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# Electrochemical patterning of cell repulsive and adhesive proteins for patterned neural cultures

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Planar microelectrode arrays (MEAs) have been used as a valuable tool for monitoring the neuronal activity in the field of electrophysiological research. Various surface micropatterning techniques including micro-contact printing, photoresist-based patterning have been used to form patterned neuronal networks on MEAs. But patterns formed by these techniques are not reconfiguable and repeated microfabrication processes are needed to reproduce the same patterns on reused MEAs. Here, we report patterning of rat hippocampal neurons on electrochemically defined cell-repulsive and adhesive surfaces based on PLL-g-PEG(Poly(L-lysine)-grafted-poly(ethylene glycol)) and PLL (Poly(L-lyinse)), respectively. To block cell attachment on the background of an MEA, PLL-g-PEG was coated uniformly onto an MEA and an electrical pulse was applied to conductive metal patterns on the MEA to release PLL-g-PEG locally. Then the selectively exposed bare conductive metal surface was coated with PLL. Selective patterning of PLL was confirmed using FITC labeled PLL. cultured hippocampal neurons rarely adhered to the PLL-g-PEG coated surface and stretched their neurites well along the PLL coated surface. In this report, we showed that electrochemical protein patterning method can be successfully used for hippocampal neural patterning. Furthermore,we expect that this method can be used to form a reconfigurable neuronal network in vitro.