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Advancement in tissue engineering scaffold development: Rapid prototyping technology

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Abstract

Generally scaffolds provide platform for the cells to grow and repair/regenerate the diseased or damaged tissue. For efficient functioning, the scaffolds are to assist the growth of the tissue in a required alignment or pattern. To date various conventional techniques have been widely used to fabricate tissue engineering (TE) scaffolds. However, the versatility of usage of scaffold materials and control over pore shape, size and interconnectivity remain ever facing challenges in the design and development of appropriate scaffolds. An innovative desktop robot based rapid prototyping (DRBRP) system has been developed that can create scaffolds virtually from any thermoplastic polymeric material with versatile patterns having controllable and fully interconnected pore networks. In this study, a range of materials have been experimented to produce 3D scaffolds with varieties of patterns. The hybrid design, which is rather considered to be a new concept in scaffold development, has also been introduced. The scaffolds were characterized in terms of physico-mechanical properties, and also tested for tissue generation via *in vitro* cell culture studies using various mammalian cells. Overall, the DRBRP system proved its efficacy in fabricating scaffolds using synthetic thermoplastic polymers with versatile patterns. The in vitro cell culture studies also demonstrated the biocompatibility and/or suitability of as-fabricated scaffolds for tissue engineering applications.

Biography

Dr. Muhammad Enamul Hoque is an Associate Professor in the Department of Mechanical, Materials & Manufacturing Engineering and served as Head for the Bioengineering Research Group at the University of Nottingham Malaysia Campus. He received his PhD in Bioengineering from NUS, Singapore in 2007. So far, he has authored TWO books, co-authored THREE book chapters and edited TWO books. He has also published more than 75 technical papers in high impact referred journals and international conference proceedings. He is an editorial manager for the Journal of Applied Mechanical Engineering, editor for Journal of Engineering Research and Design (JERD), and invited lead guest editor for the International Journal of Materials and Mechanical Engineering, and serves as a technical reviewer for about 15 international journals. He is a member of several professional scientific societies including Tissue Engineering and Regenerative Medicine International Society (TERMIS), and Tissue Engineering Society Malaysia (TESMA). His research interests include the areas of Rapid Prototyping Technology, Biomaterials, Biofuel, Tissue Engineering, Stem Cells, Nanomaterials and Composite Materials.