

3D ORGAN PRINTING: A FUTURE PROSPECT OF MEDICAL SCIENCES IN ORGAN TRANSPLANTATION

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ABSTRACT

Tissue engineering technology is a promising tool to solve the organ transplantation crisis. The organ bio-printing (3D organ printing) is the next generation alternative for organ transplantation. The structural and viscoelastic properties of assembling networks of the extracellular matrix protein type-I collagen by means of phase contrast microscopy and rotating disk rheometry is matter of concern. According to Steinberg differential adhesion hypothesis (DAH), the self-assembling of living cells into tissues of a specific cell type possesses a specific adhesion apparatus that combined with cell motility leads to cell assemblies of various cell types in the lowest adhesive energy state. The initial stage of the assembly is a nucleation process of collagen monomers associating to randomly distribute branched clusters with extensions of several microns. Eventually a sol-gel transition takes place, which is due to the interconnection of these clusters. This organ printing includes the various tools like Tissue spheroids Biofabricator, 3D Printer, Bioink, Biopaper and Bioreactor. This technology has emerged to very large extent due its wide applications application in the printing of 3D tissues. 3D printing technology for medical applications is presently an active topic of research and promising tool for future also. It is used for printing medication, skin, cartilage & bones, human embryonic stem cells, replacing tissues and organs, studying of cancer etc. It is concluded from this review that 3D organ printing or computer-aided layer-by-layer assembly of biological tissues and organs is currently feasible, fast evolving and predicted to be a major technology in tissue engineering.

Keywords: Tissue engineering, bio-printing, Steinberg differential adhesion hypothesis, 3D organ printer, biofabricator, bioink, biopaper & bioreactor

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