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Fabrication of Engineered Nanoparticles on Biological Macromolecular (PEGylated Chitosan) composite for bio-active Hydrogel System in Cardiac Repair Applications

Nanbo Liu^{ab}, Jimei Chen^b, Jian Zhuang^b and Ping Zhu^{ab*}

^aDepartment of Cardiac Surgery, Affiliated South China Hospital, Southern Medical University (Guangdong Provincial People's Hospital), Guangzhou, Guangdong, 510515, China.

^bDepartment of Cardiac Surgery, Guangdong Cardiovascular Institute, Guangdong General Hospital, Guangdong Academy of Medical Sciences, Guangzhou 510100, China.

Correspondence: Dr. Ping Zhu (tanganqier@163.com; liu.nanbo@yahoo.com)

Abstract

The development of advanced nano-mediated biological macromolecular (PEGylated Chitosan) hydrogel materials is a vital approach to enhance the efficiency of cardiac tissue applications for treatment of cardiac tissue repair. Definite properties of PEG and chitosan hydrogel matrixes including swelling, mechanical stability and porosity need to be further improved with effective and non-toxic nanoparticles to promote the cell adhesion and organization of cardiac cells. In the current study, we fabricated engineered spherical TiO₂ nanoparticles into the biologically active macromolecular (PEG/CTS) hydrogel matrixes with enhanced physico-chemical and biological properties. The morphological improved spherical TiO₂ NPs have been highly dispersed in the porous hydrogel structure and effectively promoted young modulus and swelling properties and also exhibited favorable cell adhesion and organization with the cardiomyocytes cells. The stained fluorescence images of TiO₂-PEG/CTS hydrogels on the cardiomyocytes cells show the excellent cell-hydrogel matrix interactions

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