Intra-tumor Heterogeneity and Data-Guided Modeling of Cancer

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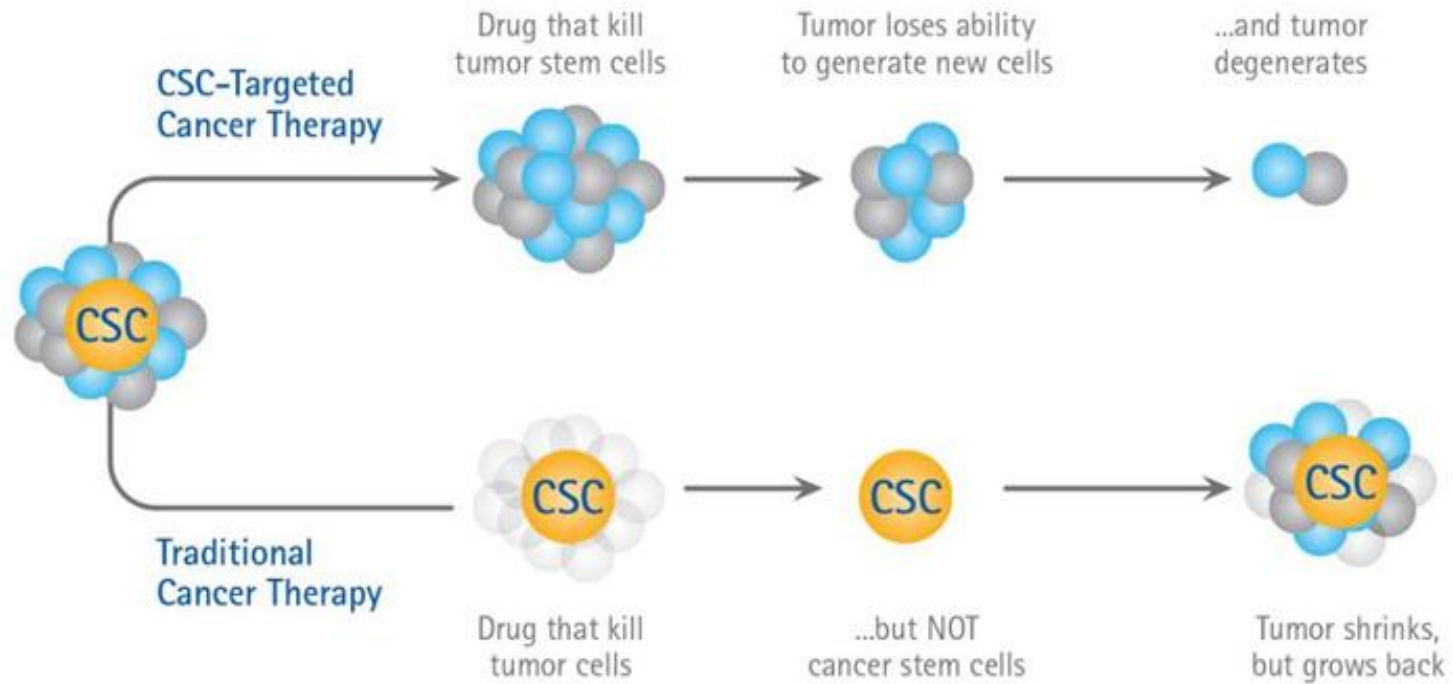
Introduction

- **Intratumor heterogeneity**
  - Within a tumor, all cells originate from one mutated cell
  - Cells within a tumor are not identical; they show genetic and nongenetic variability
- **Sources of tumor heterogeneity:**
  - Genetic: accumulation of mutations and evolution
  - Nongenetic: epigenetic, transcriptomic variations → affect cell state
  - Environmental: dynamic microenvironment influences tumor progression and clinical outcomes

Cancer Stem Cells

- CSC model: certain tumor cells have stem cell characteristics
  - Can self-renew or differentiate into cancer cells
- Where do CSCs originate?
  - Arise from mutated regular (tissue) stem cells
  - Cell state transition of tumor cells (dedifferentiation)
    - Epithelial-mesenchymal transition during metastasis
- Possible that stemness is a dynamic characteristic

Cancer Treatment

CSC-Targeted Cancer Therapy → Drug that kill tumor stem cells → Tumor loses ability to generate new cells → ...and tumor degenerates

Traditional Cancer Therapy → Drug that kill tumor cells → ...but NOT cancer stem cells → Tumor shrinks, but grows back

▶ Deeper understanding of CSCs could guide cancer treatment strategies

Research Goals

► Investigate phenotypes and "stemness" of cancer cells during tumor growth, and possible changes over time
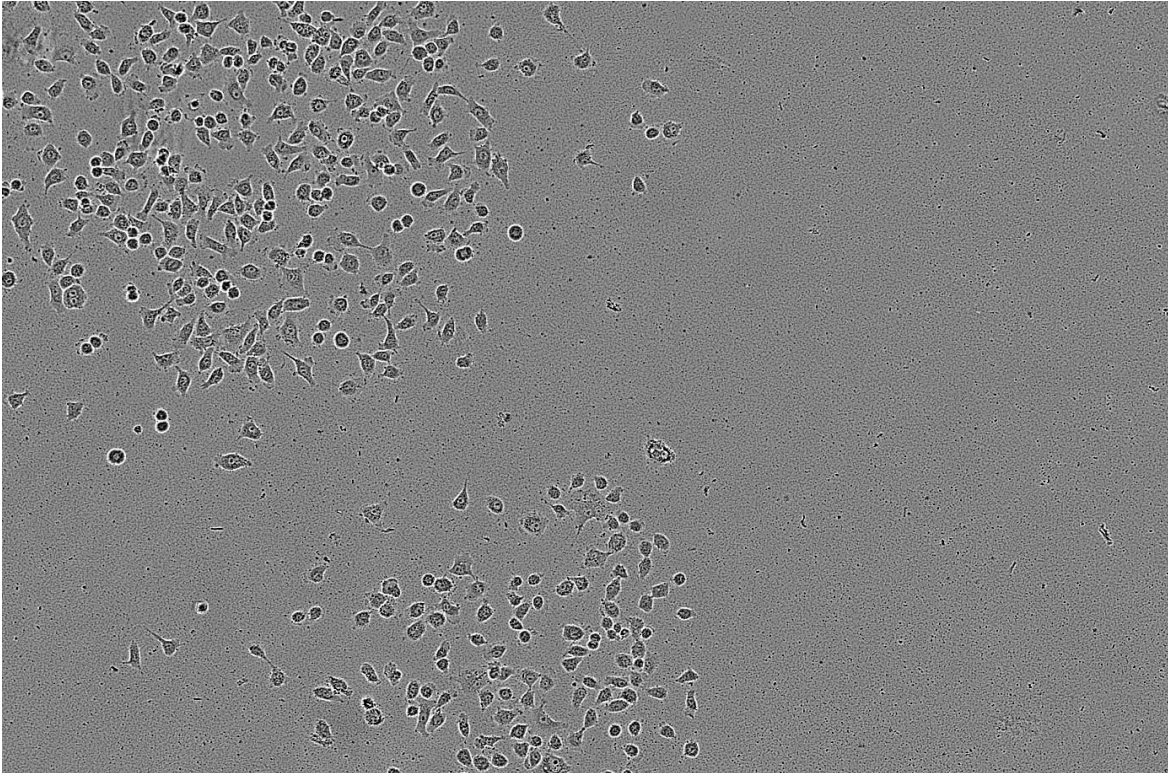
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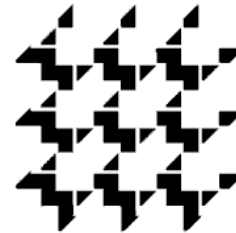
- My mentor: Dr. Subhajyoti De and Antara Biswas (Postdoc)

Sources

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