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Stiffness nanotomography of human epithelial cancer cells JACK R. STAUNTON, BRYANT L. DOSS, C. MICHAEL GILBERT, Arizona State University, SANDOR KASAS, EPFL, ROBERT ROS, Arizona State University — The mechanical stiffness of individual cells is important in both cancer initiation and metastasis. We present atomic force microscopy (AFM) based nanoindentation experiments on various human mammary and esophagus cell lines covering the spectrum from normal immortalized cells to highly metastatic ones. The combination of an AFM with a confocal fluorescence lifetime imaging microscope (FLIM) in conjunction with the ability to move the sample and objective independently allow for precise alignment of AFM probe and laser focus with an accuracy down to a few nanometers. This enables us to correlate the mechanical properties with the point of indentation in the FLIM image. We are using force-volume measurements as well as force indentation curves on distinct points on the cells to compare the elastic moduli of the nuclei, nucleoli, and the cytoplasm, and how they vary within and between individual cells and cell lines. Further, a detailed analysis of the force-indentation curves allows study of the cells' mechanical properties at different indentation depths and to generate 3D elasticity maps.

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