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Marine-based Collagen Membranes by electrospinning technique as Biomaterial for Tissue Engineering Applications

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In Tissue Engineering (TE), the design and development of a scaffold that can perfectly mimic the biological structure and microenvironment of the targeted tissue is the ultimate goal. The extracellular matrix is essential for structural and biochemical support of cells and surrounding environment. During the latest years, several attempts have been made to simply mimic this structure using synthetic polymers but facing the limitation of their chemical and structural dissimilarities compared with natural materials. Electrospinning technique is one of the most well-established processes for producing nanofibrous membranes, being thus an attractive approach, although challenging, for the fabrication of natural-derived polymer nanofiber. In this work we present different combinations of electrospun membranes using only natural but also blends of synthetic and natural polymers to produce new biomaterials envisaging TE applications such as corneal and bone. For bone, a combination of ceramic and polymer is targeted because it is the natural bone tissue composition and formulations composed by hydroxyapatite (HAp), polycaprolactone (PCL) and marine-derived Collagen (Col) and Gelatin (Gel) were studied. Marine collagens and gelatins are regarded as a safe alternative to the mammal sources, which represent social and religious constraints as well as risks associated to zoonosis, and in this work blue shark and Atlantic cod skins. Also, the ceramic component chosen (HAp) is derived from marine sources, namely blue shark teeth. The different materials were electrospun in different combinations, crosslinked and characterized to address morphological, chemical and physical characteristics.