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Improving cardiomyocyte pattern fidelity and bio-adhesion to microelectrode arrays for long-term *in vitro* cardiac electrophysiology studies

Gregg Legters, Carlota Oleaga, Gail Ekman,Candace R Martin and **J J Hickman**
University of Central Florida, USA

The patterning of cardiomyocytes on microelectrode arrays (MEAs) allows the *in vitro* measurement of conduction velocity with a defined path. However, the biomechanics of functional cardiac tissue presents unique challenges to the 2D cell culture environment. Whereas the heart allows bulk movement, the MEA surface is rigid. When beating cardiomyocytes contract, they exert a force on neighboring cells, the extracellular matrix (ECM), and proteins adsorbed to the MEA surface, creating the potential for the mechanical separation at cell to cell or cell to surface attachment points. The biomechanical durability of patterned cardiomyocytes on MEAs was studied, and the influence of long-term cell culture conditions on conduction velocity and beat frequency is reported. A combination of factors enhanced the long-term culture viability of rat and human cardiomyocytes including pattern geometry, surface modification, and protein deposition.

glegters@knights.ucf.edu

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