

Propositions belonging to the thesis
Microscopy-based Single-cell Multi-omics Profiling of Cancer Subpopulations

by

Pin-Rui Su

1. The functional single-cell selection (fSCS) pipeline facilitates not only the high-throughput imaging but also the intricate functional characterization of aberrant cancer cell subpopulations, revealing the subtle yet significant cell heterogeneity. (This thesis)
2. Combining the fSCS and cutting-edge single-cell sequencing technologies provides a breakthrough in linking microscopically observable cancer phenotypes to their driving molecular mechanisms, bypassing limitations of traditional unsupervised clustering. (This thesis)
3. From non-tumorigenic epithelial breast cells to patient-derived head and neck cancer cells, various overexpressed genes and pathways are pinpointed behind aggressive migration and mesenchymal-like transformation. (This thesis)
4. The novel spatiotemporal dynamics of 53BP1 foci formation provide deeper insights into the heterogeneity of DNA damage response after radiation exposure. (This thesis)
5. Elucidating the causative mechanism of multipolar mitosis through large-scale single-cell genomic and transcriptomic analysis is crucial for understanding how normal cells undergo malignant transformation and acquire metastatic capabilities. (This thesis)
6. Artificial intelligence (AI) algorithms have the potential to revolutionize biomedical researches by analyzing large datasets with unprecedented accuracy and speed.
7. Deciphering the complex interactions between cancer cells, the tumor microenvironment, and the immune system paves the way for innovative immunotherapeutic approaches.
8. The integration of multi-omics data at single-cell level is essential for a comprehensive understanding of cancer biology and the development of precision oncology.
9. Convergence research stimulates the emergence of new scientific paradigms and holistic knowledge beyond what individual discipline could achieve alone.
10. Cutting fundamental research funding to address shorter-term financial concerns could have unintended consequences for long-term scientific growth and innovation. (Benjamin M.H. *et al.*, *Nat. Cardiovasc. Res.*, 2023)
11. Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world. (Albert Einstein)