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KTERMS 2020

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KTERMS 2020 e-Poster List

접수번호	최종 발표번호	Topic	Title	e 포스터 발표일(심사일)	Presenter			Corresponding Author		
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P3-0148	P2-057	3. Stem Cell	The Angiogenic Potentials of Extracellular Vesicles Derived from Tissue-Resident Stem Cells	2020-08-29	Chung Eun Yeum	Paik Institute for Clinical Research, Inje University College of Medicine, Busan	Korea(Rep.of)	Young-Il Yang	Paik Institute for Clinical Research, Inje University College of Medicine, Busan	Korea(Rep.of)
P3-0216	P2-058	3. Stem Cell	Combined 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)
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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	Hyeok Kim	The catholic university of korea	Korea(Rep.of)	Kiwon Ban	City 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)
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P3-0273	P2-064	3. Stem Cell	Effect of photobiomodulation of otic lineage organoids in stem cell differentiation	2020-08-29	So-Young Chang	BLI-Korea, Dankook University	Korea(Rep.of)	Min Young Lee	Department of Otolaryngology-head & Neck Surgery, College Of Medicine, Dankook University	Korea(Rep.of)
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P3-0106	P2-072	5. Cardiovascular/nerve tissue engineering	Antagonistic Effect of Magnesium Hydroxide Nanoparticle on the Influx of PLGA Degradation 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)
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P3-0236	P2-076	6. General bioengineering	Synthesis of silver nanoparticle/graphene oxide nanocomposites for antibiofilm 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	Intan Rosalina Suhito	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

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P02-065

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

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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 ostegenesis 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

Acknowledgments

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3D PRINTING 04

P02-066

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

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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 μm in size) of the scaffold. However, there are limitations to control a smaller scales of porous structure (<10 μm) 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 hypnotized 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

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P02-067

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

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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) bioink 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

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

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Abstract

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) bioink 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 the demanding position to prevent clumping of cell aggregates and to a have high surface-to-volume ratio. It was confirmed that the pore characteristics of the PCL staggered membrane retained the viability and function of the encapsulated cells while presenting a reduced pore size. Moreover, the mitigation of inflammatory response was investigated in vitro by measuring inflammatory cytokine secretion of macrophages, and in vivo by subcutaneous implantation into Sprague Dawley rats. Together with this, beta cell aggregates were designed to contain 500 pancreatic β cells with 250 μm diameter. These aggregates showed reduced hypoxia-induced apoptosis compared to the non-printed group having the same cell concentration with a large volume. Also, the aggregates showed earlier expression of E-cadherin, cell-cell adhesion molecule related to the maintenance of β-cell viability, and promoting insulin secretion, than non-printed groups. The results of this study suggest the possibility of 3D printing for manufacturing islet encapsulation system, and it could also be applied for cell or tissue delivery (e.g., adrenal cell, Leydig cell, parathyroid, and thyroid gland) for treatment of other endocrine diseases. Further research would be undertaken to investigate the applicability of induced pluripotent stem cell-derived insulin-producing cells to this system and its ability to regulate blood sugar levels.

Keywords: 3D Bioprinting, Cell encapsulation, Cell delivery system, β Cell aggregates, Pancreatic islet transplantation.

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