Advanced Surface Modifications of Biomaterials with Carbon Nanotubes for Tissue Engineering and Regenerative Medicine

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Abstract

Engineering of the surface is the multidisciplinary research of materials science and has a broad range of applications to chemistry, biology, engineering and medicine. Surface modification of a biomaterial can be done by different methods for altering into required characteristics, such as size, morphology, topology, wettability, roughness, surface charge, reactivity, biocompatibility and applicability. Tissue engineering is the use of a combination of cells, engineering and materials methods, and suitable biochemical and physicochemical factors to improve or replace biological functions of tissues.

Here we provide the various applications of our surface modification systems and also discuss successes to date, current limitations and future directions. We developed surface modification system on polymer composites, commercial plastic wares and biochips, using carbon nanotubes with chemicals, zwitterionic polymers, polyethylene glycol (PEG), 3-aminopropyltriethoxysilane (APTES), extracellular matrix (ECM), other bioactive molecules, *etc* for efficiently enhancing cell and/or tissue functions.

Our results highlight an innovative surface-modified biomaterials for advance cell culture and tissue regeneration system and may allow the development of enabling technologies for useful applications for tissue engineering and regenerative medicine.

Keywords: surface modification, 2D culture, 3D culture, biomedical engineering, tissue regeneration