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How do heterogeneities in single cell rigidity influence the mechanical behavior at the tissue level? DAPENG BI, Rockefeller University, FRANZISKA WETZEL, ANATOL FRITSCH, University of Leipzig, M. CRISTINA MARCHETTI, M. LISA MANNING, Syracuse University, JOSEF KAES, University of Leipzig — It has been long recognized that solid tumor tissues are mechanically more rigid than surrounding healthy tissues. However recent experiments have shown that in primary tumor samples from patients with mammary and cervix carcinomas, cells exhibit a broad distribution of rigidities, with a higher fraction of softer and more contractile cells compared to normal tissues. This gives rise to a paradox: does softness emerge from adaptation to mechanical and chemical cues in the external microenvironment, or are soft cells already present inside a primary solid tumor? Motivated by these observations, we study a model of dense tissues that incorporates the experimental data for cell stiffness variations to reveal that, surprisingly, tumors with a significant fraction of very soft cells can still remain rigid. Moreover, in tissues with the observed distributions of cell stiffnesses, softer cells spontaneously self-organize into lines or streams, possibly facilitating cancer metastasis.

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