

Plenary 2

Engineering and imaging the tissue microenvironment, Karen Cheng, Department of Electrical and Computer Engineering, The University of British Columbia

The oxygen microenvironment is a key factor affecting tumour cell phenotype, cancer prognosis and treatment efficacy, as well as stem cell proliferation and cell-fate commitment. We use microfluidic methods to generate three-dimensional tumour models that use extracellular matrix components to support cell proliferation. We have developed a microfluidic platform that affords the creation of oxygen profiles that vary in time and space, precise control of the oxygen levels, and stability over time for long-term cell culture, permitting drug screening assays can last several days. Using two-photon microscopy, we track, in real-time, individual cells within 3D tumour spheroids exhibiting cyclic swelling behaviour in response to time-varying oxygen profiles, and observe doxorubicin resistance in hypoxic spheroids. In future, the cell-by-cell analysis enabled by these efforts will permit the characterization of heterogeneity within arrays of micro-tissues, the identification of subpopulations of cells and individual cells, and the assessment of their responses.