Smart Materials: Methods and Applications – 2017 (SMMA-2017)
IL14

Application of functionalized single walled carbon nanotubesand PDL-coated CdSe copolymers in neural cell differentiation and polarization*in vitro*

Abhinoy Kishore[a], Kaushiki Biswas[a], Vijaykameswara Rao N[b], Santu Sarkar[b], Raja Shunmugam[b] and Jayasri Das Sarma[a]

[a]Department of Biological Sciences, [b] Department of Chemical sciences
Indian Institute of Science Education and Research Kolkata

Single-walled carbon nanotubes (SWNTs) and PDL-coated CdSe copolymers have been increasingly used as scaffolds for neuronal growth anddifferentiation. We have investigated how biocompatible functionalized SWNTs and PDL-coated CdSe copolymers can affect theneuronal growth and morphology of an established neuroblastoma cell line neuro2a (N2a). Interestingly, SWNTscovalently attached with biocompatible poly-D-lysine (PDL), and PDL-coatedCdSecopolymersfacilitate neuronal growth and differentiation. Neuronal growth on SWNTs with a combination of poly-ethylene glycol (PEG) with laminin (LA), a positivecontrol molecule, is also studied. As expected, the mean length of the dendritic processes and axons issignificantly larger with PDL as well as PEG–LA functionalized SWNTs compared to the controlmolecules. Most importantly, N2a cells retain neuronal morphology in the culture for a longer time(21 days) in presence of SWNT–PDL or SWNT–PEG LA, compared to the control culture. SWNTsmodified neuronal cells in culture are infected with enhanced green fluorescent protein (EGFP) taggedrecombinant neurotropic mouse hepatitis virus (MHV) to demonstrate that SWNT modulated N2a cellsis a promising substrate for understanding the viral antigen spread and persistence. Detailed experiments on N2A cells with the custom designed copolymers suggested the ability to polarize neuronal growth and differentiation. Going forward, the ability to synthesize and organize functionalized QDs with biologically interacting molecules presents new opportunities in self-directed self-assembly that might be exploited in cell isolation, imaging, biosensors, and in vitro myelination system.