph A. Hill, MD, PhD Director, Harry S. Moss Heart Center Professor, Internal Medicine and Molecular Biology The University of Texas Southwestern Medical Center
3:30 p.m.	Coffee Break
SESSION 7:	Biomaterials for CV Regeneration Session Chairs: Abhishek Jain, PhD and Gang Bao, PhD
3:55 p.m.	Bioprinting a Human Heart Mark Skylar-Scott, PhD Assistant Professor, Bioengineering, Basic Science and Engineering Initiatives Betty Irene Moore Children's Heart Center, Standford Medicine
4:20 p.m.	Regenerating Lymphatic Vessels and Valves Feng Zhao, PhD Associate Professor, Department of Biomedical Engineering, Texas A&M University
4:45 p.m.	Reconstructing Organotypic Vasculature from Human iPSCs Mingxia Gu, MD, PhD Assistant Professor, UC Department of Pediatrics Cincinnati Children's Hospital Medical Center
5:10 p.m.	Imaging Atherosclerosis Laura Marcu, PhD Director, NIH-NIBIB National Center for Interventional Biophotonics Technologies Professor, Biomedical Engineering and Neurological Surgery, University of California, Davis

Banquet & Awards

7 – 10 p.m. Houston Museum of Natural Science

FRIDAY, MAY 24, 2024

7:30 – 8:30 a.m.	Breakfast Reception
SESSION 8:	Genome Editing in Cardiovascular Regeneration Session Chairs: Gang Bao, PhD and Wolfram-Hubertus Zimmerman, MD
8:30 a.m.	Gene Editing in the Treatment of Hyperlipidemia and Atherosclerosis William R. Lagor, PhD Professor, Integrative Physiology, Baylor College of Medicine
8:55 a.m.	Mechanisms and Genetic Strategies to Promote Cardiac Xenotransplantation Daniel Garry, MD, PhD Professor, Medicine, University of Minnesota Medical School
9:20 a.m.	Genome Editing Based Approaches for Treating Cardiovascular and Blood Diseases Gang Bao, PhD Professor and Chair, Biomedical Engineering, Rice University
9:45 a.m.	Long-Range Genome Engineering in Human Cells With CRISPR-Cas3 Yan Zhang, PhD Assistant Professor, Biological Chemistry, University of Michigan Medical School
10:10 a.m.	Coffee Break
SESSION 9:	Blood Vessel and Metabolic Disease Session Chairs: Jun-ichi Abe, PhD and Mikhail Kolonin, PhD
10:30 a.m.	Vascular Senescence and Dysmetabolic State Mikhail Kolonin, PhD Harry E. Bovay, Jr. Distinguished University Chair in Metabolic Disease Research Professor and Director, Center for Metabolic and Degenerative Diseases The University of Texas Health Science Center
10:55 a.m.	Angiogenic Transdifferentiation in Ischemic Tissues John P. Cooke, MD, PhD Chair and Professor, Cardiovascular Sciences Director Center for Cardiovascular Regeneration Medical Director, Center for RNA Therapeutics, Houston Methodist Research Institute
11:20 a.m.	Pathological Angiogenesis and Therapeutic Approaches Napoleone Ferrara, MD Distinguished Professor, Ophthalmology and Pathology, Senior Deputy Director for Basic Sciences UCSD Moores Cancer Center, University of California San Diego
11:45 p.m.	Bioengineering the Lymphatics in Hypertension Ying-Nan Bai, MD Associate Professor, Cardiology, Zhongshan Hospital, Fudan University, Shanghai Institute of Cardiovascular Diseases

Concurrent Luncheon Seminars:

12:30 – 1 p.m.	Advances in Engineering Human Heart, Lung and Vascular Models of Disease Joan Nichols, PhD
	Director, Regenerative Medicine Program, Houston Methodist Research Institute
1 – 1:30 p.m.	Surgeon Scientists Leading Cardiovascular Device Development Shock Wave Therapy – Johannes Holfeld, MD
	Clinician and Staff Surgeon, University Clinic of Cardiac Surgery Founder and Head CARE Cardiac Regeneration Research Group
1:30 – 2 p.m.	Next Gen Artificial Heart – William E. Cohn, MD Chief Medical Officer, BiVACOR Inc.
	Executive Director, Center for Device Innovation, Texas Medical Center Professor of Surgery, Baylor College of Medicine

SESSION 10: Insights Gained from Reprogramming to a Cardiovascular Fate Session Chairs: John P. Cooke, MD, PhD and Li Lai, PhD

2 p.m.	Single Cell Omics Approach to Study Somatic Cell Reprogramming to Cardiomyocytes
	Qian Li, PhD
	Associate Professor, Pathology and Laboratory Medicine
	University of North Carolina
2:25 p.m.	Insights into Polycystic Kidney from iPSC-derived Cardiomyocytes
	Francisco Altamirano, PhD
	Assistant Professor, Cardiovascular Sciences
	Houston Methodist Research Institute
2:50 p.m.	Modulation of Cardiovascular Cell Fate by Extracellular Matrix
	Brenda Ogle, PhD
	Professor and Department Head, Biomedical Engineering College of Science and Engineering
	University of Minnesota
3:15 p.m.	The Impacts of Microenvironment on Direct Cardiac Reprogramming
	Reza Ardehali, MD, PhD
	Professor and Chief of Cardiology
	Baylor College of Medicine
3:40 p.m.	Epigenetic Determinants of Direct Cardiac Reprogramming
ł	Yang Zhou, PhD
	Assistant Professor, Biomedical Engineering
	The University of Alabama at Birmingham

GEORGE AND ANGELINA KOSTAS RESEARCH CENTER FOR CARDIOVASCULAR NANOMEDICINE SATURDAY, MAY 25, 2024

7:30 – 8 a.m.	Breakfast Reception
8 – 8:15 a.m.	Event Check-In
8:15 – 9 a.m.	Keynote Lecture
	ARPA-H – Advancing Bold Cardiovascular Breakthroughs Ryan Spitler, PhD Program Manager, Health Science Future, ARPA-H
SESSION 11:	Nanomedicine for the Treatment of Cardiovascular Disease Session Chairs: John P. Cooke, MD, PhD and Kristopher Brannan, PhD
9:05 a.m.	In Vivo High Throughput Screening Approaches for Extrahepatic, Tissue-Specific Nucleic Acid Delivery Vehicles Kristopher W. Brannan, PhD
	Assistant Professor, Cardiovascular Sciences and The Center for RNA Therapeutics, Houston Methodist
9:30 a.m.	Secretome as Diagnostic and Therapeutic Tool for Cardiac Therapies Carmen Sucharov, PhD
	Professor, Cardiology, University of Colorado Denver
9:55 a.m.	Coffee Break
SESSION 12:	Advances in RNA Nanoengineering Session Chairs: Alessandro Grattoni, PhD and Ewan McRae, PhD
10:15 a.m.	Engineering Highly Stable RNA Nanoparticles Junhua Mai, PhD
	Assistant Research Professor, Nanomedicine, Houston Methodist Academic Institute
10:40 a.m.	Circular RNA and its Therapeutic Potential Daniel Kiss, PhD
	Assistant Professor, Cardiovascular Sciences, Houston Methodist Academic Institute
11:05 a.m.	RNA Origami and Therapeutic Applications Ewan McRae, PhD
	Assistant Professor, Cardiovascular Sciences, Center for RNA Therapeutics, Houston Methodist
11:30 p.m.	Engineering New Nanoparticles for Better Drug Delivery Henry J. Pownall, PhD
	Sanford I. Weill and Antonio M. Grotto Jr., MD Centennial Chair in Translational Biomedical Sciences Education Professor, Biochemistry in Medicine
	Houston Methodist Academic Institute Weill College Medical College

SESSION	13: Nanomedicine-Based Therapies Session Chairs: Alessandro Grattoni, PhD and Biana Godin, PhD
2:30 p.m.	RNA Nanotherapeutic for Skin Regeneration Biana Godin, MScPharm, PhD
	Associate Professor, Nanomedicine, Houston Methodist Academic Institute Weill Cornell Medical College
2:55 p.m.	RNA Nanoparticle Delivery for Vascular Regeneration Yun Fang, PhD, FAIMBE, FAHA
	Associate Professor, Medicine Co-Director, Research Training in Respiratory Biology Program, Medicine University of Chicago
3:20 p.m.	In Vivo Delivery Systems for Genome Editing Tools YouYang Zhao, PhD
	William G. Swartchild, Jr. Distinguished Research Professor
	Director, Program for Lung and Vascular Biology Head, Injury Repair and Regeneration Research, Stanley Manne Children's Research Institute Ann & Robert H. Lurie Children's Hospital of Chicago
	Professor, Pediatrics, Medicine (Pulmonary and Critical Care Medicine and Pharmacology) Northwestern University Feinberg School of Medicine
3:45 p.m.	Kostas Strategic Impact Project Presentations
	Session Chair: Alessandro Grattoni, PhD
	Co-Investigators 1: 8 min.

- Co-Investigators 2: 8 min.
- Co-Investigators 3: 8 min.

Shark Tank Session: Cardiovascular Nanomedicine

4:10 – 4:55 p.m.	Introduction of J John P. Cooke, MI			
	Shark Tank Judges:	Alessandro Grattoni, PhD, Houston Methodist Christopher Lincoln, PhD, Houston Methodist John Schultz, Houston Methodist Ryan Spitler, PhD, Health Science Futures, ARPA-H		
	Shark Tank Competitors:			
		Team 1: 15 min. (5-minute pitch; 10 min. Q&A)		
		Team 2: 15 min. (5-minute pitch; 10 min. Q&A)		
		Team 3: 15 min. (5-minute pitch; 10 min. Q&A)		
5:00 – 5:10 p.m.	Shark Tank Award Announcement Session Chair: John P. Cooke, MD, PhD			
5:10 – 5:15 p.m.		s and Adjournment D, PhD and Alessandro Grattoni, PhD		

NOTES

Thank You To Our Sponsors

George and Angelina Kostas Research Center for Cardiovascular Nanomedicine



human<mark>n</mark>



() avantor



HISTOWIZ





Many thanks to the following individuals for their help organizing this meeting

CVBE Scientific Organizing Committee

John Cooke, MD, PhD (Jianyi (Jay) Zhang, MD, PhD (Abishek Jain, PhD V Gang Bao, PhD Longhou Fang, PhD Ali Marian, MD Michael McShane, PhD Roderic Pettigrew, MD, PhD Xander Wehrens, MD, PhD Wolfram-Hubertus Zimmerman, PhD

Chairman Co-Chairman Vice-Chair Houston Methodist University of Alabama at Birmingham Texas A & M University Rice University Houston Methodist UT Health Sciences Texas A & M University Texas A & M University Baylor College of Medicine George August University Gottingen

CVBE Local Organizing Committee

John Cooke, MD, PhD, Abishek Jain, PhD, Franscico Altamirano, PhD Reza Ardehali, PhD Longhou Fang, PhD Chair Vice-Chair Houston Methodist Texas A & M University Houston Methodist Baylor College of Medicine Houston Methodist

CVBE Administrative Organizing Committee

Nelcy J. Ramirez, MBA Elizabeth Davis, PhD Michael Borkert Trevor Burt, MS, EdD Rene Castillo Doris Huang Dora LeBlanc Joseph Caleb Morgan, MBA Amanda Mureva Sheryl E. Taylor Bennet Van Meter Martin Vu, MHA Chair Co-Chair



Visit cvbe2024tmc.org for more information.



