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분야 Ⅲ : Tissue Engineering and Regenerative Medicine

PO-41 **Regulating the biogenesis pathway for boosting production yield of EVs**

Jun Yong Kim[1,2,3†], Won Kyu Rhim[1†], Chun Gwon Park[2,3] and Dong Keun Han[1*]

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PO-42 **Multifunctional PLGA scaffold with PDRN/BMP2 nanocomplex using human fetal MSCs for bone regeneration**

Da-Seul Kim[1,2], Jun-Kyu Lee[1], Tae-Hyung Kim[2] and Dong Keun Han[1*]

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PO-43 **Targeted delivery of inflammation-modulatory nanovesicles for myocardial infarction treatment**

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PO-44 **PMMA-based Low Modulus Bone Cement**

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PO-45 **Blood Plasma-loaded porous film with leaf-stacked structure as a Hemostatic Agent**

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PO-46 **Efficacy for Whitlockite for Augmenting Spinal Fusion**

Su Yeon Kwon[1], Jung Hee Shim[2], Yu Ha Kim[2], Chang Su Lim[1], Seong Bae An[1*] and Inbo Han[1*]

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PO-47 **Modulation of Angiogenesis-Myogenesis Coupling with Varying Vasculature Patterns in an In-Bath Bioprinted Skeletal Muscle Tissue**

Seungyeun Cho[1], Myungji Kim[2], Uijung Yong[1], Donghwan Kim[2], Dong Gyu Hwang[2] and Jinah Jang[1,2,3*]

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PO-48 **Fabrication of 3D porous scaffolds using marine-derived materials for bone tissue engineering**

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PO-49 **Tissue Engineered Tendon Nano-Constructs for Repair of Chronic Rotator Cuff Tears in Large-Animal Models**

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PO-50 **Injectable Hyaluronic Acid-based Hydrogel Combined with Vitamin D, TUDCA, PDRN and Exosome to Treat Tendinopathy**

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PO-51 **Development of Nanotrap with Two-Step Nanofiber Collecting System for Enhanced Stem Cell Attachment And its Application to Tracheal Regeneration**

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PO-45

Blood Plasma-loaded porous film with leaf-stacked structure as a Hemostatic Agent

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Bleeding is one of the major causes of death in trauma patients. It is known that death occurs when the amount of bleeding exceeds 40% of the total blood volume. To prevent excessive life-threatening bleeding, various hemostatic agents have been developed. Recently, many hemostatic agents based on polymeric biomaterials are commonly adapted in clinical fields to manage bleeding. Platelet-rich plasma (PRP) containing a lot of blood clotting factors is also considered as a hemostatic agent. We expected that if the PRP can be adsorbed on surface with large surface area, it will maximize their hemostatic effect. Therefore, the main aim of this study was to develop a PRP-adsorbed porous film with leaf-stacked structure (PRP-FLSS) and to confirm the feasibility of the film as a hemostatic agent. The morphology, cytotoxicity, hemolysis analysis, blood coagulation (in vitro); prevention of hemorrhage, and histological evaluation (in vivo) of PRP-*FLSS* were investigated

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Whitlockite (WH) is the second most abundant inorganic component of human bone. This study investigated the role of WH in bone remodeling and formation in a mouse spinal fusion model. Specifically, morphology and composition analysis, tests of porosity and surface area, thermogravimetric analysis, an ion-release test, and a cell viability test were conducted to analyze the properties of bone substitutes. The MagOss group received WH, Group A received 100% beta-tricalcium phosphate (β-TCP), Group B received 100% hydroxyapatite (HAp), Group C received 30% HAp/70% β-TCP, and Group D received 60% HAp/40% β-TCP (n = 10 each). The MagOss group showed more homogeneous and smaller grains, and nanopores (<500 nm) were found in only the MagOss. On micro- CT, the MagOss group showed larger fusion mass and better graft incorporation into the decorticate mouse spine than other groups. In the in vivo experiment, the MagOss demonstrated the highest new bone area. In an immunohistochemical analysis for osteocalcin, osteopontin, and CD31, the MagOss showed a highest positive area. WH showed comparable bone conductivity to HAp and β-TCP and increased new bone formation. WH is likely to be used as an improved bone substitute with better bone conductivity than HAp and β-TCP.

PO-47

Modulation of Angiogenesis-Myogenesis Coupling with Varying Vasculature Patterns in an In-Bath Bioprinted Skeletal Muscle Tissue

Seungyeun Cho[1], Myungji Kim[2], Uijung Yong[1], Donghwan Kim[2], Dong Gyu Hwang[2] and Jinah Jang[1,2,3*]

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Engineering of a biomimetic and implantable skeletal muscle tissue has been emerged as an alternative for regenerative therapy of volumetric muscle loss (VML), where excessive injuries are beyond endogenous self-repair capacity. Pre-vascularization of tissue could overcome the diffusion limit of 200 μm, enabling the fabrication of larger tissue that matches the size of injury. In addition, skeletal muscle vascular cells interact with muscle stem cells to enhance the myogenic differentiation during self-repair. We have previously developed a 3D bioprinting-based direct endothelial cell patterning method which led to a spontaneous vascular network formation. Endothelial cells, encapsulated in skeletal muscle decellularized extracellular matrix (mdECM), were printed into a supporting bath composed of myogenic cells and mdECM. Regarding the addressed vascular functions, myogenesis and angiogenesis were both enhanced at gene expression level in the vascularized tissues compared to the tissues without spatial patterning. Moreover, paracrine interaction between vasculature and muscle cells were confirmed by quantification of muscle-secreted cytokines and vascular endothelial growth factor (VEGF). In addition, varied pattern-pattern pitch resulted in different rates of angiogenesis between day 7 and 14. We expect that the spatial modulation and cell positioning, enabled by 3D printing, could maximize the synergetic effect between angiogenesis and myogenesis.

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Fabrication of 3D porous scaffolds using marine-derived materials for bone tissue engineering

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3D porous scaffolds based on biodegradable polymers are one of the materials for bone tissue regeneration. In this study, a porous scaffold was prepared by solvent-casting/particulate leaching method using PCL and marine plankton exoskeleton-derived hydroxyapatite (OceanBone-HAp) to achieve excellent bone regeneration. The morphology and physicochemical properties of the PCL/OceanBone-HAp scaffolds were evaluated by SEM, XRD, and porosity analysis. It confirmed the porous structure of the scaffold and the removal of solvent and porogen particles. *In vitro* test results showed superior cell adhesion, proliferation and viability of PCL/OceanBone-HAp scaffolds compared to only PCL scaffolds. The enhanced ALP activity and expression of BMP 2, ColIα1, OCN and BSP of the PCL/OceanBone-HAp scaffolds were confirmed by ALP assay and real-time PCR. Additionally, *in vivo* experiment using a rabbit calvarial defect model, the PCL/OceanBone-HAp scaffold showed improved bone regeneration than the PCL scaffold. Therefore PCL/OceanBone-HAp scaffold has proven to be a promising scaffold for bone repair.

Keywords: 3D porous scaffold; bone tissue engineering; marine plankton; poly(caprolactone); hydroxyapatite; bone regeneration

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