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Probing matrix and tumor mechanics with *in situ* calibrated optical trap based active microrheology JACK RORY STAUNTON, WILFRED VIEIRA, KANDICE TANNER, NIH, TISSUE MORPHODYNAMICS UNIT TEAM — Aberrant extracellular matrix deposition and vascularization, concomitant with proliferation and phenotypic changes undergone by cancer cells, alter mechanical properties in the tumor microenvironment during cancer progression. Tumor mechanics conversely influence progression, and the identification of physical biomarkers promise improved diagnostic and prognostic power. Optical trap based active microrheology enables measurement of forces up to 0.5 mm within a sample, allowing interrogation of *in vitro* biomaterials, *ex vivo* tissue sections, and small organisms *in vivo*. We fabricated collagen I hydrogels exhibiting distinct structural properties by tuning polymerization temperature T_p, and measured their shear storage and loss moduli at frequencies 1-15k Hz at multiple amplitudes. Lower T_p gels, with larger pore size but thicker, longer fibers, were stiffer than higher T_p gels; decreasing strain increased loss moduli and decreased storage moduli at low frequencies. We subcutanously injected probes with metastatic murine melanoma cells into mice. The excised tumors displayed storage and loss moduli 40 Pa and 10 Pa at 1 Hz, increasing to 500 Pa and 1 kPa at 15 kHz, respectively.

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