

생물재료공학연구실 (NBSL)

Nanoengineered Biomaterial Systems Laboratory

Department of Convergence Biosystems Engineering, Chonnam National University

지도교수 및 연구책임자

김장호 (전남대학교)



발표자

김드림 (석사과정)





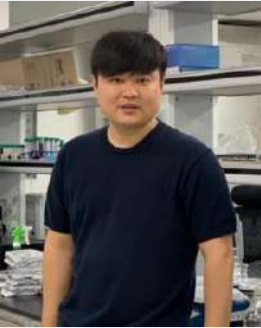
CONTENTS

I. 지도교수 및 구성 인원 소개

김장호 교수님

김장호 | 지도교수

나노바이오, 생체재료 가공, 줄기세포, 조직공학 및 재생의학 분야



- Major in Biosystems Engineering
- 전남대학교 교수(2015 ~)
- 국제 저널 부편집위원장(EAFF, FBB, FCDB, IEEE Tran. Nanobioscience, JBE)
- Organizing Chair, 2019 IEEE international Conference on Nano/Molecular Medicine and Engineering (IEEE-NANOMED)

연구 업적

- SCIE급 논문 162편 게재(JCR 상위 10% 42편)
- 특허 25건 출원 및 등록(PCT 3건, 미국 3건 포함 해외 특허 9건)

수상경력

- 보건복지부 장관상
- 광주광역시 표창장(지역 의료산업육성) 2건
- 제34회 과학기술우수논문상
- 한국기공학회 바이오공학부문 젊은과학자상
- TERMIS-AP/한국 및 일본 생체재료학회 젊은과학자상
- 우수젊은교수상(전남대학교)
- 삼성휴먼테크 논문대상(삼성전자 논문학술대회) 등 100여개 수상

대표실적

순번	제목/ 저널	비고
1 (2024)	Graphene Hybrid Tough Hydrogels with Nanostructures for Tissue Regeneration / Nano Letters	IF. 9.6 JCR 9.8%
2 (2024)	Piezoelectrically and Topographically Engineered Scaffolds for Accelerating Bone Regeneration / ACS Applied Materials & Interfaces	IF. 9.5 JCR 15.8%
3 (2023)	Transplantable stem cell nanobridge scaffolds for accelerating articular cartilage regeneration / Biomaterials	IF. 15.34 JCR 1.78%
4 (2023)	Graphene Hybrid Inner Ear Organoid with Enhanced Maturity Nano Letters	IF. 12.26 JCR 7.76%
5 (2023)	Therapeutic strategies of three-dimensional stem cell spheroids and organoids for tissue repair and regeneration / Bioactive Materials	IF. 18.90 JCR 1.1%
6 (2023)	Engineering considerations of iPSC-based personalized medicine / Biomaterials Research	IF. 11.30 JCR 5.2%
7 (2023)	Tissue-engineered tendon nano-constructs for repair of chronic rotator cuff tears in large animal models / Bioengineering & Translational Medicine	IF. 10.71 JCR 3.93%
8 (2022)	Engineering plants with carbon nanotubes: a sustainable agriculture approach / Journal of Nanobiotechnology	IF. 10.2 JCR 7.4%
9 (2022)	Biodegradable and flexible nanoporous films for design and fabrication of active food packaging systems / Nano Letters	IF. 12.26 JCR 7.76%
10 (2021)	Plasma-assisted multiscale topographic scaffolds for soft and hard tissue regeneration / NPJ Regenerative medicine	IF. 10.36 JCR 4.59%
11 (2019)	Hydrogel Nanospine Patch as a Flexible Anti-Pathogenic Scaffold for Regulating Stem Cell Behavior / ACS Nano	IF. 17.10 JCR 2.5%



구성인원

연구책임자 김장호 | 전남대학교 교수



김장호 교수님
융합바이오시스템기계공학과

박사후연구원 | 김우찬 박사과정 | Mahpara Safdar 박사과정 | Harshita Sharma 박사과정 | Sefali Bhakuni



김우찬 박사님
생물재료공학연구실



Mahpara Safdar
생물재료공학연구실



Harshita Sharma
생물재료공학연구실



Sefali Bhakuni
생물재료공학연구실

석사과정 | 김드림 석사과정 | 이신울 석사과정 | 박채연 학부과정 | 문효진



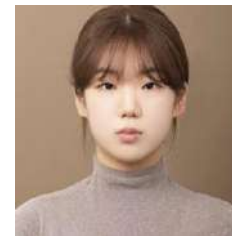
김드림
생물재료공학연구실



이신울
생물재료공학연구실



박채연
생물재료공학연구실



문효진
생물재료공학연구실

행정 | 김슬아



김슬아 선생님
생물재료공학연구실

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II. 생물재료공학연구실 연구 분야

연구분야

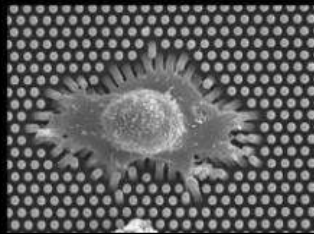
RESEARCH FIELD



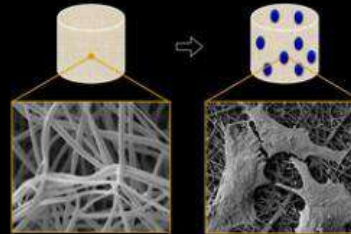
Nanoengineered Biomaterial Systems Laboratory

마이크로나노공학기술

+ Mechanical and Biomaterial Academic Backgrounds



Engineered cell



Scaffold

Engineered tissue (scaffold + cells)

Our research group focuses on development of methodologies for processing biomaterials in macro/micro/nanoscale using fundamental principles of biosystems engineering and precision manufacturing technology to develop innovative biomaterial devices and systems. Our research group explores the new area on the innovative bio & micro/nanoengineering for improving life of living systems including plants, animals, and humans. The specific research interests include i) micro/nanoengineering platforms, ii) applications for animals and humans (biomaterials, cell and tissue engineering, tissue/organ-on-chips), and iii) applications for plants (functional packing (nano-coating), growth and treatment of diseases) in the fields of Biomaterials and Biofabrication, Biologically Inspired Engineering Systems, Cell and Tissue engineering, and Agricultural Micro- and Nanotechnology.

농생명공학

조직재생 및 생체공학

Agricultural Micro- and Nanotechnologies

Development of Biomaterial Based Platforms for Agricultural Micro- and Nanotechnologies

Animal Tissue Engineering

In Vitro Animal Models

Neuro-cells boost in vet-clinics

Novel Animal Tissue-Like Structures for Animal Bone Regeneration Using Stem Cells

Innovative Multifunctional Engineered Platforms

Development of Engineering Platforms Based on Biomaterials and Biologically Inspired Design Principles

Cell and Tissue Engineering

Commercial Biomaterial Products

Cell and Tissue Regeneration using Engineering Tools

기술개요

나노구조프린팅기술

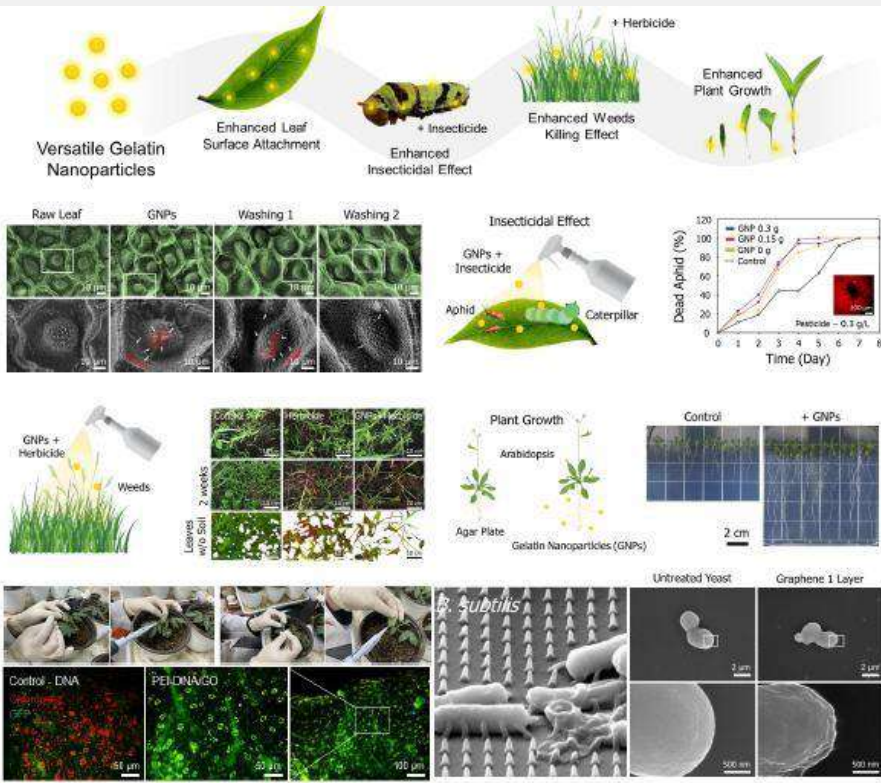
나노 스케일 생체재료 물질 합성기술

유체역학 및 진동학 시스템 나노구조체 제작 기술

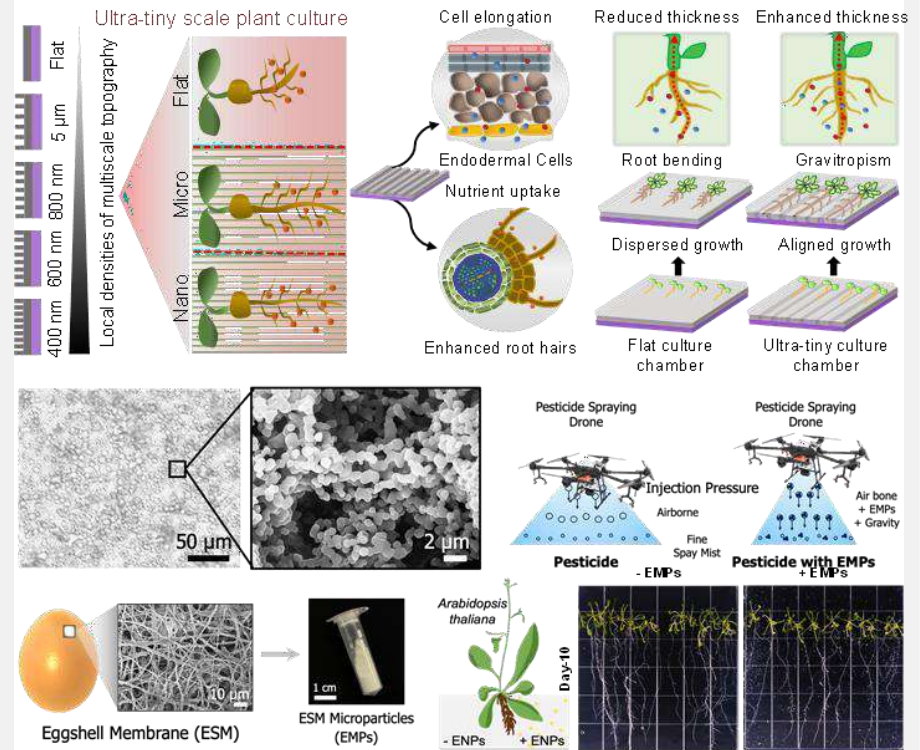
마이크로/나노 구조체 제작 기술

농업분야

농작물 생산 향상 및 식품 환경 분야



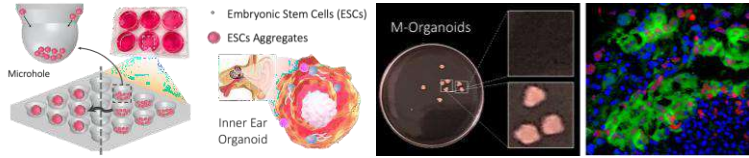
농생명자원 기반 스마트팜 응용



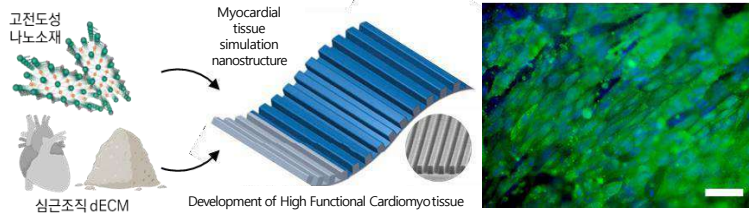
바이오메디컬분야

생체역학및조직공학

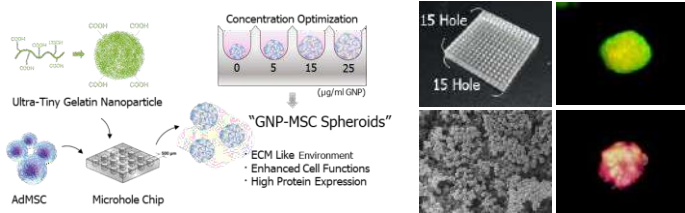
나이오가노이드



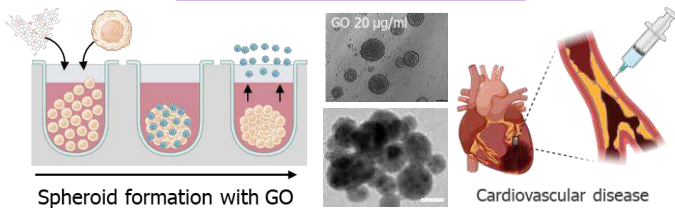
심장 근육 조직 모델



다능성 줄기세포 스페로이드

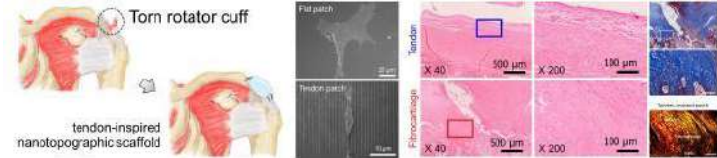


줄기세포 엑소좀



조직및장기재생적용

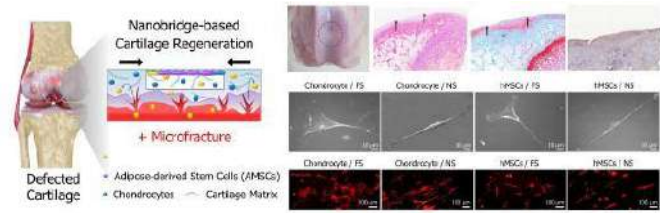
힘줄 재생



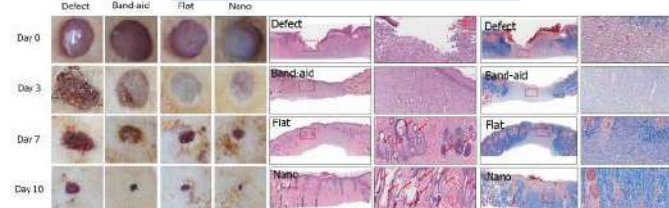
뼈 재생



연골 재생



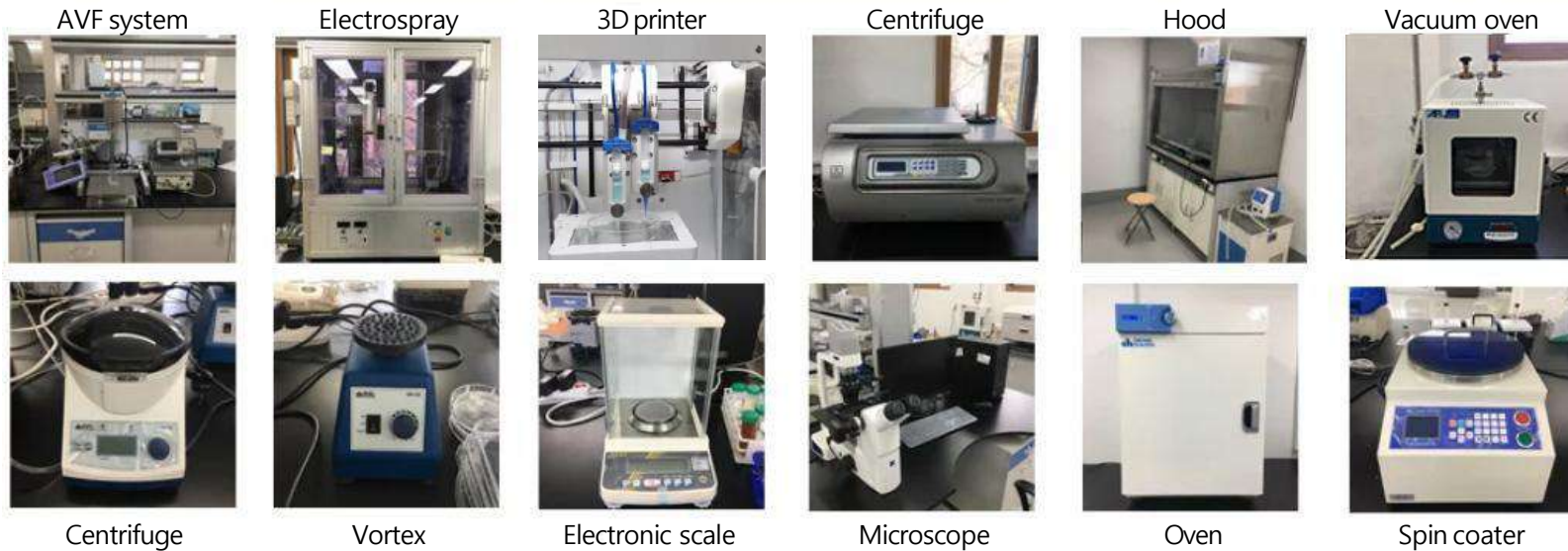
피부 재생



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III. 연구실 시설

연구실 시설 및 장비



연구실 시설 및 장비



Incubator



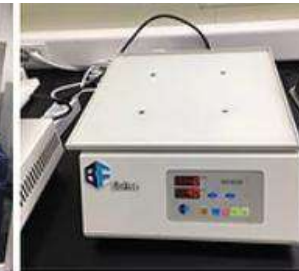
Centrifuge



Water bath



Hood



Shaker



Cold storage chamber

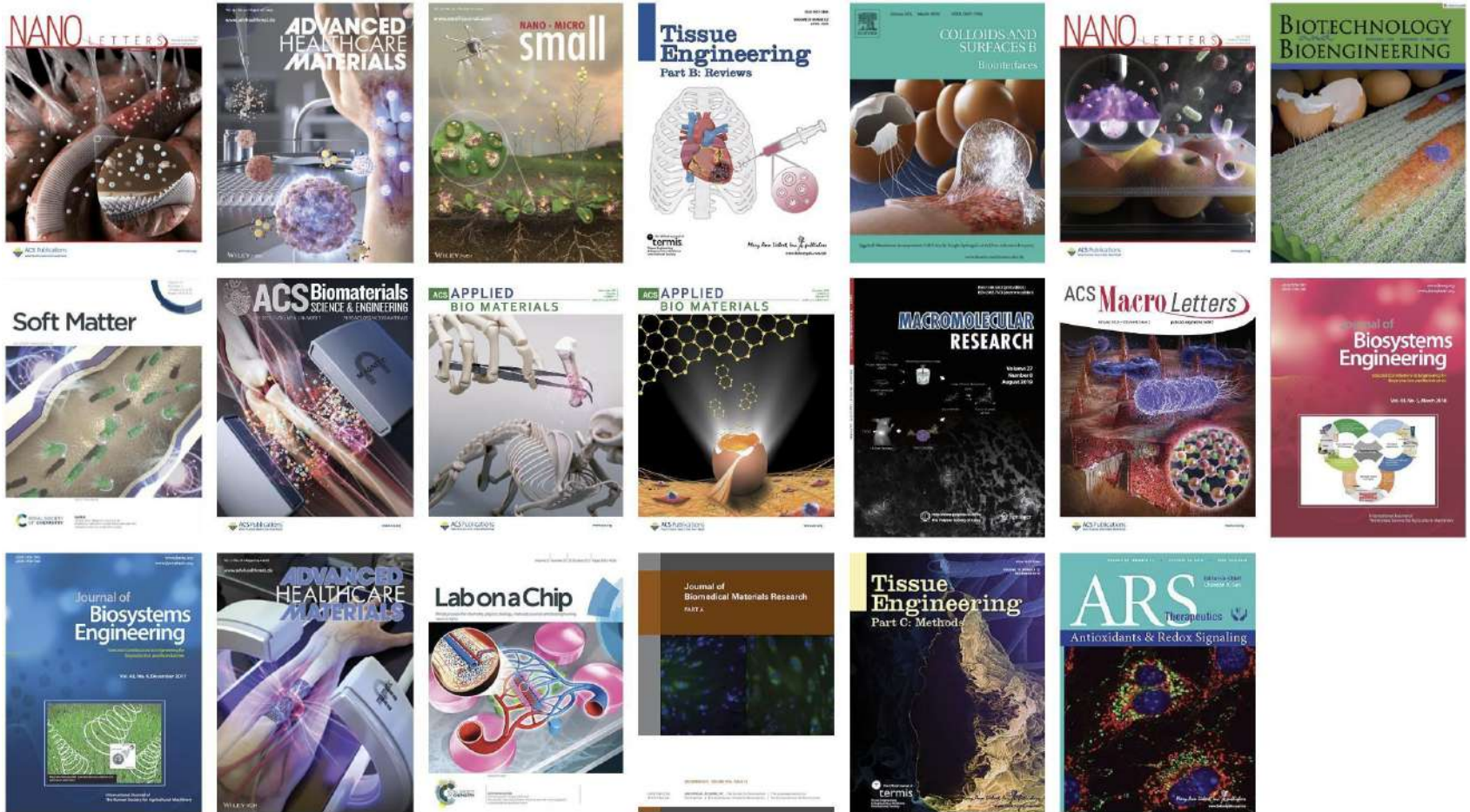
연구실 시설 및 장비



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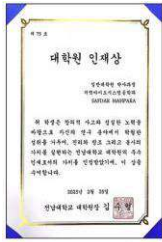
IV. 논문 출판 및 수상

논문출판및수상



2015 ~ 2025년 논문출판:160 여편출판(해외 저명학술지40곳 출판)

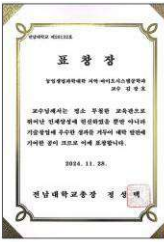
논문출판및수상



2025 전남대학교 대학원 인제상 / 우수연구자 대학원장상(Mohapatra)



2024 G-Fair 융복합수상 (2024/4) 우수포스터표창 (박상진(김도원))



2024 G-Fair 융복합수상 (2024 / 4) 인학학회 우수 교환 표창장 (교수님)



2024 한국공업학회 (2024/7/1) 생체재료 기술 공표상 (교수님)



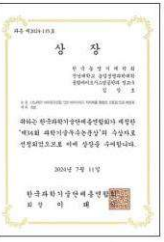
2024 세계생체재료학회(WBC) 감사장 (교수님)



2024 한국생체재료학회 추계 학술회 우수논문발표상 (김우현)



2024 한국생체재료학회 추계 학술회 우수논문발표상 (김도원)



2024 한국과학기술단체총연합회 제5회 과학기술우수논문상 (교수님)



2024 세계생체재료학회 (2024/4) 우수포스터상 (김도원)



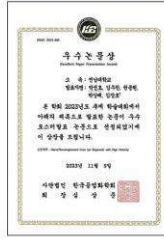
2024 한국공업학회의 추계 학술우수논문상 (김우현)



2024 전남대학교 총장 (2024/04) 이달의 전남대인 표창장 (교수님)



2023 광주광역시 (2023/11) 표창제 / 교수님



2023 한국공업학회의 추계 학술우수논문상 (박선호박사)



2023 한국공업학회의 추계 학술우수논문상 (김우현)



2023 오기노이드학회 (2023/10) Organoid 우수 논문상 (교수님)



2023 한국공업학회의 추계 학술우수논문상 (박선호박사)



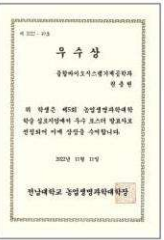
2023 한국농업기계학회 추계학술우수논문발표상 (박성배)



2023 한국농업기계학회 추계학술우수논문발표상 (김우현)



2023 세계한국생체재료학회 (2023) 우수논문발표상 / 표창



2022 전남대학교 농생명 학술 심포지엄 우수논문상 (윤민)



2022 오기노이드학회 (2022/11) 우수논문상 (박선호박사)



2022 한국농업기계학회 (2022/7) 우수논문발표상 / 대외지



2022 대한경영학회 (2022/4) 학술발표상 (유현)



2022 대한경영학회 (2022/4) 학술발표상 (유현)



2022 도시출판 문화상 (2022/9/9) 우수출판도시 기념패 (교수님)



2022 한국생체재료학회 (2022/1) 학술발표상 (박선호박사)



2022 대한기계학회 춘계학술대회 우수논문발표상 (박선호)



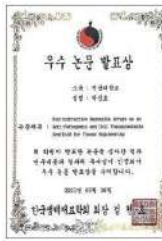
한국공업학회의 춘계학술대회 우수논문발표상 (유현)



2022 대한기계학회 춘계학술대회 우수논문발표상 (유현)



(IFB) 융합시스템산업포럼우수논문상 (박선호박사) / 선무



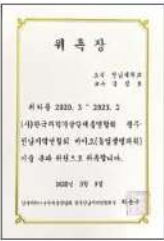
2020 REMIX-Winter School (2-Volung researcher / 우수)



2020 REMIX-Winter School (2-Volung researcher / 선무)



2020 REMIX-Winter School (2-Volung researcher / 선무)



2019 광주광역시 표창장 표창장 / 교수님



2019 IEEE NANGMONG (2019) Young Researcher Award / 선무



2019 농생명 학술발표대회 Q1 우수논문발표상 / 선무



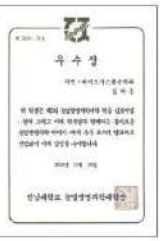
2019 농생명 학술발표대회 Q1 우수논문발표상 / 선무



2019 농생명 학술발표대회 Q1 우수논문발표상 / 선무



2019 농생명 학술발표대회 Q1 우수논문발표상 / 선무



2019 농생명 학술발표대회 Q1 우수논문발표상 / 선무

논문출판및수상



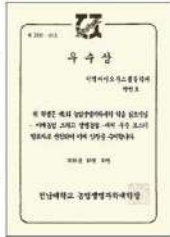
2019 연구논문기공학회 우수논문발표상 / 다문



2019 연구논문 위촉권 위촉장 / 교수님



2019 대한적십자학회 연회 감사장 / 교수님



2018 제 1회 농생명 학술 심포지엄 우수 발표상 / 신호



2018 국제노기계학회 우수논문발표상 / 신호



2018 연구논문 위촉권 위촉장 / 교수님



2018 ASABE Boyd Scott Graduate Research



2018 AKABFE 우수 발표상 (Second Place) / 선호



2018 ASABFE 우수 발표상 (Third Place) / 선호



하루이공학회 우수 발표상 / 다문



2018 공업위학회 생체재료분과 우수논문발표상 / 다문



2018 GBCS 우수 발표상 / 신호



2018 공업위학회 우수 발표상 / 신호



Outstanding Contribution in Biomaterials / 교수님



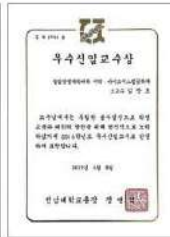
2017 ICAMD 우수 포스터 발표상 / 신호



2017 연구논문 위촉권 위촉장 / 교수님



2017 GIST 나노기공기술 컨퍼런스-GST 송정상. 장미상 / 선민, 수진, 태



2017 우수논문발표상 / 교수님 전남대학교 우수논문발표상



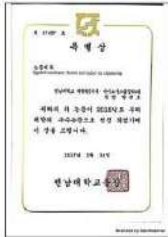
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농업부산물 기반 나노 농업

RESEARCH ARTICLE
Gelatin Nanoparticles can Improve Pesticide Delivery Performance to Plants
 Seho Park, Hakyeon Seok, Wonseok Kim, Inhee Seok, Doem Kim, Myeong Hwan Lee, Hyung Il Son, and Jaehye Kim

ABSTRACT
 Nanoparticles enabled efficient plant growth and crop production, and enhanced nutrient use efficiency. However, the poor stability of these particles in agricultural applications necessitates the development of alternative novel approaches. To address this, we developed gelatin nanoparticles (GNPs) as model carriers for small molecules and a pesticide (chlorpyrifos) and demonstrated a remarkable increase in agricultural production. In addition, GNPs showed significant uptake in various crop species and tissues. The biodegradable nature and surface of GNPs enhanced pesticide adsorption in crop surfaces. Furthermore, when combined with pesticides, GNPs demonstrated enhanced effectiveness in increasing pesticide and herbicide uptake while preserving the activity of these particles. Thus, GNPs have great potential for various agricultural applications in reducing pesticide usage. Specifically, plant growth, nutrient utilization, and insecticide herbicide and fungicide agents present the potential of crop production of GNPs in various agricultural systems.

1. INTRODUCTION
 These particles in agricultural systems could be used as small molecules, but with low stability and poor delivery efficiency to plants or insects and herbivores.

2. MATERIALS AND METHODS
 The GNP was synthesized by the method of...

3. RESULTS AND DISCUSSION
 The GNP was synthesized by the method of...

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 The GNP was synthesized by the method of...

- 젤라틴 기반 나노입자 형성
- 농약 담지 나노입자의 살충/제초
- 나노입자의 뿌리 생육 조절

나노 마이크로 미세환경 생육 조절

APPLIED ARTICLES
Ultra-Tiny Scale Topographical Cues Direct Arabidopsis Root Growth and Development
 Mijung Lee, Nadeen Pak, Wanhee Kim, Eunsun Kim, Hyeon Eun Yoon, Eui-Ki Lee, and Jaehye Kim

ABSTRACT
 Ultra-tiny scale topographical cues direct Arabidopsis root growth and development. The root growth and development of Arabidopsis is highly sensitive to environmental cues, including topographical cues. In this study, we investigated the effect of ultra-tiny scale topographical cues on Arabidopsis root growth and development. The results show that ultra-tiny scale topographical cues significantly affect Arabidopsis root growth and development. Specifically, ultra-tiny scale topographical cues increase root length and root number, and decrease root diameter. These results suggest that ultra-tiny scale topographical cues are a promising approach for controlling Arabidopsis root growth and development.

1. INTRODUCTION
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- 나노섬유 구조 모사 나노패턴 제작
- 뿌리 굵기 및 정렬의 차이 발생
- 물리적 산호의 뿌리 발달 유전자 발현 조절

바이오테크놀로지 관련 논문

나노 줄기세포 스페콜드의 조직 재생

RESEARCH ARTICLE
Nanoparticle-assisted stem cell nanofiber scaffolds for accelerating cardiac tissue regeneration
 Wonil Park, Ji Sung Park, Sangyeon Cho, Wonhee Kim, Ji Park Kim, Sang Kyu Kim, and Jaehye Kim

ABSTRACT
 Nanoparticle-assisted stem cell nanofiber scaffolds for accelerating cardiac tissue regeneration. The aim of this study was to develop a novel stem cell nanofiber scaffold for accelerating cardiac tissue regeneration. The scaffold was composed of poly(lactide-co-glycolide) (PLGA) and poly(d,l-lactide) (PLLA) nanofibers. The scaffold was coated with a layer of nanoparticles. The results show that the scaffold significantly improved cardiac tissue regeneration. Specifically, the scaffold increased the number of cardiomyocytes and improved the electrical coupling between cardiomyocytes. These results suggest that the scaffold is a promising approach for accelerating cardiac tissue regeneration.

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- 이식 가능한 줄기세포 스페콜드 개발
- 손상 연골-정상 조직 보호 및 연결
- 줄기세포 나노지형 기반 연골 유도

나노입자-줄기세포 치료제

RESEARCH ARTICLE
Ultra-Tiny Gelatin Nanoparticles-Assisted 3D Stem Cell Spheroids for Engineering Tissue Regeneration
 Doem Kim, Wanhee Kim, Hanhwa Shim, Shinyoung Lee, Chanyoung Park, Seok Park, Cheong Il Son, and Jaehye Kim

ABSTRACT
 Ultra-tiny gelatin nanoparticles-assisted 3D stem cell spheroids for engineering tissue regeneration. The aim of this study was to develop a novel stem cell spheroid for engineering tissue regeneration. The spheroid was composed of stem cells and ultra-tiny gelatin nanoparticles. The results show that the spheroid significantly improved tissue regeneration. Specifically, the spheroid increased the number of stem cells and improved the differentiation of stem cells. These results suggest that the spheroid is a promising approach for engineering tissue regeneration.

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- 젤라틴 기반 나노입자 형성
- 나노입자의 스페로이드 기능 향상
- 스페로이드의 조직 재생 강화

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농업부산물 기반 나노 농업

RESEARCH ARTICLE

small

Gelatin Nanoparticles can Improve Pesticide Delivery Performance to Plants

Sungho Park, Malaysia Selihi, Wookhan Kim, Jaehyeon Song, Deam Kim, Myoung Chwan Lee, Myoung Il Lee, and Jaehyeon Kim*

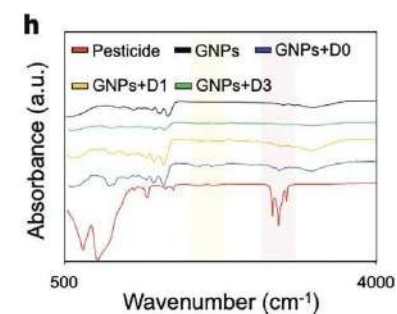
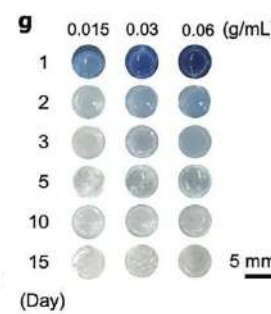
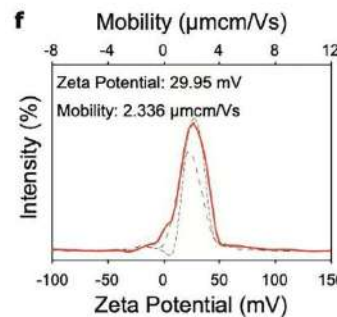
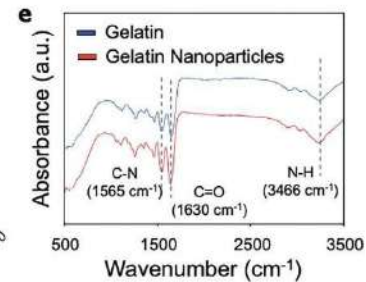
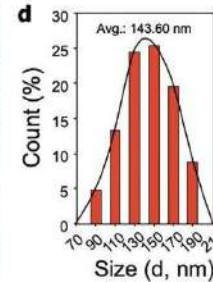
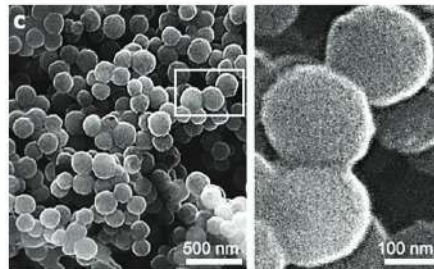
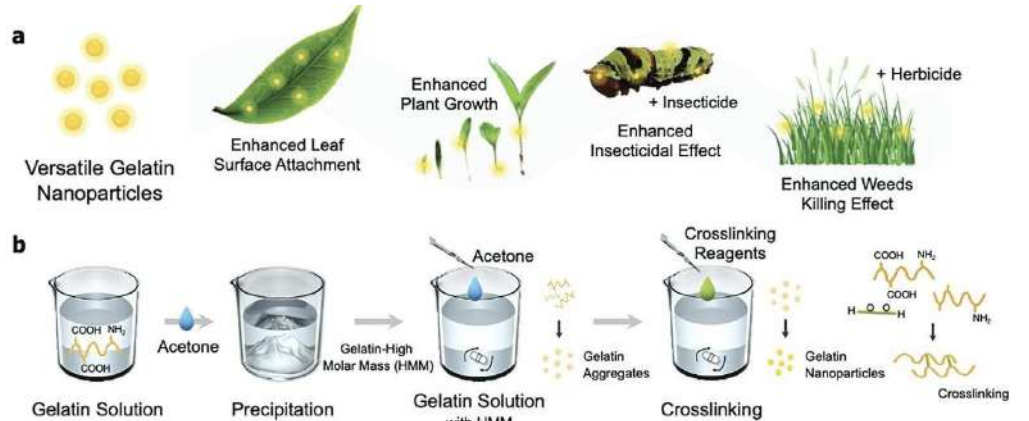
Plant protection is essential for plant growth and crop production. Conventional pesticides of agriculture, however, have poor solubility in water, resulting in agricultural applications restricted to a few types of agrochemicals. Recently, gelatin-based nanoparticles (GNPs) have been developed as a carrier for agrochemicals. However, the biodegradability and stability of GNPs remain unexplained under agricultural field conditions, where environmental conditions, such as moisture, sunlight, and temperature, are not controlled. In this study, we investigated the stability of GNPs in natural conditions and the effect of GNPs on plant growth and crop production. We found that GNPs can improve the stability of pesticides in natural conditions and enhance the delivery of pesticides to plants. These results suggest that GNPs can be used as a carrier for agrochemicals in natural conditions and improve the delivery of pesticides to plants.

Keywords: gelatin, nanoparticles, pesticides, plant growth, crop production, stability, natural conditions, delivery, agrochemicals.

1. Introduction
2. Materials and Methods
3. Results and Discussion
4. Conclusion

Received: 2023-01-10
Accepted: 2023-02-15
Published: 2023-03-01

DOI: 10.1002/smll.202300000



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농업부산물 기반 나노 농업

1. Introduction
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농업 부산물 기반 나노 농업

RESEARCH ARTICLE 

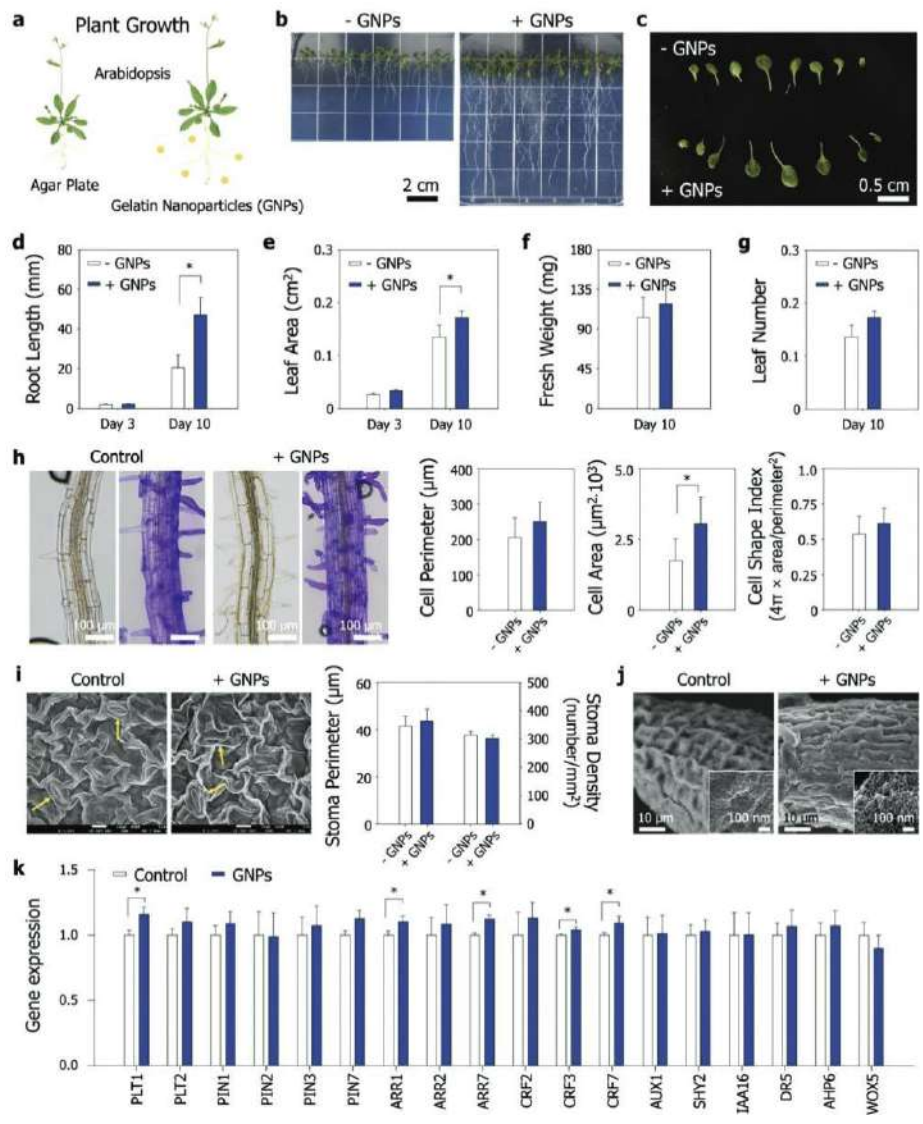
Gelatin Nanoparticles can Improve Pesticide Delivery Performance to Plants

Sungho Park, Mahyuni Saifudin, Wookcheon Kim, Jaehwi Son, Deam Kim, Myoung Chwan Lee, Myoung Il Son, and Jaehye Kim*

Plant growth promoters and pesticides are important for agricultural production. However, the poor stability of these molecules in agricultural applications necessitates the development of environmentally friendly approaches. To address this, biodegradable gelatin nanoparticles (GNPs) are synthesized using a simple and cost-effective method. The GNPs are used as a carrier for insecticide and fungicide. The GNPs improve the stability and efficacy of the active ingredients in agricultural applications. Furthermore, when used in combination with pesticides, GNPs demonstrate enhanced effectiveness in protecting plants from insect and fungal diseases. Specifically, plant root growth, surface fertilization, and increasing the number of germinating seeds are observed. The improved biological activities of GNPs in insecticide application are discussed.

Keywords: Gelatin nanoparticles, insecticide, fungicide, plant growth promoter, agricultural production, pesticide delivery, plant growth, root length, leaf area, fresh weight, leaf number, cell perimeter, cell area, cell shape index, stomata density, gene expression.

1. INTRODUCTION
 Plants require an abundant amount of water and nutrients for growth. However, soil water and nutrients are not available in sufficient quantities for agricultural production. To address this, plant growth promoters (PGPs) are used to stimulate plant growth and increase the efficiency of water and nutrient uptake. Pesticides are also used to protect plants from insect and fungal diseases. However, the poor stability of these molecules in agricultural applications necessitates the development of environmentally friendly approaches. To address this, biodegradable gelatin nanoparticles (GNPs) are synthesized using a simple and cost-effective method. The GNPs are used as a carrier for insecticide and fungicide. The GNPs improve the stability and efficacy of the active ingredients in agricultural applications. Furthermore, when used in combination with pesticides, GNPs demonstrate enhanced effectiveness in protecting plants from insect and fungal diseases. Specifically, plant root growth, surface fertilization, and increasing the number of germinating seeds are observed. The improved biological activities of GNPs in insecticide application are discussed.



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농업부산물 기반 나노 농업

RESEARCH ARTICLE

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Gelatin Nanoparticles can Improve Pesticide Delivery Performance to Plants

Sungho Park, Mulyani Setiati, Wookhan Kim, Jaehwi Son, Doam Kim, Myoung-Gwan Lee, Myoung Il Lee, and Jaehye Kim*

Research on pest control and plant growth are very important for the sustainable development of agriculture. However, the poor stability of chemical pesticides and agricultural applications associated with a development of environmentally friendly, sustainable, biodegradable gelatin nanoparticles (GNPs) are still a challenge. In this study, we developed a gelatin-based GNP formulation and used it to improve the delivery of insecticide and herbicide to plants. Furthermore, when combined with pesticides, GNPs demonstrated excellent performance in increasing the number of aphids and caterpillars on plants, respectively. Gelatin nanoparticles can improve the delivery of pesticides to plants, and the combination of GNPs with pesticides can improve the pest control performance of pesticides.

Introduction: The latest trend in agriculture is to use green and safe pesticides. However, the poor stability of chemical pesticides and agricultural applications associated with a development of environmentally friendly, sustainable, biodegradable gelatin nanoparticles (GNPs) are still a challenge. In this study, we developed a gelatin-based GNP formulation and used it to improve the delivery of insecticide and herbicide to plants. Furthermore, when combined with pesticides, GNPs demonstrated excellent performance in increasing the number of aphids and caterpillars on plants, respectively. Gelatin nanoparticles can improve the delivery of pesticides to plants, and the combination of GNPs with pesticides can improve the pest control performance of pesticides.

1. Introduction

Pesticides are used to control pests and diseases on crops. However, the use of pesticides is becoming increasingly difficult due to the development of resistance in pests and diseases.

Therefore, the development of new pesticides is necessary. In this study, we developed a gelatin-based GNP formulation and used it to improve the delivery of pesticides to plants.

Furthermore, when combined with pesticides, GNPs demonstrated excellent performance in increasing the number of aphids and caterpillars on plants, respectively.

Gelatin nanoparticles can improve the delivery of pesticides to plants, and the combination of GNPs with pesticides can improve the pest control performance of pesticides.

Keywords: Gelatin nanoparticles, pesticides, plant growth, pest control.

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Received: 2023-01-01; Accepted: 2023-02-01; Published: 2023-03-01

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Full text available at: <https://doi.org/10.1002/2475-2875.12345>

DOI: 10.1002/2475-2875.12345

ISSN: 2475-2875

Volume 1, Issue 1, 2023

Pages 1-10

Keywords: Gelatin nanoparticles, pesticides, plant growth, pest control.

Abstract: Gelatin nanoparticles (GNPs) were synthesized and used to improve the delivery of pesticides to plants. The combination of GNPs with pesticides improved the pest control performance of pesticides.

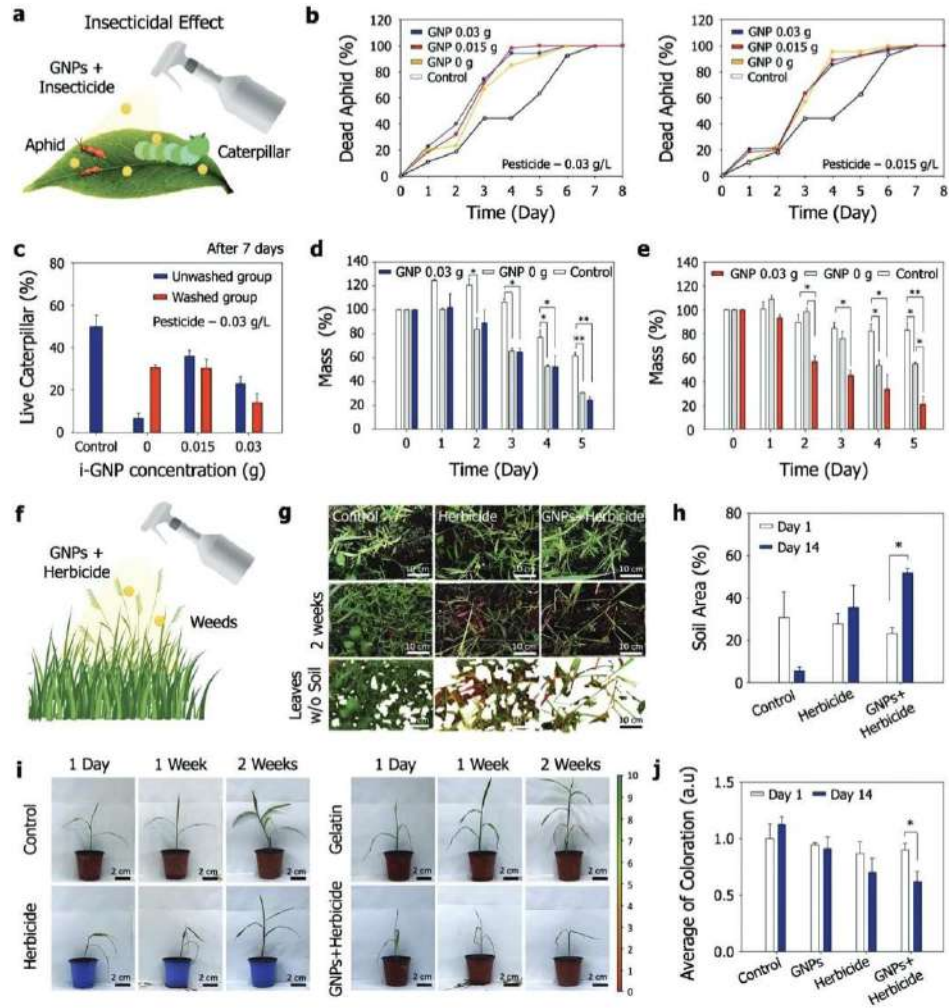
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농업 관련 논문

농업부산물 기반 나노 농업

- 절모된 기반 나노 입자 형성
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농업부산물 기반 나노 농업

RESEARCH ARTICLE 

Gelatin Nanoparticles can Improve Pesticide Delivery Performance to Plants

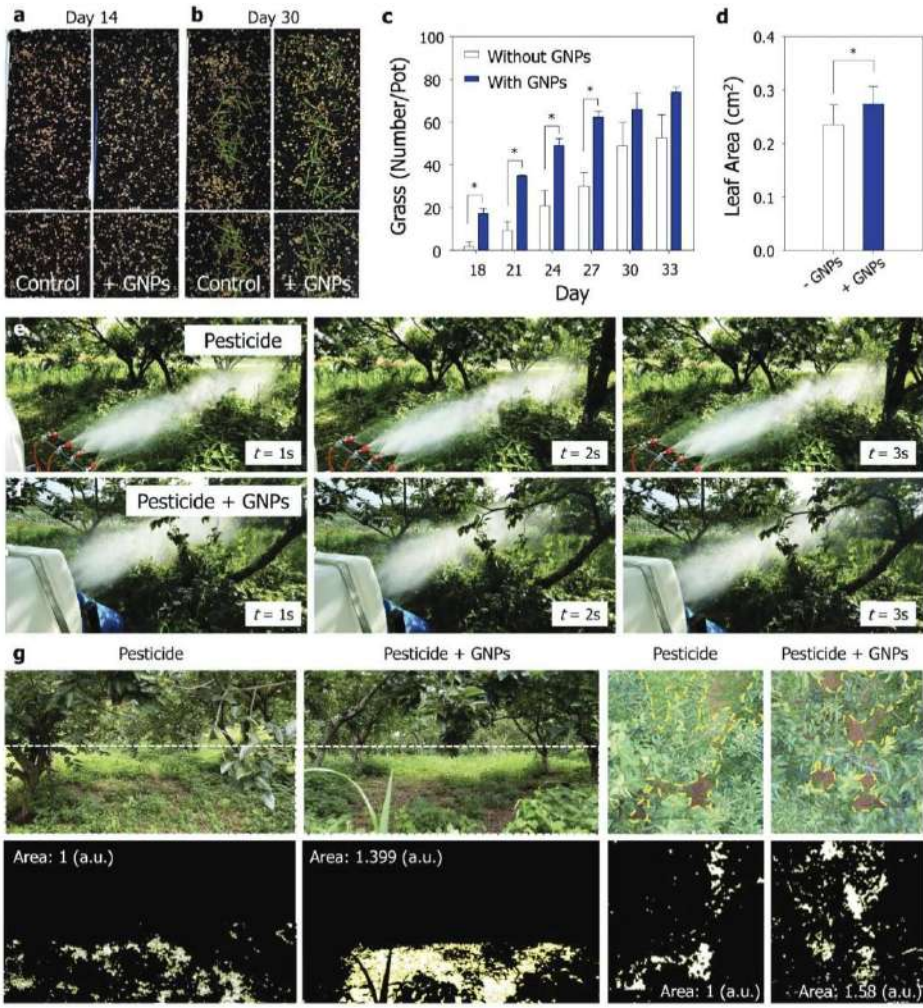
Seohe Park, Mulyani Setiati, Wookan Kim, Jeehee Son, Doan Kim, Myung Choon Lee, Myoung Il Lee, and Jaehye Kim*

Increased pesticide use has posed a great environmental risk to human health and the environment. However, the poor solubility of many pesticides in agricultural applications necessitates the development of environmentally friendly approaches. To address this, biodegradable gelatin nanoparticles (GNPs) are synthesized using a simple and cost-effective method. The GNPs are used as a carrier for agricultural pesticides. In a field trial, the GNPs significantly improve the delivery performance of agricultural pesticides to plants. Furthermore, when combined with pesticides, GNPs demonstrate excellent adhesion to plant leaves, resulting in a higher pesticide retention rate on the leaf surface. The GNPs also improve the penetration of pesticides into the plant tissue, resulting in a higher pesticide retention rate in the plant tissue. The GNPs also improve the penetration of pesticides into the plant tissue, resulting in a higher pesticide retention rate in the plant tissue.

Keywords: gelatin nanoparticles, pesticide delivery, plant growth, agricultural pesticides, environmental risk, human health, biodegradable, agricultural applications, environmentally friendly approaches, solubility, agricultural pesticides, biodegradable, gelatin nanoparticles, synthesized, simple, cost-effective method, carrier, agricultural pesticides, delivery performance, plants, retention rate, leaf surface, penetration, plant tissue, pesticide retention rate.

1. INTRODUCTION
Pesticides are essential agricultural products used to kill the target organisms, but they have caused environmental pollution and human health problems. Therefore, the development of environmentally friendly pesticides is an urgent task. Gelatin nanoparticles (GNPs) are biodegradable and non-toxic, making them suitable for agricultural applications. GNPs can be used as a carrier for agricultural pesticides, improving their delivery performance to plants. In this study, we synthesized GNPs and evaluated their ability to improve pesticide delivery to plants in a field trial. The results show that GNPs significantly improve the delivery performance of agricultural pesticides to plants, resulting in a higher pesticide retention rate on the leaf surface and a higher pesticide retention rate in the plant tissue.

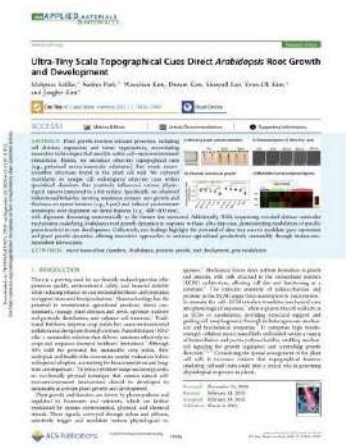
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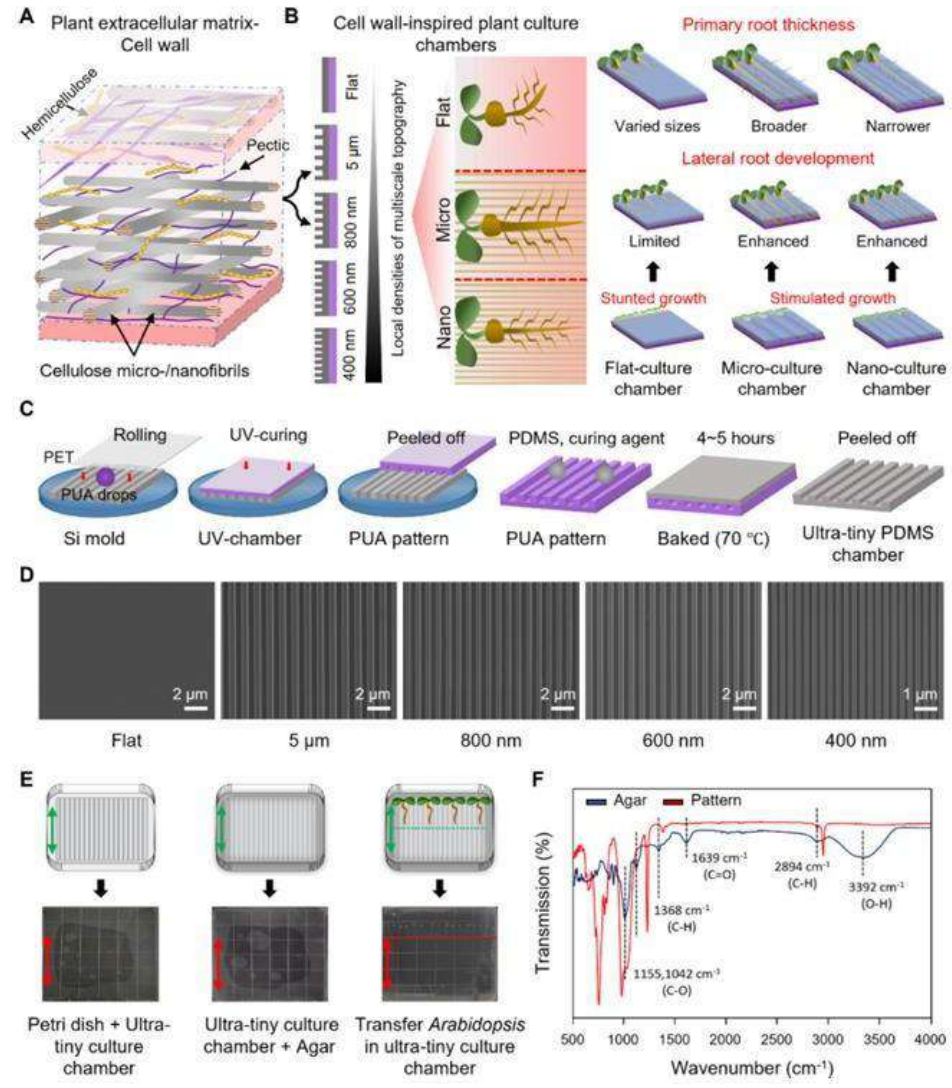
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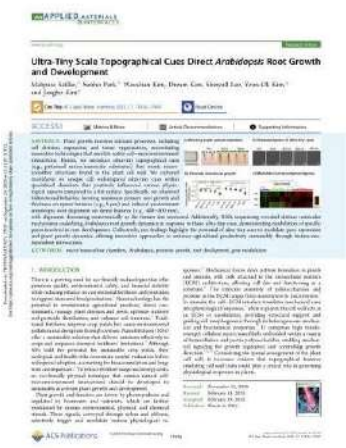
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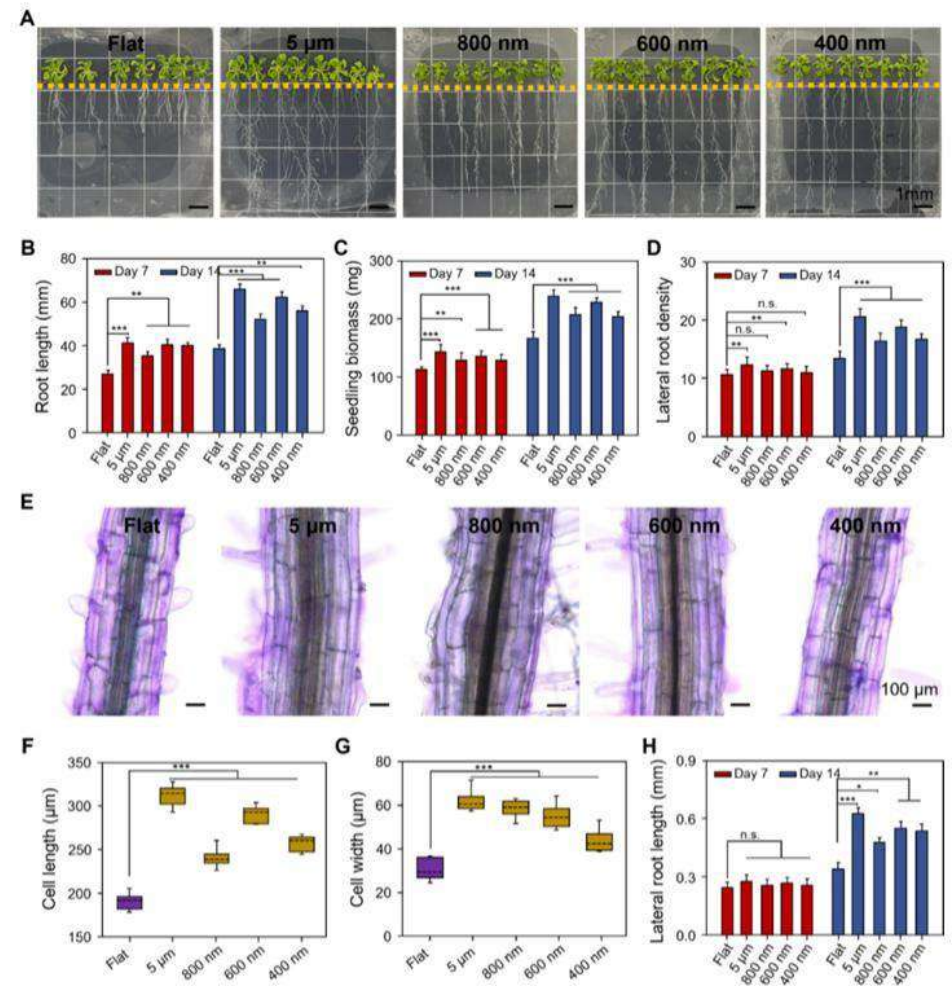
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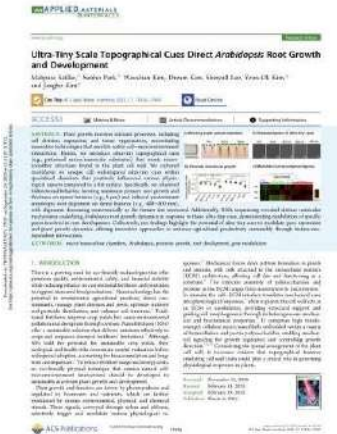
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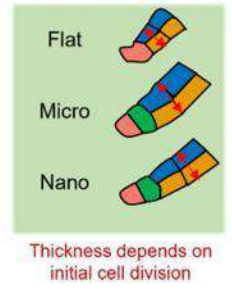
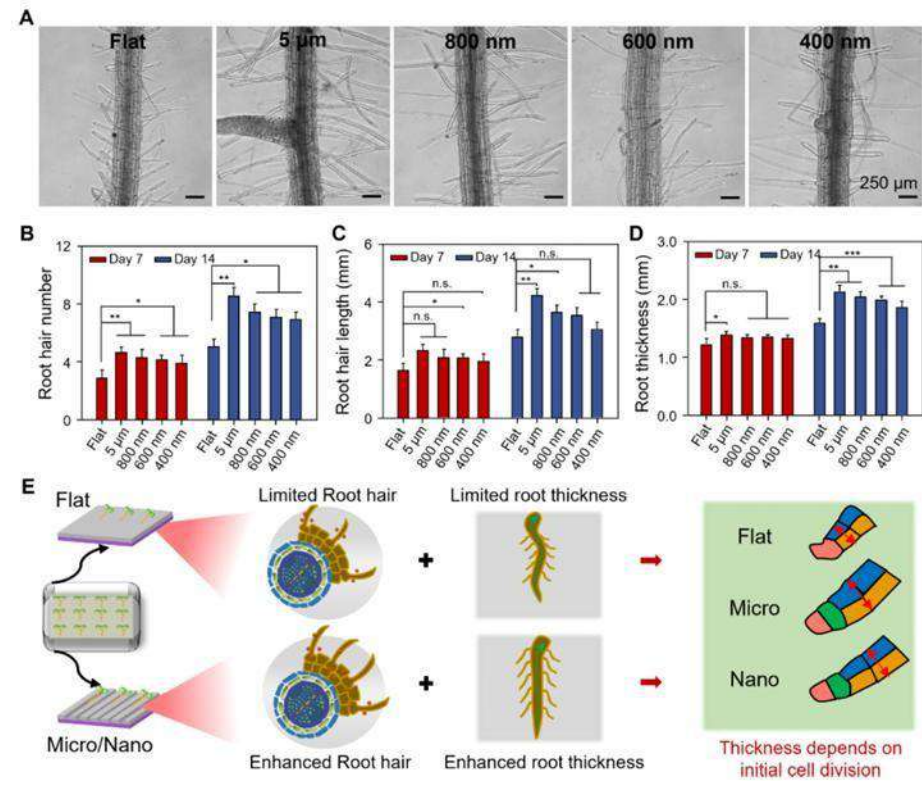
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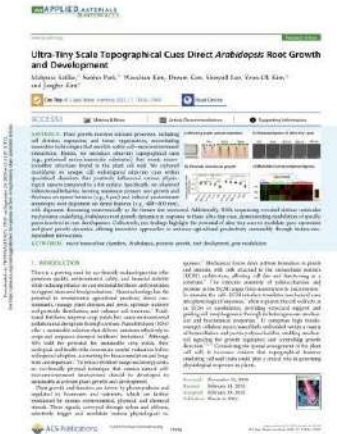
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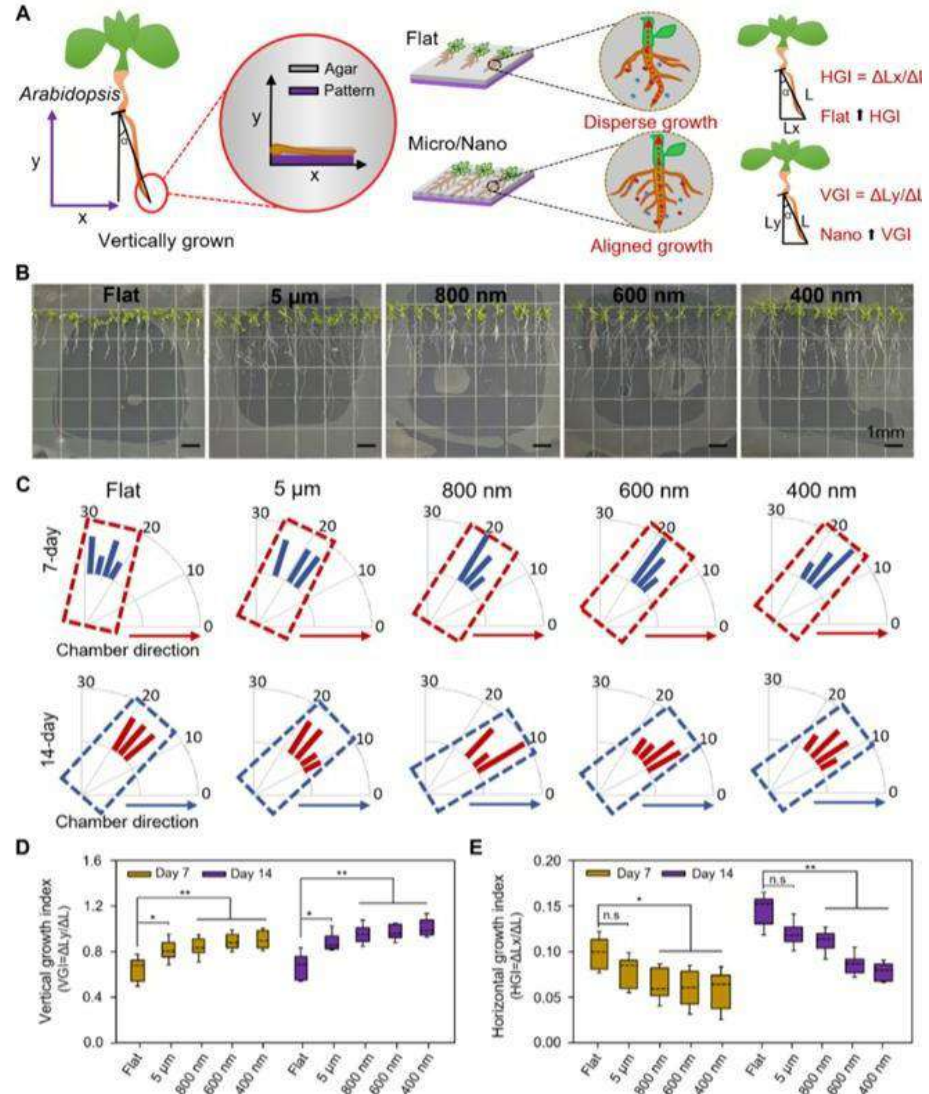
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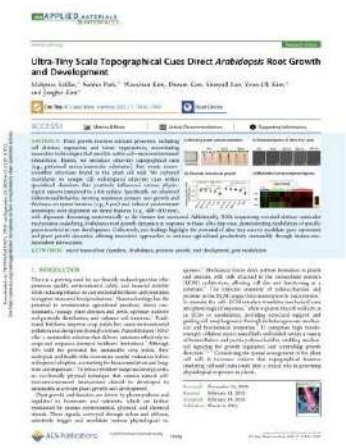
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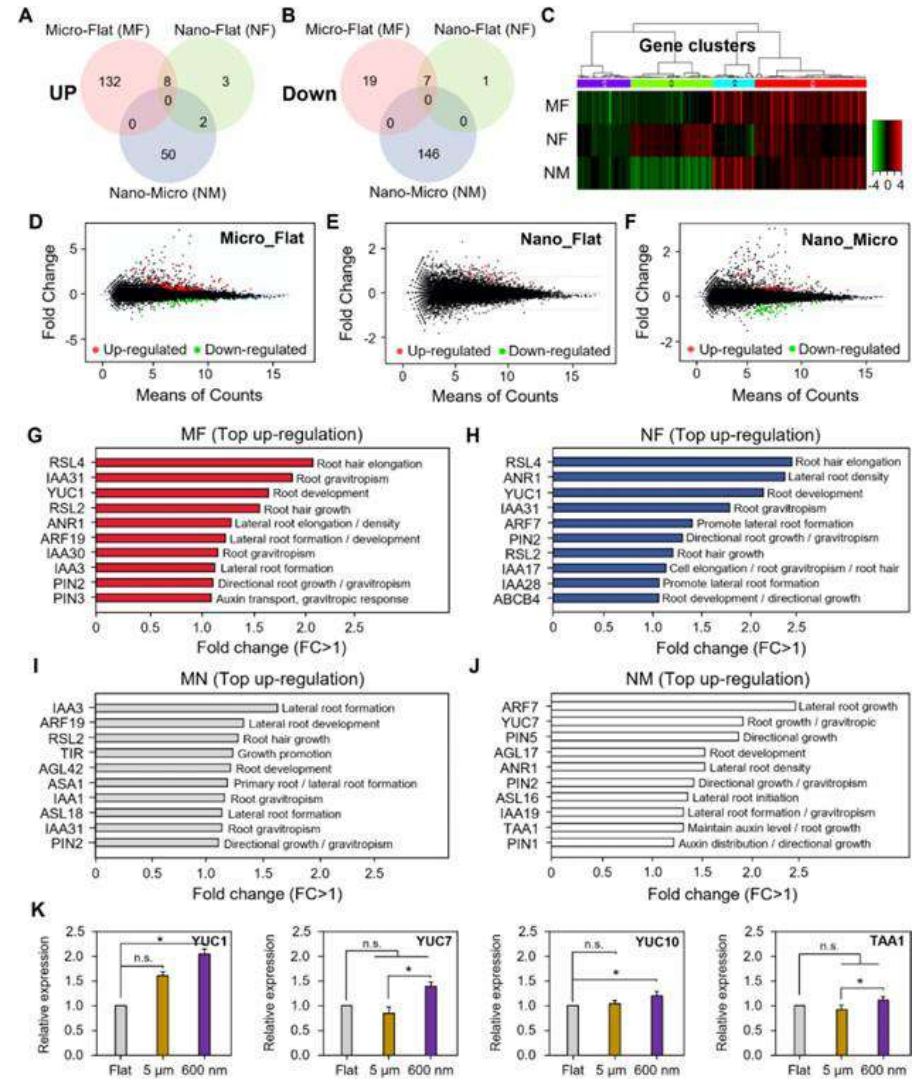
대표 연구 논문 소개

농업 관련 논문

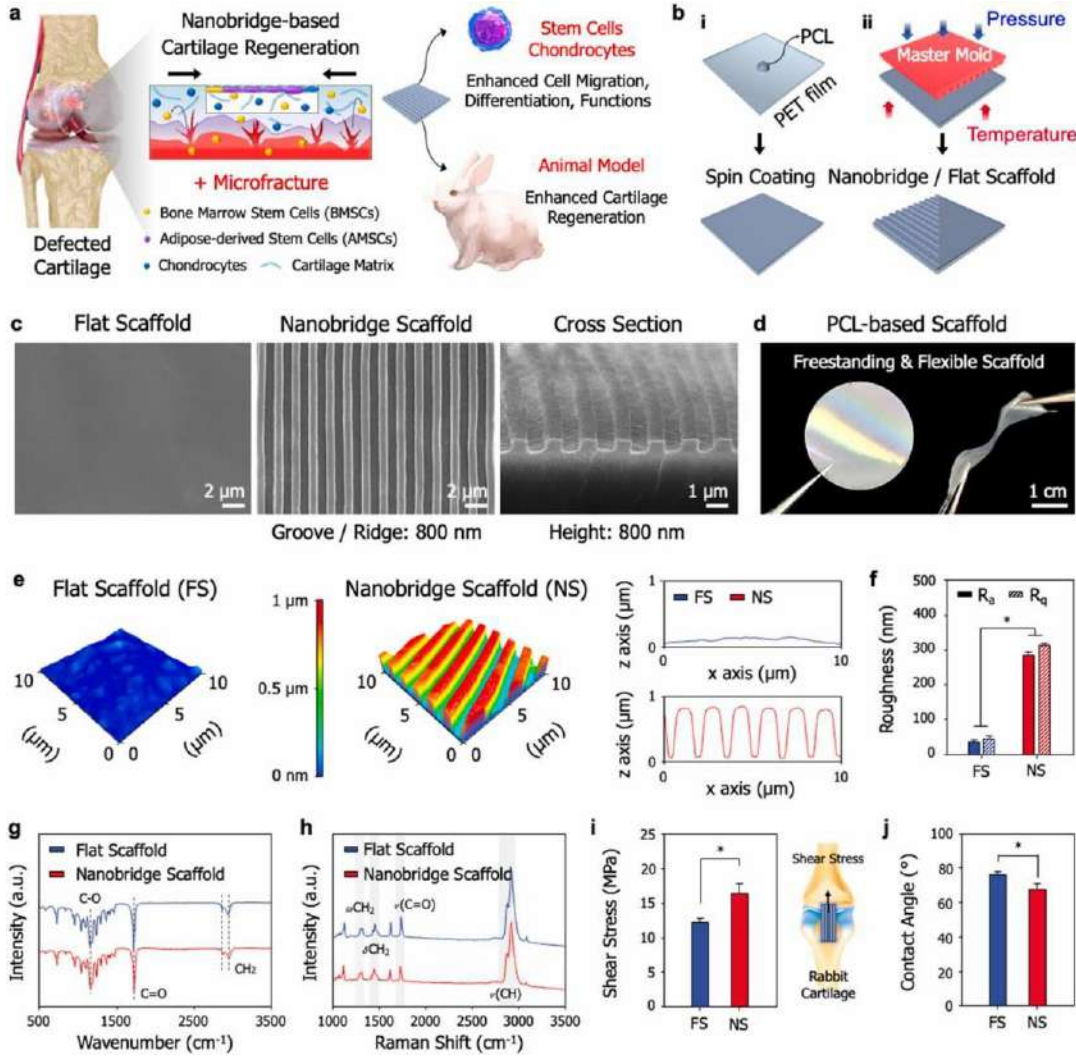
나노마이크로 미세환경 생육 조절



- 나노섬유 구조 모사 나노패턴 제작
- 뿌리 굵기 및 정렬의 차이 발생
- 물리적 신호의 뿌리 발달 유전자 발현 조절



대표 연구 논문 소개



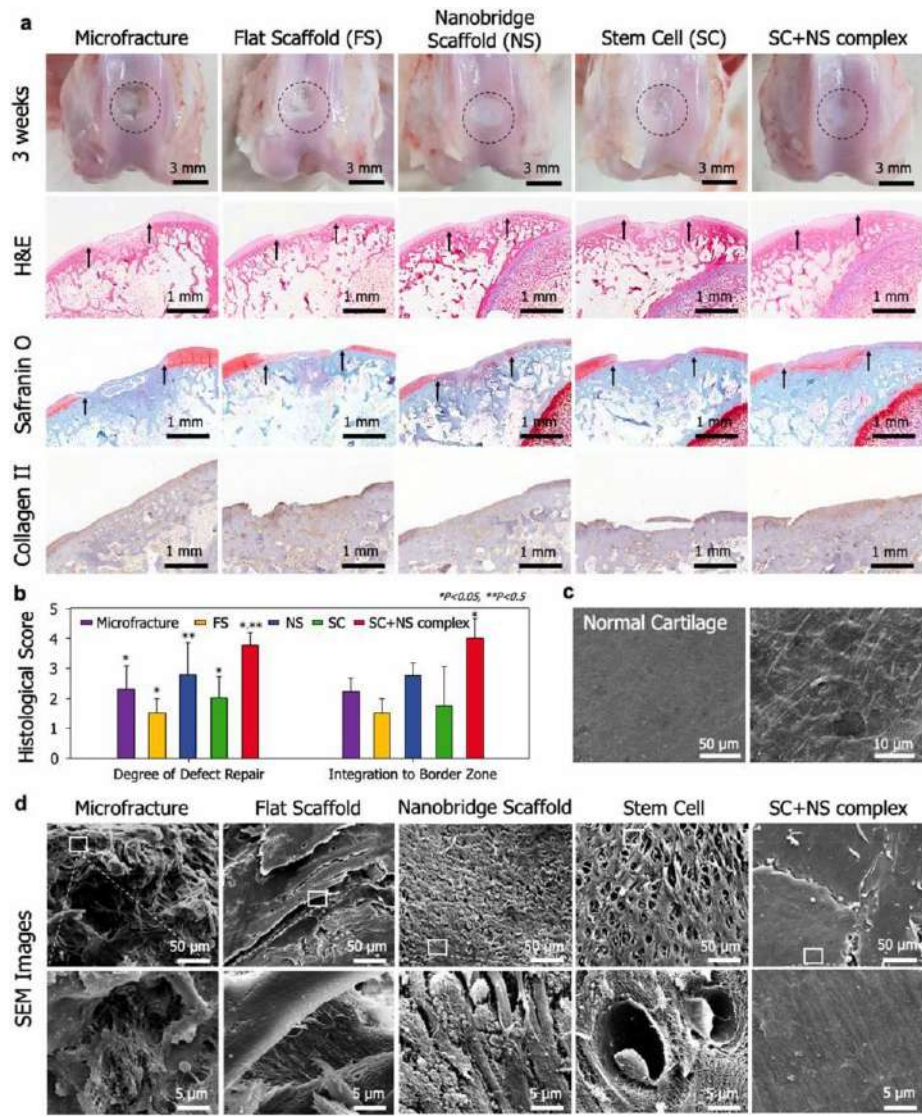
바이오메디컬 관련 논문

나노 줄기 세포 스케폴드의 조직 재생



- 이식 가능한 줄기 세포 스케폴드 개발
- 손상 연골 정상 조직 보호 및 연결
- 줄기 세포 나노지형 기반 연골 유도

대표 연구 논문 소개



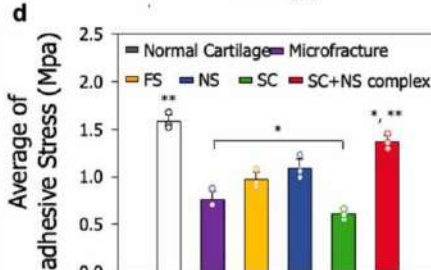
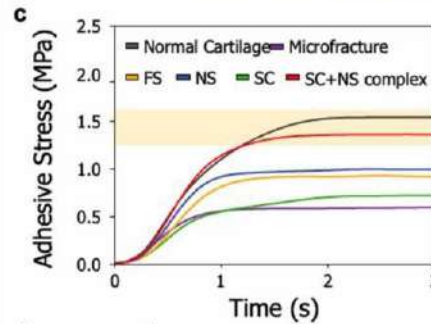
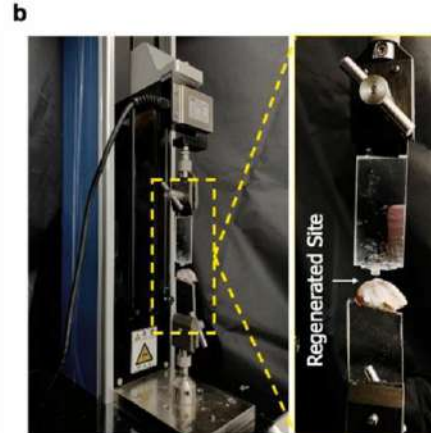
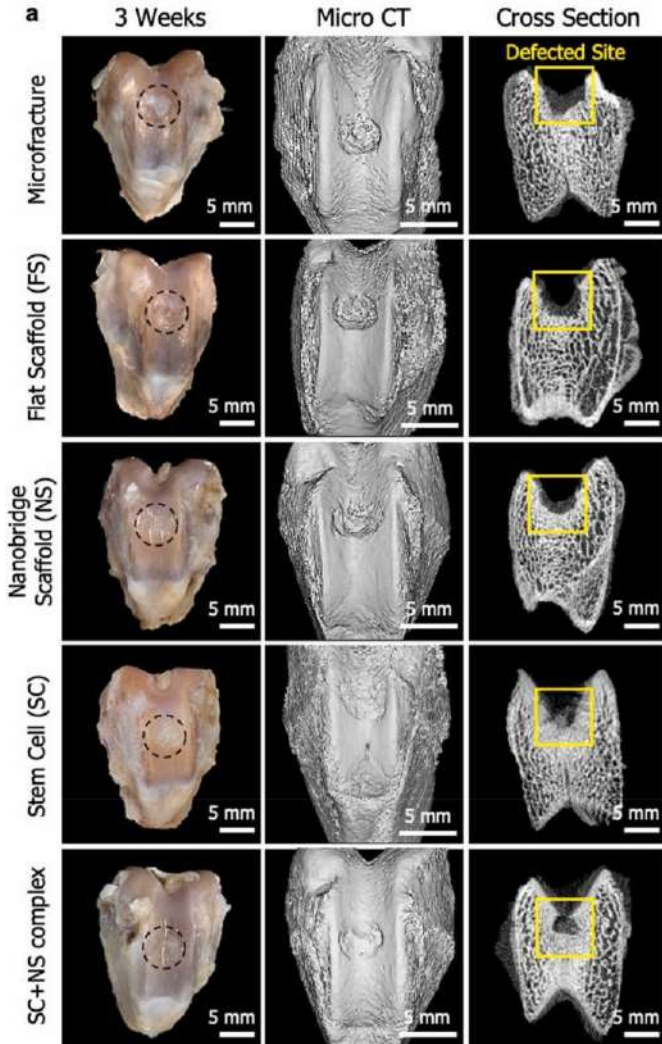
바이오메디컬 관련 논문

나노 줄기세포 스캐폴드의 조직 재생



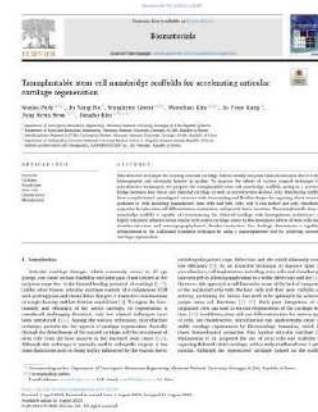
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대표 연구 논문 소개



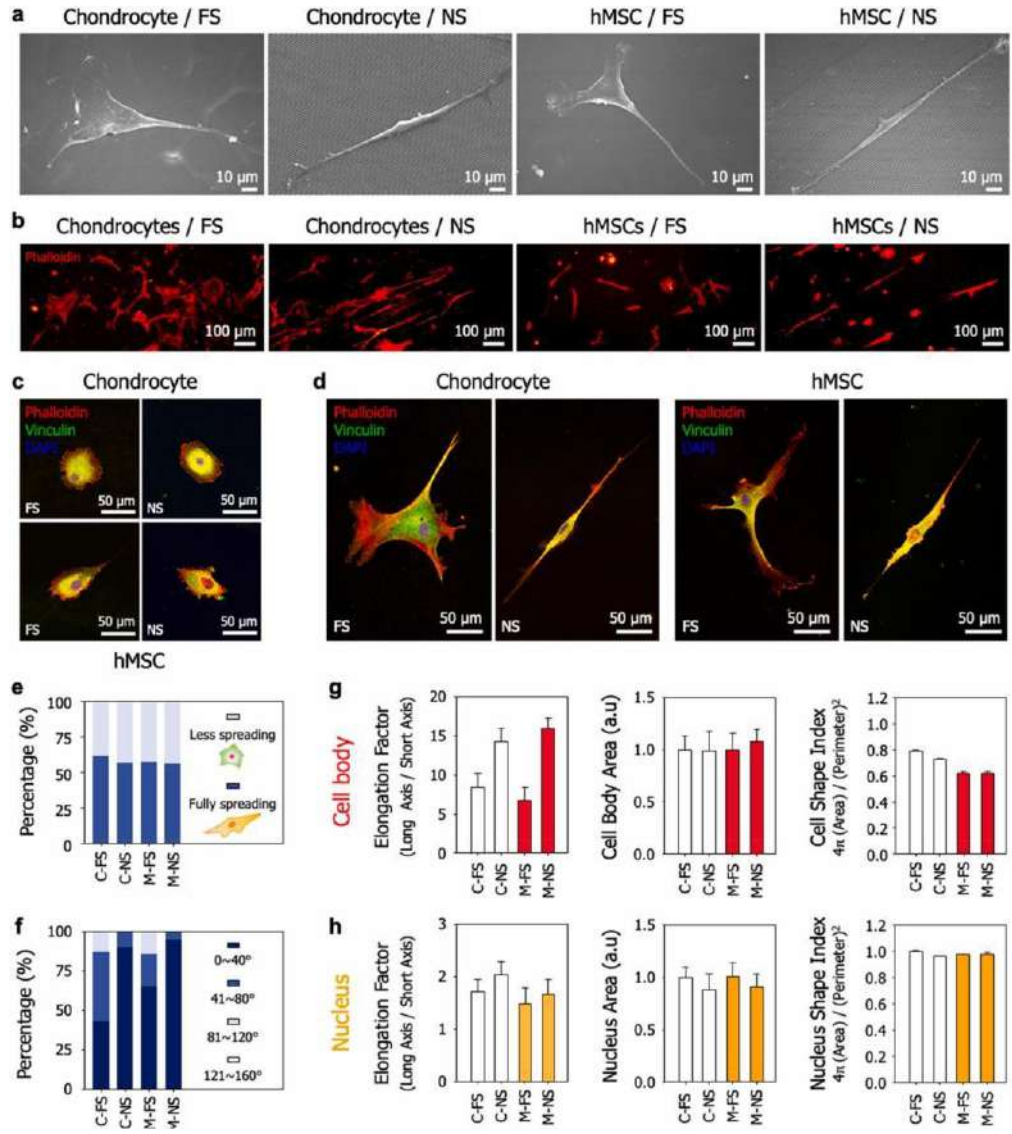
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나노 줄기세포 스캐폴드의 조직 재생



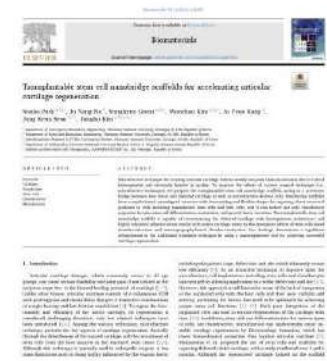
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대표 연구 논문 소개



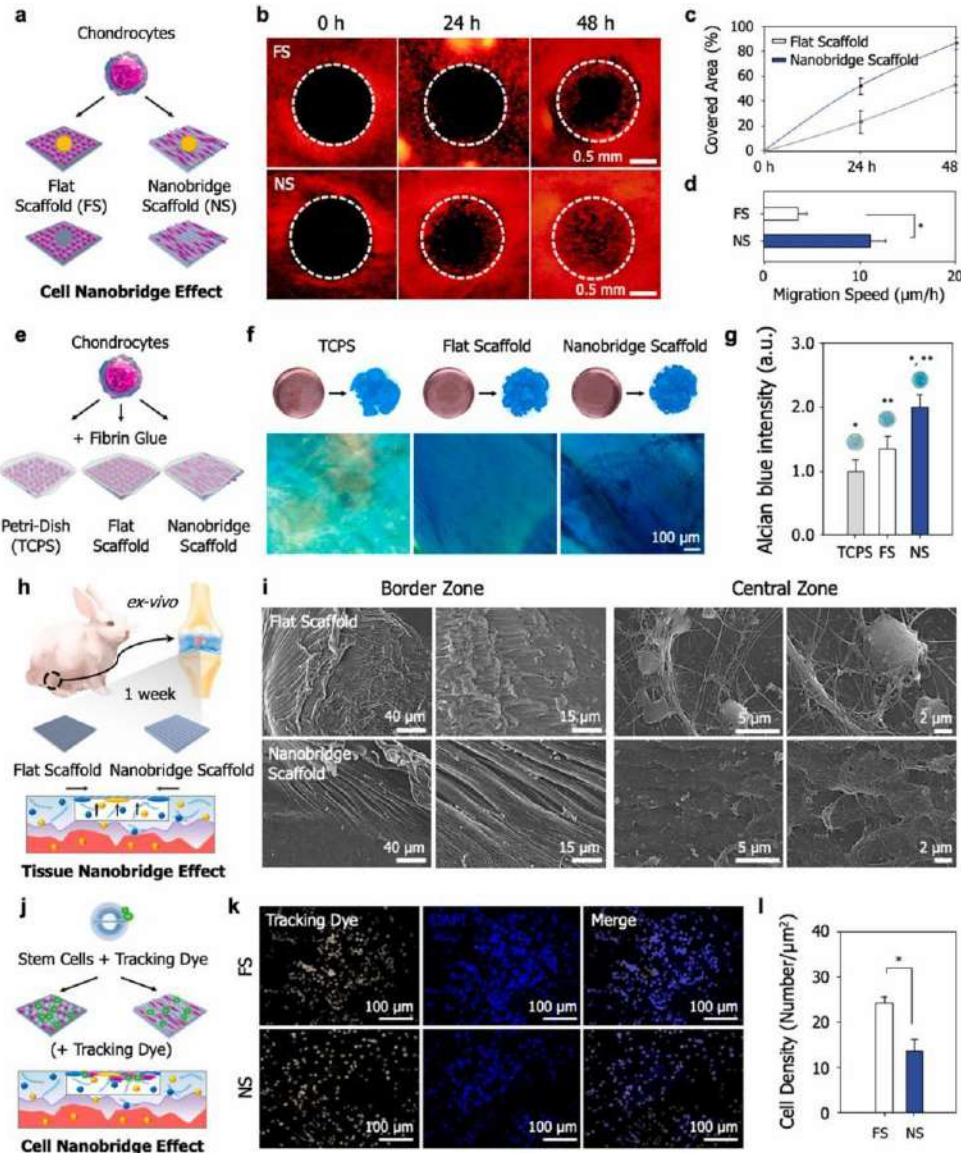
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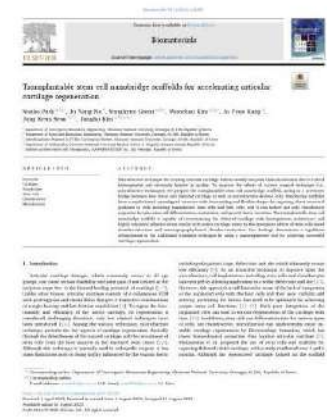
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대표 연구 논문 소개



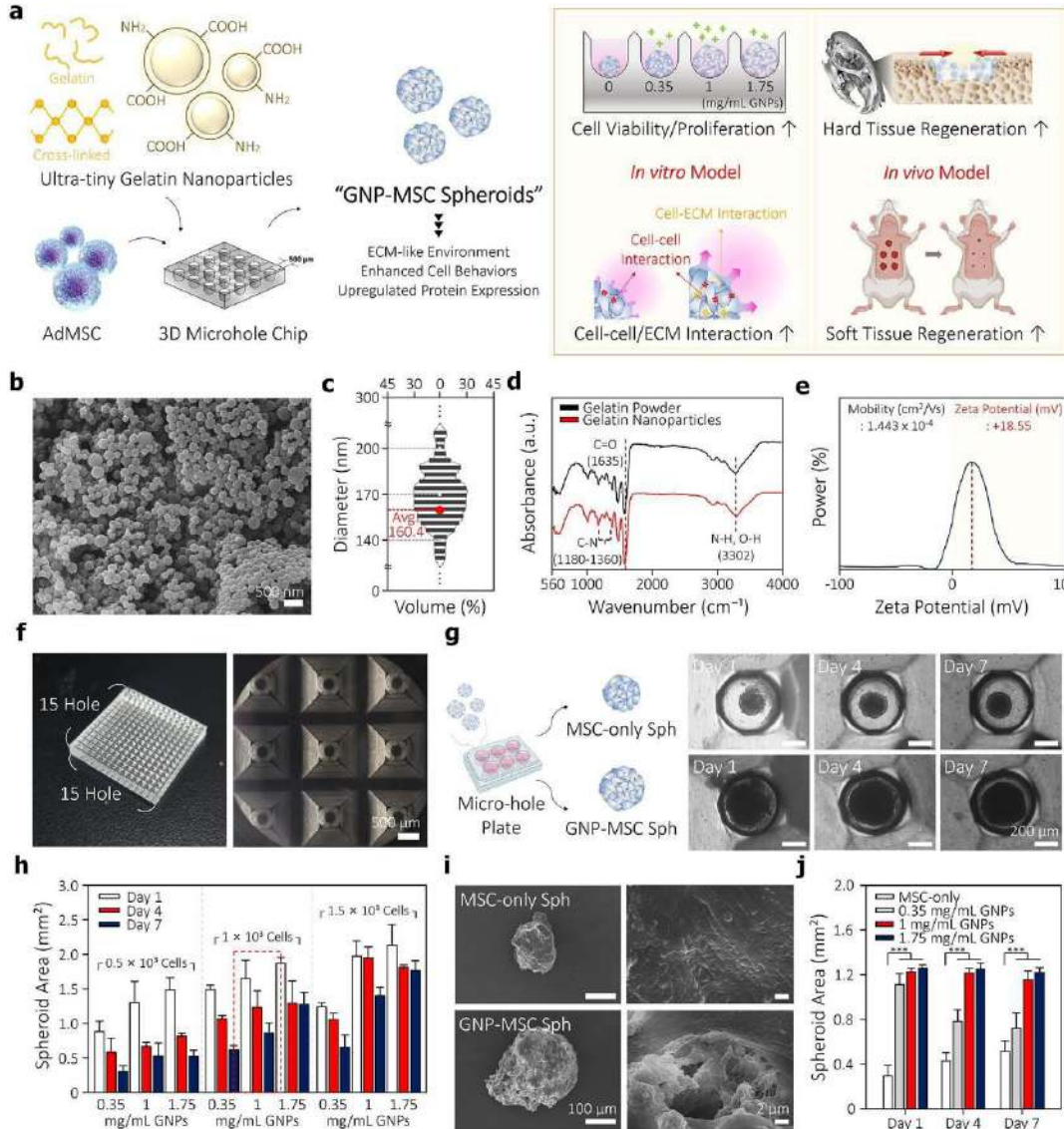
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대표 연구 논문 소개



바이오메디컬 관련 논문

나노입자 줄세포 치료제

RESEARCH ARTICLE

Ultra-Tiny Gelatin Nanoparticles-Assisted 3D Stem Cell Spheroids for Engineering Tissue Regeneration

Daewon Kim, Myoung Kwon, Hanbita Sharma, Shinyoung Lee, Chanyoung Park, Seokwon Park, Cheon-Woong Park, and Jongho Kim*

1. Introduction

Stem cell spheroids offer an efficient approach for tissue repair. Better modeling and therapeutic applications. However, conventional spheroids suffer from low cell viability, such as necrotic cell death and limited cell-cell contact, which hinders their application. Therefore, this study aims to propose an ultra-tiny gelatin nanoparticle (GNP)-assisted spheroid, which is designed to overcome the above-mentioned limitations. Ultra-tiny GNP-MSC spheroids are synthesized and cultured on a 3D microhole chip. The ultra-tiny GNP-MSC spheroids show enhanced cell viability, proliferation, and differentiation capabilities. In addition, ultra-tiny GNP-MSC spheroids show enhanced cell-cell and cell-ECM interactions. These ultra-tiny GNP-MSC spheroids are used for tissue regeneration in a 3D microhole chip. The ultra-tiny GNP-MSC spheroids show enhanced cell viability, proliferation, and differentiation capabilities. In addition, ultra-tiny GNP-MSC spheroids show enhanced cell-cell and cell-ECM interactions. These ultra-tiny GNP-MSC spheroids are used for tissue regeneration in a 3D microhole chip.

2. Results and Discussion

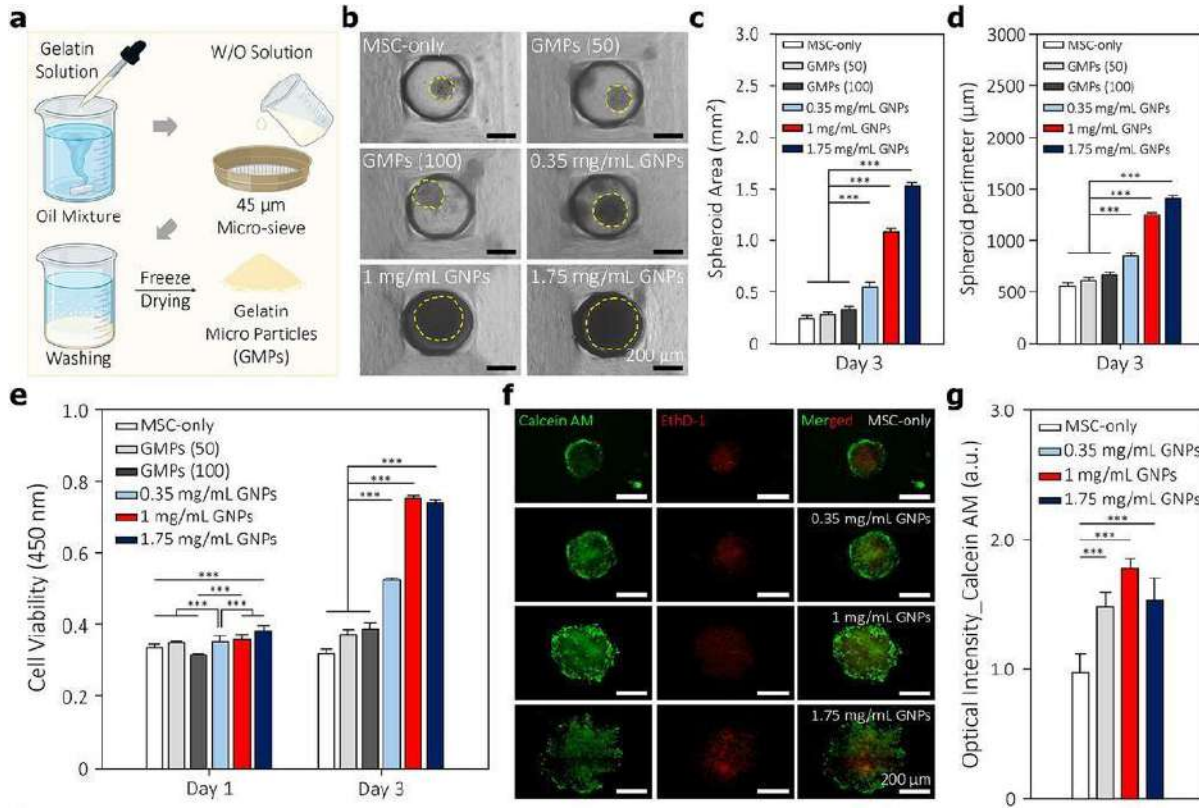
The ultra-tiny GNP-MSC spheroids show enhanced cell viability, proliferation, and differentiation capabilities. In addition, ultra-tiny GNP-MSC spheroids show enhanced cell-cell and cell-ECM interactions. These ultra-tiny GNP-MSC spheroids are used for tissue regeneration in a 3D microhole chip.

3. Conclusion

The ultra-tiny GNP-MSC spheroids show enhanced cell viability, proliferation, and differentiation capabilities. In addition, ultra-tiny GNP-MSC spheroids show enhanced cell-cell and cell-ECM interactions. These ultra-tiny GNP-MSC spheroids are used for tissue regeneration in a 3D microhole chip.

- 젤라틴 기반 나노입자 형성 나노
- 입자의 스페리드 기능 향상 스
- 페로이드의 조직 재생 강화

대표 연구 논문 소개



바이오메디컬관련논문

나노입자줄세포치료제

RESEARCH ARTICLE

Ultra-Tiny Gelatin Nanoparticles-Assisted 3D Stem Cell Spheroids for Engineering Tissue Regeneration

Daewon Kim, Myecheol Kim, Hanbita Sharma, Shinyoung Lee, Chanyoung Park, Sangke Park, Cheon-Young Park, and Jongho Kim*

1 Introduction

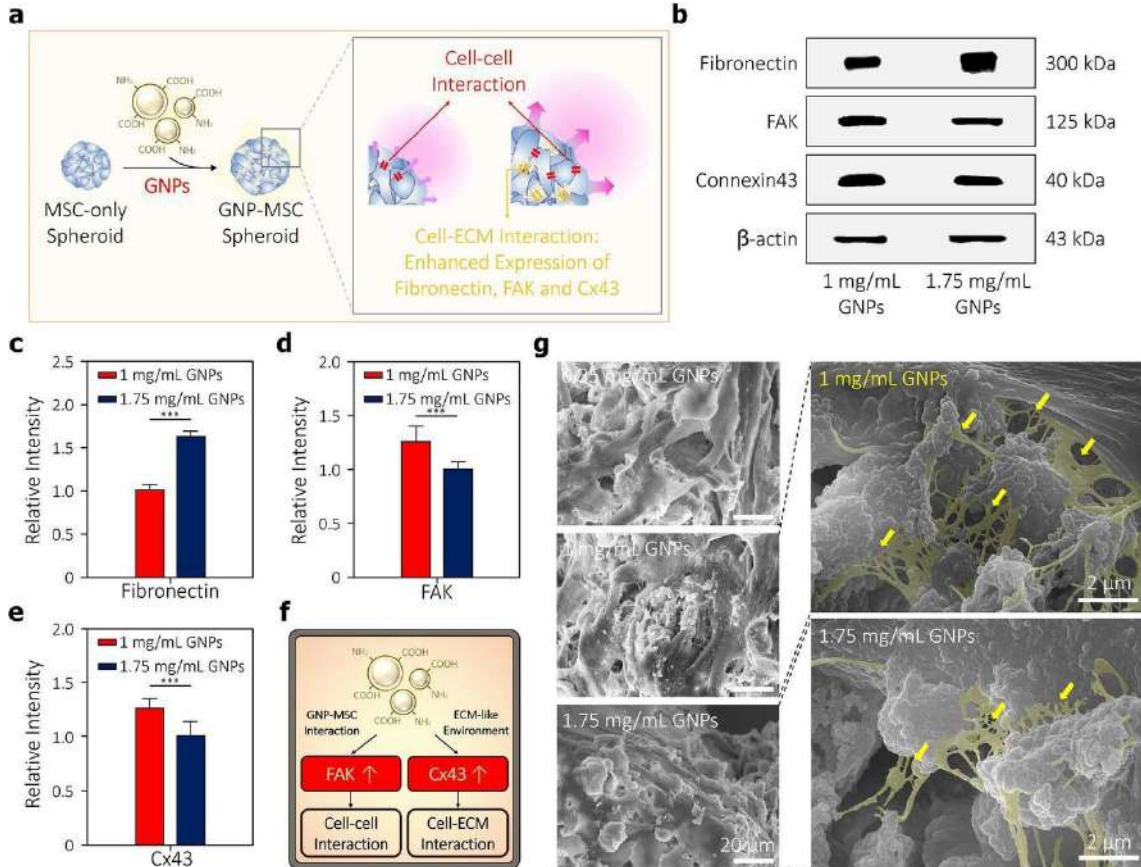
Three-dimensional (3D) spheroid culture systems are widely used in tissue engineering and regenerative medicine. However, conventional 2D culture systems have several limitations, such as limited cell proliferation and the lack of three-dimensional structure. To overcome these limitations, 3D spheroid culture systems have been developed. However, the size of the spheroids is still limited, and the cell viability is still low. In this study, we developed ultra-tiny gelatin nanoparticles (GMPs) to assist in the formation of 3D stem cell spheroids. The GMPs were synthesized by a simple method and showed excellent biocompatibility. The GMPs-assisted 3D stem cell spheroids showed significantly larger size and higher cell viability compared to the control group. These results suggest that the GMPs-assisted 3D stem cell spheroids could be a promising approach for tissue engineering and regenerative medicine.

at spheroid size. Based on the results, we demonstrated that the GMPs-assisted 3D stem cell spheroids showed significantly larger size and higher cell viability compared to the control group. These results suggest that the GMPs-assisted 3D stem cell spheroids could be a promising approach for tissue engineering and regenerative medicine.

Keywords: Gelatin nanoparticles, 3D stem cell spheroids, tissue engineering, regenerative medicine.

- 젤라틴기반나노입자형성 나노
- 입자의스페로이드기능향상 스
- 페로이드의조직재생강화

대표 연구 논문 소개



바이오메디컬관련논문

나노입자줄세포치유제

RESEARCH ARTICLE

Ultra-Tiny Gelatin Nanoparticles-Assisted 3D Stem Cell Spheroids for Engineering Tissue Regeneration

Daewon Kim, Myoung Kim, Hanbit Sharma, Shinyoung Lee, Chanyoung Park, Seokho Park, Chang-Wook Park, and Jongsik Kim*

1. Introduction
Stem cell spheroids offer an efficient approach for tissue repair. Better modeling and therapeutic applications. However, traditional spheroid culture systems require tedious, costly, and time-consuming manual handling, which hinders large-scale spheroid production. Therefore, this study aims to propose an ultra-tiny gelatin nanoparticle (GNP)-assisted spheroid culture system designed to overcome spheroid formation and maintenance. Spheroid formation is highly dependent on GNP size, GNP concentration, and spheroid formation time. Ultra-tiny GNP (100 nm) spheroids showed enhanced cell-cell and cell-ECM interactions, leading to enhanced spheroid formation and maintenance. Ultra-tiny GNP spheroids showed enhanced cell-cell and cell-ECM interactions, leading to enhanced spheroid formation and maintenance. Ultra-tiny GNP spheroids showed enhanced cell-cell and cell-ECM interactions, leading to enhanced spheroid formation and maintenance.

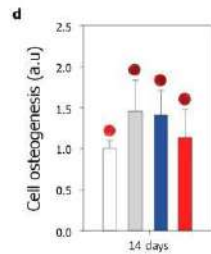
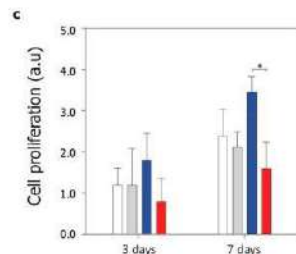
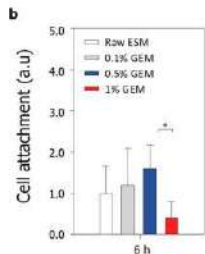
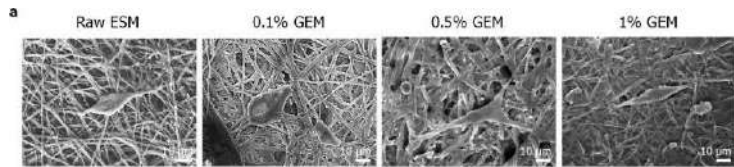
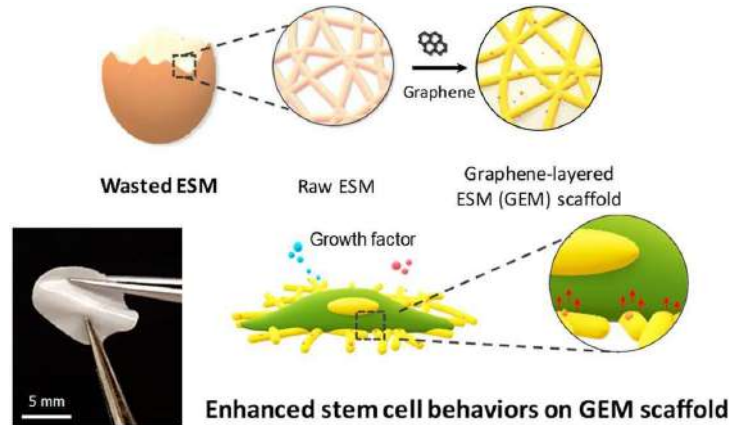
2. Materials and Methods
2.1. Cell Culture and Spheroid Formation
2.2. GNP Synthesis and Characterization
2.3. GNP-Assisted Spheroid Formation
2.4. Spheroid Characterization
2.5. In Vitro Differentiation Assays
2.6. In Vivo Tissue Regeneration Assays

DOI: 10.1002/ami.202300000

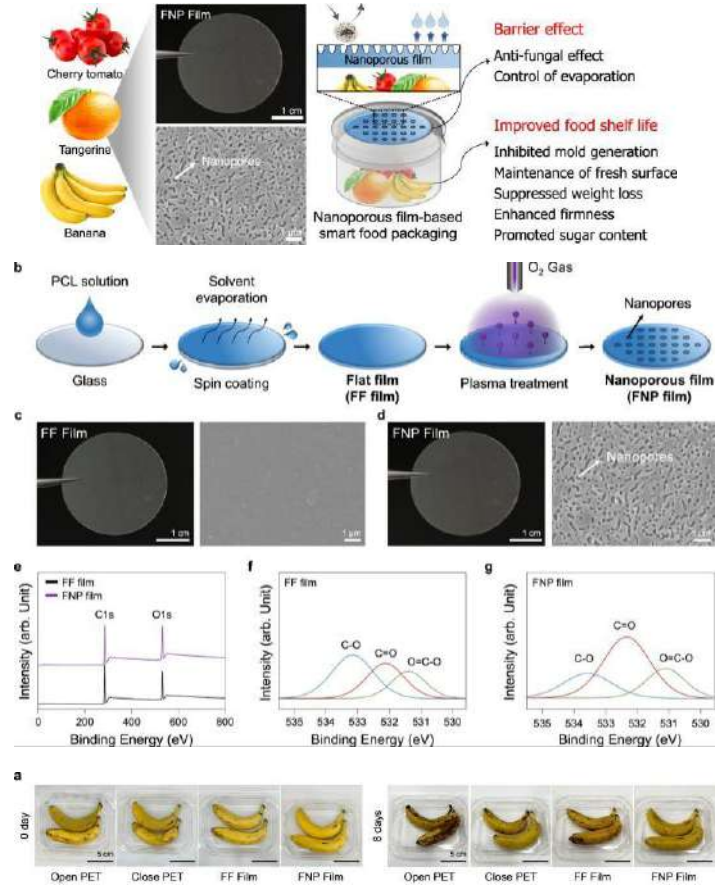
- 젤라틴 기반 나노입자형성 나노
- 입자의스페로이드기능향상 스텍
- 페로이드의조직재생강화

농업분야

3-농생명자원기반나노소재응용

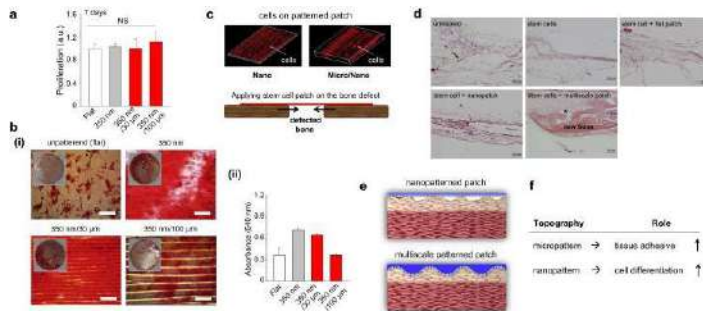
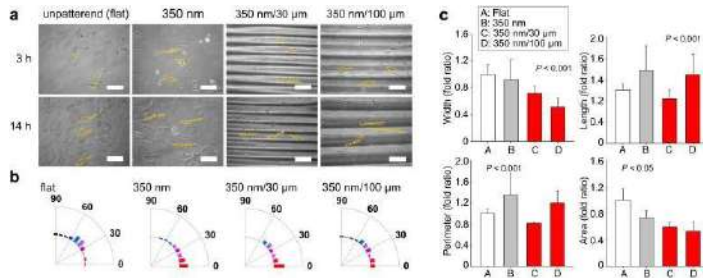
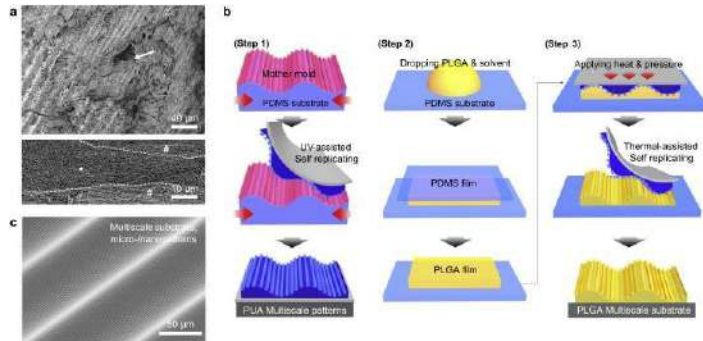


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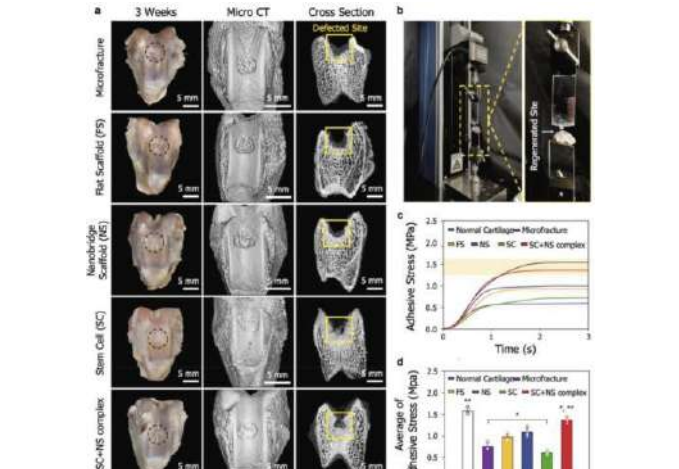
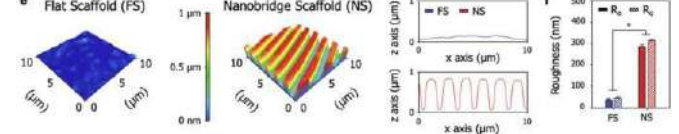
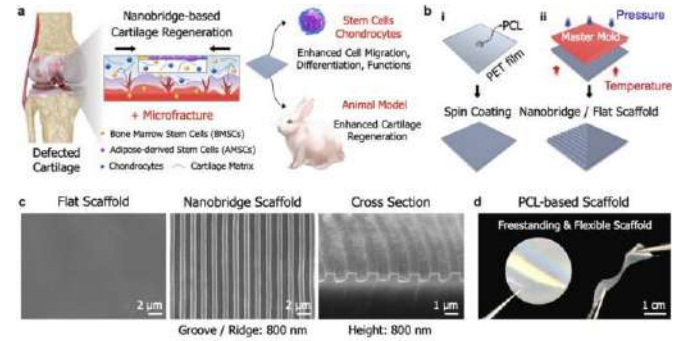


생명공학(바이오메디컬) 분야

1) 뼈조직재생응용

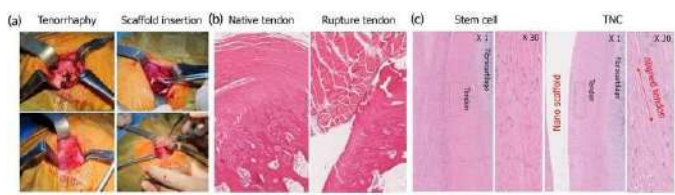
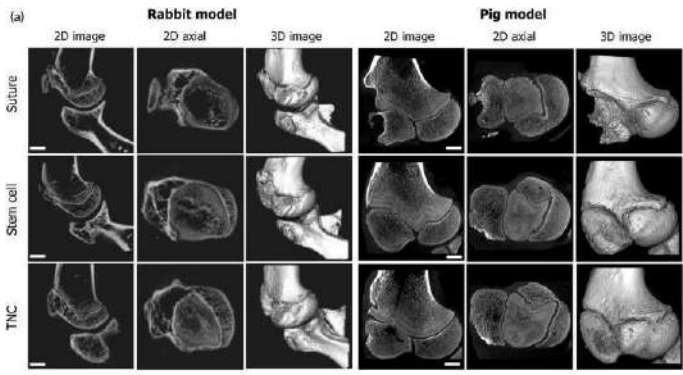
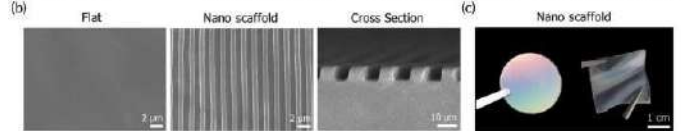
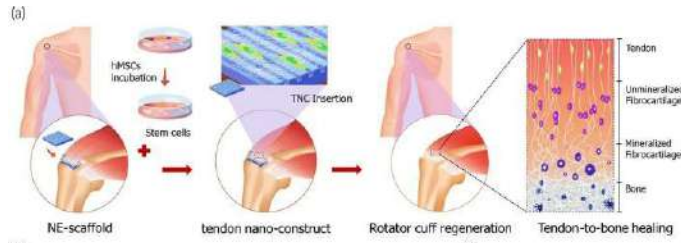


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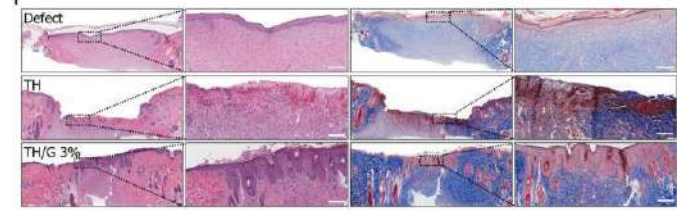
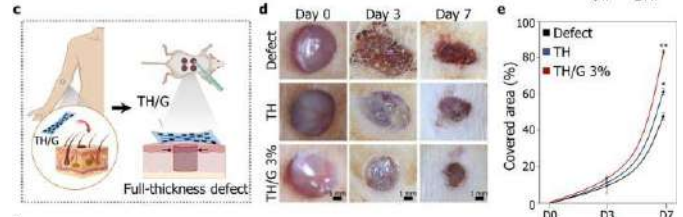
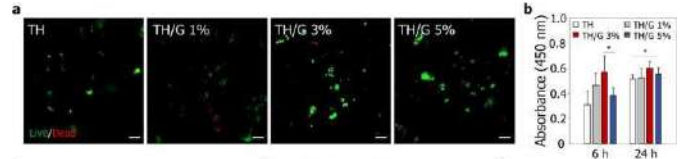
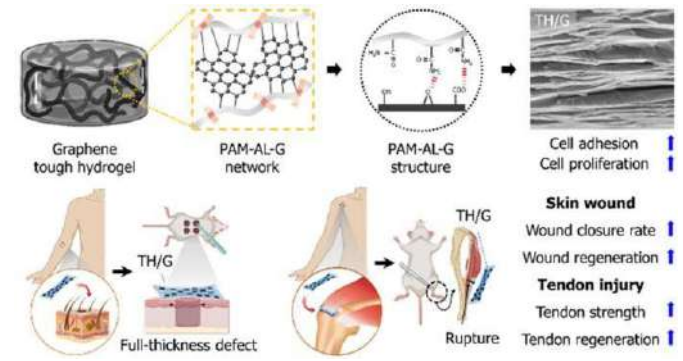


생명공학(바이오메디컬) 분야

3. 힘줄 조직 재생 응용

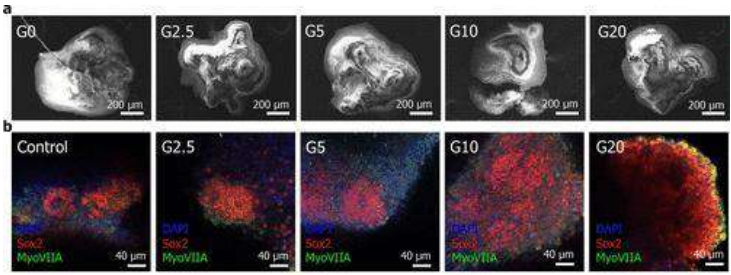
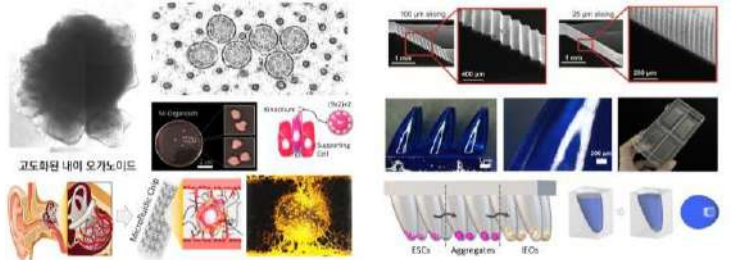
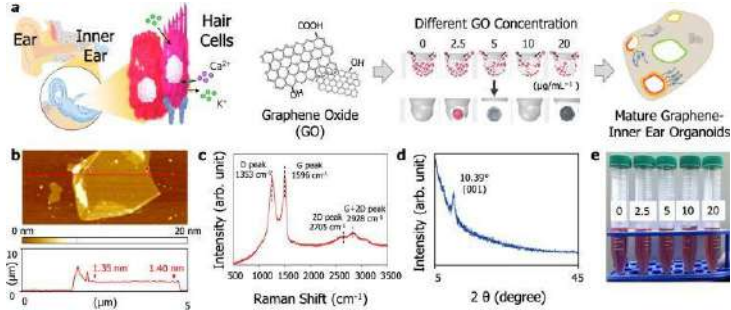


4. 피부 조직 재생 응용

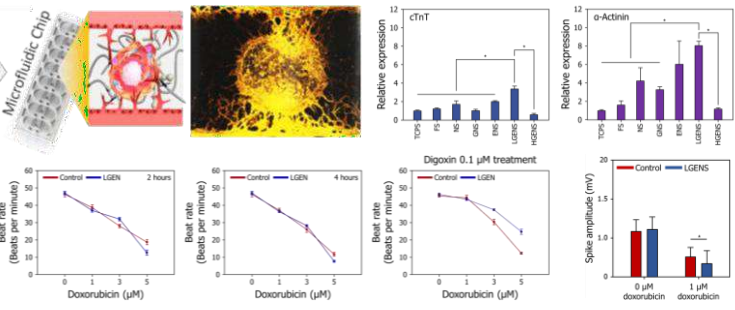
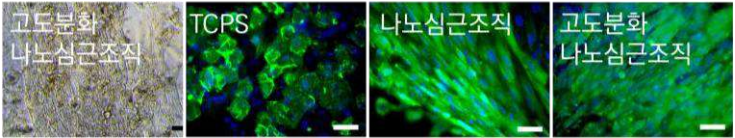
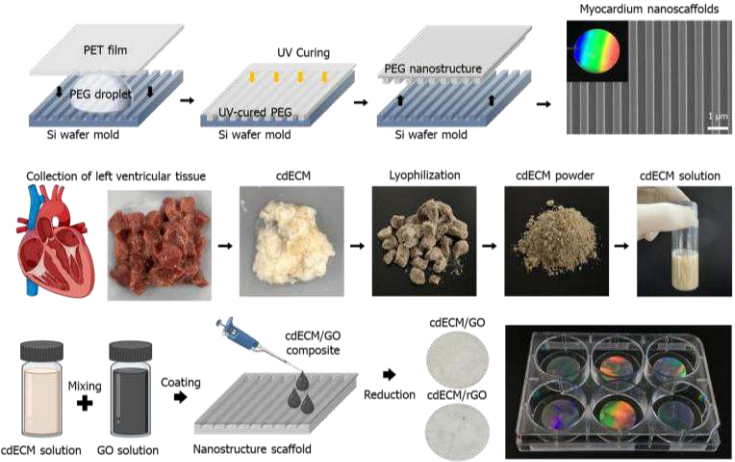


생명공학(바이오메디컬) 분야

5. 오가노이드 제작 및 적용 기술



6. 심장 및 혈관 조직 재생 응용



졸업논문작성가이드

1. 졸업논문 작성을 위한 사전 미팅 진행

2. 연구 주제 선정 및 연구 수행을 위한 기초 지식 및 실험법 숙지

3. 연구 주제 기반 연구 진행 및 실험 결과 도출

4. 실험 결과 기반 결론/기대효과 도출 및 졸업논문 작성



“학생 의견 적극적인 반영+대학원생과의 적극적인 연구 협업으로
학생 주도형 졸업논문 작성”

졸업논문작성가이드

1. 졸업논문 작성을 위한 사전 미팅 진행 및 사전 지식 교육



졸업논문 작성을 위한
지도교수님과의 미팅



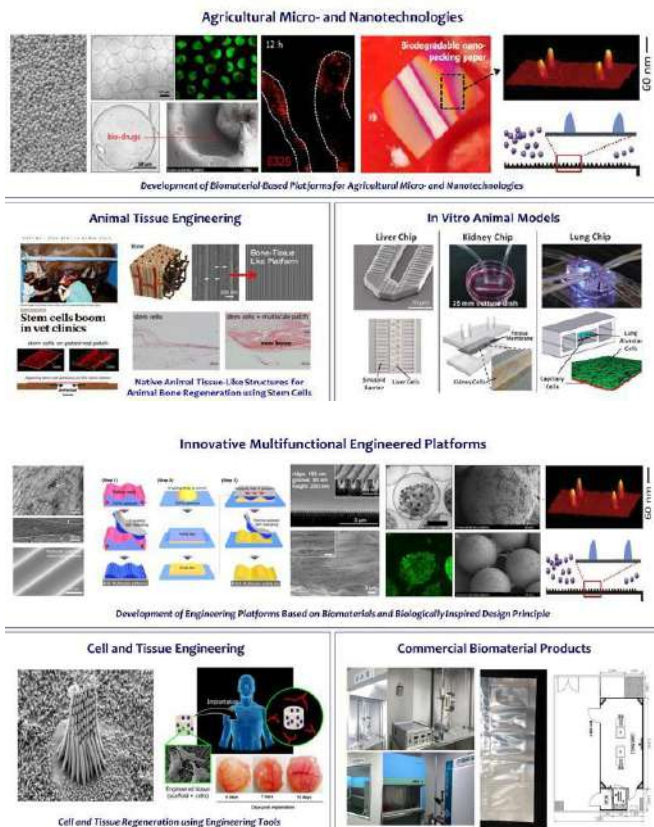
졸업논문 작성을 위한
대학원생과의 미팅



졸업논문 준비를 위한 기술 개인
강의 및 수업 (대학원생-졸업학생)

졸업논문작성가이드

2. 연구 주제 선정 및 연구 수행을 위한 기초 지식 및 실험법 숙지



학생 의견 반영 연구 주제 선정

연구실 환경 파악 및 연구 기초 지식 배양

졸업논문작성가이드

4. 실험 결과 기반 결론/기대효과 도출 및 졸업논문 작성

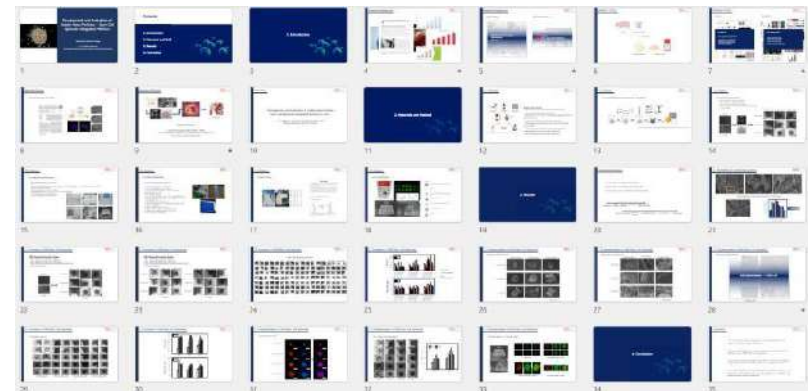


Development and Evaluation of Gelatin Nano Particles – Stem Cell Spheroid Integrated Platform

Biosystem Capstone Design

23-1 Semester, Dream Kim

Nanoengineered Biomaterial Systems Laboratory Chonnam National University



Conclusion



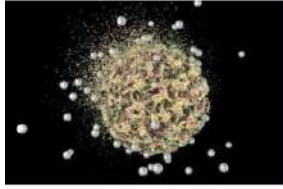
- The developed gelatin nanoparticle is well integrated into the surface and inside of MSC spheroids.
- Through SEM analysis, the optimal condition for the number of spheroid cells is 1000 cells on the platform.
- According to Immunocytochemistry, WST-1 Assay, and Live/Dead Assay, 1000 cells MSC / 0.0003 g GNP is the optimal condition.
- The optimal particle size in the suspension injection is 150 μm \downarrow \Rightarrow If injected at the optimal ratio, it can be applied as an effective non-surgical rotator cuff tear treatment.

실험 결과 기반 결론 및 기대효과 작성

졸업 발표자료 및 논문 작성

졸업논문작성가이드

4. 실험 결과 기반 결론/기대효과 도출 및 졸업논문 작성

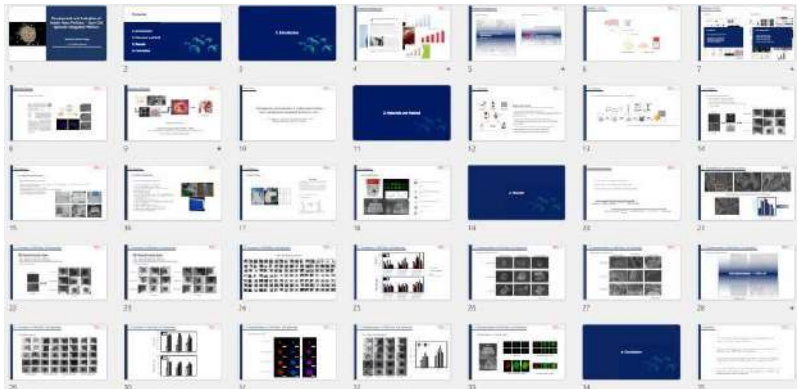


Development and Evaluation of Gelatin Nano Particles – Stem Cell Spheroid Integrated Platform

Biosystem Capstone Design

23-1 Semester, Dream Kim

Nanoengineered Biomaterial Systems Laboratory Chonnam National University



Conclusion



- The developed gelatin nanoparticle is well integrated into the surface and inside of MSC spheroids.
- Through SEM analysis, the optimal condition for the number of spheroid cells is 1000 cells on the platform.
- According to Immunocytochemistry, WST-1 Assay, and Live/Dead Assay, 1000 cells MSC / 0.0003 g GNP is the optimal condition.
- The optimal particle size in the suspension injection is 150 μm \downarrow \Rightarrow If injected at the optimal ratio, it can be applied as an effective non-surgical rotator cuff tear treatment.

실험 결과 기반 결론 및 기대효과 작성

졸업 발표자료 및 논문 작성

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- TERMIS EU – 프라하, 체코



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- TERMIS EU – 할슈타트, 오스트리아



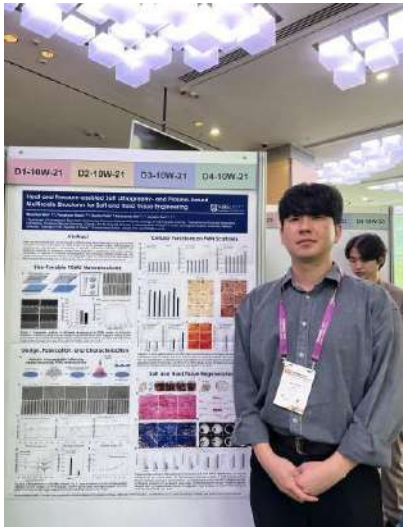
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국제 학회

- 2024 IEEE-NANOMED - 하와이



국내외 학회

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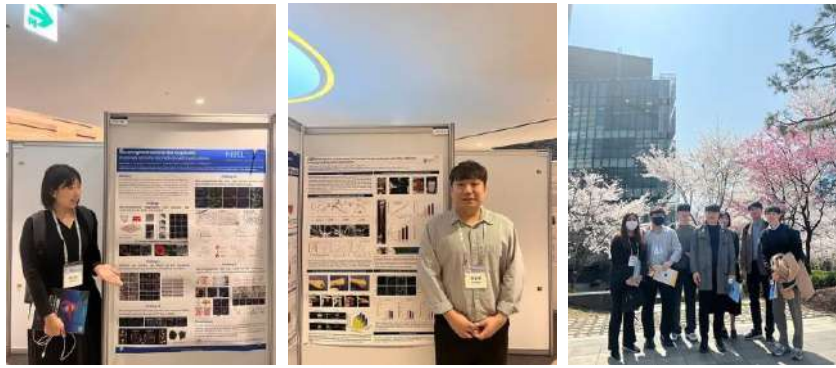


• 농업생명과학대학 심포지엄

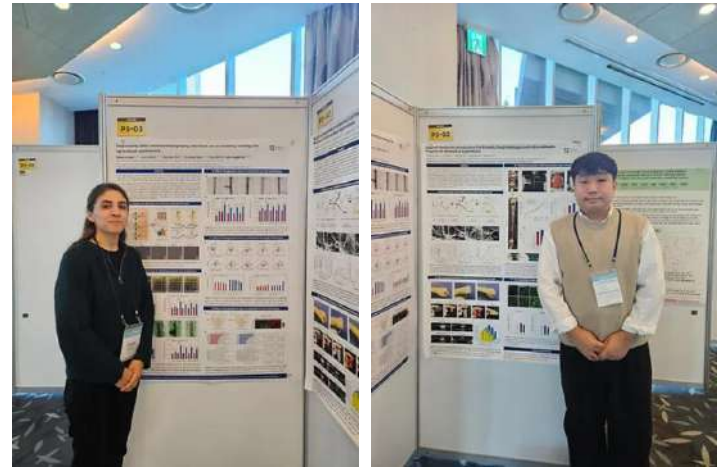


국제 학회

• 한국생체재료학회



• 한국농업 기계학회 추계학술대회



• 한국농업 기계학회



국내외 학회 수상

• 학회수상



기타활동

- Baseball game (KIA vs SSG, 한화)



- Soccer game (Republic of Korea vs Iran)



기타활동



졸업생 현황



Sunho Park (Ph.D.)

BS/MS/Ph.D/Post-Doc. (2012 - 2024)

Major in Biosystems Engineering

Current Job: Professor (Pusan National University)

Publications: 1st Paper – 18 / Co-paper – 21

Honors and Awards: IEEE-NANOMED Young Research Awards Along with 20 Awards



Sangbae Park (Ph.D.)

Post-Doc. (2023 - 2024)

Major in Biosystems Engineering

Current Job: Professor (Seoul National University)

Publications: 1st Paper – 11 / Co-paper – 20

Honors and Awards: IEEE-NANOMED Young Research Awards Along with 20 Awards



Woochan Kim (Ph.D.)

BS/MS/Ph.D (2011 - 2024)

Major in Biosystems Engineering

Current Job: Post-Doc (Chonnam National University)

Publications: 1st Paper – 8 / Co-paper – 15

Honors and Awards: Outstanding Poster Award Along with 10 Awards



Daun Kim

M.S. Graduate (2017 - 2019)

Major in Biosystems Engineering

Current Job: Researcher, Jeonnam Bioindustry Park

Publications: 1st Paper – 3 / Co-paper – 7

Honors and Awards: KTR



Myunghwan Jeong

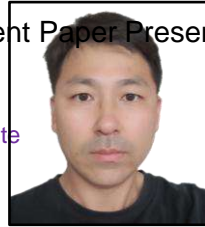
Ph.D. student (2021 ~)

Major in Biosystems Engineering

Current Job: Korea Testing & Research Institute

Position: Cheif Researcher

Department: Quality Assurance team



Myunghwan Jeong

Ph.D. student (2021 ~)

Major in Biosystems Engineering

Current Job: Korea Testing & Research Institute

Position: Cheif Researcher

Department: Animal Alternatives & Skin Clinical Center



전남대학교융합바이오시스템계공학과
생물재료공학연구실

Thank You

지도교수.김징호