The Torch
Vol. 3 (22)

Electrospinning in making of tissue engineering scaffolds

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Tissue engineering is a multidisciplinary field of science aiming for the regeneration of tissues using a combination of cells and scaffolds. Electrospinning is a method of producing fibres using electrostatic force to draw charged threads of polymers. This method uses electrostatic forces to produce fibrous scaffolds from biocompatible materials. The electrospun fibrous scaffold provides fibrous structures with interconnected pores that mimic the natural extracellular matrix in the tissues of the body. Thus, these fibres show high potential in the formation of functional tissues. Further, the parameters of electrospinning can be controlled for the large-scale production of scaffolds with controllable single fibre diameter. However, the reduction of pore size from the microscale to the nanoscale causes a decrease in the porous structure due to a decrease in the fibre diameter. This hampers cellular migration into the fibrous scaffolds, hence restricting tissue ingrowth. It also leads to the formation of a two-dimensional surface rather than a three-dimensional surface which resembles the extracellular matrix more closely. Therefore, both the advantages and disadvantages of electrospinning must be considered so as to fabricate nanoscale fibres with high functionality.

Keywords: Electrospinning, Electrostatic, Tissue engineering, Regeneration, Scaffold, Extracellular matrix

Citation:
Quratulen Khan. Electrospinning in making of tissue engineering scaffolds. The Torch. 2022. 3(22). Available from: https://www.styvalley.com/pub/magazines/torch/read/electrospinning-in-making-of-tissue-engineering-scaffolds.