EDITORIAL

Bioprinting and biofabrication for tissue engineering in Asia

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Bioprinting is a novel technology that has a greater potential to revolutionize the field of tissue engineering and regenerative medicine. The growth of this technology is commendable and the applications explored are far and wide, including skin printing, orthopedics, cardiovascular applications, dental and maxillofacial applications, cancer research, and personalized medicine. Bioprinting is moving from tissue printing toward printing of functional organs. Although printing fully functional organ cannot be expected to be achieved in this decade, given the challenges and complexities, diligent efforts are taken by researchers around the world to realize this ambitious goal. Asia has contributed its share to the global bioprinting research community. A keyword search in Scopus with "bioprinting" showed that Asia has 30% share of the research publications in the past decade (2008-2018), the details are shown in table below.

Years	Total number of articles	Number of articles from Asia	% share from Asia
2008-2018	2715	812	29.91
2019 (till June 20)	441	143	32.43

In this special issue on "Bioprinting and Biofabrication for Tissue Engineering in Asia," there are a total of five original research articles from four different countries including Singapore, China, Taiwan, and Australia. The article from Ou *et al.*[1] on personalized drug-loaded dental patches in this issue is an example of the use of bioprinting for precision medicine, which is one of the potential future applications of bioprinting. In addition to patient-specific customization, the dental patches can be made to have different drug-releasing profile by altering the shape of the patch, showing the potential of bioprinting in personalized medicine. One of the challenges the bioprinting community focuses on is vascularization. Yao *et al.*[2] presented a work on achieving *in vivo* angiogenesis by bioprinting of hydrogel-based microspheres coated by human umbilical vein endothelial cells (HUVECs), without any exogenous growth factors. Shie *et al.*[3] proposed a combination of two printing techniques, namely, extrusion and piezoelectric printing for the regeneration of defective complex hard tissues in deep bone structures. The extrusion method was used to print the ceramic scaffold structure and the piezoelectric printing was used to print the stem cells directly on the surface of the scaffold. Vijayavenkataraman *et al.*[4] reported a work on conductive and biodegradable hydrogel based on collagen and a block copolymer of polypyrrole and polycaprolactone for bioprinting of neural tissue constructs, with the potential to be used for the repair of damaged neural tissues and for drug testing or precision medicine applications. Finally, in their perspective article, Ng and Yeong[5] discuss about the integration of three-dimensional bioprinting within miniaturized microfluidics platform to bring about a paradigm shift in the field of skin toxicology testing.

References

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