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Micropatterned Electroactive Scaffolds for bone tissue engineering

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Bone tissue is naturally sensitive to mechano-electrical cues provided by its microenvironment. Tissue engineering relies on the development of scaffolds suitable to apply specific stimuli in order to recreate bone tissue microenvironments and trigger their natural recovery. The morphological clues of scaffolds can determine cell behavior and, therefore, the patterning of electroactive polymers can be a suitable approach for bone tissue engineering. This work reports on the influence of electroactive poly(vinylidene fluoride-co-trifluoroethylene) (P(VDF-TrFE)) micropatterned scaffolds in the adhesion, proliferation, and differentiation of bone cells. The micropatterned scaffolds were developed resorting to soft lithography in the form of arrays of lines, intermittent lines, hexagons, linear zigzags and curved zigzags with dimensions of 150 μm. Structures with more and less anisotropy –hexagons and lines, respectively –were selected to evaluate the influence of different sizes dimensions (25, 75, and 150 μm) in bone cells adhesion and proliferation. Differentiation tests were also performed on the intermediated size of 75 μm hexagons and lines patterns. The results shown that cell adhesion site and orientation of pre-osteoblasts can be controlled by the topography of the scaffolds [1]. Moreover, it is demonstrated that more anisotropic surface microstructures are able to promote bone differentiation without the need of further biochemical stimulation [2]. This work proves the relevance of patterned scaffolds to induce proper tissue regeneration.

References
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