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12:15 PM, 1315 CHEMISTRY

Analytical Seminar

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" Paper-based tissue constructs for quantifying the role of oxygen in promoting aggressive cancer phenotypes "

Cells cultured in three-dimensional scaffolds are more predictive of *in vivo* phenotypes and responses than the monolayer cultures traditionally grown on plastic dishes. Despite this improved predictability, there is a slow adoption of 3D culture models because they are more cumbersome to setup, maintain, and analyze than monolayer cultures. Our lab is developing a culture system that combines the predictive power of 3D tissue-like cultures, the ease of setup associated with monolayer cultures, and the ability to engineer environments with specific oxygen and nutrient profiles. These profiles are particularly important in cancer, as solid tumors lack the vasculature necessary to properly perfuse the cellular mass. Reduced oxygen tensions, or hypoxia, in tumors is associated with more aggressive cancers.

We are utilizing our paper-based cultures to address two long-standing questions in cancer biology. First is the role of oxygen gradients in directing cellular movement. We have recently shown that oxygen is a chemoattractant in 3D cultures, and now know the extent to which cells invade is dependent on the steepness of the oxygen gradient. Second is the increased drug resistance of cells undergoing hypoxia. We are quantifying the relationship between oxygen tension, cellular metabolism, and susceptibility to chemotherapeutics. In particular, is drug resistance related to a passive resistance caused by decreased metabolism and proliferation or an active resistance caused by up-regulation of drug pumps?

In this talk, I will highlight the culture system and the methods we are developing to evaluate how sub-populations of cells in low oxygen tensions become more invasive and evade chemotherapeutics. I will also focus on recent advances in constructing breast and colon tumor models for studying drug penetration and metabolism.