3D MICRO PATTERNED DUAL HYDROGEL SYSTEM FOR STUDIES IN AXON GROWTH AND GUIDANCE.

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Using a digital micromirror device (DMD) dynamic mask for photolithography, we constructed specific poly(ethylene glycol) dimethacrylate (PEG) patterns to develop a dual hydrogel system for controlled neurite outgrowth. UV light was patterned by the DMD and used for photopolymerization of PEG into specified shapes, such as bifurcating channels. A self-assembling peptide hydrogel, Puramatrix (3DM), was injected inside the PEG voids, and embryonic rat dorsal root ganglia (DRG) were cultured inside the peptide hydrogel portion of the construct where neurite growth and direction could be examined. The PEG portion of the hydrogel constructs served as a cell restrictive border, which constrained and directed the neurite extension within the cell-permissive peptide hydrogel. We have verified that our dual-hydrogel system is cell viable, and that neurite growth occurs throughout the peptide hydrogel. Directing neurite growth to specified targets presents a challenging goal, and, using our model, neurite outgrowth was oriented along predetermined geometric constraints. The design of the dual-hydrogel system forms a foundation for controlling the microenvironment to study the optimization of CNS repair under various conditions, and long term goals will include the incorporation of chemotactic and haptotactic signals to guide neurite growth.

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