

Division of Matrix Biology



Raghu Kalluri, PhD,
Chief

● Overview

The Division of Matrix Biology at Beth Israel Deaconess Medical Center, 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 cell matrix research and clinical medicine. Matrix biology is the study of extracellular matrix (ECM) and its communication with cells. Where cells are present in the human body, matrix is also present. 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 biology research into an effort to improve the quality of life of our patients. Additionally, the Division will participate in the program development of the Transplant Center and also the Cancer Center at BIDMC.

Dr. Raj Mariappan recently joined the Division of Matrix Biology in 2007. Dr. Mariappan is a practicing pathologist at BIDMC with research interests in myelofibrosis, bone marrow stromal cells, and their potential role in fibrosis and neoplasms of the hematopoietic system.

● 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 collabora-

tion with the Department of Pathology, we hope to establish diagnostic tests for various matrix and vascular related diseases.

● Educational Programs

Dr. Raghu Kalluri teaches at both 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 Harvard Medical School and Post Doctoral Fellows (clinical and research track). 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 Harvard University. 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. Six Harvard graduate students are currently in the division working towards their PhD degree.

● Research Activities

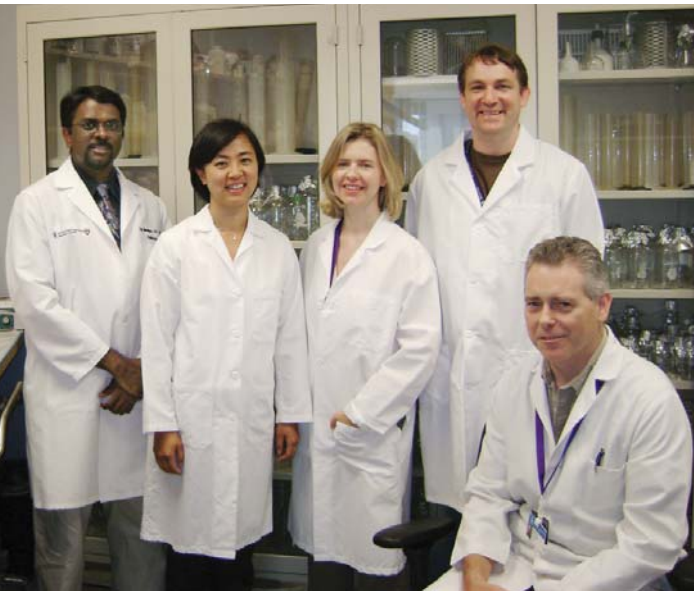
Research Funding • AY'07

Federal Direct	597,742
Federal Indirect	271,990
Other Direct	1,174,370
Other Indirect	304,480

The Division of Matrix Biology focuses on the study of cellular microenvironment as determined by extracellular matrix (ECM) and base-

ment 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:

- vascular biology and angiogenesis
- tumor microenvironment
- cancer progression and metastasis
- genetic and acquired kidney diseases
- organ fibrosis
- basement membrane assembly
- tissue engineering and stem cell biology
- diseases related to reproduction and pregnancy



- Faculty Members of the Division of Matrix Biology, left to right: Dr. Raj Mariappan, Dr. Yuchi Han, Dr. Elisabeth Zeisberg, Dr. Michael Zeisberg, Dr. Warren Hill

● 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. Dr. Michael Zeisberg received the Carl W. Gottschalk Award of the American Society of Nephrology 2006. Dr. Elisabeth Zeisberg received a Scientist Development Award from the American Heart Association and a Kirschstein career development award from the NIH in 2008.

● Selected Publications

Kanasaki K, Palmsten K, Sugimoto H, Ahmad S, Hamano Y, Xie L, Parry S, Augustin H, Gattone V, Strauss J, Folkman J, Kalluri R. Deficiency in catechol-O-methyltransferase and 2-methoxyestradiol in mice is associated with placental hypoxia and a preeclampsia-like phenotype. *Nature* 2008; 453:1117-21.

Kalluri R, Han Y. Targeting TGF-beta and the extracellular matrix in Marfan's syndrome. *Dev Cell* 2008; 15:1-2.

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; 67:10123-8.

Hill W, Meyers S, von Bodunge M, Apodaca G, Dedman J, Kaetzel MA, Zeidel M. Studies on localization and function of annexin A4a within urinary bladder epithelium using a mouse knockout model. *Am J Physiol-Renal Physiol* 2008; 294:F919-927.

Tanjore H, Zeisberg E, Naini-Gerami B, Kalluri R. Beta1 integrin expression on endothelial cells is required for angiogenesis but dispensable for vasculogenesis. *Dev Dyn* 2008; 237:75-82.

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 Biol* 2008; 313:584-93.

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

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

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

Warren Hill, PhD

Raghu Kalluri, PhD

Rajan Mariappan, MD, PhD

Elisabeth M. Zeisberg, MD

Michael Zeisberg, MD