"Electrospun fibrous mats as promising platforms for regenerative medicine"

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In the regenerative and tissue engineering field several efforts are currently devoted to the devise of biomimetic multifunctional composites able to simulate the composition and/or the morphology of the tissue to be regenerated. Indeed, following the biomimetic approach, it is fundamental not only to reproduce the chemical composition of the native tissue but also to resemble the structure and to properly tailor the surface properties, particularly in terms of topography and wettability. The chemical and physical properties of the designed materials can be suitably tuned to drive stem cell fate both *in vitro* and *in vivo*, being able to furnish a specific set of signals, favouring cell adhesion, movement, orientation and proliferation, as well as differentiation, in the case of stem cells, towards specific cell phenotypes (mechanochemical transduction) [1-3]. Among the processing scaffolds techniques, electrospinning is a low-cost, user friendly, and versatile process able to process several kinds of materials, including ceramics, polymers and composites, in fibers with large surface area-to-volume ratio [4-7]. In particular, it has recently emerged as a very promising approach, due to its ability to generate structures which well mimic those of the native tissue extracellular matrix typical of different biological tissues, directing specific stem cell fates, or promoting tissue organization [3,8,9].
Moreover, this technique occurs at ambient conditions, and, therefore is very suitable to encapsulate and stabilize thermolabile substances (biomolecules, drugs, growth factors, antioxidants, antimicrobial agents..), ensuring their controlled release and providing specific functionalities [10]. The surfaces of the obtained fibrous membranes can be also properly modified [11] and functionalised in order to improve the biological response. Honeycomb like [12,13] and hierarchical [14] microstructures can be realized by properly monitoring the solution/suspension properties and the process parameters [12-15].
In this framework, biopolymeric and composite fibrous mats were successfully processed by electrospinning. The obtained systems were fully characterized in terms of microstructural, thermal, and mechanical and biological properties by observation at scanning electron microscopy (SEM), X-ray diffraction, FT-IR spectroscopy measurements, differential scanning calorimetry (DSC), X-Ray diffraction (XRD) analysis, uniaxial tensile tests, cytotoxicity tests.

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