ENGINEERING VASCULARIZATION

JOHNS HOPKINS 2017 NANO-BIO SYMPOSIUM

JOHNS HOPKINS
INSTITUTE *for*
NANOBIOTECHNOLOGY

ORGANIZED BY INBT AND THE
PHYSICAL SCIENCES-ONCOLOGY CENTER

WELCOME

Welcome to the Johns Hopkins Institute for Nano-BioTechnology's (INBT) 11th annual symposium. The theme of this year's meeting is Engineering Vascularization and is jointly sponsored by INBT and the Johns Hopkins Physical Sciences-Oncology Center (PSOC).

Blood vessels provide life-giving nutrients to both natural or engineered tissue, but they also provide a conduit by which tumors can thrive. The challenge of vascularization is that we want blood vessels to grow to support the repair of diseased or damaged tissue, while in other cases, we want to limit their growth to prevent disease spread. Today our faculty expert presenters will explore many aspects of vascularization, from understanding the microenvironment inside tumors to improving the vascularization of engineered tissues.

The challenge of vascularization is ongoing and requires the collaborative efforts of researchers in biomedical engineering, the basic sciences and medicine. Our speakers represent thought leaders in their respective fields who understand that the solutions to the puzzle of encouraging blood vessel formation in one instance while arresting them in another must come from a multidisciplinary team approach. We hope that you will gain a deeper understanding of engineering vascularization as it relates to programing stem cells and reprogramming the frameworks upon which blood vessels grow, as well as to the success of grafted engineered tissues or biomaterials and regenerative medicine. Many of our talks today will also address how vascularization impacts the growth and spread of cancerous tumors.

Thank you for joining us for our talks this morning. We also hope that you will join us for our poster sessions this afternoon, which showcase current research from INBT and PSOC affiliated laboratories from divisions across the University. The graduate students and postdocs (and in some cases, undergraduates) who present their posters here all value your questions and feedback on their research, so we encourage you to stay and talk with them. Finally, if there is anything we can do to make your visit with us today more pleasant, please don't hesitate to ask one of us or an INBT staff member or volunteer.

Sharon Gerecht, PhD
Director
Professor ChemBE

Hai-Quan Mao, PhD
Associate Director
Professor MSE

2017 JOHNS HOPKINS INSTITUTE FOR NANOBIOTECHNOLOGY
& PHYSICAL SCIENCES-ONCOLOGY CENTER ANNUAL SYMPOSIUM
THEME: ENGINEERING VASCULARIZATION

AGENDA

FRIDAY, MAY 5
OWENS AUDITORIUM AND PRE-FUNCTION ROOM AND CORRIDOR
JOHNS HOPKINS SCHOOL OF MEDICINE

8:00–9:00
CONTINENTAL BREAKFAST AND REGISTRATION

9:00–9:05
WELCOME AND PART I INTRODUCTIONS
FROM INBT DIRECTOR
Sharon Gerecht, PhD

9:05–9:35
REPROGRAMMING THE ENDOTHELIUM:
AN INITIAL STEP IN THE PROCESS
OF ANGIOGENESIS
David Cheresh, PhD

9:35–10:05
IMAGING TO NAVIGATE
THE TUMOR MICROENVIRONMENT
Zaver Bhujwalla, PhD

10:05– 10:35
ANGIOCRINE FUNCTIONS OF
ORGANOTYPIC ENDOTHELIUM
IN REGENERATION AND TUMORIGENESIS
Shanin Rafii, MD

10:35–10:45
COFFEE BREAK

10:45–10:50
PART II INTRODUCTIONS
FROM INBT ASSOCIATE DIRECTOR
Hai-Quan Mao, PhD

10:50–11:20
PLATFORM TECHNOLOGIES FOR ENGINEER-
ING VASCULARIZED TISSUE GRAFTS
Warren Grayson, PhD

11:20–11:50
CHALLENGE TO CARDIOVASCULAR DISEASE
USING 3D PRINTING AND TISSUE ENGINEERING
Narutoshi Hibino, MD, PhD

11:50–12:20
STRATEGIES FOR VASCULARIZATION
OF BIOMATERIAL SYSTEMS FOR
TISSUE REGENERATION
David Kaplan, PhD

12:20–1:30
LUNCH BREAK

1:30–2:30
POSTER SESSION A

2:30–3:30
POSTER SESSION B

3:45–4:00
PRIZE PRESENTATIONS AND PHOTOS

4:00
ADJOURN

SPEAKERS

WARREN GRAYSON, PHD

Warren Grayson is an associate professor with joint appointments in the departments of Biomedical Engineering and Materials Science and Engineering at Johns Hopkins University and is a founding member of the Translational Tissue Engineering Center. He obtained his BS in chemical and process engineering at The University of the West Indies, his PhD in Biomedical Engineering from Florida State University, and completed his postdoctoral training at Columbia University in New York. His research interests focus on engineering musculoskeletal grafts for craniofacial and orthopaedic tissue regeneration. Grayson has been recognized by the Maryland Science Center as an Outstanding Young Engineer, and has received awards from the Orthopaedic Research Society, the American Society for Bone and Mineral Research, Tissue Engineering & Regenerative Medicine International Society, and the prestigious Early Faculty CAREER Award from the National Science Foundation. He has authored over 60 peer-reviewed articles and book chapters and holds several patents for bioreactor and biomaterial designs. Grayson's lab is dedicated to developing translational approaches for regeneration of musculoskeletal tissues. His research endeavors have included understanding the role of the stem cell niche and regulating the in vitro environment to regulate the growth and differentiation characteristics of bone marrow-derived mesenchymal stem cells; the cultivation of large tissue engineered constructs using advanced; custom-designed bioreactors; and the combination of novel biomaterials with stem cells for regenerating bone and skeletal muscle to treat critical-sized bone defects and volumetric muscle loss, respectively.

ZAVER BHUJWALLA, PHD

Zaver Bhujwalla is a professor in the departments of Radiology and Oncology at the Johns Hopkins University School of Medicine. She earned her PhD from the University of London. Her work is dedicated to the applications of molecular and functional imaging to understand and target cancer and the tumor microenvironment. Bhujwalla is a Fellow of the International Society of Magnetic Resonance in Medicine, the American Institute of Biomedical Engineers, and the World Molecular Imaging Society. She served as President of the World Molecular Imaging Society from 2012-2013. Bhujwalla is currently associated with the editorial boards of *Molecular Imaging*, *NMR in Biomedicine*, *Cancer Biology and Therapy,* and *Tomography*. She serves as the Specialty Chief Editor of Cancer Imaging and Diagnosis for the journal *Frontiers in Oncology*. At Johns Hopkins University School of Medicine she serves as Vice-Chair of Radiology Research, Director of the Division of Cancer Imaging Research, the Johns Hopkins In-vivo Cellular and Molecular Imaging Center Program, and the MRB Molecular Imaging Center and Cancer Functional Imaging Core. She co-directs the Cancer Molecular and Functional Imaging Program of the Sidney Kimmel Comprehensive Cancer Center. She also serves as Chair of the Career Development Advisory Committee of the Department of Radiology.

SPEAKERS

DAVID CHERESH, PHD

David Cheresh received his doctorate in immunology from the University of Miami School Of Medicine. He is the recipient of numerous awards including the 15th Hans Linder Memorial Lecture from the Weizmann Institute of Science in Rehovot, Israel; the XXIII Annual Myron Karon Memorial Lectureship from the University of Southern California; the Robert Flynn Professorship Award from Tufts University School of Medicine; the Judah Folkman lectureship; and the Paget-Ewing award from the Metastasis Research Society/American Association for Cancer Research. He has also received both an American Cancer Society Faculty Research Award and a National Cancer Institute Merit Award. Cheresh has made fundamental discoveries in the role that gangliosides, integrins, growth factor receptors, and intracellular kinases play in tumor growth and vascular remodeling. His early work focused on the functional role of the GD2 ganglioside in neuroectodermal tumors. At that time, Cheresh discovered the anti-GD2, a monoclonal antibody (now termed Unituxin), which the FDA approved in 2015 for patients with advanced neuroblastoma. He discovered that integrin $\alpha_V\beta_3$ is specifically expressed on angiogenic endothelial cells where it contributes to the growth of tumor-associated blood vessels and plays a role in the progression of various cancers. Cheresh has developed antibodies, kinase inhibitors, and nanoparticles now in clinical development in patients with cancer and inflammatory disease. Most recently, Cheresh has identified how tumor stem cells develop in response to therapeutic intervention or cellular stress. Cheresh and his colleagues have identified specific pathways that contribute to cancer stemness and have begun to develop therapeutics to target these pathways in order to reverse drug resistance and cancer progression.

NARUTOSHI HIBINO, MD, PHD

Narutoshi Hibino received his undergraduate and medical degrees from Ehime University in Japan. He completed cardiac and cardiovascular surgery fellowships and obtained board certifications at Tokyo Women's Medical University, internationally recognized as one of the top heart hospitals. Following a research fellowship for tissue engineering at Yale University, he completed pediatric cardiac surgery fellowships at Children's National Medical Center in Washington, DC and Nationwide Children's Hospital in Columbus, OH, before joining the faculty at Johns Hopkins University School of Medicine. Hibino's research interests involve healing the heart with a patient's own cells, as well as growing vascular grafts and other items of repair through a process of tissue engineering and 3D printing technology.

SPEAKERS

SHAHIN RAFII, MD

Shahin Rafii is the Arthur B. Belfer Professor of Medicine, Director of the Ansary Stem Cell Institute and Division Chief for Regenerative Medicine at Weill Cornell Medical College. His research focuses on identifying cellular and molecular pathways involved in organ regeneration and maladaptation of tumor microenvironment. His group has spearheaded the concept that endothelial cells—by supplying paracrine factors, known as angiocrine factors—directly specify and maintain self-renewal and differentiation of hematopoietic, liver and lung stem and progenitor cells. By contrast, aberrant production of angiocrine factors promotes tumor growth. His laboratory has devised an innovative technology to generate abundant stable and functional tissue-specific endothelial cells that could be therapeutically transplanted for organ regeneration or targeted for blocking tumor growth.

DAVID KAPLAN, PHD

David Kaplan is the Stern Family Endowed Professor of Engineering at Tufts University and a Distinguished University Professor. He is professor and chair of the Department of Biomedical Engineering, with joint appointments in the Tufts University Sackler School of Biomedical Science, Tufts University Dental School, Department of Chemistry, and the Department of Chemical and Biological Engineering. His research focus is on biopolymer engineering to understand structure-function relationships, with a focus on silks, collagens and elastins. His research group focuses on utilization of these biopolymers for biomaterials, tissue engineering and regenerative medicine. Since 2004, he has directed the National Institutes of Health P41 Tissue Engineering Resource Center that involves Tufts University and Columbia University. He has published over 700 peer-reviewed papers. He is the editor-in-chief of *ACS Biomaterials Science and Engineering* and serves on many editorial boards and programs for journals and universities. His lab has been responsible for over 100 patents issued or allowed, and about a dozen start-up companies.

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JOHNS HOPKINS INSTITUTE FOR NANOBIOTECHNOLOGY (INBT), founded in 2006, serves as a hub for interdisciplinary research, training, outreach, and entrepreneurship at the interface of nanobiotechnology and medicine. INBT has more than 220 researchers conducting interdisciplinary research in diverse areas. INBT affiliated researchers have generated more than $80 million in research funding through a diverse portfolio. INBT has launched numerous research centers and initiatives, including the Physical Sciences-Oncology Center, Center for Cancer Nanotechnology Excellence, and Center for Digital Pathology. INBT has established training programs that educate students from pre-college through the postdoctoral level, both domestically and abroad, and more than 15 companies have been created by INBT affiliated faculty members.

For more information visit http://inbt.jhu.edu