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Cardiomyocytes beat best on a matrix with heart-like elasticity – Molecular mechanics of the changes CHRISTINE CARAG, ADAM ENGLER, DENNIS DISCHER, University of Pennsylvania — Cardiomyocytes derived from embryos beat spontaneously in culture, but it is shown here with a series of flexible substrates that matrices which mimic the elasticity of the developing heart are optimal for 1-Hz beating, for transmitting contractile work to the matrix, and for promoting actomyosin striation. On hard matrices that mechanically mimic a post-infarct fibrotic scar, cells overstrain themselves, lack striated myofibrils and stop beating; on very soft matrices, cells preserve contractile beating for days in culture but do very little work. Optimal matrix leads to a strain match between cell and matrix, and suggests dynamic differences in intracellular protein structures. A novel 'cysteine shotgun' method of labeling the in situ proteome reveals differences in assembly or conformation of several abundant cytoskeletal proteins, including vimentin, filamin and myosin.

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