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Neuronal Response to Memory Shape Polymer Aerogel

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ABSTRACT

Cells and in particular nerve cells are heavily influenced by external stimuli including surface topographies and the stiffness of the substrate [1]. These external parameters affect different cellular behavior including growth rate and orientation [2]. Recent studies have demonstrated the potential of aerogels as a neural scaffold and its prospects as a biomaterial [3] [4] [5]. The 3-D structure inherent to aerogels offers an advantage over other substrates that are biocompatible but 2-D, and therefore lack the dimensionality needed to mimic in vivo conditions. A new class of nanostructured Shape Memory Polyurethane Aerogels (SMPA) offer a unique set of physical parameters with well-defined thermodynamic-kinetic correlations of their shape recovery rate and elastic modulus [6] [7]. Here, the authors report on recent work performed on two types of SMPA prepared with an aliphatic triisocyanate and different mixtures of short-diol derivatives of ethylene glycol: Mix-14 (Young's modulus 0.818 MPa) and Mix-18 (Young's modulus 0.543 MPa). The interaction of PC-12 cells with these substrates was investigated and the cellular response was quantified as a function of pore size and surface topography. Results show longer neurites on these aerogels compared to previous studies. Furthermore, the shape of the PC-12 cells is also affected and a detailed analysis will be provided.

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