

Effects of Mechanical Rigidity and Geometric Control on Colon Cancer Metastasis

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Key Research Aims and Goals

To understand the mechanism of coupled mechanical-elasticity cues and geometric cues on the onset of *in vitro* colon cancer metastasis.

Research Highlights and Results

- We have discovered that human colon carcinoma (HCT-8) cells consistently show *in vitro* metastasis-like phenotype (MLP) when cultured on substrates with appropriate mechanical stiffness (21-47 kPa), but not on very soft (1 kPa) and very stiff substrates (3.6 GPa) [[1, 2], Fig. 1a].
- We now have developed a novel micro-patterning technique to spatially confine the living cells adhesion within pre-defined geometric zones on 2D polyacrylamide hydrogel substrates (Fig. 1b).

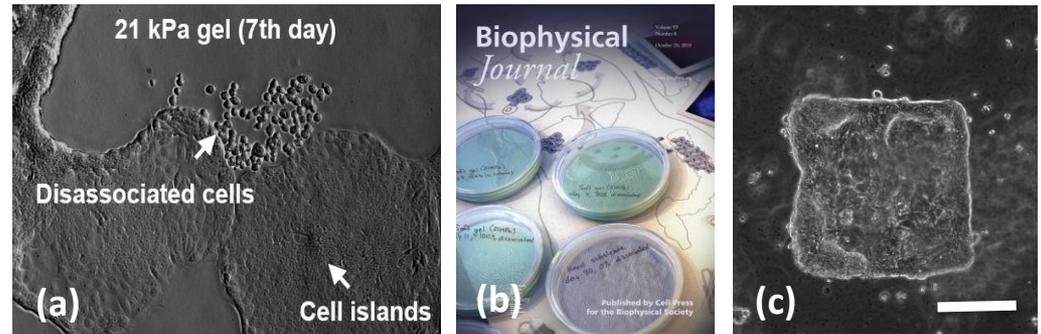


Fig 1 (a) HCT-8 cells cultured on intermediate stiffness gel substrates ($E=21$ kPa, coated with fibronectin) show metastatic-like phenotype (MLP) after 7 days culture; (b) The Biophysical Journal Coverage of our results; (c) HCT-8 cells are cultured on micro-patterned fibronectin square (edge width: 500 μm) on 21 kPa gel substrate. Scale bar: 250 μm .

Future Research Plans

- The developed micro-patterning technique will enable us to study the coupled effect of geometric cues and rigidity cues on the onset of *in vitro* metastasis.
- Successful identification and mechanistic understanding of metastasis-triggering signals is critical for the design of novel anti-metastasis therapeutics.

[1] Xin Tang, Theresa Kuhlenschmidt, Jiayi Zhou, Philip Bell, Fei Wang, Mark Kuhlenschmidt, Taher Saif. Mechanical Force Affects Expression of an In Vitro Metastasis-Like Phenotype in HCT- 8 Cells. *Biophysical Journal*. 2010;99:2460-9. **(Featured as Cover Article)**

[2] Xin Tang, Tony Cappa, Theresa Kuhlenschmidt, Mark Kuhlenschmidt, Taher Saif. Specific and Non-Specific Adhesion in Cancer Cells with Various Metastatic Potentials. Book Chapter of "Mechanobiology of Cell-Cell and Cell-Matrix Interactions", 2011. Springer Science+Business Media, LLC.