The Effect of Mechanical Compression on Cancer Cell Proliferation

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Tissues in our body experience a variety of mechanical stimuli that are important in physiological and pathophysiological conditions. Compression can arise from cells in the stiff micro environment around the solid tumor as well as from migration of a metastatic cancer cell through tight vasculature. Such mechanical stresses may have a profound impact on tumor growth and development. There is conflicting literature on how mechanical compression influences proliferation and how cancer cells respond to compression is not entirely well understood. To further explore this field, breast cancer cells (MDA-MB-231) and healthy breast epithelial cells (MCF10A) were used to investigate the impact of compression on cancer cell proliferation. Different weights were applied to simulate different compressive stresses the cells can experience in the body. Cells were imaged using a fluorescence microscope. Cell proliferation was quantified by using ImageJ software. The results show that compression affects healthy breast cells and breast cancer cells, breast cancer cells are more responsive to changes in their mechanical environment than healthy breast cells, and breast cancer cell proliferation is not affected after a threshold of compression is reached. These results provide insight on the relationship between mechanical compression and cancer cell proliferation. Since proliferation of breast cancer cells was inhibited by compression, medical researchers can develop drugs that increase mechanical compression on a tumor to slow its rate of growth. These discoveries set the stage for a new area in cancer treatment research focusing on the mechanical influences on cancer rather than the genetic and biological influences.