EDITORIAL

Bioprinting of 3D Functional Tissue Constructs

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In recent years, bioprinting has attracted growing research interest due to its unique capability in fabricating complex tissue-specific architectures and precisely positioning living cells in a controllable and reproducible manner. Bioprinting involves multiple disciplines such as biomaterials, mechanical engineering, life science, and medicine. It has become a powerful tool to generate 3D living tissue constructs that replicate the physiological environments, sustain long-term culture, and function as native tissues. Extensive research efforts have been made to print large and functional tissue constructs with biomimetic vascular networks and micro/nanoscale architectures similar to native organs. This special issue is dedicated to summarizing the most recent advances, strategies, and applications of bioprinting techniques ranging from the development of bioinks to engineering of 3D tissue constructs. Four original research articles and four review articles are included in this special issue.

A key aspect of bioprinting is bioinks, which should have optimal rheological and biological properties for successful printing as well as maintaining cell viability and growth capability. In this special issue, Li *et al.* proposed a quantitative thermal model to predict the printability and printing accuracy of alginate–gelatin composite bioinks[1]. Photo-crosslinkable bioinks, which can respond to light and induce structural or morphological transition, were considered as a promising bioink candidate for bioprinting, due to their high biocompatibility, ease of fabrication, as well as controllable mechanical, and degradation properties. A review article by Mei *et al.* summarized the commonly used photo-crosslinkable hydrogels and discusses their potential applications for printing bone and cartilage constructs[2]. In addition, Chen *et al.* developed an elastic and stretchable bioink by combining a polyacrylamide covalent network with a gelatin colloidal network, which was successfully used for high-precision fabrication of ionic skins[3].

Vascular-like networks can be bioprinted to support the growth of 3D tissue constructs. Mao *et al.* presented a novel coaxial electrohydrodynamic bioprinting strategy to generate perfusable core-sheath hydrogel filaments, which can be assembled into 3D constructs with a thickness of more than 3 mm[4]. Their success in printing the thick 3D pre-vascularized cardiac constructs shows great potential to engineer living tissues with complex vascular structures. In a review article, Liu *et al.* compared bioprinting and bioassembling methods for engineering microvessels from the perspectives of fabrication efficiency, the sizes of the engineered microvessels, and the ability to construct complex 3D microvascular networks[5].

Bioprinting can be applied to generate various *in vitro* biological models with complex structural features and tissue-specific functions. With respect to organoids as emerging biological models, Ren *et al.* examined existing bioprinting methods and bioinks and envisioned possible directions for future organoid bioprinting[6]. Similarly, Yang *et al.* reviewed recent advances regarding the fabrication methods and applications of heart-on-a-chip, where various bioprinting techniques underpin the construction of cardiac microtissues[7]. In an original research article, Pei *et al.* reported an integrated bioprinter that enabled the fabrication of layered gradient pore structures of brain-like tissues while maintained a high cell viability[8].

Conflict of interest

No conflict of interest was reported by the authors.

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