

Role of 3D Bioprinting in Personalized Therapy

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ABSTRACT

3D bioprinting is revolutionary emerging innovative technology in the field of biomedical and pharmaceutical sciences combining engineering, manufacturing and medicine. In the process, various cells, tissues, organ models are 3D Bio-printed by using bioinks for in vitro or in vivo applications like drug discovery, drug testing and Personalized therapy. Bioprinters are advanced manufacturing devices, which print three-dimensional cells, organ models and functional tissues layer by layer. They are printed by using Bioinks, which are mainly composed of specialised material made of hydrogels mixed with living cells, which are designed to mimic the natural extracellular matrix. The models are used for drug testing and precise pharmacotherapy by using tissue models. 3D bioprinting includes three stages, the first stage is the Preparatory stage. It is a crucial foundational phase in image processing and material formulation done by computer-aided design (CAD) and supporting structure in high-resolution medical images according to the patient's unique anatomy. The second stage is the bioprinting stage where layer-by- layer fabrication of a cell or tissue is printed by using selected bioink. The third stage is the Post printing stage where maturation, testing and stabilization of the construct in a Bioreactor is done. The recent advancement in 3D bioprinting is personalized therapy used to create a patient's specific tissue for tailored drug testing. These models are used for Drug screening where we can grow stem cells in the laboratory. In scaffolds, a patient's specific anatomical structure is designed based on medical imaging. It helps to create a patient's specific medicine for immediate and extended release of drug for personalized drug delivery.

Keywords: *Bioprinters, Bioinks, Bioreactor, Scaffold, Drug screening*

