Morphological and physiological dynamics of Neuronal spines in presence of Semiconducting Single Walled Carbon Nanotube

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Introduction: Regenerative medicine has been targeting the development of fully functional neuronal circuits from damaged ones. Damage in neuronal circuit could be because of trauma or diseases like Alzheimer's or reduced cognitive ability due to aging. One of the approaches toward this goal is to mimic the unique microenvironment in tissues specific for certain cells. This is carried out by enriching the scaffold by extracellular molecules that mimic the matrix inside the tissues._One of the most studied nanomaterials is carbon nanotubes (CNT)._Carbon nanotubes are composed of sheets of graphene formed into a cylinder, either single cylinder, single walled carbon nanotubes (SWCNT) or multiple concentric cylinders, multiwalled carbon nanotube (MWCNT). For our studies we have use semiconducting single walled carbon nanotube.

Methods: The study carried out in Primary hippocampal neuron from *P0-P1 wistar rat pup*. Morphology was studied by intracellular labelling by using Alexa 590. Physiological studies carried by using Cal520 AM for calcium imaging. The images were capture using customize fast scanning two photon imaging system.

Results: With the introduction of Semiconducting SWCNT on primary hippocampal neuron there were increase in Dendrites and number of dendritic Filipodia. Also, though the spine populations seem similar in both treated and control group, the size of stubby and mushroom spine was larger in treated culture as compared to control. The Cal520 AM studies reflect the action potential firing. The Nanoparticle treated neuronal culture shows the increase firing frequency as compared to control. Also, the treated culture last longer in in vitro condition. The network matures faster when treated by semiconductiong SWCNT.

Conclusion: The semiconducting single walled carbon nanotube may affect the neuronal network restructuring.

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