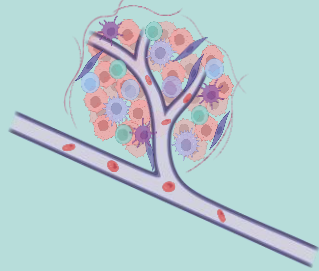
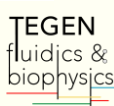


Unraveling Breast Cancer Heterogeneity: Microfluidic Sorting and Bioassay-Based Functional Analysis



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Current problems

Metastasis causes 90% of cancer deaths.

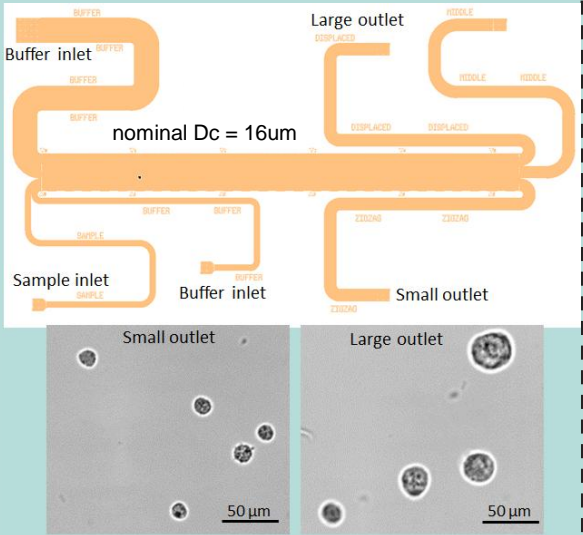
Alteration in the cancer cell mechanics correlate with disease state.

Solution

Breast cancer cells can be sorted into sub-populations as **small and large** based on size.

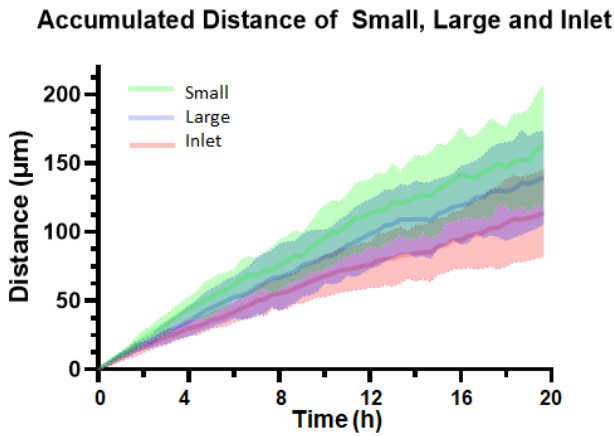
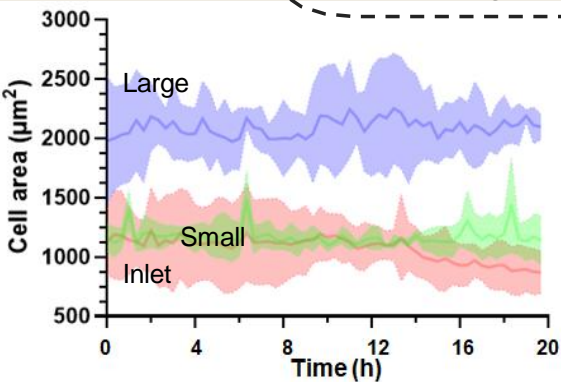
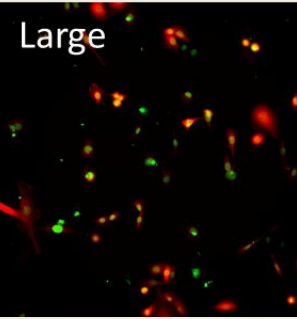
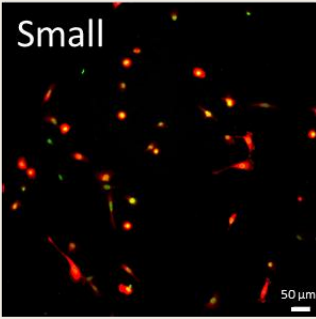


Method: Deterministic lateral displacement (DLD)



Findings I

Small Cells Exhibit Enhanced Migration on Basement Membrane Extract (BME)



- Small breast cancer cells showed significantly greater migration on BME over 20 hours compared to large cells.
- Nuclei size and cell area confirmed persistent morphological differences between subpopulations as well as inlet.

Next



I Future work will examine patient-derived circulating tumor cell deformability under varying pressures and their long-term behavior related to proliferation and motility.

II The analyses will comprise qRT-PCR, antibody assay, and long-term time-lapse imaging to deepen our understanding of the cancer cascade.

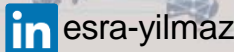
Acknowledgments



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Esra Yilmaz

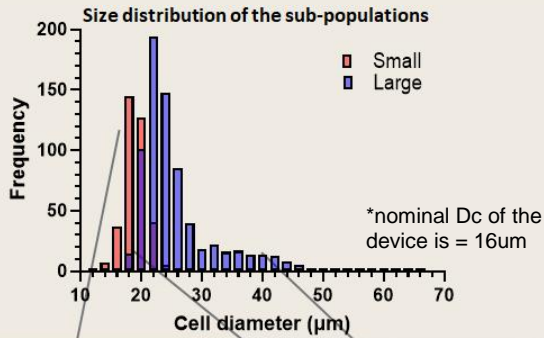
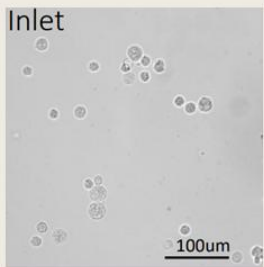
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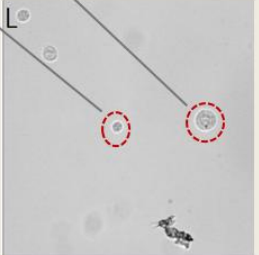
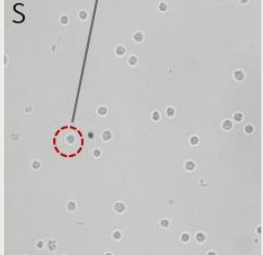
Our research goal

- Characterizing cancer cells by their mechanical properties, which often relate to disease fate.
- Exploring subpopulation functionality and their role in cancer metastasis.

Size-Based Sorting Reveals Distinct Cancer Cell Populations



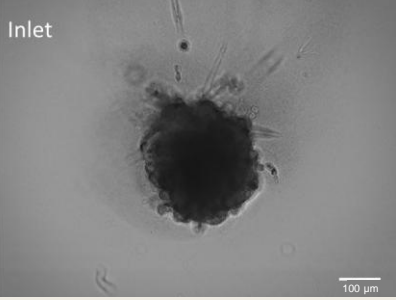
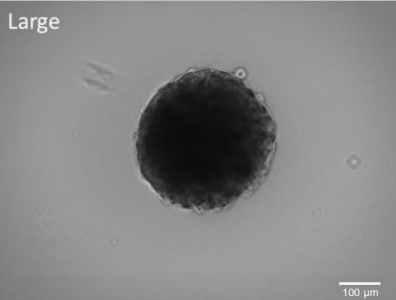
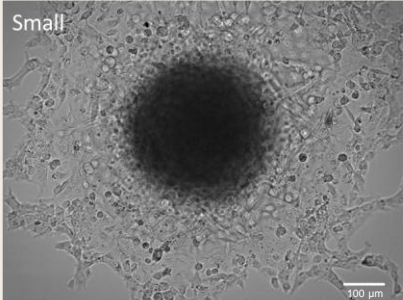
Experimental Conditions:
• Sample Pressure: 80 mbar
• Buffer 1 (Large): 87 mbar
• Buffer 2 (Small): 82 mbar
Q=30 ul/min



- Small cells display a narrow, uniform size range whereas large cells show broader heterogeneity, including clusters.

Findings III

Small-Cell Spheroids Show Invasive Behaviour in 3D Matrigel



- Spheroids derived from small cells exhibited invasive protrusions in 3D Matrigel, whereas those from large cells maintained a compact and organized structure, highlighting functional differences in invasiveness. This suggests higher invasive potential in the small-cell subpopulation.