

Wednesday, November 19, 2025 | 108 Snell Engineering Ctr | 12:00 PM

Distinguished Seminar Speaker

***The Role of Mammary Tissue Damage
in Breast Cancer Recurrence and Metastasis***

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Abstract. Triple negative breast cancer (TNBC) recurrence rates remain high despite aggressive therapeutic intervention, including surgery, chemotherapy, immunotherapy, and radiotherapy. Recent studies suggest that circulating tumor cell recruitment rather than persistent tumor cells in the irradiated surgical bed may enable recurrence. However, the mechanisms that govern how the breast tissue microenvironment facilitates recurrence and metastasis are not well understood. In this seminar, our recent efforts in studying the role of irradiated mammary tissue in influencing tumor cell behavior will be presented. Our novel decellularized extracellular matrix hydrogels

derived from mammary glands as well as the contribution of stromal cells to tumor cell recruitment will be discussed. Our work reveals that radiation damage of breast tissue promotes a pro-tumor and immunosuppressive microenvironment through alterations in the structure and composition of the extracellular matrix. We also establish that radiation causes metabolic reprogramming in fibroblasts that supports tumor growth. Our studies represent an important step toward elucidating the impact of stromal cells in driving worse outcomes following therapy in patients with TNBC. Future research will utilize these results to engineer improved biomimetic *in vitro* tumor and tissue microenvironment models to probe the complex physical, chemical, and biological cues that regulate TNBC recurrence and metastasis.

Biography. Dr. Marjan Rafat is an Assistant Professor of Chemical and Biomolecular Engineering at Vanderbilt University. She has courtesy appointments in the departments of Biomedical Engineering and Radiation Oncology and is a member of the Program in Cancer Biology at the Vanderbilt University School of Medicine and the Breast Cancer Research Program at the Vanderbilt-Ingram Cancer Center. Among other recognitions, she has received the NIH Pathway to Independence award, the Young Innovator in Cellular and Molecular Bioengineering award, Breast Cancer Alliance Young Investigator award, Concern Foundation Conquer Cancer Now award, METAvivor Early Career Investigator award, and the American Cancer Society Research Scholar Grant. She received a bachelor's degree in Chemical Engineering from MIT, a PhD in Engineering Sciences from Harvard University, and was a postdoctoral scholar at Stanford University in the Department of Radiation Oncology. Dr. Rafat currently applies chemical and biomedical engineering concepts toward understanding the mechanisms driving breast cancer recurrence and metastasis. Her interdisciplinary laboratory at Vanderbilt examines and models the tumor and tissue microenvironment. She has contributed over 50 peer-reviewed publications, 7 book chapters, and over 85 conference presentations and proceedings.