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# KTERMS 2020

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Innovation and Challenge in Regenerative Medicine

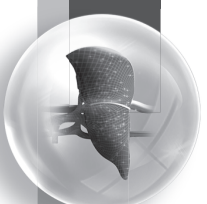
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# KTERMS 2020 e-Poster List

접수번호	최종 발표번호	Topic	Title	e 포스터 발표일(상시입)	Presenter			Corresponding Author		
					Name	Affiliation	Country	Name	Affiliation	Country
P3-0203	P2-065	2. Tissue Regeneration	Preparation of Oxygen-releasing Capsules and their Application for large-sized Tissue Regeneration	2020-08-29	Jeongyeon Choi	Korea Institute of Industrial Technology	Korea(Rep.of)	Jeong Ok Lim	Kyungpook National University School of Medicine, Kyungpook National University Hospital	Korea(Rep.of)
P3-0180	P2-066	2. Tissue Regeneration	3D Bioprinting of Multi-layered Tissue Constructs using Esophageal Tissue-derived Blotks for Esophageal Regeneration	2020-08-29	Hyoyung Nam	Pohang University of Science and Technology	Korea(Rep.of)	Jinah Jang	Pohang University of Science and Technology	Korea(Rep.of)
P3-0148	P2-067	3. Stem Cell	The Angiogenic Potentials of Extracellular Vesicles Derived from Tissue-Resident Stem Cells	2020-08-29	Chung Eun Yeum	Palk Institute for Clinical Research, Inje University College of Medicine, Busan	Korea(Rep.of)	Young-il Yang	Palk Institute for Clinical Research, Inje University College of Medicine, Busan	Korea(Rep.of)
P3-0216	P2-068	3. Stem Cell	Combina treatment with a CHIR99021 and Forskolin reduces cell mass formation of human-induced neural stem cells transplanted into the injured spinal cord	2020-08-29	Jinsoo Oh	Yonsei University	Korea(Rep.of)	Jinsoo Oh	Yonsei University	Korea(Rep.of)
P3-0264	P2-069	3. Stem Cell	Effect of Osteogenic Peptide on Trans-derived Mesenchymal Stem Cells (TMSCs)	2020-08-29	Young Min Choi	Ewha Womans University	Korea(Rep.of)	Inho Jo	Ewha Womans University	Korea(Rep.of)
P3-0092	P2-060	3. Stem Cell	A combined therapeutic approach using human induced pluripotent stem cell-derived endothelial cells and mesenchymal stem cells engineered with SDF-1 alpha improves vascular regeneration in myocardial infarction	2020-08-29	Hyek Kim	The catholic university of Korea	Korea(Rep.of)	Kimwon Ban	Ciy University of Hong Kong	Hongkong
P3-0164	P2-061	3. Stem Cell	Characterization of the CD200+ growth plate cells for bone formation via endochondral ossification	2020-08-29	Inho Baek	Dongguk univ.	Korea(Rep.of)	Soo Hong Lee	Department of Medical Biotechnology, Dongguk University	Korea(Rep.of)
P3-0179	P2-062	3. Stem Cell	Vertical nanowire electrode array platform for human neural stem cell neurogenesis via intracellular electrical stimulation	2020-08-29	Jong Saung Lee	연세대학교 Yonsei University	Korea(Rep.of)	Seung-Woo Cho	Yonsei University	Korea(Rep.of)
P3-0222	P2-063	3. Stem Cell	MCR-p2 PEPTIDE IMPROVES THE THERAPEUTIC POTENTIAL OF MESENCHYMAL STEM CELLS	2020-08-29	Soo Bin Lee	KONKUK UNIVERSITY	Korea(Rep.of)	Ssang-Gao Cho	KONKUK UNIVERSITY	Korea(Rep.of)
P3-0273	P2-064	3. Stem Cell	Effect of photomodulation of oliv lineage organoids in stem cell differentiation	2020-08-29	Se-y Young Chang	BLKorea, Dankook University	Korea(Rep.of)	Min Young Lee	Department of Otolaryngology-head & Neck Surgery, College Of Medicine, Dankook University	Korea(Rep.of)
P3-0074	P2-065	3. Stem Cell	Gold nanostructure/polymer-nanopatterned graphene oxide that enhance the osteogenesis of adipose-derived mesenchymal stem cells	2020-08-29	Eeseul Kang	Chung-Ang University	Korea(Rep.of)	Tae-Hyung Kim	Chung-Ang University	Korea(Rep.of)
P3-0174	P2-066	4. 3D Printing	P-CLVD/xyapatite composite scaffold with hierarchical porous structure via three-dimensional printing	2020-08-29	Seung Hyun Im	Korean Institute of Machinery and Materials	Korea(Rep.of)	Si A Park	Korean Institute of Machinery and Materials	Korea(Rep.of)
P3-0235	P2-067	4. 3D Printing	3D bioprinting of Multi-Scale Encapsulation System for Islet Transplantation	2020-08-29	Dong Gyu Hwang	Pohang University of Science and Technology	Korea(Rep.of)	Jinah Jang	Pohang University of Science and Technology	Korea(Rep.of)
P3-0261	P2-068	4. 3D Printing	Evaluation of the biomimetic 3D printed hybrid scaffold for the large bone defect in rabbits	2020-08-29	Hyun Min Cho	CHONNAM NATIONAL UNIVERSITY	Korea(Rep.of)	SE EUNKIM	CHONNAM NATIONAL UNIVERSITY	Korea(Rep.of)
P3-0278	P2-069	4. 3D Printing	Development of Optimal Gelatin Methacryloyl Blotnk for 3D Inkjet Bioprinting	2020-08-29	Yunil Lee	POSTECH	Korea(Rep.of)	Sungjune Jung	POSTECH	Korea(Rep.of)
P3-0288	P2-070	4. 3D Printing	Decellularized extracellular matrix-based bio-ink with enhanced 3D printability and mechanical properties	2020-08-29	Min Kyong Kim	Ulsan National Institute of Science and Technology	Korea(Rep.of)	Hyun-Wook Kang	Ulsan National Institute of Science and Technology	Korea(Rep.of)
P3-0290	P2-071	4. 3D Printing	Development of 3D printing-based random-derived stem cell-laden 3D microtissues for tendon tissue engineering	2020-08-29	Kyoohee CHO	Soonchunhyang Institute of Med-hio Science (SIMS), Soonchunhyang University, Cheonan-si 31151, Republic of Korea	Korea(Rep.of)	Yongsung HWANG	Soonchunhyang Institute of Med-hio Science (SIMS), Soonchunhyang University, Cheonan-si 31151, Republic of Korea	Korea(Rep.of)
P3-0106	P2-072	5. Cardiovascular/nerve tissue engineering	Antagonistic Effect of Magnesium Hydroxide Nanoparticle on the Influx of PI-3KA Degraderation Product into Endothelial Cells by Modulating MCT1 Activity	2020-08-29	Kyoung-won Ko	CHA University	Korea(Rep.of)	Dong Keun Han	CHA University	Korea(Rep.of)
P3-0104	P2-073	5. Cardiovascular/nerve tissue engineering	Multilayer-Coated Drug-Eluting Balloon for Restenosis Inhibition	2020-08-29	HAK IL LEE	CHA University	Korea(Rep.of)	DONG KEUN HAN	CHA University	Korea(Rep.of)
P3-0020	P2-074	6. General bioengineering	ELF-EMF Enhance Hair Growth Molecules in Dermal Papilla Cells	2020-08-29	Young-Kwon Seo	Dongguk University	Korea(Rep.of)	Young-Kwon Seo	Dongguk University	Korea(Rep.of)
P3-0113	P2-075	6. General bioengineering	Combination of Local Electrical Ablation Technique with Immune Adjuvant for Effective Lung Cancer Immunotherapy	2020-08-29	Eun-Jin Go	CHA University	Korea(Rep.of)	Wooram Park	Catholic University of Korea	Korea(Rep.of)
P3-0236	P2-076	6. General bioengineering	Synthesis of silver nanoparticle/graphene oxide nanocomposites for antibioblim applications	2020-08-29	Jonghoon Choi	Chung-Ang University	Korea(Rep.of)	Jonghoon Choi	Chung-Ang University	Korea(Rep.of)
P3-0072	P2-077	6. General bioengineering	A Spheroid-forming multifunctional conductive platform that electrochemically detects anticancer effects of curcumin in a multicellular brain cancer model	2020-08-29	Inam Rossalina Suhlo	Chung Ang University	Korea(Rep.of)	Tae-Hyung Kim	Chung Ang University	Korea(Rep.of)
P3-0266	P2-078	6. General bioengineering	Upregulating angiogenic efficacy of human adipose derived stem cells using pH-sensitive gold-iron nanoparticles	2020-08-29	Jisoo Im	Sungkyunkwan University	Korea(Rep.of)	Suk Ho Bhang	Sungkyunkwan University	Korea(Rep.of)



The study of cochlear hair cells regeneration which caused by irreversible hearing loss have been conducted around the world. Stem cell therapy is one of the potential therapeutic tools for inner ear diseases. Recent PBM has been shown to stimulate different types stem cells to migrate, proliferate and differentiate in vitro. Meanwhile, very little is known about the effect of PBM on the differentiation of embryonic stem (ES) cells towards the otic lineage. In this study, we determined the optimal condition to differentiate the stem cell into the otic organoid. Using a mouse embryonic stem cell with GFP, different culture techniques and cell density has been tested and effect of photobiomodulation was analyzed. As results, Embryoid-body (EB) formed by hanging drop was much larger than monolayer culture. The diameter of EBs statistically increased with the increase of cellular density but the largest number of organoids was observed. MyosinVIIa positive cells inside the organoid was observed and confirmed by RT-qPCR. Only 630 of LED irradiation increased the organoid formation rate. EBs with PBM (630 nm) showed higher expression of MyosinVIIa and lesser expression of Oct4 compared to differentiation without PBM. ROS was overexpressed as well. With the RNA seq analysis among the biological process, nervous system development-related processes are enriched with only down-regulated genes in PBM group. Among the down regulated genes *Hes5* which inhibits the hair cell transdifferentiation process are negatively down-regulated in PBM group. In this study, we found that PBM with LED has a potential to differentiate EBs into inner ear hair cell-like cells.

**Keywords**

Photobiomodulation, embryonic stem cell, otic lineage, organoid, differentiation

**References**

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P02-065

**Gold nanostructure/  
peptide-nanopatterned graphene oxide  
that enhance the osteogenesis of adipose-  
derived mesenchymal stem cells**

**Ee-Seul Kang<sup>1</sup>, Yoojong Han<sup>2</sup>, Hyunbin Son<sup>1</sup>,  
Zhengtang Luo<sup>3</sup> and Tae-Hyung Kim<sup>1,4,\*</sup>**

<sup>1</sup>School of Integrative Engineering,  
Chung-Ang University, Seoul, Republic of Korea  
<sup>2</sup>R&D division, Nanobase, Inc., Seoul, Republic of Korea  
<sup>3</sup>Department of Chemical and Biological Engineering,  
Hong Kong University of Science and Technology,  
Kowloon 999077, Hong Kong, China  
<sup>4</sup>Integrative Research Center for Two-Dimensional Functional Materials,  
Institute of Interdisciplinary Convergence Research,  
Chung-Ang University, Seoul, Republic of Korea

thkim0512@cau.ac.kr

Graphene derivatives have immense potential in stem cell based regenerative therapies, particularly for bone regeneration. Herein, we report a graphene oxide (GO)-based hybrid platform (GOHP) that is highly effective in guiding the osteogenesis of human adipose-derived mesenchymal stem cells. GO was uniformly coated onto an indium tin oxide electrode (ITO), followed by electrochemical deposition of Au nanostructures (GNSS). A quadruple-branched arginine-glycine-aspartic acid (4-RGD-C) was self-assembled onto the gold nanoparticles, generating the final GOHP platform. We generated substrates with various gold nanoparticle-RGD peptide cluster densities, and found that the one with the highest density of GNSS (deposition time of 120 s) exhibited the highest osteogenic differentiation efficiency for human adipose-derived mesenchymal stem cells (hAMSCs) based on the mRNA expression level, osteocalcin expression, and osteoblastic mineralization. hAMSCs induced to differentiate into osteoblasts shown higher calcium accumulations after 14-21 days than when grown on typical GO-GNSS complexes. Total RNA sequencing results revealed that CVD graphene and GOHP induced the osteogenesis of hAMSCs via the upregulation of transcription factors related to direct osteogenesis. Wnt activation, and extracellular matrix deposition. The results demonstrate that GOHP can efficiently derive osteoblasts from mesenchymal stem cells and highly promising for treating various disease/disorders, including osteoporosis, rickets, and osteogenesis imperfecta.

**Keywords**

Graphene oxide, RGD peptide, Nanopattern, Mesenchymal stem cells, Osteogenesis

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3D PRINTING

04

P02-066

**PCL/hydroxyapatite  
composite scaffold with hierarchical  
porous structure via three-  
dimensional printing**

**Seung Hyun Im<sup>1,2</sup>, Ji Min Seok<sup>1</sup>, Jae Eun Jeong<sup>1</sup>,  
Jae Young Lee<sup>2</sup> and Su A Park<sup>1,\*</sup>**

<sup>1</sup>Department of Nano-Inspired Nanococonvergence Systems,  
Korea Institute of Machinery and Materials, Republic of Korea  
<sup>2</sup>School of Materials Science and Engineering,  
Gwangju Institute of Science and Technology (GIST), Republic of Korea

psa@kimm.re.kr

Tissue engineering approach is a promising technique for critical bone defect treatment compared to autograft or allograft with the aspect of supply and disease transmission issues. Fabrication of appropriate bone scaffold for tissue engineering is essential for increasing bone regeneration after implantation. The principal role of bone scaffold is an acceleration of cell migration from host tissues and desired differentiation while sustaining the dynamic stress from environment. Interaction with host tissues and environment should be modulated to increase cell attachment and proliferation. Structural properties, especially porosity is decisive factors for regulating those interactions with controlling the infiltration of nutrient and cells into the scaffold. Three-dimensional printing can be employed to control the geometry and size of macropores (>100  $\mu$ m in size) of the scaffold. However, there are limitations to control a smaller scales of porous structure (<10  $\mu$ m) on the scaffold. Recently, the effect of microporous structure on cell attachment and osteogenic differentiation has been explored [1]. Fabrication of microporous structure increases the surface area of scaffold resulting in higher adsorption of proteins and cell attachment. Therefore, non-solvent induced phase separation (NIPS) technique was applied to create microporous structure with the exchange of solvent and non-solvent (or DMSO and water). This advanced fabrication method forms hierarchical porous three-dimensional scaffold leading to better cell proliferation and differentiation [2]. In this work, we incorporated hydroxyapatite to reinforce mechanical strength and biological performances. Hydroxyapatite is osteoinductive and osteoconductive but brittle materials. Therefore, incorporation with synthetic polymers such as PCL, PLLA has been preferred in the bone tissue engineering application. However, those direct mixing methods cover hydroxyapatite surface with polymer resulting in the hindrance of the interaction with host tissue and environment. We hypothesized the incorporation of hydroxyapatite into microporous scaffold could result in improved participation

with the interaction of host tissues and environment. We demonstrated that hydroxyapatite nanoparticles were uniformly incorporated and distributed on the surface of scaffold retaining microporous structure. The addition of hydroxyapatite increases the hydrophilicity and compressive strength of scaffold. Those results leads to improved cell attachment. Overall, this method suggests a way to fabricate composite scaffold containing hierarchical porous structure.

**Keywords**

hydroxyapatite, 3d printing, hierarchical, composite, polymer

**References**

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P02-067

**3D Bioprinting of  
Multi-Scale Encapsulation System  
for Islet Transplantation**

**Dong Gyu Hwang<sup>1</sup>, Yeonggwon Jo<sup>1</sup>, Uijung Yong<sup>2</sup>,  
Seungyeun Cho<sup>3</sup>, Myungh Kim<sup>1</sup>, Jaewoock Kim<sup>4</sup>,  
Yoo-mi Choi<sup>2</sup>, Jinhah Jang<sup>1,2,4,5,\*</sup>**

<sup>1</sup>School of Interdisciplinary Bioscience and Bioengineering,  
POSTECH, Pohang, Republic of Korea.  
<sup>2</sup>Department of Creative IT Engineering, POSTECH, Pohang, Republic of Korea  
<sup>3</sup>Department of Life Sciences, POSTECH, Pohang, Republic of Korea  
<sup>4</sup>Department of Mechanical Engineering, POSTECH, Pohang, Republic of Korea  
<sup>5</sup>Institute of Convergence Science, Yonsei University, Seoul, Republic of Korea

jinhahjang@postech.ac.kr

Islet transplantation is a promising treatment for Type 1 diabetes (T1D). However, there are clinical limitations such as cell dispersion, hypoxia, and inflammatory response, which lead to loss of cell functions. Islet encapsulation has been studied to overcome these limitations. Macroencapsulation refers to encapsulating a large volume of islets in one system so that it is retrievable. However, this system has a low surface-to-volume ratio, which interferes with the diffusion of oxygen and nutrients. Here, we suggest a 3D bioprinting strategy for a one-step fabrication of a multi-scale encapsulation system. The developed 3D bioprinted system has both features of macroencapsulation and microencapsulation systems. The polycaprolactone (PCL) construct acts as a macroencapsulation system by protecting internal engineered pancreatic tissue and allow it retrievable. In addition, engineered pancreatic tissue that is printed directly into the PCL encapsulation system using a pancreatic tissue-derived decellularized extracellular matrix (pdECM) biopink serves as a microencapsulation system. The engineered pancreatic tissue contains cells fabricated into the aggregates to mimic the native islet morphology, and these aggregates are placed at