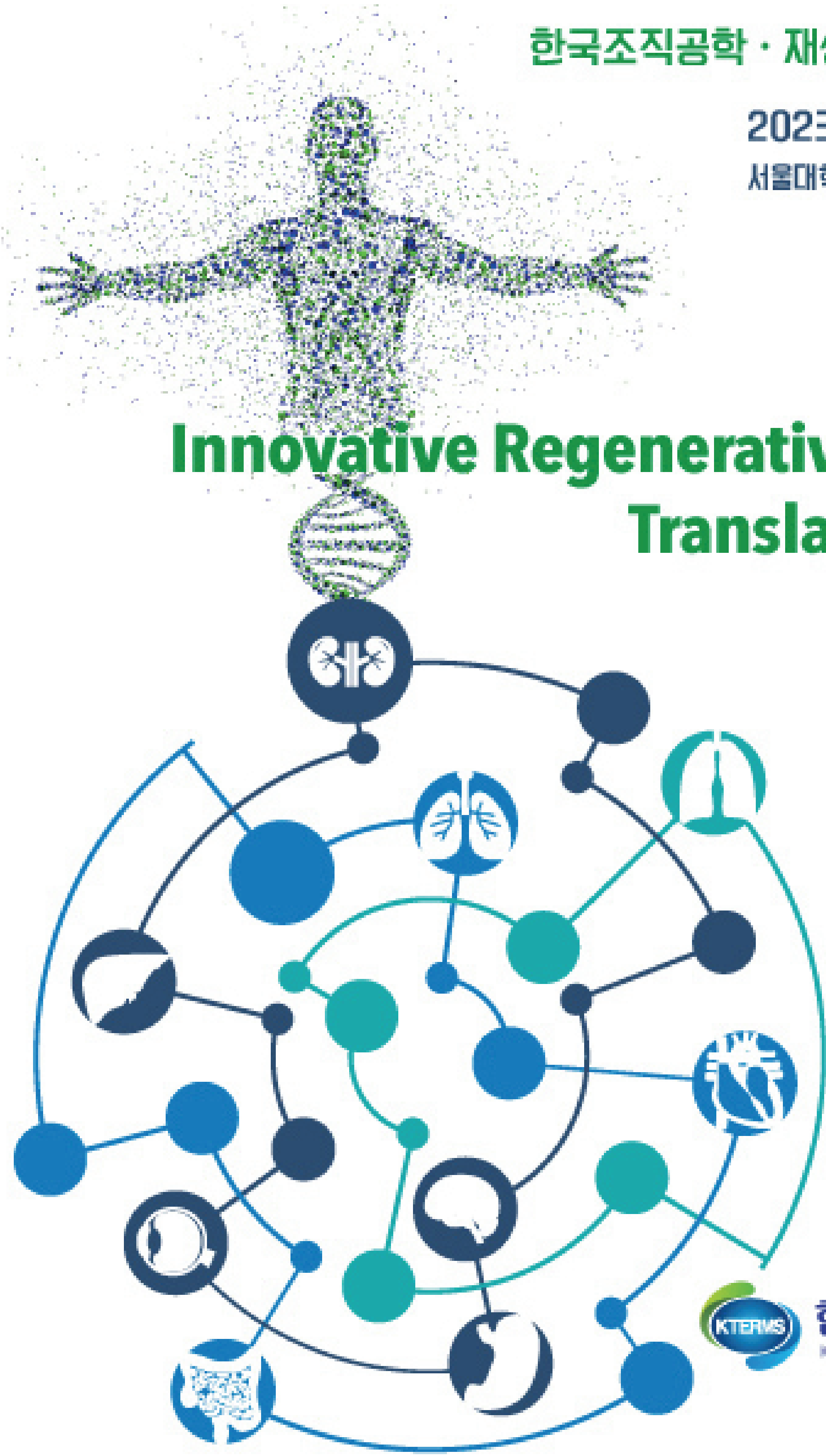
2023 KTERMS

한국조직공학 · 재생의학회 제23차 학술대회

2023. 05. 19(금) ~ 05. 20(토)

서울대학교병원 의학연구혁신센터, 어린이병원



Innovative Regenerative Medicine for Translation to Human

한국조직공학·재생의학회

Korean Tissue Engineering and Regenerative Medicine Society

09:30 - 10:50	10:10-10:30	S01-3	Electrothermal soft manipulator enabling safe transport and handling of thin cell/tissue sheets 김병수 (한국세라믹기술원)	S02-3	Macrophage polarization and CREB during wound healing on PBMT 임남규 (단국의대)	S03-5	Development of a physiologically relevant 3D-printed airway model to study SARS-CoV-2 infection and evaluate antiviral drugs efficacy 이윤지 (POSTECH) 10:10-10:20	PS01 - Tissue Engineering PS02 - Plastic Surgery & Dermatology
						S03-6	Enhancing the anti-cancer properties of natural killer cells through lipid mediated biomaterials in surface engineering 박희원 (동국대) 10:20-10:30	
	10:30-10:50	S01-4	3D organ-on-a-chip inspired scalable prevascularized tissue constructs for transplantation 방석영 (동국대)	S02-4	The employment of high-resolution multi-omics toolkits and their applications in the field of regenerative medicine research 김현제 (서울의대)	S03-7	Tissue adhesive cellulose hydrogel for hemostatic application 전지훈 (연세대) 10:30-10:40	
						S03-8	Fabrication of transmurally oriented myocardial fibers on a chamber-like structure via 3D bioprinting-based tissue assembly 황동규 (POSTECH) 10:40-10:50	
10:50-11:05		Coffee Break						
11:05-11:45		Plenary Lecture I - Common marmoset, as a preclinical model animal Dr. Erika Sasaki (Central Institute for Experimental Animals, Japan) (대면 강연) 좌장 : 임정옥 (경북대)						
11:45-13:15		KTERMS General Meeting (정기 총회) & Lunch						
		Organoids		Cardiovascular Therapy		Young Investigator I		
		좌 장	황용성 (순천향대), 이만열 (순천향대)	좌 장	김병수 (서울대), 박훈준 (가톨릭의대)	좌 장	윤정기 (중앙대), 김한영 (가톨릭대)	
	13:15-13:35	S04-1	Toxicity assessment with a human induced pluripotent stem cell derived alveolar organoids 양세란 (강원대)	S05-1	Peptide-based cancer therapy by inhibiting angiogenesis 권유욱 (서울의대)	S06-1	ER71/ETV2 improve hair regeneration from chemotherapy-induced alopecia by enhancing angiogenesis 이태진 (강원대)	

Fabrication of Transmurally Oriented Myocardial Fibers on a Chamber-like Structure via 3D Bioprinting-based Tissue Assembly

Dong Gyu Hwang[1], Hwanyong Choi[2], Uijung Yong[3], Donghwan Kim[1], Jinah Jang[1,2,3,4]*

[1]School of Interdisciplinary Bioscience and Bioengineering, [2]Department of Mechanical Engineering, [3]Department of Convergence IT Engineering, [4]Center for 3D Organ Printing and Stem Cells, POSTECH, Republic of Korea

*Correspondence: jinahjang@postech.ac.kr

The left ventricle of the heart has a distinctive fiber arrangement that twists as it contracts, generating contractile forces and improving the ejection fraction. The advancement of biofabrication technology has enabled the study of cardiac physiology through engineered heart tissue (EHT), and efforts have been made to control cardiomyocyte alignment to comprehend the underlying mechanisms that govern the structure and function of the heart. There are two conventional methods used to induce cell alignment: one involves seeding cells on highly aligned structures, while the other involves encapsulating cells in extracellular matrix (ECM)-based hydrogels and subjecting them to tensile stress. These methods are effective in inducing cellular alignment; however, they lack the flexibility to generate multi-axial alignment. Recently, integration of conventional methods and bottom-up approaches (e.g., tissue assembly) has been suggested to achieve multi-axial cellular alignment. It has been demonstrated that multiple-axis control can be achieved by stacking or wrapping aligned cells. Another approach is to control directionality through printing using anisotropic elements (e.g., microtissue, ECM fibers). However, the alignment can be attenuated by externally applied tensile stress during tissue maturation.

Here, we propose a bioprinting-based method for rapidly prototyping tissue modules and creating structural complexity by assembling them. We developed EHT generation and assembly platforms, and they were used to generate and assemble EHT modules that recapitulate cardiac physiologies (e.g., contractile force, electrophysiological properties, and cellular alignment). These platforms were demonstrated to enable the fabrication of cardiac tissues with various structures and the control of structural and functional changes. Finally, we utilized the bioprinting-based tissue assembly to create myocardial fiber orientation on a chamber-like structure. This structure consists of three distinct layers, each of which exhibits a different fiber orientation. This method can serve various applications, such as disease modeling by employing disease modules or a multi-organ platform by assembling multiple organ modules.

Keywords : 3D bioprinting, Tissue assembly, Engineered heart tissue, Chamber-like structure