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EDITORIAL

Special Issue on Tissue Engineering

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Tissue engineering is an emerging multidisciplinary research field that involves expertise related to cell biology, micro/nanoscale engineering, and medicine. Engineering artificial tissues are of great benefit for restoring the lost function of diseased or damaged organs. The current research trends of tissue engineering aim to integrate cell-laden biodegradable scaffolds, microvasculatures, biomolecules, and micro/nanoscale engineering platforms. Due to its importance in human health, we select tissue engineering as a theme of this Special Issue of *Biomedical Engineering Letters*. This Special Issue introduces four review papers covering various state-of-the-art technologies, including microengineering technologies, scaffold design and bio-inspired mechanics.

The first paper entitled "Application of cellular micropatterns to miniaturized cell-based biosensor" is described by Koh and colleagues. Micropatterning enables the control of cell growth, differentiation, and apoptosis for cell-based sensor applications. Cellular detection on micropatterned substrates is generally performed by electrochemical methods (e.g., impedance-based electrochemical method, potential-based method) and optical methods (e.g., bioluminescence, fluorescence). The cellular micropatterning technique can also be integrated within microfluidics to enable high-throughput drug screening and discovery. Thus, this paper reviews the contemporary micropatterning technologies and their various miniaturized cell-based biosensor applications, such as multi-phenotypic cell microarray, drug screening, and pathogen detection.

Micropatterning techniques can also be used to fabricate microwells. Park and colleagues present an overview of "Microwell fabrication methods and applications for cellular studies". This review introduces various fabrication techniques of microwells and mechanisms of cell trapping and handling. Microwells can be fabricated by soft lithography, implementation of physical forces, and micro-injection molding to manipulate the single cell trapping and cell aggregation. By using such microwell platforms, embryonic stem cells can be induced to form uniform-sized embryoid bodies that can be used to generate therapeutic cell types.

The third paper entitled "Forming vascular networks within functional cardiac tissue constructs" is described by Bae and colleagues. Hydrogels are of great interest in scaffold fabrication for tissue engineering and regenerative medicine

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applications due to their high water content as well as enhanced biological and mechanical properties. This review highlights various vascularization methods and their applications for functional cardiac tissue constructs.

Tissue engineering approaches can also be enhanced by learning from nature. In a paper by Kim and colleagues, the mechanism of bioinspired xylem sap drinking and mechanical analysis is described. The insects primarily feed on plant xylem sap. The xylem sap feeding is explained by the interactions between the tension in xylem sap and suction pressure of pumping muscles, showing that the insects are able to feed xylem sap when suction pressure exceeds the maximum tension. This mechanism of xylem sap feeding is also elucidated by X-ray visualization method and hydrogel-based microfluidic platform that can mimic the plant system in a well-defined microenvironment.

We would like to express our gratitude to the authors who present thorough overview of various state-of-the-art technologies and highlight their tissue engineering applications. We would also like to appreciate to the managing editor (Prof. Jae Sung Lee) and Editor-in-Chief (Prof. Sang-Hoon Lee) of the *Biomedical Engineering Letters* for their support and contribution of this Special Issue.