KSBM

2023년 한국생체재료학회 추계 학술대회 및 총회

(공동개최 : 차의과학대학교 중점연구소)

Fall Meeting of the Korean Society for Biomaterials
(Joint host : CHA Univ. Priority Research Institute)

http://www.ksbm.or.kr

http://www.celgen-cha.com

발표자료집
제27권 4호

- 일 시 : 2023년 9월 21일(목) ~ 22일(금)
- 주 관 : 한국생체재료학회
- 후 원 : KOFST 한국과학기술단체총연합회 JEJU CVB 제주컨벤션뷰로

http://www.ksbm.or.kr

This work was supported by the Korean Federation of Science and Technology Societies(KOFST)
Grant funded by the Korean Government.

Sep. 20(수), 2023	
Time	Landing Ballroom A
13:30-14:00	*Registration & Opening Ceremony*
14:00-15:20	〈1부〉 생체재료 분석 기법 및 활용 방안
15:20-15:30	*Coffee Break*
15:30-16:50	〈2부〉 생체재료연구에서의 빅데이터 획득 및 분석 개론
16:50-17:00	*Coffee Break*
17:00-18:20	〈3부〉 RNA치료제 전달시스템 : 기초 및 최신 연구동향

Sep. 21(목), 2023			
Time	Landing Ballroom A	Landing Ballroom B	Landing Ballroom C
08:30-09:00	*Opening Ceremony*		
09:00-10:20	Session 1 : Tissue & Disease Modeling and Therapy for Regeneration	Session 2 : Advanced Strategies for Bioanalyte Detection in Therapy	Student Oral Competition I
10:20-10:40	*Coffee Break*		
10:40-12:00	Session 3 : The Potential of Extracellular Vesicles in Biomedical Applications	Session 4 : Biofabrication in Healthcare: Applications, Challenges, and Future Directions	Student Oral Competition II
12:00-12:20	*Coffee Break*		
12:20-13:00	Plenary Lecture I Nicholas A. Peppas (The University of Texas at Austin, USA)		
13:00-14:40	*KSBM General Meeting & Lunch & Poster Presentation Session*		
14:40-16:00	Session 5 : Medical Applications of Non-Polymeric Biomaterials	Session 6 : Bio-interfaced Medical Devices for Diagnosis and Therapy	Session 7 : Advanced 3D Bioprinting Technology
16:00-16:20	*Coffee Break*		
16:20-17:40	Session 8 : Advanced Immunoengineering for Cancer and Inflammation	Session 9 : Innovations in Drug Delivery Systems: Advancing Therapeutics for the Future	*Gala Dinner Preparation*
17:40-21:00	*Gala Dinner*		

Sep. 22(금), 2023			
Time	Landing Ballroom A	Landing Ballroom B	Landing Ballroom C
09:00-10:20	Session 10 : Emerging technologies in Medical & Wearable Devices	Session 11 : Tackling the Technical Challenges in Regenerative Medicine	Session 12 : Recent Advances in Skin Regeneration and Skincare Treatments
10:20-10:40	*Coffee Break*		
10:40-12:00	Session 13 : Innovative Approaches for the Development of Gene/Cell Therapeutics	Session 14 : Nanobio Convergence: Shaping Future Therapies and Biosensors	Session 15 : Advanced Functional Biomaterials and Engineering for Personalized Medicine
12:00-12:20	*Coffee Break*		
12:20-13:00	Plenary Lecture II Jian Yang (Pennsylvania State University, USA)		
13:00-14:00	*Lunch & Poster Presentation Session*		
14:00-15:20	Session 16 : Beyond Drug Delivery: Pioneering Technology and Pre-Clinical Advancements	Session 17 : Advances in Regenerative Dentistry	Student Oral Competition III
15:20-15:40	*Coffee Break*		
15:40-17:00	Session 18 : Emerging Junior Investigator Session	Session 19 : Women Scientists in Biomaterials : From Basic to Commercial Operation	Student Oral Competition IV
17:00-17:30	*Award Ceremony & Poster Presentation Award) and Closing Remarks*		

[1]Department of Food and Nutrition, Andong national university, Andong 36729, Republic of Korea, *yecho@andong.ac.kr

PO-054 **Mubong-dervied nanovesicles modulate differentiation and mineralization in MC3T3-E1 cells**

Sang-Hoon Lee[1], Sang Suk Kim[2] and Young-Eun Cho[1,*]

[1]Department of Food and Nutrition, Andong National University, Andong 36729, Republic of Korea, [2]Citrus Research Institute National Institute of Horticultural and Herbal Science, *yecho@andong.ac.kr

분야 Ⅲ : Tissue Engineering and Regenerative Medicine

PO-055 **Immediately implantable graphene oxide-laden glycol chitosan / hyaluronic acid based hydrogels for in situ bone therapy**

Sangjin Lee[1,*]

[1]Biofunctional Materials, Division of Applied Oral Sciences and Community Dental Care, Faculty of Dentistry, The University of Hong Kong, 34 Hospital Road, Sai Ying Pun, Hong Kong Special Administrative Region, *dentsj@hku.hk

PO-056 **The global market trends and prospects for the regeneration medicine**

Doyeon Lee[1], Keunhwan Kim[1], Youngsuk Lee[1] and Joon Woo Lee[2,*]

[1]Division of Data Analysis, Korea Institute of Science & Technology Information (KISTI), Seoul 02456, Korea, *jwlee@kisti.re.kr

PO-057 **Controlled afterglow luminescent particles for photochemical tissue bonding**

Dong Chul Cho[1], Seong-Jong Kim[1] and Sei Kwang Hahn[1,*]

[1]Department of Materials Science and Engineering, POSTECH, *skhanb@postech.ac.kr

PO-058 **Effect of cross-linker chain length on biophysical property of hyaluronic acid hydrogel dermal filler**

Mungu Kim[1] and Sei Kwang Hahn[1,*]

[1]Department of Materials Science and Engineering, POSTECH, *skhanb@postech.ac.kr

PO-059 **Differentiation of iPSC to EPC using a VEGF-mimetic peptide for myocardial ischemia disease**

Siyeon Kim[1], Alvin Bello[1] and Soo-Hong Lee[1,*]

[1]Department of Biomedical Engineering, Dongguk University, *soohong@dongguk.edu

PO-060 **Enhanced bone regeneration effect with oxygen plasma-treated PCL nanofiber membrane with iPSC-MSCs**

Hyejong Choi[1], Woongjin Cho[1], Hyemin Kang[1], Gunwoo Lee[1], Young-Kwon Seo[1,*] and Soo-Hong Lee[1,*]

[1]Department of Biomedical Engineering, Dongguk University, 32 Dongguk-ro, Ilsandong-gu, Goyang, Gyeonggi 10326, Republic of Korea, *bioseo@dongguk.edu, soohong@dongguk.edu

PO-061 **Growth Factors loaded gelatin microparticles in 3D cell spheroids promote the differentiation of induced pluripotent stem cells into mesenchymal stem cells**

Nityanand Prakash[1], Siyeon Kim[1], Alvin Bacero Bello[1] and Soo-Hong Lee[1,*]

[1]Department of Biomedical Engineering, Dongguk University, 32 Dongguk-ro, Ilsandong-gu, Goyang, Gyeonggi 10326, Republic of Korea, *Correspondence: soohong@dongguk.edu

PO-062 **ASC-laden bioink patch comprising placenta-derived ECM with controllable drug delivery system for comprehensive management of diabetic wound healing via 3D bioprinting technology**

Hye Jin Kim[1], Yeonggwon Jo[2], Ji Hwan Kim[3], Yoo-mi Choi[4], Hwan Yong Choi[3] and Jinah Jang[1,2,3,4,*]

[1]Department of Convergence IT Engineering, Pohang University of Science and Technology (POSTECH), [2]School of Interdisciplinary Bioscience and Bioengineering, Pohang University of Science and Technology (POSTECH), [3]Department of Mechanical Engineering, Pohang University of Science and Technology (POSTECH), [4]Center for 3D Organ Printing and Stem cells, Pohang University of Science and Technology (POSTECH), *Corresponding Author : jinahjang@postech.ac.kr

PO-063 **Enhanced regenerative potential and mass production of MSCs-exosomes for cartilage tissue regeneration using a 3D culture system with growth factor-loaded microcarriers**

Hyoeun Park[1], Yoshie Arai[1], Woong Jin Cho[1], Bo Won Kim[1], Palem Ramasubba Reddy[1] and Soo-Hong Lee[1,*]

[1]Department of Biomedical Engineering, Dongguk University, Seoul, Republic of Korea, *soohong@dongguk.edu

PO-064 **Hyaluronic acid hydrogel with gradient mechanical properties for tissue engineering**

Mina Kwon[1] and Ki Su Kim[1,*]

[1]School of chemical engineering, Pusan National University, *kisukim@pusan.ac.kr

PO-065 **Sprayable CIP-loaded Ti_3C_2 MXene/SA hydrogel for antibacterial and wound healing drug release system**

Hyeonhyeong Yoo[1], Hyeongtaek Park[1] and Hwan D. Kim[1,2,3,*]

[1]Departmen of IT Convergence (Brain Korea Plus 21), Korea National University of Transportation, Republic of Korea, [2]Department of Polymer Science and Engineering, Korea National University of Transportation, Republic of Korea, [3]Department of Biomedical Engineering, Korea National University of Transportation, Republic of Korea, *hdkim@ut.ac.kr

PO-066 **The therapeutic potential of epiphyseal growth plate cells for bone regeneration in osteoporosis model**

Inho Baek[1], Jieun Jeon[1], Byoung Ju Kim[2] and Soo-Hong Lee[1,*]

[1]Department of Biomedical Engineering, Dongguk University, Seoul, Republic of Korea, [2]ATEMs, 9th floors, 7, Jeongui-ro 8-gil, Songpa-gu, Seoul, Republic of Korea, *soohong@dgu.ac.kr

PO-067 **PDGF-BB-immobilized multi-layered membrane for accelerated tendon regeneration and prevention of tissue adhesion**

Ho Yong Kim[1], Min Ji Kim[1], Seung Hyeon Cho[1], Myung-Keun Song[2], Dong Hee Kim[2] and Se Heang Oh[1,*]

[1]Department of Nanobiomedical Science, Dankook University, Cheonan 31116, Korea, [2]Department of Orthopaedic Surgery, Gyeongsang National University Hospital, Jinju 52727, Korea, *seheangoh@dankook.ac.kr

PO-068 **Enhanced myogenic differentiation in C2C12 cells using bioactive 3D printing scaffolds with Mg^{2+}-incorporating hydrogels**

Hyo Jung Jo[1], Jeong Min Kim[2], Moon Sung Kang[1], Hee Jeong Jang[1], Kyung Min Park[2] and Dong-Wook Han[1,*]

[1]Department of Cogno-Mechatronics Engineering, Pusan National University, South Korea, [2]Department of Bioengineering and Nano-Bioengineering, Incheon National University, South Korea, *nanohan@pusan.ac.kr

PO-069 **Nitric oxide-releasing bioinspired scaffold for exquisite regeneration of osteoporotic bone**

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

[1]Department of Biomedical Science, CHA University, Republic of Korea, *dkhan@cha.ac.kr

PO-59

Differentiation of iPSC to EPC using a VEGF-mimetic peptide for myocardial ischemia disease

Siyeon Kim[1], Alvin Bello[1] and Soo-Hong Lee[1,*]

[1]Department of Biomedical Engineering, Dongguk University, *soohong@dongguk.edu

Differentiating induced pluripotent stem cells (iPSCs) into endothelial progenitor cells (EPCs) offers a promising strategy for treating ischemic diseases. Vascular endothelial growth factor (VEGF) is commonly used to induce iPSC to EPC differentiation. However, full-length VEGF is expensive, can induce off-target effects and possess potential immunogenicity. To overcome these limitations, VEGF mimetic peptides can serve as potential alternatives. These peptides are short amino acid sequences of the VEGF that are cheaper yet highly specific and are equally effective in inducing VEGF-related functions. In this study, we investigated the possibility of differentiating iPSCs into EPCs using a VEGF mimetic peptide and compared its efficacy to the full VEGF. We synthesized a VEGF peptide (Peptide A) and conducted a tube formation assay in HUVEC cells. Results showed a comparable ability of Peptide A to induce tube formation, like VEGF. iPSCs were then differentiated with either VEGF or Peptide A. Notably, during differentiation, both groups exhibited the formation of tube-like structures. Moreover, endothelial cell markers, CD31, ICAM-1 and CD106, were detected in both groups. Interestingly, the Peptide A treated group exhibited higher expression levels compared to VEGF, suggesting its potential as a potent inducer of endothelial lineage differentiation.

PO-60

Enhanced bone regeneration effect with oxygen plasma-treated PCL nanofiber membrane with iPSC-MSCs

Hyejong Choi[1], Woongjin Cho[1], Hyemin Kang[1], Gunwoo Lee[1], Young-Kwon Seo[1,*] and Soo-Hong Lee[1,*]

[1]Department of Biomedical Engineering, Dongguk University, 32 Dongguk-ro, Ilsandong-gu, Goyang, Gyeonggi 10326, Republic of Korea, *bioseo@dongguk.edu, soohong@dongguk.edu

Polycaprolactone (PCL) has been widely used as guided bone regeneration (GBR) membrane because of its biodegradability and biocompatibility. However, PCL has high hydrophobicity and no functional group capable of interacting with cells. Among surface modification techniques, oxygen plasma treatment is a simple and effective way to increase the hydrophilicity of PCL. In this study, we aimed to enhance the bone formation effect of GBR membranes on oxygen plasma treatment. GBR membranes were fabricated by electrospinning using PCL, and surface modification of it was carried out with oxygen plasma treatment (O2 10 sccm, RF 20 W, 1 min). According to scanning electron microscopy imaging, the plasma treatment did not affect the nanofibrous structure of PCL membranes. However, the plasma treatment increased hydrophilicity and oxygen content on the surface of PCL membranes compared to the untreated control group. In addition, the plasma treatment significantly increased the adsorption of bovine serum albumin, and the cell attachment and proliferation of induced pluripotent stem cell-derived mesenchymal stem cells (iMSCs) were cultured on the membranes. The plasma treatment also enhanced the migration of osteoblasts cultured on the membrane. The bone regeneration effect of the plasma-treated membrane was validated using a rat calvarial defect model. Therefore, we believe oxygen plasma treatment would be useful for preparing surface modified GBR membranes promoting bone regeneration.

Keywords: Polycaprolactone, Electrospinning, Oxygen plasma treatment, Guided bone regeneration

PO-61

Growth Factors loaded gelatin microparticles in 3D cell spheroids promote the differentiation of induced pluripotent stem cells into mesenchymal stem cells

Nityanand Prakash[1], Siyeon Kim[1], Alvin Bacero Bello[1] and Soo-Hong Lee[1,*]

[1]Department of Biomedical Engineering, Dongguk University, 32 Dongguk-ro, Ilsandong-gu, Goyang, Gyeonggi 10326, Republic of Korea, *Correspondence: soohong@dongguk.edu

Mesenchymal stem cells (MSC) are multipotent and self-renewing cell sources for regenerative medicine. However, their application in cell therapy is limited due to challenges in cell isolation and inconsistencies among sources. Consequently, there is a necessity for an easy and efficient alternative method to generate MSCs that can replace adult MSC sources. Induced pluripotent stem cells (iPSCs) offer a potential solution by enabling direct differentiation into MSCs through a sequential commitment to the mesoderm lineage and specific growth factor-induced differentiation. This study aims to differentiate iPSCs into MSCs using a 3-dimensional spheroid incorporated with gelatin microparticles (GMPs) with different release patterns. The initial commitment of cells to the mesoderm lineage was facilitated by rapid release of CHIR99021 from fast-releasing GMPs, while the subsequent differentiation into MSCs was achieved by sustained release of FGF2 from slow-releasing GMPs. Our preliminary studies indicated that CHIR99021 outperformed BMP4 in inducing iPSC commitment to the mesoderm lineage, as confirmed by qRT-PCR and Western blot analyses while FGF2 further induces the differentiation of mesoderm cells to MSC. Additionally, we successfully developed GMPs with appropriate degradation properties, allowing for the subsequent release of CHIR99021 and FGF2. This study will develop an improved and efficient 3D composite cell spheroid differentiation method for generating iPSC-MSC.

PO-62

ASC-laden bioink patch comprising placenta-derived ECM with controllable drug delivery system for comprehensive management of diabetic wound healing via 3D bioprinting technology

Hye Jin Kim[1], Yeonggwon Jo[2], Ji Hwan Kim[3], Yoo-mi Choi[4], Hwan Yong Choi[3] and Jinah Jang[1,2,3,4,*]

[1]Department of Convergence IT Engineering, Pohang University of Science and Technology (POSTECH), [2]School of Interdisciplinary Bioscience and Bioengineering, Pohang University of Science and Technology (POSTECH), [3]Department of Mechanical Engineering, Pohang University of Science and Technology (POSTECH), [4]Center for 3D Organ Printing and Stem cells, Pohang University of Science and Technology (POSTECH), *Corresponding Author : jinahjang@postech.ac.kr

The escalating global prevalence of diabetic wounds presents a complex therapeutic challenge. Although stem cell therapy holds promise, effectively delivering mesenchymal stem cells (MSCs) to wound sites remains challenging. To overcome this, various approaches have developed hydrogel matrices with extracellular matrix (ECM) scaffolds containing live cells. However, the use of MSCs in ECM bioinks for healing is limited due to their insufficient secretion of wound healing factors. This study suggests a novel diabetic wound healing patch with placenta-derived extracellular matrix (PldECM) bioink and adipose-derived mesenchymal stem cells (ASCs) with advanced drug delivery system. Comprehensive proteomic analysis and cytokine assays demonstrated the favorable impact of PldECM on ASCs, such as anti-inflammatory and angiogenic effects, with high levels secretion of effective factors. Also, *in vitro* wound healing test discovered that PldECM bioink provides superior effectiveness to other bioinks in hyperglycemia. Furthermore, antibiotics and neuropathy drug for better healing can be released in control by polydopamine-modified PldECM bioink. This patch with inventive strategy is expected to address multiple barriers to diabetic wound healing. By harnessing the synergistic potential of ASC-laden PldECM bioinks with drug releasing controllability based on 3D bioprinting technology, it has the capacity to revolutionize treatment approaches and improve patient outcomes.