

3rd International Conference on Tissue Science & Regenerative Medicine

September 24-26, 2014 Valencia Convention Centre, Spain

Development, characterization and cell cultural response of a 3Dbiocompatible micro-patterned polycaprolactone scaffolds designed and fabricated integrating lithography and micromolding fabrication techniques

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Scaffold design and fabrication are very important subjects for biomaterial, tissue engineering and regenerative medicine research playing a unique role in tissue regeneration and repair. Polycaprolactone (PCL) is very attractive bioresorbable polyester due to its high permeability, biodegradability and capacity to be blended with other biopolymers. By virtue of its ability to naturally degrade in tissues, PCL holds immense promise as new materials for implantable biomedical microdevices. This work focuses on the establishment of a microfabrication process integrating lithography and micromolding fabrication techniques for the realization of 3D microstructured PCL devices. Scaffold's surface exhibits a combination in the patterned length scales; cylindrical pillars of 10 µm height and 10 µm diameter were arranged in a hexagonal lattice with periodicity of 30 µm and their sidewalls were nano-sculptured with a regular pattern of grooves leading to a spatial modulation in the z direction. To demonstrate that these biocompatible pillared PCL substrates are suitable to a proper cell growth, NIH/3T3 mouse embryonic fibroblasts were seeded on microstructured substrates and their key adhesion parameters were evaluated. Scanning Electron Microscopy and immunofluorescence analysis were done to check cell survival, proliferation and adhesion; cells growing on the PCL substrates appeared healthy and formed a well-developed network in close contact with the micro and nano features of the pillared surface. Those highly flexible scaffolds could be a promising candidate solution for a wide range of tissue engineering and regenerative medicine applications.

Biography

Tania Limongi is research scientist in the Physical Science and Engineering Department of the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia. She received in 1999 her Master Degree in Biological Sciences at the University of L'Aquila and her PhD in Microsystem Engineering at the University of Rome Tor Vergata in 2004. She published more than 30 papers in reputed journals; her work is mainly addressed on the development of new tissue engineering approaches and on X-ray, TEM and Atomic Force microscopy application for the study of DNA/protein interactions and single molecule localization techniques.

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