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Mechanical Properties of Human Cells Change during Neoplastic Processes[1] MARTIN GUTHOLD, XINYI GUO, KEITH BONIN, Wake Forest University, KARIN SCARPINATO, Georgia Southern University — Using an AFM with a spherical probe of 5.3 μm, we determined mechanical properties of individual human mammary epithelial cells that have progressed through four stages of neoplastic transformation: normal, immortal, tumorigenic, and metastatic. Measurements on cells in all four stages were taken over both the nucleus and the cytoplasm. Moreover, the measurements were made for cells outside of a colony (isolated), on the periphery of a colony, and inside a colony. By fitting the AFM force vs. indentation curves to a Hertz model, we determined the Young's modulus, E. We found a distinct contrast in the influence a cell's colony environment has on its stiffness depending on whether the cells are normal or cancer cells. We also found that cells become softer as they advance to the tumorigenic stage and then stiffen somewhat in the final step to metastatic cells. For cells averaged over all locations the stiffness values of the nuclear region for normal, immortal, tumorigenic, and metastatic cells were (mean +/- sem) 880 +/- 50, 940+/-50, 400 +/- 20, and 600 +/-20 Pa respectively. Cytoplasmic regions followed a similar trend. These results point to a complex picture of the mechanical changes that occur as cells undergo neoplastic transformation.

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