OBTAINING OF COLLAGEN ADDITIVE NANOFIBER TO IMPROVE CARTILAGE TISSUE SCAFFOLD WITH ELECTROSPINNING METHOD

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1. Introduction

Tissue engineering is the process of replacing damaged tissue or limb with the ones that are developed snythetically or naturally or supporting their functions, or the orientation of tissue recovery through the body (Yaşar ve Aydın, 2010)

Tissue engineering is unquestionably one of the popular fields of biomedicine. (Derelioğlu, 2007). Current research in medicine regarding tissue engineering is based on developing support and structure material (cell and tissue scaffold) using biomaterial (biocompatible material). Biomaterial is a frequently used input in tissue engineering due to its natural plymer texture, convenience for chemical modification and to be used in gel form, biocompatibility and non-toxicity.

In this project, to improve cartilage tissue scafold with electrospinning method is obtained collagen additive nanofiber.

2. Method

In this study, bio TPU polymer is used in order to produce nanofibre. TPU is preferred for the goal of this study since it is a biocompatible, flexible, strong and renewable polymer. Electrospinning collector is covered with aluminum foil in order to peel the product off easily. The current speed of 2 ml/h for Sample 1 is set as 16 kV voltage. 2 hours of electrospinning is applied. Scanning Electron Microscope is used for the examination of surface morphology. ATR-FTIR spectrums resulting from these interactions are observed to examine qualitative and quantitative analysis of solid, liquid and gas molecules in whether organic or inorganic structure in short time. Contact angle is measured with sesile drop. In order to measure the biocompatibility of a K-TPU nanofibre cytotoxicity test is conducted.

3. Results

Tissue support material in structure of nanofibre is produced by polymerization process.

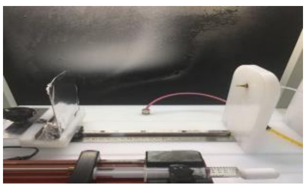

Figure 3.1. Electrospinning device

3.1. Characterization of Polymer

3.1.1. Scanning Electron Microscope (SEM)

In this study, K-TPU nanofiber solutions are measured for their reticulated nanofibre diameter (nm) based on their SEM images. Diameter of a K-TPU nanofibre is defined as 268 nm.

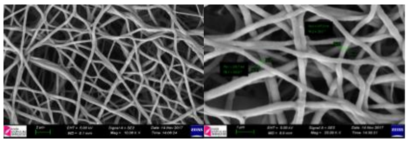

Figure 3.2. K-TPU nanofibre SEM image

3.2.2. Fourier Transformative Infrared Spectrophotometer (FTIR)

Detected that 1530 cm^{-1} pick is intensified in K-TPU analysis. This indicates that BioTPU adequately develops bond with collagen.

3.2.3. Contact Angle

Contact angle measurement reveals that Bio-TPU polymer surface contact angle for Sample 1 is 120.32°, K-TPU polymer surface contact angle is 86.15°.

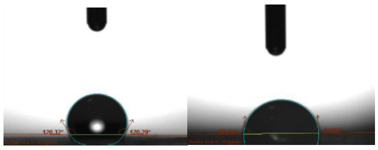

Figure 3.3. Bio-TPU and KTPU contact angle

3.2.4. Biocompatibility Test

3.2.4.1. Cytotoxicity Test

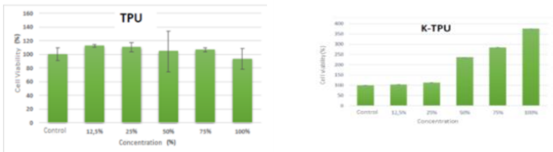

Figure 3.4. Percentage of viability in TPU and K-TPU

4. Conclusion

Tissue support for cartilage is developed with colagen additive. By means of tissue engineering, biocompatibility between the cartilage and colagen additive is augmented and hydrophilicity is improved. Without the polymer that is used in the literature losing its bond texture, a nanotechological product is developed with the electrospinning method that is meant for a treatment to acheive tissue recovery. K-TPU nanofibre is put through characterization process.

5. References

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