

Division of Matrix Biology



Raghu Kalluri, PhD,
Chief

● Overview

The Division of Matrix Biology at Beth Israel Deaconess Medical Center, which was established in March 2006, is the first of its kind in the country to reside within a Department of Medicine and is unique in its combination of matrix research and clinical medicine. Matrix biology is the study of extracellular matrix (ECM) and its communication with cells. Where cells are present, matrix is also present, throughout the human body. This area of biology is gaining wide prominence as a key structural and functional regulator of organ function. Currently, about 31 human diseases occur due to direct genetic defects in the ECM and basement membrane proteins. An emerging crossroads between matrix biology research and medical practice created a unique opportunity at BIDMC to form this Division. The central mission of the Division of Matrix Biology is to establish a research enterprise, renowned for its bench-to-bedside-to-bench model of translational matrix research and for its collaboration with industry, as a pathway for transferring our matrix and vascular biology research into an improvement of the quality of life. Additionally, the Division will participate in the program development of the Transplant Center and also the Cancer Center at BIDMC.

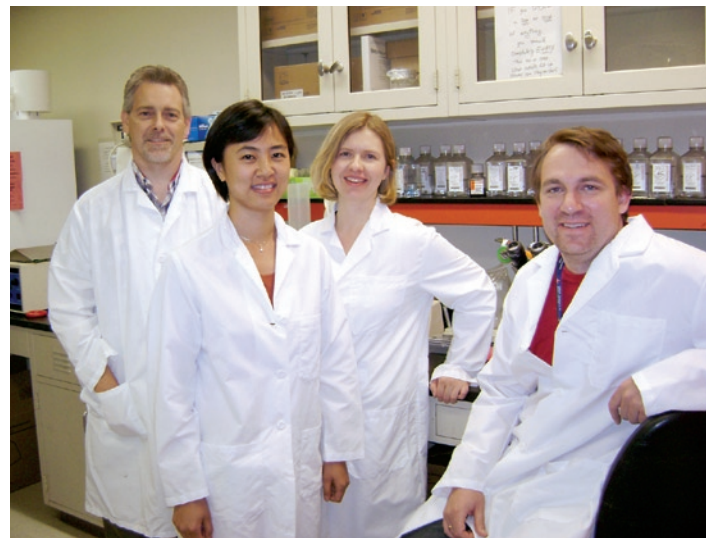
Dr. Yuchi Han and Dr. Warren Hill recently joined the Division of Matrix Biology. Dr. Han is a practicing cardiologist at BIDMC with a research interest in cardiac valve disease. Dr. Hill's research focuses on mammalian bladder function.

● Clinical Activities

An integrative mission of the Division of Matrix Biology is to provide consults for clinicians in the diagnosis and treatment of vascular and matrix related diseases. In collaboration with the Department of Pathology, we hope to establish diagnostic tests for various matrix and vascular related diseases.

● Educational Programs

Raghu Kalluri teaches at both the Harvard Medical School (Medical School and the BBS Graduate Program) and the joint Division of Health Science Technologies (HST) Program of Harvard Medical School and Massachusetts Institute of Technology. The Division of Matrix Biology is actively engaged in mentoring of MD and PhD students at the Harvard Medical School and Post Doctoral Fellows (clinical



● Faculty Members of the Division of Matrix Biology (left to right):
Dr. Warren Hill, Dr. Yuchi Han, Dr. Elisabeth Zeisberg, Dr. Michael Zeisberg

and research track) at Harvard. We also offer the opportunity of research electives to students and fellows from various national and international universities. We have an active undergraduate and high school student internship program via the Harvard University programs. Dr. Kalluri is an adjunct faculty of the Department of Biological Chemistry and Molecular Pharmacology at HMS, the Harvard-MIT Division of Health Sciences and Technology and the Harvard Stem Cell Institute. Four Harvard graduate students are currently in the division working towards their PhD degree.

● *Research Activities*

The Division of Matrix Biology focuses on the study of cellular microenvironment as determined by extracellular matrix (ECM) and basement membranes (BM) in the regulation of the tissue behavior during health and disease. This fundamental interest in matrix biology translates into several major focus areas: 1) vascular biology and angiogenesis, 2) tumor microenvironment, 3) cancer progression and metastasis 4) genetic and acquired kidney diseases.

● *Awards and Honors*

Dr. Raghu Kalluri received the 2007 Harvard Graduate Student Council-Everett Mendelsohn Excellence in Mentoring Award. He also received the HMS Office of Diversity and Community Service-Young Mentor Award. Michael Zeisberg received the Carl W. Gottschalk Award of the American Society of Nephrology 2006. Elisabeth Zeisberg received a Scientist Development Award from the American Heart Association and a Kirschstein career development award from the NIH.

● *Selected Publications*

Kalluri R. Proteinuria with and without renal glomerular podocyte effacement. *J Am Soc Nephrol* 2006; 17:2383-9.

Kanasaki K, Kanda Y, Palmsten K, Tanjore H, Lee SB, LeBleu V, Gattone V, Kalluri R. Integrin β Mediated Matrix Assembly

and Signaling is Critical for the Normal Development and Function of the Kidney Glomerulus. *Dev Bio.* (In Press)

Sugimoto H, Grahovac G, Zeisberg M, Kalluri R. Renal fibrosis and glomerulosclerosis in a new mouse model of diabetic nephropathy and its regression by BMP-7 and advanced glycation end-product inhibitors. *Diabetes* 2007; 56:1825-33.

Tanjore H, Zeisberg E, Naini-Gerami B and Kalluri R. Beta1 integrin expression on endothelial cells is required for angiogenesis but dispensable for vasculogenesis. *Dev. Dyn.* (In Press)

Teng Y, Zeisberg M, Kalluri R. Transcriptional regulation of epithelial-mesenchymal transition. *J Clin Invest* 2007; 117:304-306.

Tse JC, Kalluri R. Mechanisms of metastasis: Epithelial-to-mesenchymal transition and contribution of tumor microenvironment. *J Cell Biochem* 2007; 101:816-29.

Zeisberg E, Kalluri R. Controlling angiogenesis in heart valves. *Nat Med* 2006; 12:1118-9.

Zeisberg E, Potenta S, Xie L, Zeisberg M, Kalluri R. Discovery of Endothelial to Mesenchymal Transition as a Source for Carcinoma-Associated Fibroblasts. *Cancer Res.* 2007 Nov 1;67(21):10123-8.

Zeisberg EM, Tarnavski O, Zeisberg M, Dorfman AL, McMullen JR, Pu WT, Chandraker A, Roberts AB, Neilson EG, Sayegh MH, Izumo S, Kalluri R. Endothelial to mesenchymal transition contributes to cardiac fibrosis. *Nat Med* 2007; 13:952-61.

Zeisberg M, Yang C, Martino M, Duncan M, Rieder F, Tanjore H, Kalluri R. Fibroblasts derive from hepatocytes in liver fibrosis via epithelial to mesenchymal transition. *J Biol Chem* 2007; 282:23337-47.

● *Faculty*

Yuchi Han, MD

Elisabeth M. Zeisberg, MD

Warren Hill, PhD

Michael Zeisberg, MD

Raghu Kalluri, PhD