

KSC-JCS Joint symposium

Engineering of Bioartificial Heart ~ Next Step for Cardiac Regeneration?

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Abstract

Induced Pluripotent Stem cell-derived cardiomyocytes (iPS-CMs) have been considered as promising cell sources for regeneration therapy, while disease-specific iPS-CMs have been utilized for disease modeling/drug discovery research for intractable heart diseases.

In most cases, iPC-CMs were arranged and analyzed as single cells or two-(2D)/three-dimensional (3D) tissues regardless of native anatomical structures. Although these tissues have recapitulated patients' phenotypes or showed physiological function to certain extent, there still exists strong demand to regenerate physiologically-/pathophysiologically-relevant cardiac tissues comparable to native tissues/organs.

To elucidate the point, we have attempted to engineer an "organ-like" 3D cardiac tissues using decellularized extracellular matrices (dECM). As a result, we have successfully constructed the dECM-based 3D-engineered hearts showing spontaneous beatings as a "whole organ" and demonstrated well-organized dynamic excitation-propagation using live cell/tissue imaging (Yasui et al. *Biomaterials* 2014), although "the hearts" also demonstrated arrhythmogenic properties such as 2) unsynchronized and 3) disorganized conduction.

In this symposium, introducing our study of dECM-based 3D "organ-like" cardiac tissues, we will discuss prospect and problems to create "Bioartificial Heart".