seminar

SEMTE

Engineering Approaches for In Vivo Capture and Detection of Metastatic Cells

School for Engineering of Matter, Transport and Energy

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abstract

Breast cancer is a leading cause of death for women worldwide, with the majority of deaths resulting from metastasis. Typically, metastasis remains undetected until metastatic cells have colonized one or more sites and affected organ function, at which point the disease is incurable. Prior to colonization of a metastatic site, a "pre-metastatic niche" is established, creating a tumor-supportive microenvironment that includes numerous cell types and factors. Importantly, the existence of the pre-metastatic niche implies that metastasis to a particular site is not random, but is pre-determined. In this talk, I will describe engineering approaches to create a defined in vivo microenvironment recapitulating the pre-metastatic niche in order to recruit and detect metastatic breast cancer cells. Biomaterial scaffolds were designed to capture circulating metastatic cells, substantially reducing tumor burden in other organs that are standard sites of breast cancer metastasis. Furthermore, label-free detection of the arrival of metastatic cells at the scaffold site was achieved using light scattering-based imaging techniques that identify changes to the nanoscale tissue architecture associated with the presence of tumor cells. In addition to enabling early detection of metastasis, these scaffolds provide a platform for identifying the cell types and signals that regulate the earliest events in colonization, which could lead to discovery of novel therapeutic targets. Taken together, the early detection and therapeutic potential of this technology could transform treatment and prevention of metastatic disease.

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biosketch

Samira M. Azarin obtained a B.S. in Chemical Engineering from the Massachusetts Institute of Technology in 2006. She went on to receive a Ph.D. in Chemical Engineering from the University of Wisconsin-Madison in 2011, where she studied stem cell engineering under the guidance of Professors Sean Palecek and Juan de Pablo. She is currently a postdoctoral fellow in Chemical and Biological Engineering at Northwestern University in the laboratory of Professor Lonnie Shea. Her current research interests include engineering systems to study and control breast cancer progression and metastasis.

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