# Stem Cell Growth on PCL Scaffolds

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## Introduction

- Stem cells can be defined as versatile, unspecialized cells that have the potential either to divide to make more stem cells or to differentiate into one or more cell types, usually in response to some kind of signal (Evans, 2006).
- Tissue engineering can be defined as using a scaffold with the appropriate architecture to guide the repair and restoration of function to damaged tissues or organs (Yao et al., 2011).
- Developing scaffolds that mimic the architecture of normal tissue is one of the major challenges in the field of tissue engineering (Shoichet, 2009).
- Nowadays, there are several techniques available for synthesis that match such challenges (Johnson et al., 2009).
- Electrospinning is the most widely studied technique and has also demonstrated the most promising results in terms of tissue engineering applications (Athira et al., 2014).

## Article

Evaluation of Stem Cells' Growth on Electrospun Polycaprolactone (PCL) Scaffolds Used for Soft Tissue Applications (Akram et al., 2017).

## Goals

This study focuses on the preparation of synthetic tissue from a biodegradable polymer that can be used for soft tissue applications using the electrospinning technique.

## Approach / Procedure / Methods

An experimental technique has been adopted in this paper.

## Results

- Scanning electron microscope image for the processed (Fig. 2(a)) 10 % W/V PCL scaffold showed that the low polymer concentration resulted in a small fiber diameter since the average fiber diameter was about 259 nm (Fig. 2(b)), and this will provide the large surface area

favorable for cell adhesion.

- There is a decrease in the contact angle with time (Table 1); therefore, the scaffolds were soaked in media for two hours after soaking in serum and before adding stem cells in order to be more hydrophilic and to improve the cell's attachment.
- SEM analysis revealed low growth rates for stem cells, and this may attributed to the beadon-string structure for this scaffold, which will decrease the surface area allowed for cell adhesion because increasing the fiber diameter will decrease the surface area, and this, in turn, will lower cell adhesion (Li et al., 2005).
- Histological analysis revealed that the presence of the beaded structure prevented the spread of cells inside the scaffold despite the good average pore size for this scaffold, which was equal to 6400 nm.
- The formation of a confluent monolayer of stem cells was noticed with the scaffold 15 % W/V PCL soaked in serum.
- The staining with toluidine blue for a 15% PCL scaffold, which was not soaked in serum, also revealed the suitability of this scaffold structure for stem cells spread inside the scaffold.

# Conclusion

- The results of cell growth analysis by SEM for the prepared scaffolds, which are (10, 15, and 20) % W/V PCL, showed that the best scaffold in supporting stem cell adhesion and proliferation was 15 % W/V PCL because it revealed high growth rates of stem cells even when it wasn't soaked in serum.
- However, soaking the scaffolds in 100% fetal bovine serum before adding the media with cells will improve the hydrophilicity of the scaffold surface, which will improve, in turn, the attachment of cells on the scaffold and accelerate the formation of confluent monolayer.
- On the other side, the results of histological analysis for these scaffolds revealed the suitability of a uniform fibrous structure that is beads, with pore size larger than 5000 nm for cell spread inside the scaffold.
- This was noticed in both 15 and 20% PCL scaffolds, which had uniform fibrous structures without beads and average pore size larger than 5000 nm.
- Therefore, both 15 and 20% PCL scaffolds supported the spread of stem cells inside the scaffold to enhance the 3D growth and the formation of regenerative tissue.

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