Editorial

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Challenges and advances in stem cell therapy

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Summary **After decades of research, stem cells have shown tremendous promise to treat a range of diseases, such as heart disease, diabetes, and neurodegenerative disease. However, many challenges remain in their transformation from bench to bedside, such as the potential risk of tumorigenicity from undifferentiated human induced pluripotent stem cells (hiPSC), the lack of large-scale culture systems for clinical treatment, and the inconvenience of cell therapy itself. "Cell sheet technology" and secretome therapy represent advances in these regards. With gradual breakthroughs in theory and technology, stem cell therapy will lead to a new medical revolution in the coming era.**

Keywords: Stem cell, tissue engineering, cell sheet, secretome, regenerative medicine

Stem cells have the potential to differentiate into more than 200 types of adult cells in the body (*1*). They provide new cells for the body as it grows and substitute for target cells that have been damaged (*2*). Stem cell therapy, also known as regenerative medicine, uses stem cells and their derivatives to promote repair of damaged, diseased, or dysfunctional tissue. Heart disease, diabetes, neurodegenerative disease, hair loss, and even aging are all expected to benefit from this therapy (*3*).

Although stem cell therapy has shown considerable promise, in reality many challenges remain in its transformation from bench to bedside, such as the potential risk of tumorigenicity from undifferentiated human induced pluripotent stem cells (hiPSC), the lack of large-scale culture systems for clinical treatment, and the inconvenience of cell therapy itself. "Cell sheet technology" for tissue engineering represents an advance in overcoming the drawbacks of traditional transplantation techniques. In this issue of *BioScience Trends*, Gao *et al*. (*4*). described their progress in combining "cell sheet technology" and hiPSC-derived cardiac cells to fabricate functional human cardiac tissues. Another advance in stem cell-related therapies is secretome therapy. Secretome therapy has several advantages that stem cell-based therapy lacks, such as the fact that secretomes can be manufactured and transported more easily and there is no need to match the donor and recipient to avoid rejection, so secretome therapy has attracted a lot of attention. A review from Xia *et al*. (*5*) describes more detailed merits and applications of stem cell secretomes in this issue.

Stem cell therapy is at the forefront of life science. With gradual breakthroughs in theory and technology, stem cell therapy will provide new possibilities in the treatment of diseases and disorders that yet cannot be or that are hard to cure and lead to a new medical revolution in the coming era.

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