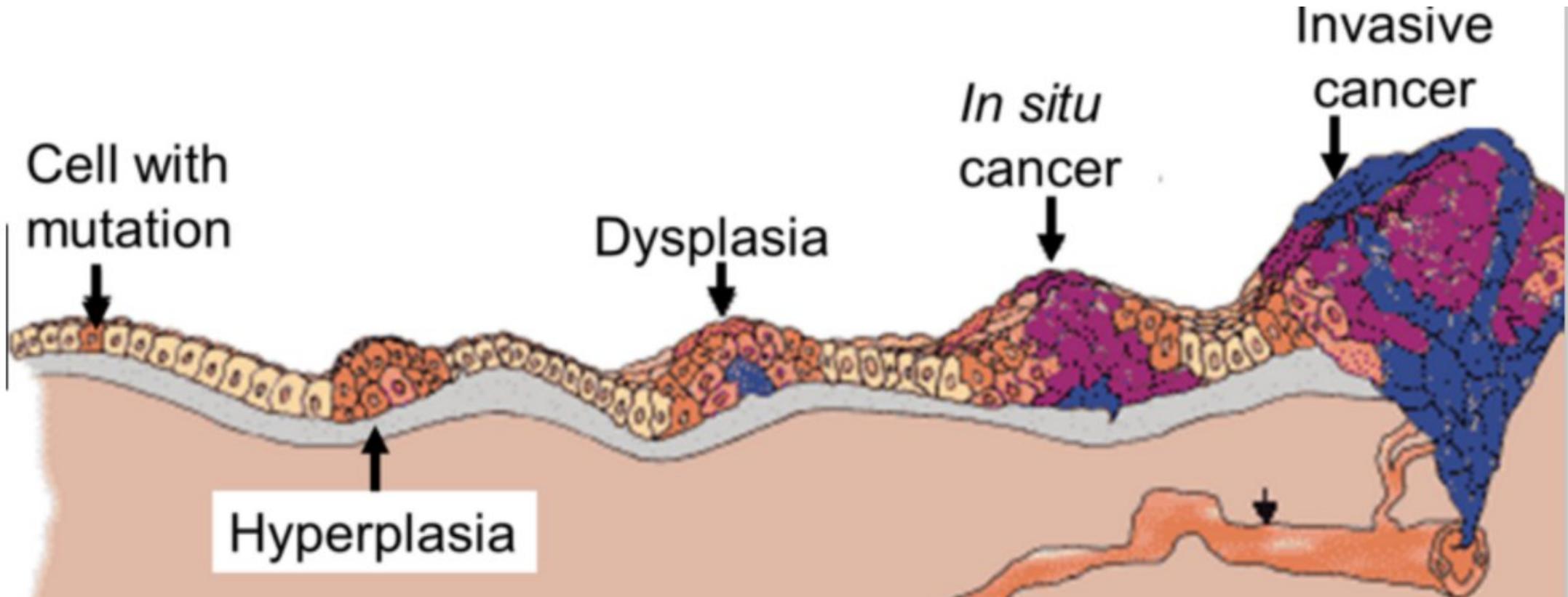


What Single-Cell Data Is Teaching Us About Cancer Evolution

From curiosity to cancer insight
one cell at a time.



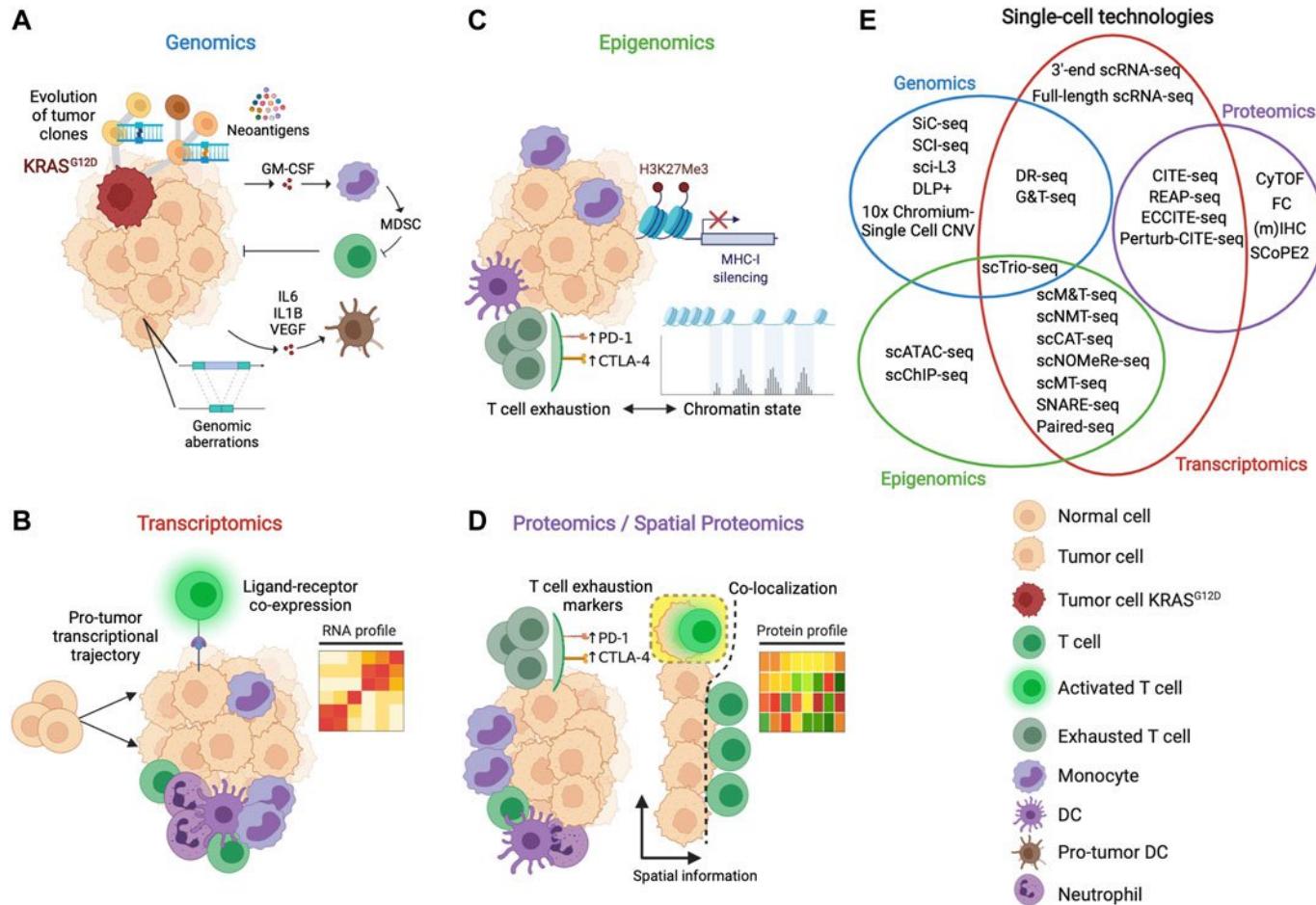
Source: [12](#)

Cancer as a Living, Evolving System

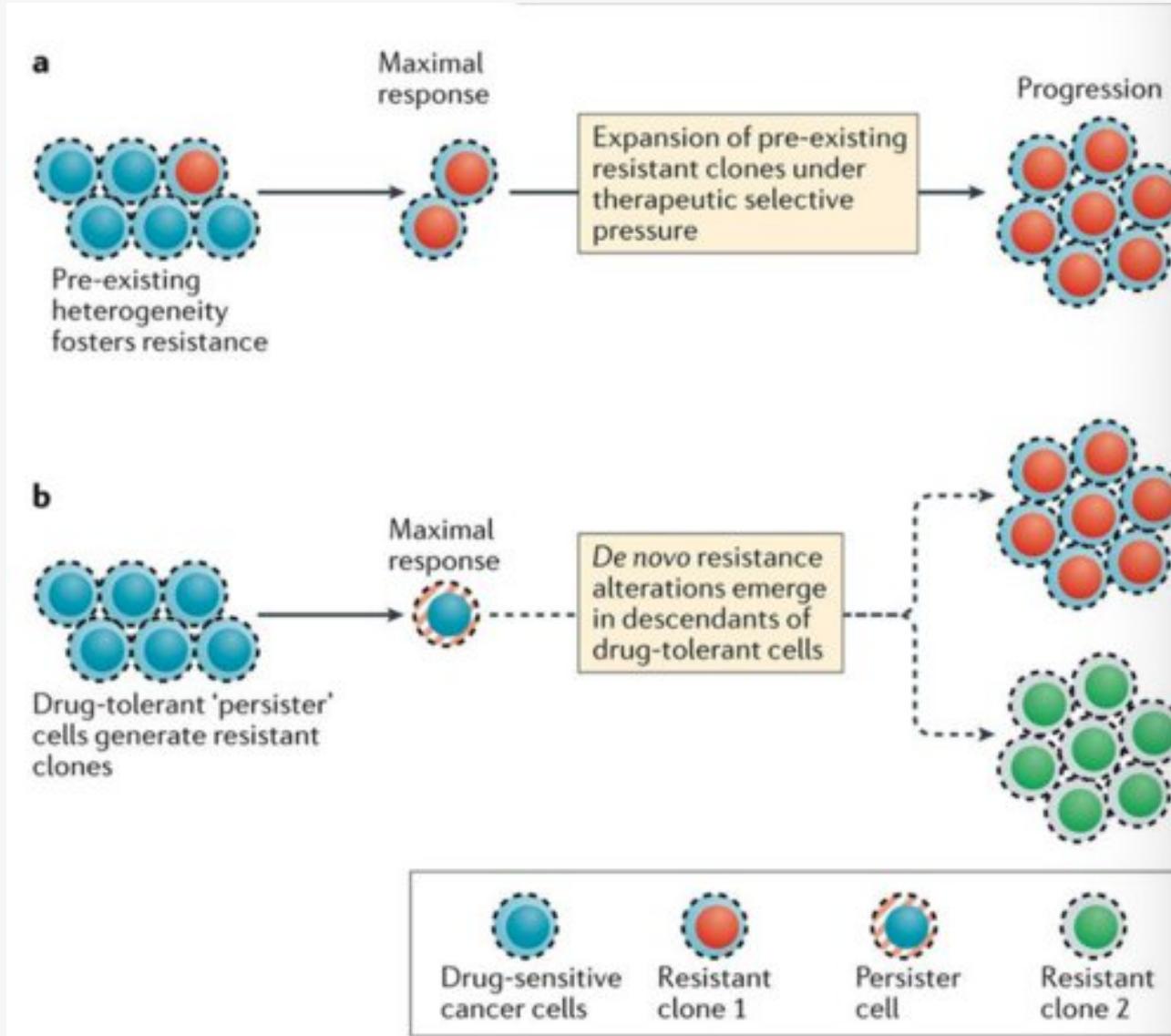
- ✓ Cancer isn't just a lump of cells.
- ✓ It's a **dynamic ecosystem**: tumor cells, immune cells, and stroma all talking, competing, and adapting [5].
- ✓ Single-cell data lets us peek **cell by cell** [3].

Tumour Diversity (Heterogeneity)

- ✓ Every tumor is unique.
- ✓ Some cells divide fast, some sleep, some hide from therapy.
- ✓ This **diversity drives evolution** – the more diverse, the harder it is to treat [6].
- ✓ scRNA-seq lets us map all these cell types **in one tumour** [3].

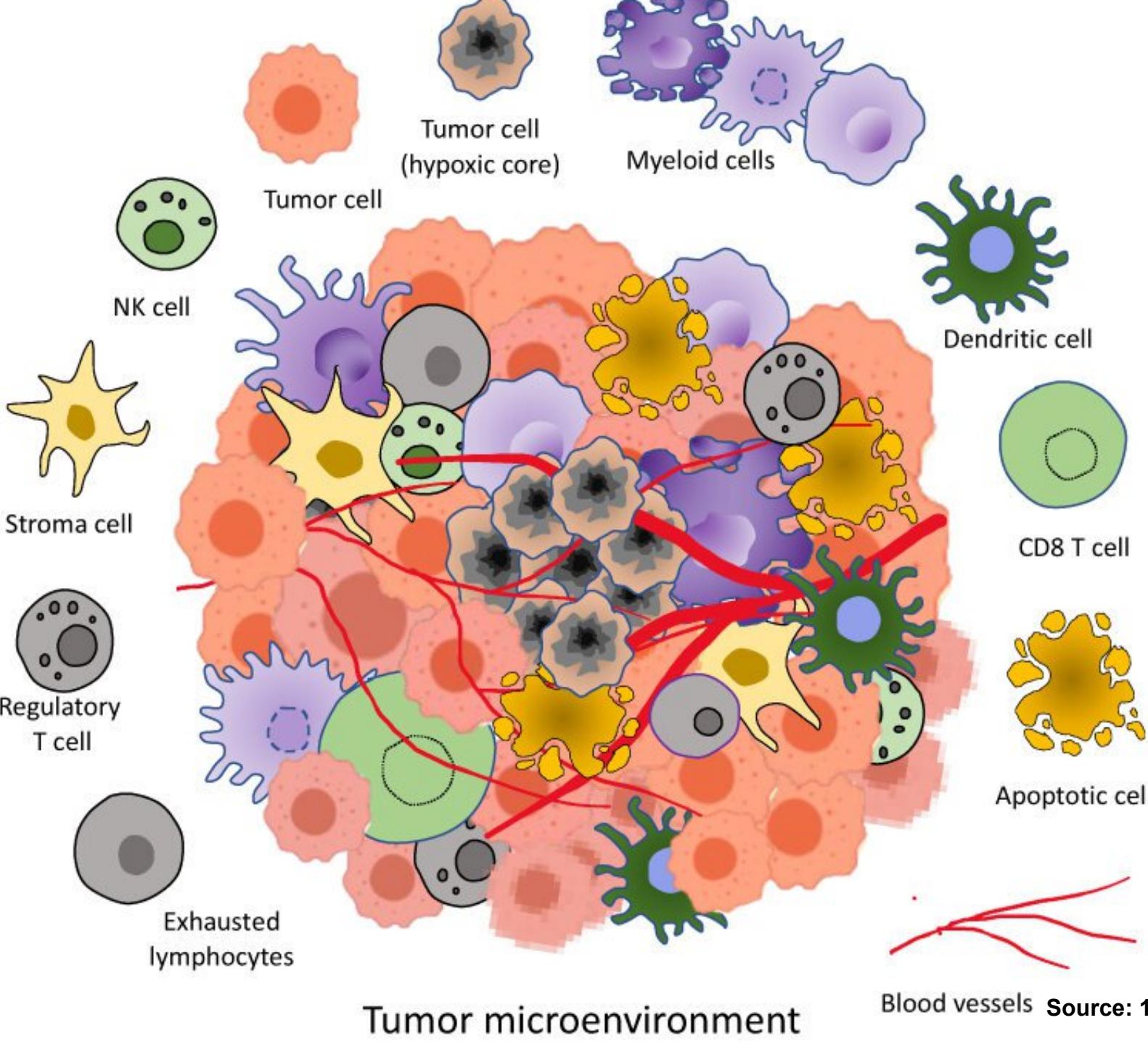


Source: 4



How Tumours Resist Therapy

- ✓ Resistance isn't just mutations – it's **flexible, adaptive behaviour**.
- ✓ Cells can switch identity (plasticity) to survive stress [9].
- ✓ Some hide in dormancy, some reprogram metabolism [11].
- ✓ Even the immune system gets tricked – tumours build **protective niches** [10].



Tumour Microenvironment: The Neighbourhood

- ✓ Tumours don't grow alone – they live in a neighbourhood of immune and stromal cells.
- ✓ scRNA-seq shows:
 - Exhausted immune cells
 - Supportive fibroblasts
 - Molecular conversations (ligand-receptor interactions)
- ✓ **Cancer evolves together**, not in isolation [8].

Why This Matters & What's Next



Single-cell data
helps:

Spot rare cells
driving relapse
Map tumour
interactions
Predict how
cancers might
adapt



Future: AI, spatial maps,
personalized therapy.



Takeaway: Cancer is **alive, adaptable, and collaborative** – understanding it cell by cell is game-changing.

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