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Electrospun nanofibers based on natural biomaterials for regenerative medicine

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In tissue regeneration, it is fundamental that the used scaffolds mimic the structure and the functions of the extracellular matrix. Common scaffolding methodologies, such as solvent casting, particulate leaching, gas foaming, and freeze drying, difficulty satisfy this requirement. On the contrary, the electrospinning technique has demonstrated its ability in fabricating nanofibrous scaffolds able to duplicate the native tissue structure. Electrospinning is a versatile method to create fibres having a diameter can range from 5 nm to more than 1 μm. Electrospun webs provide scaffolds with a wide range of mechanical properties (from plastic to elastic), optimized porosity and topographical cues. This results in improved cellular response and it is often translated into accelerated tissue healing and regeneration. Various synthetic and natural biodegradable polymers have been electrospun for producing nanofibrous substrates with the desired mechanical and chemical properties. Moreover, drugs, growth factors and other active molecules can be added inside the nanofibers. We demonstrated the fabrication of composite nanofibers based on polymers derived from natural sources (such as alginate, cellulose, and chitosan) and functionalized with active agents. The antimicrobial activity, cytotoxicity and inflammatory response of the realized fibrous scaffolds were investigated *in-vitro* and *in-vivo*. The obtained results show that they are promising architectures for regenerative medicine and wound care medical devices.

Biography

Hadi Hajiali completed his M.Sc. degree in Biomedical Engineering (Biomaterials) from Iran University of Science and Technology in 2010. He has consistently ranked the first student of his class in B.Sc. and M.Sc. courses. His Master's dissertation was "Synthesize Nanocomposite Scaffolds and Examine their Properties for Bone Tissue Engineering". Moreover, he joined Tissue Engineering and Nanomedicine Research Center at Shahid Beheshti University of Medical Sciences to work on the projects which were related to regenerative medicine. He is currently a PhD student in Bioengineering (Bionanotechnology) at University of Genova and Italian Institute of Technology (IIT). His PhD project is "Smart-Nanostructured Scaffolds for Regenerative Medicine". The results of his research projects have been published as several papers.

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