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Electrospun silk fibroin meshes combined with graphene oxide as novel biomaterials for tissue engineering applications

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Graphene based materials are being studied as emerging scaffolds for tissue engineering applications due to their excellent properties in terms of biocompatibility. Numerous reports have noted the optimal adhesion and proliferation of diverse type of cells growing on graphene oxide (GO) materials, moreover the chemical nature of graphene seems to act also on the differentiation of stem cells. In this work we explored the possibility to produce electrospun silk fibroin (SF) scaffolds with GO in order to combine the excellent properties of both biomaterials. The GO was added by two different procedures; absorption of GO on the surface of the fibers and incorporation of GO in the electrospinning solution. The first one was performed by means of one dipping cycle of the SF electrospun mats in GO aqueous suspension (1mg.mL^{-1}) and the second through the electrospinning of a 18% (w/v) SF aqueous solution (containing SF:GO in 1000:1 ratio). Adhesion and proliferation of L929 fibroblasts growing onto these materials were studied by SEM and MTT assay, respectively. Both materials showed a significant stimulatory effect in the proliferation of L929 cell cultures 4 days after the seeding (Tukey, $p<0.05$). Considering pure SF electrospun mats (SF) as negative controls the proliferation increased by 64.7% in meshes with GO adsorbed (SF/GO$_{ab}$) and by 30.3% in meshes with GO incorporated in the electrospinning solution (SF:GO$_{1000:1}$). Therefore, this work suggests the potential use of electrospun SF-GO scaffolds for applications in biomedicine.

Biography

Salvador Aznar-Cervantes works as a Researcher in the Department of Biotechnology, in the R&D Center in Biotechnology and Biomedicine, IMIDA (Murcia). He obtained his degree in Biology from the University of Murcia (2006), and then he completed his Doctoral thesis, working as a grant holder (FPI-INIA), under the direction of Dr. José Luis Cenis Anadón, in January 2013. During the course of his PhD, he researched on biotechnological and biomedical applications of the silk worm (*Bombyx mori*). This period was complemented with 3 successive visits (2010, 2011, and 2012) to the Department of Chemical Engineering of Massachusetts Institute of Technology (MIT), where he also collaborated with Tufts University (Professor David L. Kaplan) and the Massachusetts General Hospital (Professor Robert Redmond).

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