

عنوان مقاله:

Evaluation of the Growth and Differentiation of Spermatogonial Stem Cells on a 3D Polycaprolactone/Multi-Walled Carbon Nanotubes-based Microfibrous Scaffold

محل انتشار:

فصلنامه گزارش های زیست فناوری کاربردی، دوره 9، شماره 4 (سال: 1401)

تعداد صفحات اصل مقاله: 10

نویسندگان:

Masoud Ghorbani - *Applied Biotechnology Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran*

Mohammad Reza Nourani - *Nanobiotechnology Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran*

Hanieh Alizadeh - *Department of Cellular and Molecular, Central Tehran Branch, Islamic Azad University, Tehran, Iran*

Vahabodin Goodarzi - *Applied Biotechnology Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran*

خلاصه مقاله:

Introduction: Spermatogenesis is the process that Spermatogonial Stem Cells (SSCs) differentiate to spermatozoa. Effective in vitro differentiation of SSCs to sperm can be a promising sign for the reconstruction of spermatogenesis disorders. This research was designed to evaluate the effect of a 3D Polycaprolactone/Multi-Walled Carbon Nanotubes-based microfibrous scaffold on the culture and differentiation of mouse SSCs to germ cells. **Materials and Methods:** In this research, by using the electrospinning technique, a microfibrous Polycaprolactone (PCL) scaffold incorporated with Multi-Walled Carbon Nanotubes (MWCNTs) was fabricated. The microfibrous PCL/MWCNTs were assessed using Scanning Electron Microscopy (SEM), Transmission Electron Microscope (TEM), Fourier Transform Infrared Spectroscopy (FTIR), and water contact angle measurements. Then, the isolated SSCs were characterized using flow cytometry. Also, the survival and differentiation of SSCs on the 3D fabricated scaffold and tissue culture plate (2D) were evaluated using MTT and real-time PCR for PLZF, ID4, C-Kit, and SYCP3 genes, respectively. **Results:** Morphological assessment of the scaffold showed that PCL/MWCNTs were randomly oriented as microfibrous. In addition, TEM images indicated the presence of Carbon Nanotube (CNT) into PCL polymer. The characterization result of SSCs indicated that approximately 99% of SSCs were positive for promyelocytic leukemia zinc finger (PLZF). Seeded SSCs on the PCL/MWCNTs scaffold had a high survival rate and differentiation. Accordingly, qRT-PCR results demonstrated that the SSCs on the 3D scaffold overexpressed the C-Kit and SYCP3 genes (Markers of differentiated cells) whereas expression of the PLZF and ID4 genes had no significant difference between 2D and 3D groups. **Conclusions:** This research showed the engineered 3D scaffolds can support the proliferation and differentiation of SSCs to germ cells. In addition, this 3D microenvironment could be useful as a new approach in 3D culture systems, especially for culture and the differentiation of SSCs.

کلمات کلیدی:

لینک ثابت مقاله در پایگاه سیویلیکا:

<https://civilica.com/doc/1602573>

