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Investigation of cell morphology for disease diagnostics via high content screening

SHYAM KHATAU, Johns Hopkins University

Ninety percent of all cancer-related deaths are caused by metastatic disease, i.e. the spreading of a subset of cells from a primary tumor in an organ to distal sites in other organs. Understanding this progression from localized to metastatic disease is essential for further developing effective therapeutic and treatment strategies. However, despite research efforts, no distinct genetic, epigenetic, or proteomic signature of cancer metastasis has been identified so far. Metastasis is a physical event: through invasion and migration through the dense, tortuous stromal matrix, intravasation, shear forces of blood flow, successful re-attachment to blood vessel walls, migration, the colonization of a distal site, and, finally, reactivation following dormancy, metastatic cells may share precise physical properties. Cell morphology is the most direct physical property that can be measured. In this work, we develop a high throughput cell phenotyping process and investigate the morphological signature of primary tumor cells and liver metastatic pancreatic cancer cells.