Micropatterning for Olfactory Bulb and Hippocampus Neuronal Network Structures

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The control of neuronal cell adhesion and growth in artificially defined networks in vitro was developed for the study of neuronal signals propagation. Appropriate analysis is still greatly hindered by inherent morphological complexity of cultured neural network without any control in location of and/or synaptic connection between neurons. In order to build neural networks on a substrate, it is required to modify the substrate surface suitable for patterning neurons.

Soft contact printing with a polydimethyl-siloxane (PDMS) stamp, which was fabricated by photolithography and molding, was used for controlling selective neuronal cell adhesion and growth. The experimental results indicate that the PDL(cytopilic) pattern stamping on PEG (cytophobic) background is effective in growing the hippocampal neuron cells and olfactory cells selectively along the PDL pattern. To optimize neuron growth and pattern forming neural networks, we counted cell body on node and neurits extended along track. And we traced how the neurons found PDL(cytophilic) tracks using dendrites to locate themselves on tracks.