

## ***Towards A Human Breast Cell Atlas***

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THE UNIVERSITY OF TEXAS  
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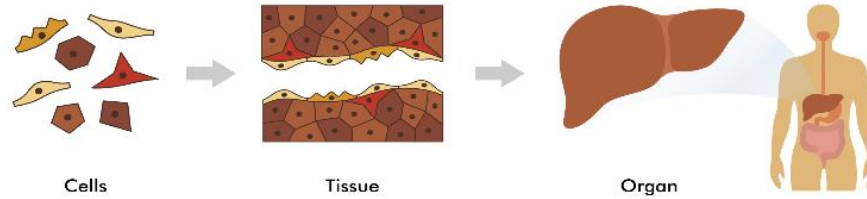
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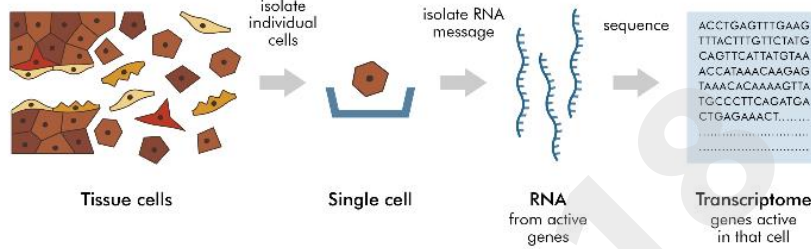
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## Cell: Basic Building block of life

### Cell is the fundamental unit of life



### Single Cell Genomics



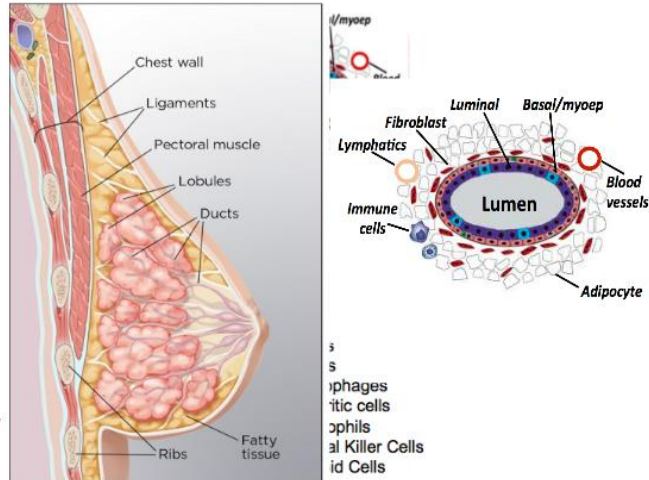
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## Anatomy of Cell Types in the Human Breast

- Known cell types**
- Luminal epithelial
  - Basal epithelial
  - Fibroblasts
  - Adipocytes
  - Endothelial cells
  - Lymphatic cells
  - Neuronal
  - Smooth muscle
  - Skin cells
  - **Immune cells**
    - T-cells
    - Macrophages
    - Mast Cells
  - smooth muscle
  - **immunocytes**

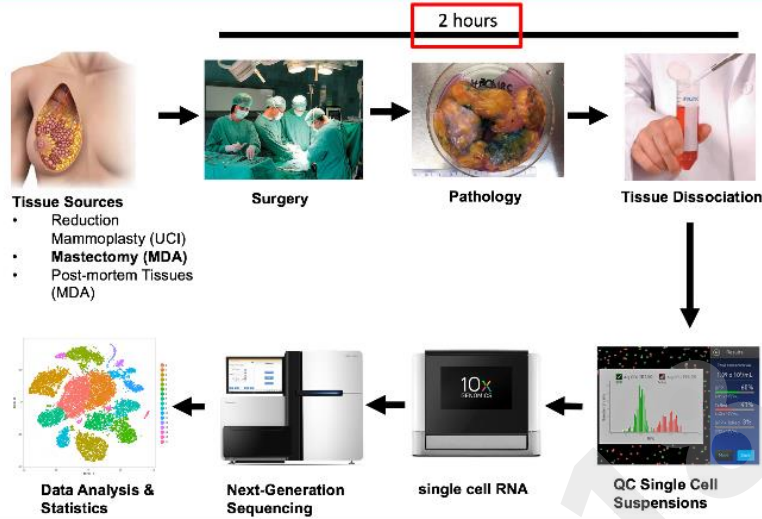
Important biological variations in the breast include: age, parity/pregnancy, menopausal status



<https://www.mskcc.org/cancer-care/types/breast/anatomy-breast>

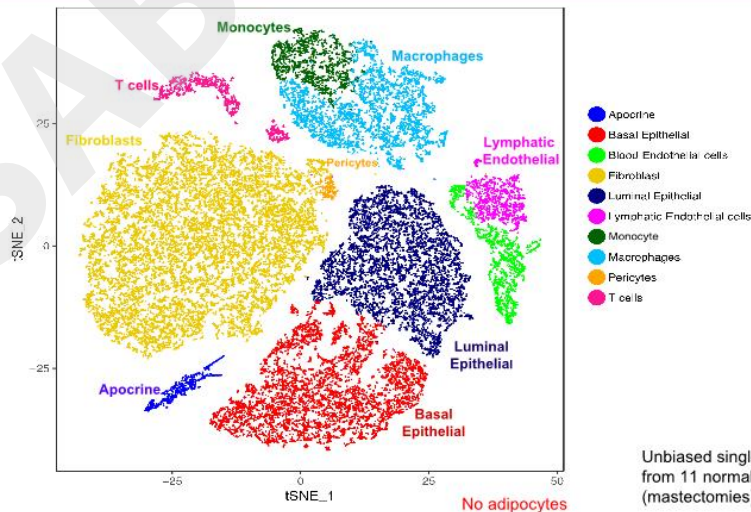
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## Program for Rapid Breast Tissue Collection & Processing



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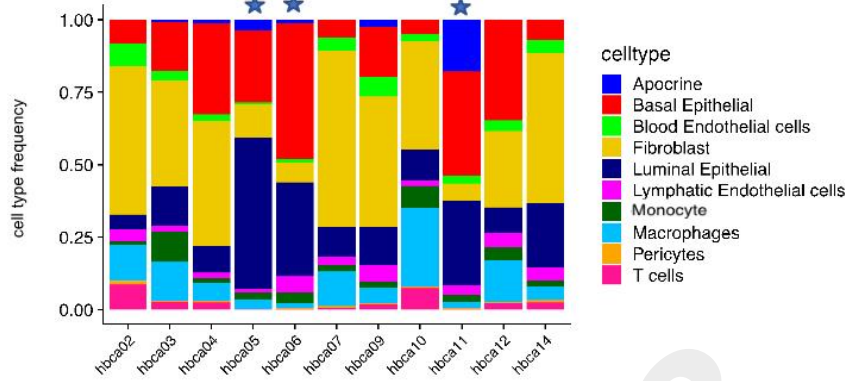
## Cell Types identified in Breast Tissues from 11 Women



Unbiased single cell RNA of 32148 cells from 11 normal breast tissues (mastectomies)

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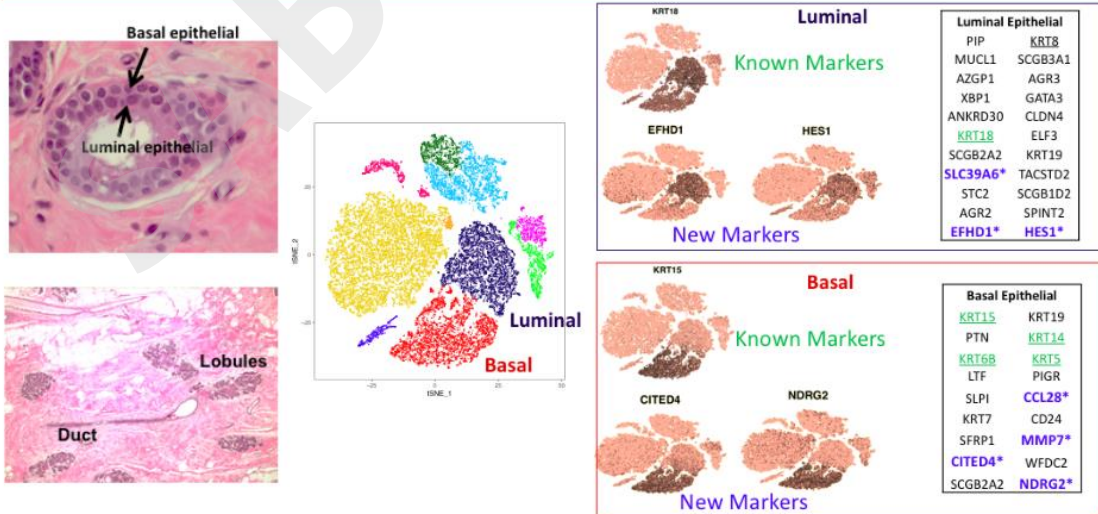
## Cell Type Composition varies in different patients



- Fibroblasts and Epithelial cells are most abundant cell types, but their frequencies vary across women
- Unexpectedly, immune cell populations (T-cells, macrophages) were identified in many normal breast tissues and vary across women
- Adipocytes were removed during dissociation process and were not identified in the datasets

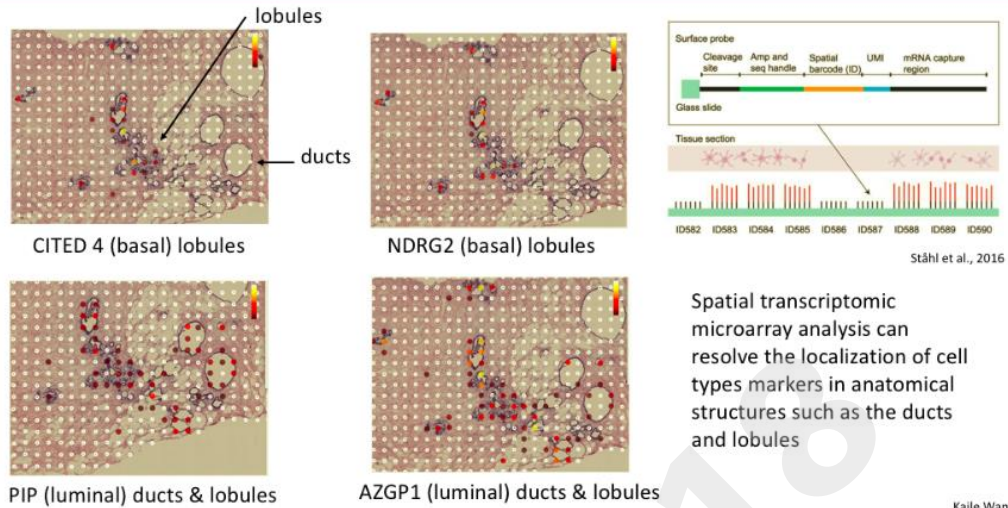
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## Known and Novel Markers of Epithelial Cell Types



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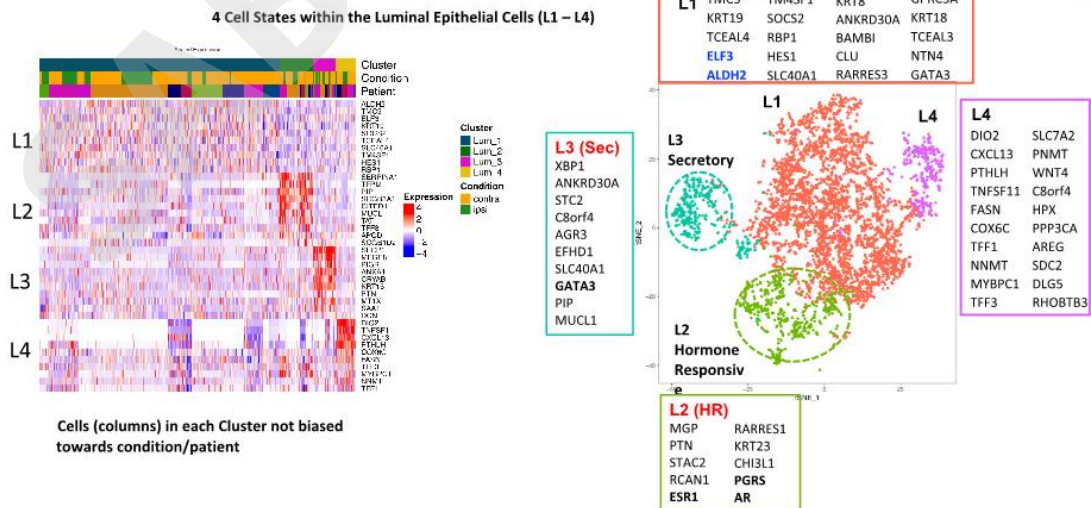
## Validation of Epithelial Markers in Ducts and Lobules by Spatial Transcriptomics



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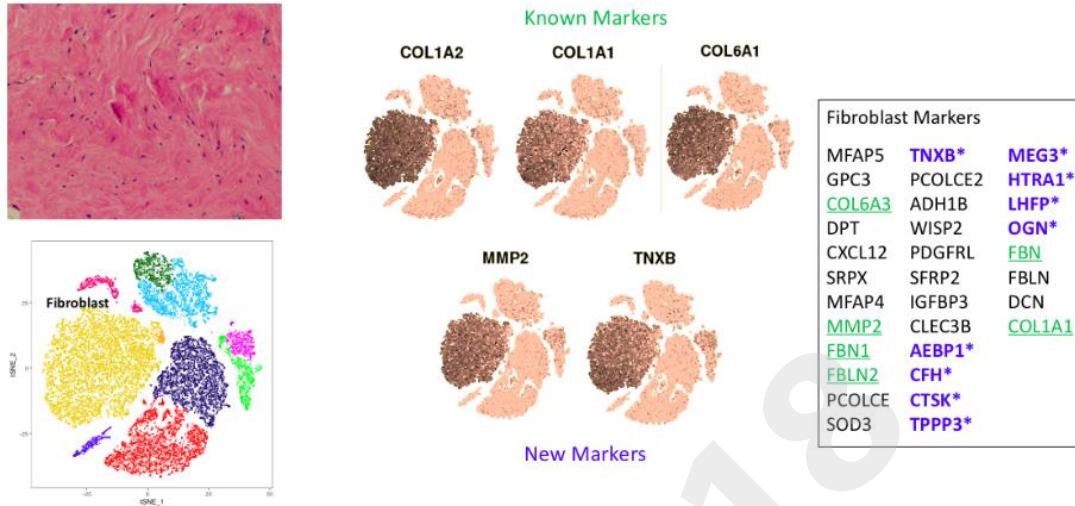
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## Expression Cell States in Luminal Epithelial Cells

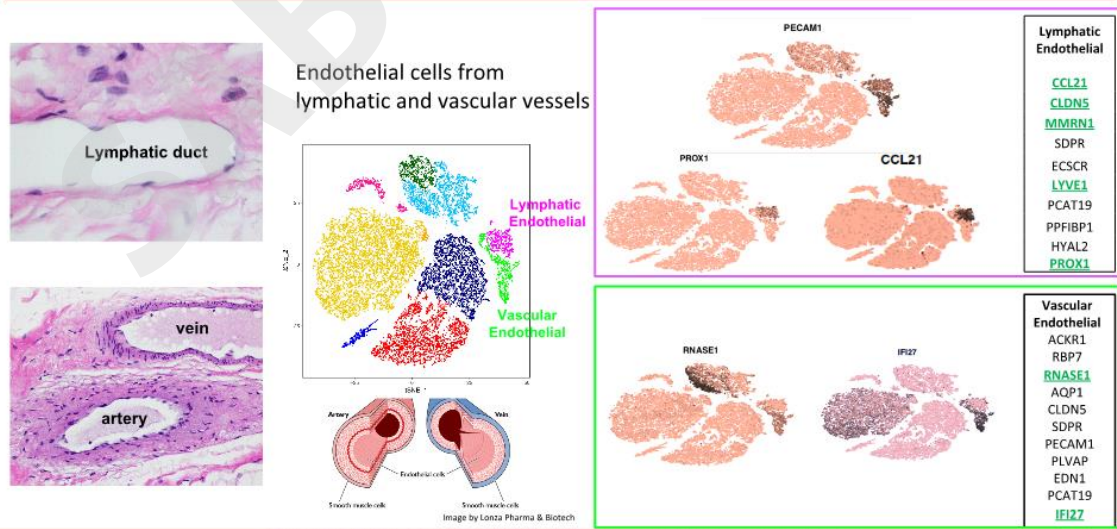


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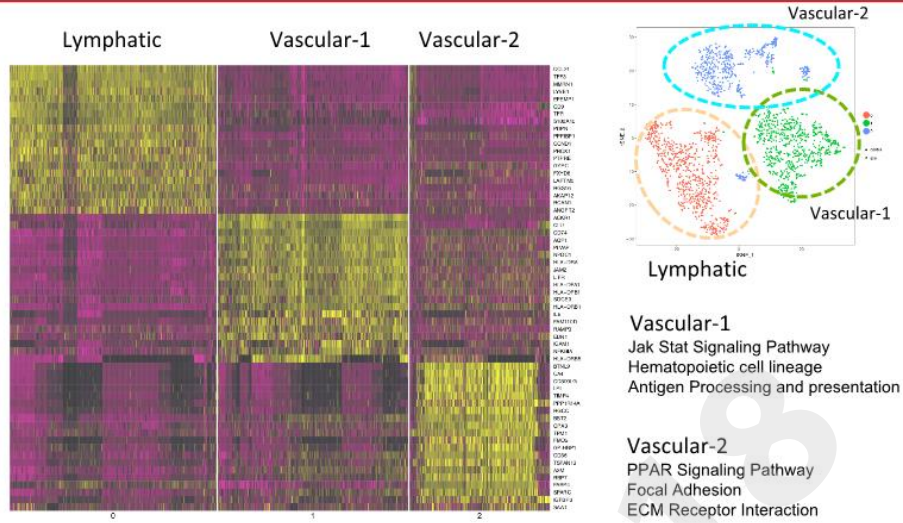
## Fibroblast Cells in Normal Breast Tissue



## Endothelial Cell Groups

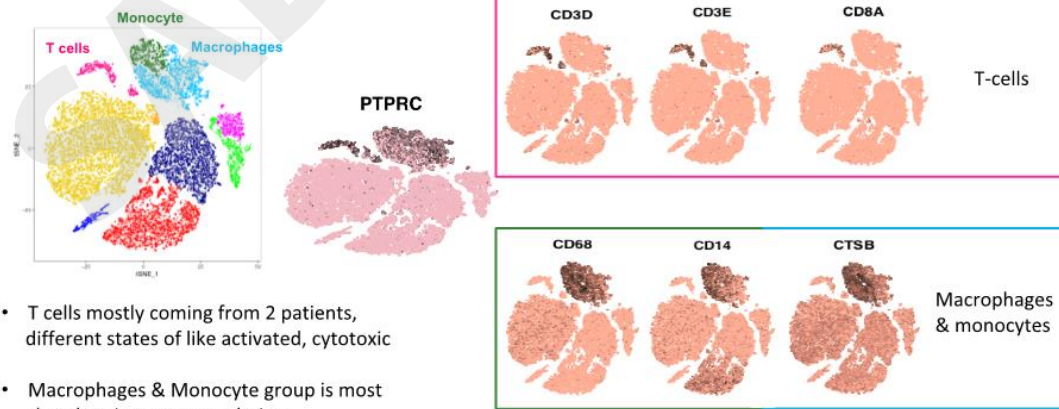


## Three Groups of Endothelial Cells



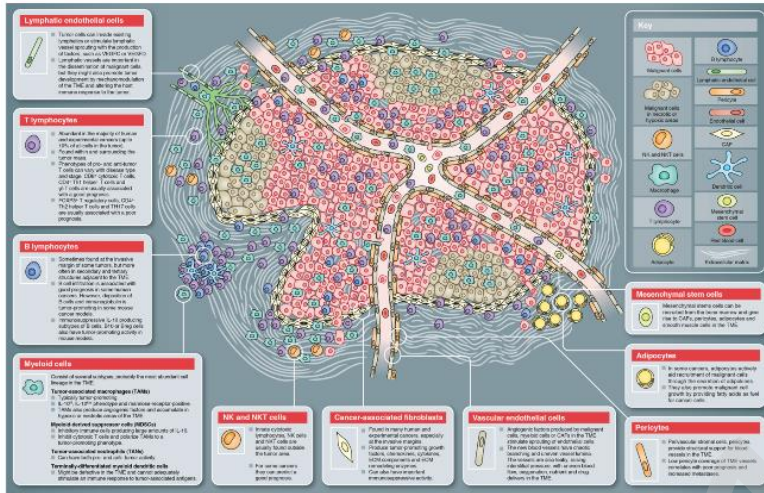
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## Immune Cells



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# Stromal Cell Types in the Breast Tumor Microenvironment



Carcinoma Associated Fibroblasts (CAFs),  
 Tumor Endothelial Cells (TECs),  
 Tumor Associated Macrophages (TAMs),  
 T-cells,  
 Tumor Associated Adipocytes (TAAs),

Balkwill et al., 2012

## Summary

- Major cell types in the breast include epithelial cells (luminal, basal), fibroblasts and endothelial cells (lymphatic, vascular).
- Minor cell types include immune cells (macrophages, t-cells), apocrine cells, pericytes and others.
- Notably adipocytes were not detected as they were removed during dissociation protocol, which are now being isolated by single nucleus RNA sequencing
- Single cell RNA sequencing identified 2-6 cell states (expression programs) for most cell types, many of which relate to unknown biological functions
- Many new markers were identified for most cell types and cell states in the breast, and are being spatially validated



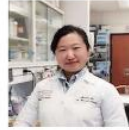
## Acknowledgements

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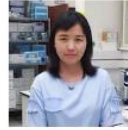
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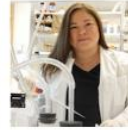
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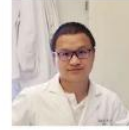
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