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Nanoparticle aggregated silicon nanostructures and applications in tissue engineering

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The main goal in tissue engineering is to construct a nanostructured matrix that is in likeness to the natural extra cellular matrix (ECM). It has been previously shown that a two dimensional scaffold does not elicit similar response from cells as the natural environment. A two dimensional matrix changes the micro and macro environment of the cell and consequently results in the change of its phenotype. Therefore it is imperative to have a three dimensional environment. In addition, the nanoscale nature of the matrix is an important factor. It has been shown that nanoscale symmetry offers integrins and adhesion points of cells points of adhesion and these cues are transferred to the cytoskeleton of the cell. In this direction, we introduce a nanofibrous silicon-gold matrix that provides a three dimensional and nanoscale surface for the healthy proliferation of fibroblasts. The three dimensional nanofibrous matrix is manufactured via ultrafast laser fabrication. A silicon wafer coated with gold is used as a substrate. The nanofibrous matrix is characterized via scanning electron microscopy, transmission electron microscopy and electro dispersive spectroscopy. Mouse embryonic fibroblasts were cultured on these matrices to qualitatively and quantitatively measure cells proliferation. Scanning electron microscopy and fluorescence microscopy is employed to assess cell adhesion and proliferation. Results suggest healthy growth and proliferation of fibroblasts. It is noted that the individual nanoparticles on the nanofibers provide adhesion points for fibroblasts. This nanofibrous matrix has the potential to carve a niche in the field of tissue engineering and regeneration.

Biography

Priyatha Premnath completed her Undergraduate degree at SRM, India. She then completed her Doctoral studies at Ryerson University. Her research areas include biomaterials, tissue engineering and nanotechnology. Her research interests also include ultrafast laser processing.

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