Study of the contact between neural cells and carbon nanotubes

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Carbon nanotubes (CNT) are one of promising nanotechnology products. Unique electronic properties, high mechanical strength, excellent flexibility and large specific surface area of nanotubes make them suitable for creating novel biocompatible composite materials for bio-nano-electronics application. Currently one of the major challenges for biotechnology is maintaining the exchange of electric signals between biological objects and electronic devices. CNTs can be used for neuron signal processing and transmission for surgery and electronic implants integration. CNT can also be used as transducers in biological molecular detectors and sensors.

In this work we investigate the possible technological routes for maintaining an electrical contact between biological objects and carbon nanotubes. In order to improve the contact between cells and CNTs the latter have to be functionalized by biological surfactant like protein, DNA, etc. Here we used the CNT/bovine serum albumin (BSA) composite. We demonstrate an increase in proliferation when a voltage of about 100 mV is applied to CNT/BSA film [1]. We also compare properties of nanotube films fabricated using two different techniques. One type of films was made by depositing CNTs from BSA solution while the second type was a CVD as-growth film. We investigated formation of the “artificial synapse” between CNT and neural cells [2]. We discovered that intensity of G-band Raman shift increases for CNT/BSA film at specified points under axon. We suggest this phenomenon to better signal propagation by ion concentration increasing.

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