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8th World Congress and Expo on

Cell & Stem Cell Research

March 20-22, 2017 Orlando, USA

The role of biodegradable engineered random polycaprolactone nanofiber scaffolds seeded with nestin-positive hair follicle stem cells for tissue engineering

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Background: Tissue engineering is a new approach to reconstruction and/or regeneration of lost or damaged tissue. The purpose of this study was to fabricate the polycaprolactone (PCL) random nanofiber scaffold as well as evaluation of the cell viability, adhesion, and proliferation of rat nestin-positive hair follicle stem cells (HFSCs) in the graft material using electrospun PCL nanofiber scaffold in regeneration medicine.

Materials & Methods: The bulge HFSCs was isolated from rat whiskers and cultivated in Dulbecco's modified Eagle's medium/F12. To evaluate the biological nature of the bulge stem cells, flow cytometry using nestin, CD34 and K15 antibodies was performed. Electrospinning was used for the production of PCL nanofiber scaffolds. Furthermore, scanning electron microscopy (SEM) for HFSCs attachment, infiltration, and morphology, 3-(4,5-di-methylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay for cell viability and cytotoxicity, tensile strength of the scaffolds mesh and histology analysis were used.

Results: Flow cytometry showed that HFSCs were nestin and CD34 positive but K15 negative. The results of the MTT assay showed cell viability and cell proliferation of the HFSCs on PCL nanofiber scaffolds. SEM microscopy photographs indicated that HFSCs are attached and spread on PCL nanofiber scaffolds. Furthermore, tensile strength of the scaffolds mesh was measured.

Conclusion: The results of this study revealed that modified PCL nanofiber scaffolds are suitable for HFSCs seeding attachment and proliferation. Furthermore, HFSCs are attached and proliferated on PCL nanofibers scaffolds.

Biography

Maliheh Nobakht is a full Professor of Medical Histology and Embryology in Iran University of Medical Sciences. She is a board certified Histologist and Embryologist and is engaged in education and is a basic Science Scientist known an Investigator at Iran University. She has expertise in wound healing and stem cell biology, scaffold and Neuroscience. She graduated from Tehran University in 1985, with a Bachelor of Science degree in Biology. Then, she received Master of Science degree on Histology and Embryology in 1987. She received her PhD degree from Tarbiat Modarres University on Histology in 1992. Subsequently, in 1994, she completed her Post-doctoral training in Molecular Biology and Electron Microscopy under supervision of Professor Leblond and Dr. Lee at McGill University and Shriner's Hospital in Montreal, Quebec, Canada. She became a full Professor in Histology Medicine in 2011 and at the same time, she was appointed to be the Co-director of the vice of education.

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