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Biomaterials-based 3D Cell Printing for Next-Generation Therapeutics and Diagnostics

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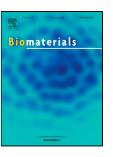
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Abstract

Building human tissues via 3D cell printing technology has received particular attention due to its process flexibility and versatility. This technology enables the recapitulation of unique features of human tissues and the all-in-one manufacturing process through the design of smart and advanced biomaterials and proper polymerization techniques. For the optimal engineering of tissues, a higher-order assembly of physiological components, including cells, biomaterials, and biomolecules, should meet the critical requirements for tissue morphogenesis and vascularization. The convergence of 3D cell printing with a microfluidic approach has led to a significant leap in the vascularization of engineering tissues. In addition, recent cutting-edge technology in stem cells and genetic engineering can potentially be adapted to the 3D tissue fabrication technique, and it has great potential to shift the paradigm of disease modeling and the study of unknown disease mechanisms required for precision medicine. This review gives an overview of recent developments in 3D cell printing and bioinks and provides technical requirements for engineering human tissues. Finally, we propose suggestions on the development of next-generation therapeutics and diagnostics.

Keywords: 3D printing; biomaterials; tissue engineering; regenerative medicine; *in vitro* tissue model; personalized medicine

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