Single-cell technology

Single-cell technology refers to techniques and tools that allow scientists to study individual cells in a manner that is isolated from other cells in a tissue or sample. This technology enables researchers to investigate cellular behavior and molecular processes at a highly resolved and granular level. It is widely used in the fields of genetics, epigenetics, genomics, transcriptomics, and proteomics, among others, to provide a better understanding of cellular function, disease mechanisms, and cellular heterogeneity. Single-cell technology is also crucial for the development of personalized medicine and regenerative therapies.

Single-cell technologies have enabled the characterization of the tumor microenvironment at unprecedented depth and have revealed vast cellular diversity among tumour cells and their niche. Anti-tumour immunity relies on cell-cell relationships within the tumour microenvironment, yet many single-cell studies lack spatial context and rely on dissociated tissues. Karimi et al. applied imaging mass cytometry to characterize the immunological landscape of 139 high-grade glioma and 46 brain metastasis tumours from patients. Single-cell analysis of more than 1.1 million cells across 389 high-dimensional histopathology images enabled the spatial resolution of immune lineages and activation states, revealing differences in immune landscapes between primary tumours and brain metastases from diverse solid cancers. These analyses revealed cellular neighbourhoods associated with survival in patients with glioblastoma, which we leveraged to identify a unique population of myeloperoxidase (MPO)-positive macrophages associated with long-term survival. The findings provide insight into the biology of primary and metastatic brain tumours, reinforcing the value of integrating spatial resolution to single-cell datasets to dissect the microenvironmental contexture of cancer [1)]

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Karimi E, Yu MW, Maritan SM, Perus LJM, Rezanejad M, Sorin M, Dankner M, Fallah P, Doré S, Zuo D, Fiset B, Kloosterman DJ, Ramsay L, Wei Y, Lam S, Alsajjan R, Watson IR, Roldan Urgoiti G, Park M, Brandsma D, Senger DL, Chan JA, Akkari L, Petrecca K, Guiot MC, Siegel PM, Quail DF, Walsh LA. Single-cell spatial immune landscapes of primary and metastatic brain tumours. Nature. 2023 Feb 1. doi: 10.1038/s41586-022-05680-3. Epub ahead of print. PMID: 36725935.