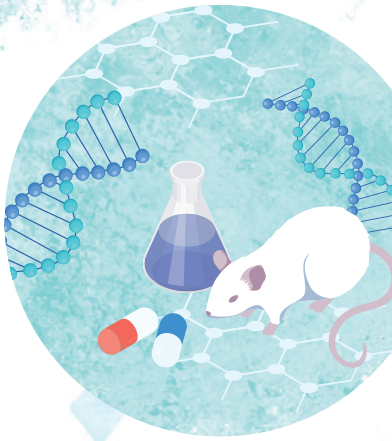
KALAS



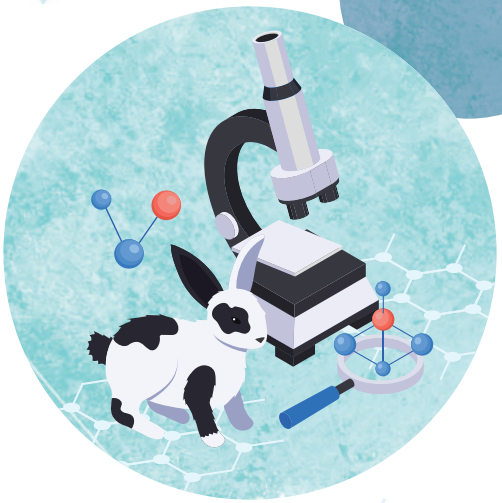
www.kalas.or.kr

2025 한국실험동물학회

동계심포지엄

2025. 2. 5.(수) - 2. 8.(토)

강원도 평창 알펜시아 컨벤션센터



주 최 | 한국실험동물학회 식품의약품안전처

후 원 | KOFST Korean Federation of Science & Technology Societies GWTO 강원관광재단 Gangwon Tourism Organization

실험동물 산업의 토탈솔루션 기업
쓰리샤인에서 해결해드립니다!

급변하는 국제정세에 저상장 고비용시대에 직면해있는
대한민국 실험동물 산업 미래를 친환경 실험동물실로 해결해 드립니다

1. 실험동물실 건축면적, 비용
   → 약 30%절감
2. 공조실 면적 약 50% 절감
   → 공조기 용량 약 70%절감
3. 열에너지(전기료)유지관리비
   → 약 70%절약
4. 취기(냄새)없는 쾌적한
   실험동물실 실현
5. 케이지 유지관리비
   → 약 90%절감

※실증: 20년이상 사용되는 케이지세트

00대학교 거점센터

차세대 실험동물실

저비용 고효율과 유지관리비 절감으로 미래경쟁력을 갖추세요!

(주)쓰리샤인은 기획, 설계, 예산, 컨설팅을 무료제공하며 상세설계, 시공, 사육장비, 관리장비, 실험장비, 수술장비, 소독장비 등 50여종 200여 품목을 직접생산 유지관리 하는 전무후무한 토탈써비스 기업입니다. 많은 이용바랍니다

(주) 쓰리샤인
THREESHINE INC.
대전광역시 유성구 테크노1로 37-3 쓰리샤인
T : 042-933-3361 F : 042-933-3398
E-mail : sk@threeshine.com Home page : www.threeshine.com

KMEDI hub
대구경북첨단의료산업진흥재단

www.kmedihub.re.kr

대구경북첨단의료산업진흥재단은

국가 주도로 의료연구개발을 추진할 목적으로 설립된 공공기관으로
'아이디어 - 개발 - 임상 - 사업화' 까지 모든 단계를 지원하고 있습니다.

*『첨단의료복합단지 육성에 관한 특별법』 제11조에 의거

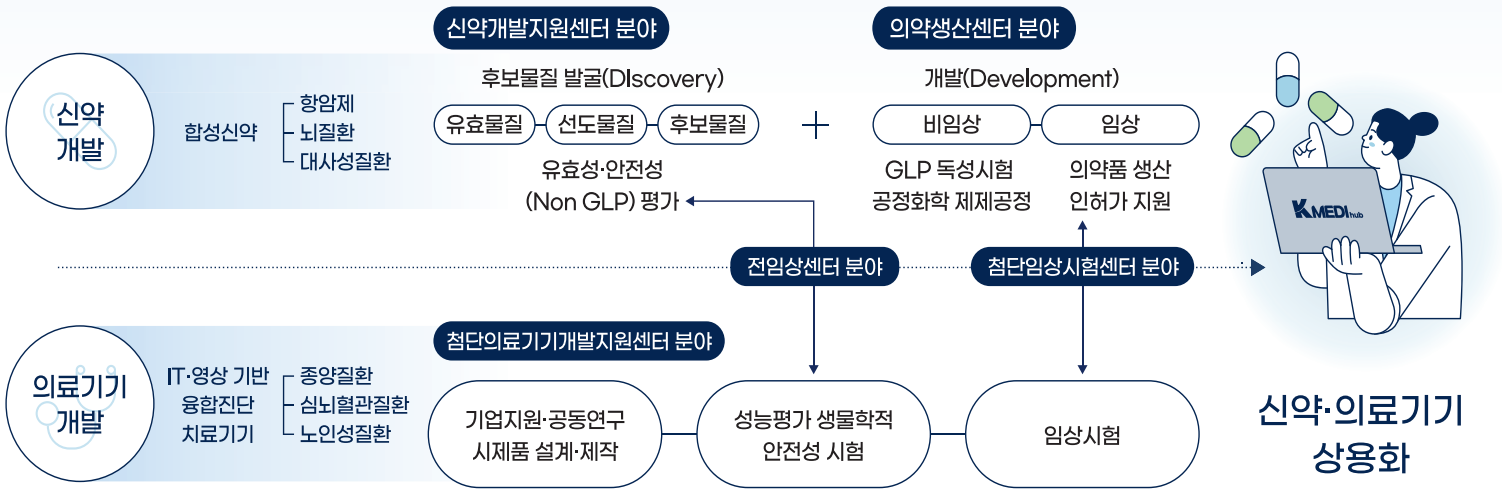
문의처
053-790-5798
yun0509@kmedihub.re.kr

연구장비
4,183대
('24년 9월 기준)

인력
423 명
('24년 9월 기준)

핵심 연구시설
4 개 센터
- 신약개발지원센터
- 첨단의료기기개발지원센터
- 전임상센터 · 의약생산센터

K-MEDI hub 주요 기능



전임상센터
Preclinical Research Center

신약 및 의료기기 개발을 위한 수요자 맞춤형 기술 지원 시스템 제공

신약 개발 지원
- 후보물질 유효성평가
- *in vivo* PK 평가
- 예비 독성평가(non-GLP)

의료기기 개발 지원
- 시제품 성능 평가
- 예비 생물학적 안전성 평가
- 인허가 시험평가 모니터링
- 인허가 평가 항목 컨설팅

생체영상 분석
- 의료제품 유효성 및 안전성 평가
- 생체영상 빅데이터 구축
- 바이오이미징 전문가 양성 교육

자원 및 환경관리
- 헬스모니터링
- 사육 및 유지관리
- 생체자원 거점기관

질환 모델 제작
- 형질전환 모델 제작
- 표현형 분석
- 화학적·수술적 모델 제작

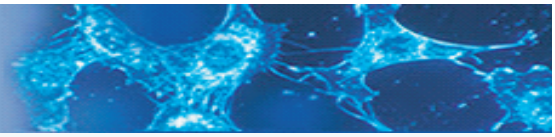
맞춤형 교육·실습 지원
- 임상의(의사, 수의사 등) 교육 프로그램
- 준의료활동종사자, 학생 교육 프로그램
- IACUC 워크숍 등

미래의료기술연구동
2025년 개소!

| 건립목적
- 미래형 중동물 자원(미니피그 등) 활용 차세대 의료기기 및 의료제품 개발 지원 특화 동물실험시설

| 주요특화시설
- 하이브리드 수술실(Angio-CT, OCT 등 활용)
- 첨단 스마트 수술실
- 치과용 의료기기 평가실 등

XpressBio



Animal Health Monitoring 시약 전문메이커 XpressBio

XpressBio의 한국내 공식대리점은 엠알텍입니다.

◈ Xpressbio 제품이 선택받는 이유

- Assay kit들이 모두 동일하고 간편한 protocol로 구성돼 있어 사용상의 편리성이 있습니다.
- 동일분야의 타 제품들과 견줄만한 품질과 경제적인 가격으로 공급됩니다.
- Multiplex virus screening set는 하나의 ELISA well당 최대 6종의 virus type을 맞춤제작할 수 있습니다.
- 국내 유수의 수많은 개별 및 기관 연구소에서 사용 중입니다.

◈ Simian products series

최소 25종 이상의 영장류 virus ELISA, ELISA plate 와 controls 그리고 Simian virus antigens도 별도이용 가능

Simian SARS-CoV-2 COVID-19 Kits

- Spike Protein
- Receptor-Binding Domain and Membrane Protein
- Nucleoprotein

◈ PCR Positive Controls

믿고 사용하는 40여종의 Mouse, Rat, Simian virus PCR Positive Controls을 공급합니다.

◈ HIV products series

HIV-1 p24 ELISA, Extended Range HIV-1 p24 ELISA, SIV p27 ELISA, Integrase Assay, HIV-1 Reverse Transcriptase Assay

Animal Health Monitoring Products

- Simian Halth Monitoring Products
- Rodent and Rabbit Health Monitoring Products
- Canine and Feline Health Monitoring Products
- Other Kit Contents
- Antigen

Customized Multiplex ELISA development Sets

- Mouse
- Rat
- Simian

Microbiology and Vaccine Research

- HIV/SIV Products
- Human Infectious Disease products
- Vaccine Research Products

Molecular Biology

- PCR Positive controls
- cDNA Libraries (Human, Animal, Plant)
- cDNA Synthesis Kits

*기타 문의는 이메일 또는 전화를 주시면 자세한 상담이 가능하오니, 많은 관심 바랍니다.

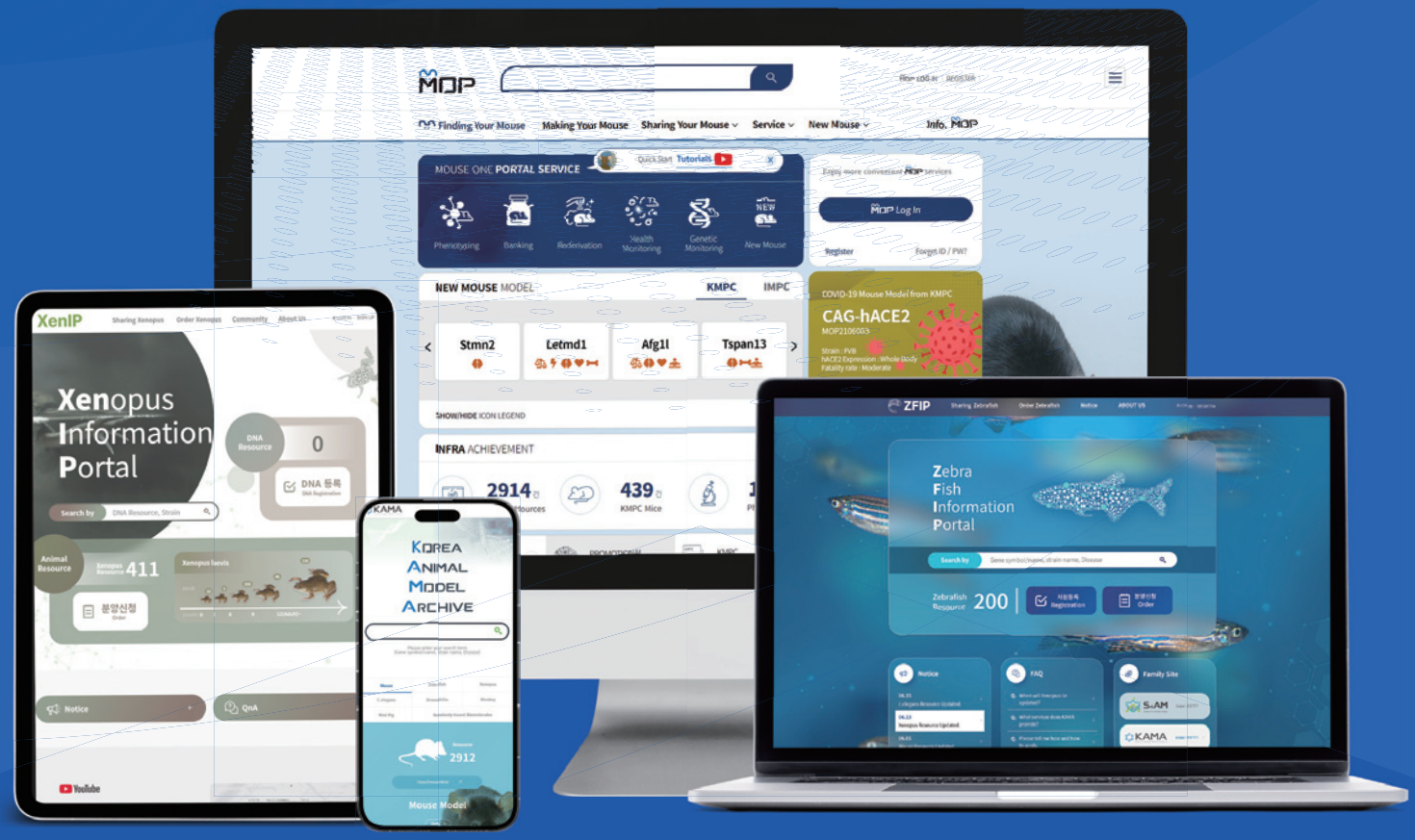
MRTeck
Medical Research Technology Korea
한국 공식 단독대리점 엠알텍

경기 구리시 갈매중앙로 190, 구리갈매휴밸나인 C-8087/D8086
TEL: 031-552-8339 FAX: 031-552-7317 help@mrteck.co.kr
www.mrteck.co.kr (https://xpressbio.com/distributors)

과학기술정보 지식서비스 포털 구축 전문 업체

위너소프트

- 지식 정보 검색 서비스 개발
- 과학 기술 연구 사업 홍보 사이트 개발
- 국내, 해외 연구정보 연계 서비스 개발



제노푸스 모델동물 자원정보 포털 개발

MOP 마우스 종합서비스 포털 개발

KAMA 모델동물 자원정보 포털 개발

제브라피쉬 모델동물 자원정보 포털 개발

WinnerSoft

문의 | 02-784-8501

www.khav.co.kr

맞춤형 CRO
경쟁력의 중심 KHAV

인체 의약품과 동물용 의약품에
대한 1:1 맞춤 시험 서비스

20 years	Customizing	Professional	Facilities	Challenge 시험
다수의 시험 Know how 다양한 Virus Strain 보유	고객 맞춤형 디자인 설계 및 시험 가능	전문가 Network 구성 (의대 및 수의대 교수)	BL2/ABL2 및 BL3 / ABL3 시설 보유 (건국대 內)	고 위험성 전염성 병원체 Challenge 시험 경험 보유 (인수공통전염병, SARS Cov2)

인체 의약품

- BL3 / ABL3를 이용한 Challenge 시험
- 항균, 항바이러스 및 백신제제 등 효능 평가
- 소독제, 의료기기 등 성능 평가

동물 의약품

- 국가 출하 승인 검정 시험
- BL2 / ABL2 및 BL3 / ABL3 동물 시험
- 항균, 항바이러스 및 백신제제 등 효능 평가

1:1 맞춤 시험 서비스

- 다수의 병원체, 동물 종, 평가항목을 통한 고객 Customizaing 시험 가능

Konkuk Human & Animal Vaccine Company
Non Clinical Contract Research Organiz

KHAV
ONE HEALTH

LUCKY SCIENTECH

ABSL2, ABSL3

동물실험에 최적화된 제품과 기반 기술부터
생물안전 실험실(ABSL2, ABSL3)을 위한 최고의 선택

실험동물장비 및 기자재 산업의 선두주자 **럭키싸이언텍**은
최고의 기술력과 솔루션으로 성공적인 실험동물연구의
최고의 파트너가 되겠습니다.

Rack&Cage Washer	I.V.C Rack Systerm	동물실 전용 Cage 세척제 소독제	일회용 Caging system ABSL2 ABSL3	동물실 전용 일회용 Gloves Goggles
Griton Manufactaring USA	Thoren Caging System USA	(Cage2 Wash5) Veltek Associates USA	Innovive LLC USA	Isofield

The begining of bioscience LUCKY SCIENTECH

(주) 럭키싸이언텍 TEL (032) 623-0899
E-mail luckyst1@lstbest.co.kr

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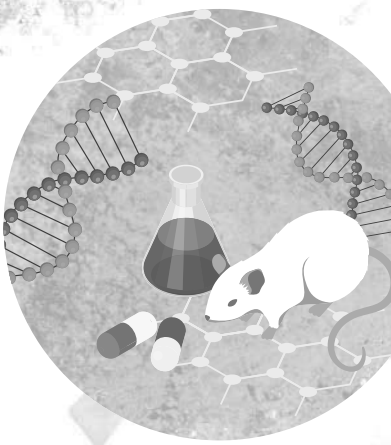

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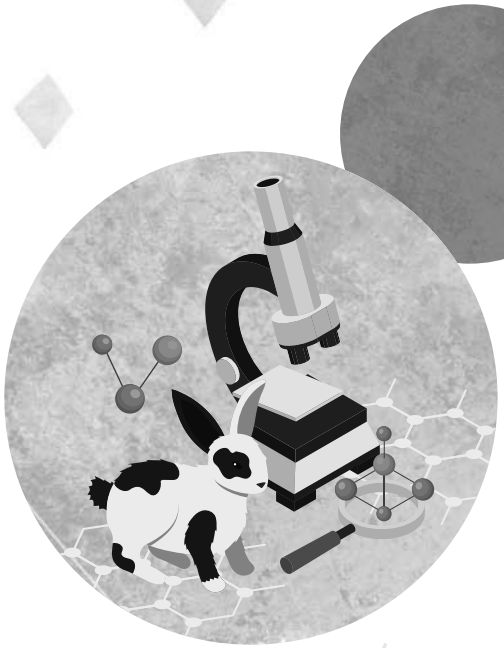
2025 한국실험동물학회
동계심포지엄



2025. 2. 5.(수) - 2. 8.(토)

강원도 평창 알펜시아 컨벤션센터

주 최 | 한국실험동물학회 식품의약품안전처

후 원 | KOFST Korean Federation of Science & Technology Societies GWTO 강원관광재단 Gangwon Tourism Organization

INVITATION

한국실험동물학회 회원 여러분께,

안녕하십니까?

우리 학회는 1985년 5월 설립되어 40년간 의생명과학 연구 분야의 중추적인 학회로 발전해 왔습니다. 학회 설립 40주년을 맞이하는 2025년에 동계학술대회를 개최할 수 있도록 아낌없는 지원과 헌신적인 노력을 해 주신 모든 회원분들께 감사드립니다. 또한 여러분의 지속적인 노력과 도움에 대해 학회를 대표하여 깊은 감사의 말씀을 드립니다.

한국실험동물학회는 매년 2번의 학술대회를 개최하는 전통을 이어오고 있습니다. 동계학술대회를 통해 실험동물을 기반으로 연구하는 연구자들 간의 인적 네트워크를 구축하고 활성화하는 장을 제공하고 있습니다. 이번 동계학술대회는 평창 알펜시아 컨벤션센터에서 2025년 2월 5일(수) ~ 2월 8일(토)에 개최합니다. 동계학술대회가 성공적으로 개최될 수 있도록 다양한 학술프로그램을 포함하여 현장 부스, 영상 광고, 런천 세미나 등을 준비하고 있습니다. R&D 예산 감축 등으로 어려운 상황이지만 한국실험동물학회의 모든 회원들과 산학협력기업 회원들의 많은 도움과 참여를 부탁드립니다.

미래 먹거리 산업의 하나로써 바이오 분야는 빠르게 변화되고 발전하고 있으며, 바이오 분야의 발전과 더불어 실험동물 분야의 책임도 더욱 중요해지고 있습니다. 시대적 흐름에 따른 사회적 소임을 다하기 위해 이번 동계학술대회에서는 특별강연을 비롯하여 다중오믹스 분야, 마이크로바이옴 분야, 건강에 미치는 미세플라스틱, 인공지능 기반의 3D 분석 기술, 인공지능을 이용한 신약 개발, 생체 내 영상, 말초기관과의 신경 상호 작용, 실험동물 모델에서 조직병리 이해 등을 주제로 한 심포지엄 및 실험동물기술원 교육 강연, IACUC 심포지엄 등 최신 연구의 추세를 반영하여 다양한 주제의 강의를 준비하였습니다.

마지막으로 동계학술대회를 준비하기 위해 노력하시는 학회 임원님들의 노고에 진심으로 감사드립니다. 회원 여러분이 주도적으로 활동하고 소통하는 건강하고 행복한 학회가 될 수 있도록 노력하겠습니다. 이번 학회를 통해 학문적 교류와 활발한 친목의 장이 만들어지기를 바랍니다.

감사합니다.

(사)한국실험동물학회 이사장 **최 양 규**

21대 한국실험동물학회 임원 명단

직책		성명	소속
이사회	이사장	최양규	건국대학교
	이사	남기택	연세대학교
	이사	이정규	중앙실험동물(주)
	이사	서준교	한림대학교
	이사	정자영	KBIO HEALTH
	이사	신재호	을지대학교
	이사	진희경	경북대학교
	이사	장재진	(주)오리엔트바이오
	이사	이태훈	전남대학교
고문	고문/전임회장	이영순	서울대학교
	고문/전임회장	한상섭	전북대학교
	고문/전임회장	장자준	서울대학교
	고문/전임회장	조정식	한국실험동물협회
	고문/전임회장	강종구	충북대학교, (주)바이오톡스텍
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	고문/전임회장	박재학	서울대학교
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	고문/전임회장	김철규	제주대학교
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	자문위원	박정규	서울대학교
	자문위원	송시환	(주)코아스템캠온
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	위원(ME간사)	조종기	서울대학교
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	위원(ME간사)	현영민	연세대학교
	위원(ME간사)	홍정주	한국생명공학연구원
	위원(ME간사)	황인구	서울대학교
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	위원	윤경아	건국대학교
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	위원	김주연	한양대학교
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	위원(하계간사)	정수명	성균관대학교
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	위원(하계)	이현지	고려대학교
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	위원	김재길	한신메디칼(주)
	위원	박천귀	(주)쓰리샤인
	위원	유병천	(주)아이티스텐다드
	위원	이 오	(주)오리엔트바이오
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	위원(인증간사)	양세란	강원대학교
	위원(인증간사)	이진수	충남대학교
	위원(전산간사)	전희연	가톨릭대학교
	위원(전산간사)	이정민	삼성병원
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	강원지회장	김태민	서울대학교
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고혁완	연세대학교
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서준교	한림대학교
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송창우	안전성평가연구소
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양세란	강원대학교
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최연식	한국폴리텍바이오대학
최영석	건국대학교
최우성	(주)메디키나바이오
최재훈	한양대학교
한범석	호서대학교
허승호	서울아산병원
허용	대구가톨릭대학교
현병화	한국과학기술원
황대연	부산대학교
황성순	연세대학교
황정호	안전성평가연구소
황종익	고려대학교

발전기금 납입 회원

2025. 01. 01. 기준

성명	소속	금액 (단위 : 원)
Alan Lee Chedester	NIH	300,000
Toru Takeo	Kumamoto University	USD 1,000
강병철	서울대학교	2,311,200
강종구	충북대학교, (주)바이오톡스텍	1,000,000
강진석	남서울대학교	200,000
권구범	NTCV Vaccine Co.	300,000
권중기	전북대학교	200,000
김길수	경북대학교	200,000
김대용	서울대학교	350,000
김대중	충북대학교	517,000
김덕원	삼양약화학	50,000
김배환	계명대학교	802,280
김윤배	충북대학교	267,680
김종성	아주대학교의료원	267,680
김종춘	전남대학교	300,000
김형식	부산대학교	300,000
남정석	광주과학기술원	869,950
박재학	서울대학교	5,955,525
박충권	녹십자 EM	300,000
서경덕	천안연암대학	100,000
서준교	한림대학교	1,769,950
석승혁	서울대학교	2,100,000
성제경	서울대학교	300,000
성하정	마이더스인터내셔널코리아	200,000
손우찬	울산대학교	100,000
송시환	(주)코아스템켐온	100,000
송창우	안전성평가연구소	3,650,000
신영수	신구대학교	467,680
신재호	을지대학교	200,000
안병우	충북대학교	200,000
염수청	서울대학교	200,000
오승현	서울대학교	200,000
오양석	한림대학교	1,791,299
원무호	강원대학교	3,000,000
위명복	강원대학교	391,200

성명	소속	금액 (단위 : 원)
유영춘	건양대학교	200,000
이민재	강원대학교	500,000
이범준	충북대학교	200,000
이병한	오송첨단의료산업진흥재단	367,680
이상구	(주)바이오톡스텍	200,000
이상필	(주)한주씨엠아이	4,000,000
이수해	식품의약품안전처	100,000
이영순	서울대학교	10,000,000
이정규	(주)중앙실험동물	1,000,000
이철호	한국생명공학연구원	200,000
이한웅	연세대학교, (주)젠크로	5,000,000
인증위원회	인증위원회	3,000,000
인증위원회	동물실험길잡이 인세	36,587,000
장동덕	국군의학연구소	200,000
장자준	서울대학교	882,400
정기원	(주)엠제이엘티디	1,000,000
정재황	충북도립대학	100,000
정지윤	공주대학교	200,000
제정환	서울대학교	837,630
조기행	서울대학교	300,000
조윤주	서정대학교	200,000
차신우	안전성평가연구소	200,000
천병년	(주)우정바이오	2,000,000
최경철	충북대학교	1,000,000
최양규	건국대학교	2,769,950
최연식	한국폴리텍바이오대학	200,000
최우성	(주)메디키나바이오	200,000
한남옥	(주)코아텍	30,000,000
한범석	호서대학교	200,000
허용	대구가톨릭대학교	200,000
현병화	한국과학기술원	30,300,000
황대연	부산대학교	200,000
황인구	서울대학교	1,900,000
(재)한국건설생활환경시험연구원		2,000,000

학술상·편집위·실험동물연구장학생 후원금 납입 내역

2025. 01. 01. 기준

소속	금액 (단위 : 원)	년도
(주)쓰리샤인	25,000,000	2005~2009
(주)코아텍	10,000,000	2016
중앙실험동물(주)	235,000,000	2007~2024

2025 한국실험동물학회 평생회비 납입회원

2025. 01. 01. 기준

성명	소속
강경수	신구대학교
강병철	서울대학교
강종구	충북대학교, (주)바이오톡스텍
강진주	경북대학교
고은아	제주대학교
곽동미	경북대학교
구재형	대구경북과학기술원
권구범	NTCV Vaccine Co.
권동락	대구가톨릭대학교의료원
권명상	강원대학교
권은아	서울대학교병원
권재성	연세대학교
권태준	대구경북첨단의료산업진흥재단
김건아	을지대학교
김경원	서울아산병원
김근형	충북대학교
김길수	경북대학교
김대원	강릉원주대학교
김대중	충북대학교
김명옥	경북대학교
김무강	(재)충남동물자원센터
김배환	계명대학교
김보라	국립암센터
김상아	서울대학교
김상운	한국생명공학연구원
김상현	대구경북첨단의료산업진흥재단
김선호	(주)폴라스
김성곤	대구경북첨단의료산업진흥재단
김옥진	원광대학교
김용안	충남대학교
김우석	건국대학교
김유용	서울대학교
김정훈	서울대학교
김종남	서울대학교
김종민	청주대학교
김종춘	전남대학교
김주완	대구한의대학교
김중현	오송첨단의료산업진흥재단
김진만	(주)코아텍
김철규	제주대학교
김충수	대구경북첨단의료산업진흥재단
김충용	(주)제니아
김태완	경북대학교
김태환	경북대학교
김형식	부산대학교
김혜진	한국한의학연구원
김희정	키프라임리서치
김희진	농림축산검역본부
나운성	전남대학교
나이랑	서울대학교병원
남기택	연세대학교
남병수	한국한의학연구원
남상윤	충북대학교
남정석	광주과학기술원
노재일	연세대학교
류동렬	광주과학기술원
류정주	대구경북첨단의료산업진흥재단

성명	소속
문지영	대전보건대학교
박대훈	동신대학교
박민경	한국화학연구원
박부환	인하대학교
박상인	대구한의대학교
박승춘	경북대학교
박인선	인하대학교
박재학	서울대학교
박종환	전남대학교
박준석	대구경북첨단의료산업진흥재단
박진성	Cenyx Biotech
박천귀	(주)쓰리샤인
배재성	경북대학교
배춘식	전남대학교
백인정	서울아산병원
복진웅	연세대학교
서병부	대구대학교
서준교	한림대학교
서진희	한국원자력의학원
석승혁	서울대학교
성영훈	울산대학교
성제경	서울대학교
성하정	마이더스인터내셔널코리아
손성향	아주대학교
손화영	충남대학교
송문용	한국건설생활환경시험연구원
송승우	Harlan Korea Ltd
송창우	안전성평가연구소
신재호	을지대학교
신태훈	제주대학교
신형철	한림대학교
안재범	오산대학교
안지완	서울대학교
오경진	한국생명공학연구원
오구택	이화여자대학교
오미경	한양대구리병원
오승현	서울대학교
오연수	강원대학교
오은석	양산부산대학교병원
우계형	세명대학교
원무호	강원대학교
위갑인	대구경북첨단의료산업진흥재단
유대영	서울대학교
윤기영	신구대학
윤준원	서울대학교
이경선	오송첨단의료산업진흥재단
이공현	단디큐어
이광훈	대구경북첨단의료산업진흥재단
이국현	서울대학교
이근식	강원대학교
이동준	부산대학교
이만휘	경북대학교
이민재	강원대학교
이범준	충북대학교
이병한	오송첨단의료산업진흥재단
이상래	아주대학교
이상필	(주)한주씨엠아이

성명	소속
이순신	순천향대학교
이윤재	한양대학교 구리병원
이재형	바이오지노케어
이재훈	연세대학교
이정규	중앙실험동물(주)
이정범	순천향대학교
이종권	식품의약품안전처
이준구	한경국립대학교
이준호	바이오피아
이철호	한국생명공학연구원
이충현	단국대학교
이학모	서울대학교병원
이한웅	연세대학교, (주)젠크로
이현웅	(주)대종기기산업
이현주	(주)샘타코 바이오코리아
임재향	이화여자대학교 의과대학
장용기	(주)백신글로벌산업화기반구축사업단
장윤성	전북대학교병원
장자준	서울대학교
장재진	(주)오리엔트바이오
전현정	한국식품연구원
정기원	(주)엠제이엘티디
정민재	한림대학교
정원일	한국과학기술원
정의숙	대구경북첨단의료산업진흥재단
정자영	오송첨단의료산업진흥재단
정지운	연암대학교
제정환	서울대학교
조우리	K-MEDI Hub 전임상센터
조익준	오송첨단의료산업진흥재단
조재진	서울대학교
조정식	한국실험동물협회
조준휘	강원대학교병원
조현무	가톨릭대학교 은평성모병원
진희경	경북대학교
채갑용	부산식품의약품안전청
천병년	(주)우정바이오
최경철	충북대학교
최병태	부산대학교
최양규	건국대학교
최영석	건국대학교
최영현	동의대학교
최우성	(주)메디키나바이오
최은화	강원대학교
최정훈	강원대학교
최준영	대구경북첨단의료산업진흥재단
최혜윤	대구경북첨단의료산업진흥재단
한남옥	(주)코아텍
한덕주	건일제약(주)
한진수	건국대학교
한태원	한국식품연구원
허승호	서울아산병원
홍성근	경상대학교
홍의주	충남대학교
황인구	서울대학교
황정호	안전성평가연구소
황종익	고려대학교

2025 한국실험동물학회 동계심포지엄 협력기업

회사명	대표자	전화번호	홈페이지
(재)국가모델동물연구소	성제경	02-885-8380	www.mousephenotype.kr
(주)디비엘	주재훈	070-4242-1546	www.dbl.kr
(주)마크로젠 모델동물사업부	김창훈	02-3663-2004	www.macrogen.com
(주)묘성	김갑수		www.myosungbio.com
(주)바이오덱, (주)바이탈스, (주)안강	홍찬형	031-928-6416	www.biodech.com
(주)바이오톡스텍	강종구	043-210-7781	www.biotoxtech.com
(주)싸이텍코리아	박찬승	02-986-4413~5	www.scitechkorea.com
(주)쓰리샤인	박천귀	042-933-3361	www.threeshine.com
(주)아이티스텐다드	유병천	02-6271-1009	itstandard.co.kr
(주)영바이오	송영종	031-759-9931~2	www.youngbio.kr
(주)오리엔트바이오	장재진	031-730-6728	www.orientbio.co.kr
(주)오스테오시스	안영복	02-6124-5911	www.osteosys.com
(주)우정바이오	천병년		www.woojungbio.kr
(주)위너소프트	지운학	02-784-8501	
(주)이우과학교역	강현철	02-3473-2332	iwoo.co.kr
(주)정도비앤피 & NATSUME	정병도	02-952-8214	www.Jeungdo.co.kr
(주)카브	송창선	02-6461-009	www.khav.co.kr
(주)킴앤프렌즈	김광용		www.kimnfriends.co.kr
(주)코아텍	한남옥	031-611-8221	www.koatech.co.kr
(주)폴라스	김선호	02-3426-9165	
Cyagen	Lanqing Han		www.cyagen.kr
HLB bioStep	문정환	070-7703-7666	www.hlbbiostep.com
OPTIPHARM	김현일	043-249-7593	www.optipharm.co.kr
VETCOM	김찬수		vetcom.co.kr
대구경북첨단의료산업진흥재단 전임상센터	정명훈	053-790-5798	www.kmedihub.re.kr
라온메타(주)	이순형	070-8240-5617	www.metademy.ac
라온바이오(주)	나종성	031-283-4197	www.raonbio.co.kr
라크(주)	이재구		www.lacin.co.kr
럭키싸이언텍(주)	김철용		
식품의약품안전평가원	강석연	053-960-1334	
아이아이에스(IIS)	나겸재		iiscience.com
압타머사이언스 CRO센터	한동일		www.aptsci.com
주식회사 메디코어스	윤귀영	031-698-4903	www.medikors.com
주식회사 셀퓨릭스	신지웅	031-8039-6588	www.cellpurics.com
주식회사 에코엔테크	기혜란	032-325-6166	www.ecoandtech.co.kr
주식회사 엠알솔루션	김광호	031-360-0030	www.mrso.co.kr
주식회사 엠알텍	박병선	031-552-8339	www.mrteck.co.kr
중앙실험동물(주)	이정규	02-3461-5255	www.labanimal.co.kr
한신메디칼 주식회사	김정열		www.hanshinmed.co.kr

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17:00-18:00	평의원회
18:00-19:00	이사회 (몽블랑)

2/6 (목)					
장소	1F 오디토리움	1F 평창홀	1F 대관령 II	2F 그랜드볼룸	
09:00-09:40	등록			포스터 부착 (9시-12시)	
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11:40-12:10	**런천세미나 1**	**런천세미나 2**			
12:10-13:00	점심시간 및 부스 방문			포스터 전시	
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16:00-17:40	**Symposium 6** 실시간 생체 내 이미지 분석을 통한 생명현상 연구 및 인공지능 기반의 3D 분석 기술	**Symposium 7 (IACUC)** IACUC 심의 시 동물대체시험법 적용 사례를 어떻게 평가할 것인가?			
17:40-20:00	**총회 및 환영만찬 (2F 그랜드볼룸)**				

2/7 (금)					2/8 (토)	
장소	1F 오디토리움	1F 평창홀	2F 그랜드볼룸		장소	대관령 II
09:00-09:30	등록		포스터 전시	부스 전시	09:00-12:00	산학연 워크숍
09:30-11:10	**Symposium 8** 인공지능(AI)과 혁신의 만남: 신약개발 패러다임의 대전환	**Symposium 9** General Understanding of Histopathology in Animal Model Study				
11:10-11:30	휴식					
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12:30-13:00	점심시간 및 부스 방문					
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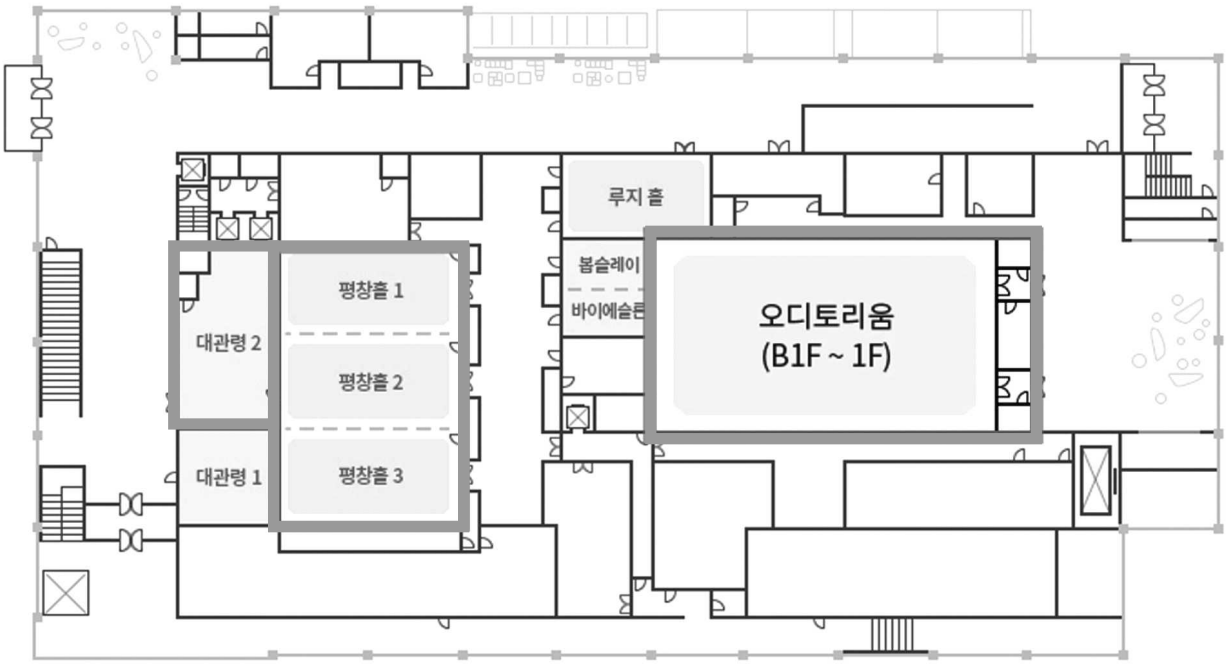
14:00-14:30	포스터 및 부스 방문					
14:30-16:10	**Symposium 10** A novel insight into neuronal interactions with peripheral organs	**Symposium 11 (KLAT Education II)** 실험동물의 생체 내 영상				
16:10-16:20	휴식					
16:20-17:00	폐회식		포스터 철거			

Hall Information _ 1F

한국실험동물학회 2025 동계심포지엄 평창 알펜시아 컨벤션센터 1F



장소 안내

1. 강연장 안내

Lecture 1 (오디토리움)

2/6(목) : 개회식 / Symposium 1, 4, 6 / 런천세미나 1

2/7(금) : Special Lecture / Symposium 8, 10 / 폐회식

Lecture 2 (평창홀)

2/6(목) : Symposium 2, 5, 7 / 런천세미나 2

2/7(금) : Symposium 9, 11

Lecture 3 (대관령 II)

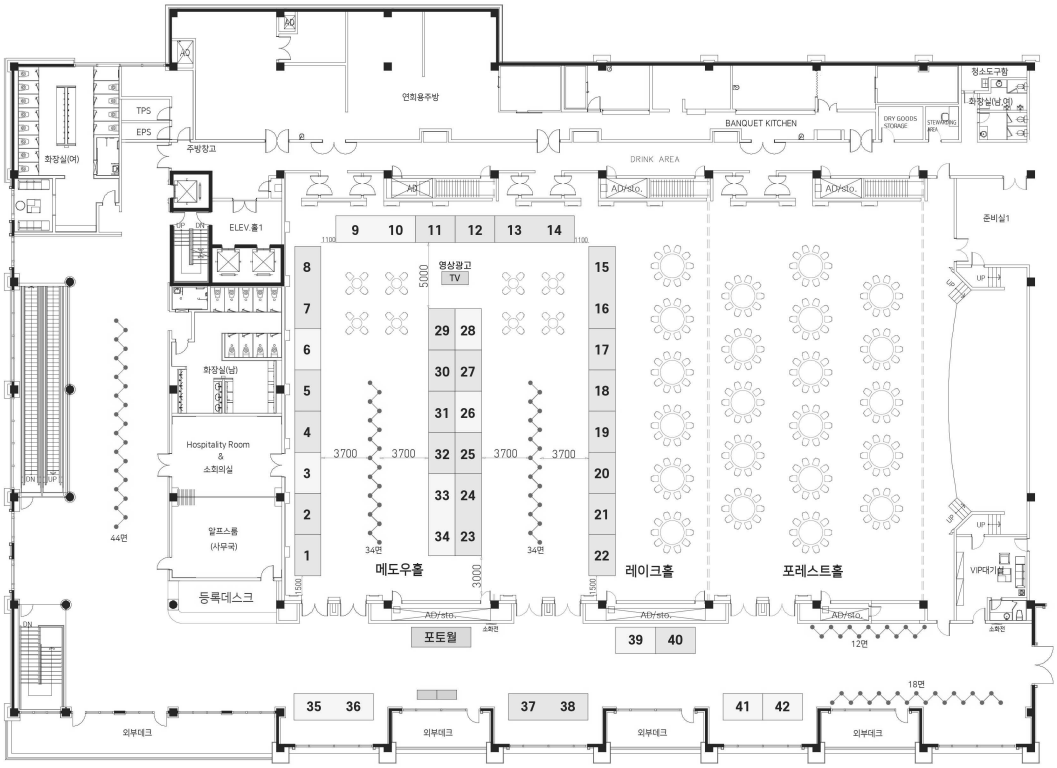
2/6(목) : Symposium 3

2. 루지홀 (Preview Room) : 연자 및 좌장 대기실, 연자 강연자료 확인 장소

3. 대관령 II : 인증위원회 총회, 평의원회, 산학협력 간담회

Hall Information _ 2F

한국실험동물학회 2025 동계심포지엄 **평창 알펜시아 컨벤션센터 2F**



No.	기업명
1	중앙실험동물(주)
2	(주)이우과학교역
3	(주)마크로젠 모델동물사업부
4	(주)김앤프렌즈
5	주식회사 엠알솔루션
6	주식회사 셀퓨릭스
7	(주)쓰리샤인
8	
9	라온바이오(주)
10	
11	싸이텍코리아
12	라온메타(주)
13	(주)바이오덱, (주)바이탈스, (주)안강
14	
15	(주)정도비앤피 & NATSUME
16	
17	OPTIPHARM
18	압타머사이언스 CRO센터
19	주식회사 에코엔테크
20	(주)오스테오시스
21	한신메디칼 주식회사

No.	기업명
22	식품의약품안전평가원
23	메트라이프
24	
25	(주)폴라스
26	(주)디비엘
27	(재)국가모델동물연구소
28	(주)우정바이오
29	(주)영바이오
30	(주)묘성
31	주식회사 메디코어스
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PROGRAM

2025. 2. 6.(목)

Symposium 1
10:00-11:40 (오디토리움)

In-Depth Understanding of Disease in the Multi-Omics Era: From Single Cell to System-Level Approach

Organizer : 정수명 (성균관대학교) / Chair : 황성순 (연세대학교)

Revealing somatic mutations as a novel cause of brain disorders: a multi-omics perspective from single cells to systems	**김준호**	성균관대학교
Systems biology of human – leveraging multi-omics power for the understanding of metabolic diseases	**이선재**	GIST
Integrative multi-omics analysis of medication-related osteonecrosis of the jaw: elucidating molecular mechanisms and developing predictive models	**김윤학**	부산대학교
Aquatic toxicology with Danio rerio and Daphnia magna: a data-driven approach	**오창규**	부산대학교

Symposium 2 (실험동물기술원 교육강연 I)
10:00-11:40 (평창홀)

실험동물의 고통관리

Organizer : 김동재 (대구경북과학기술원) / Chair : 제정환 (서울대학교)

마취제 작용 기전의 이해	**유보경**	제주대학교
진통제의 종류 및 작동원리	**이진수**	충남대학교
Pain and distress management in animal experiments using rodents	**전현정**	한국식품연구원
돼지와 토끼에서의 마취 및 통증관리	**김종성**	아주첨단의료바이오연구원

Symposium 3 (공모 1)
10:00-11:40 (대관령 II)

Transgenic method for xenotransplantation

Organizer : 김현일 ((주)옵티팜) / Chair : 윤익진 (건국대학교), 김현일 ((주)옵티팜)

How to make transgenic pig for xenotransplantation?	**심주현**	(주)옵티팜
Transgenic type of miniature pig for xenotransplantation	**김현일**	(주)옵티팜
The results of xenotransplantation for transgenic type	**윤익진**	건국대학교
Future transgenic type to improve the results of xenotransplantation	**한규현**	연세대학교

런천세미나 1
11:40-12:10 (오디토리움)

Organizer : (주)쓰리샤인 / Chair : 최연식 (한국폴리텍바이오대학)

실험동물실 오염예방을 위한 빌트인 장비 SOP	**박천귀**	(주)쓰리샤인

런천세미나 2
11:40-12:10 (평창홀)

Organizer : (주)아이티스텐다드 / Chair : 이호 (국립암센터)

동물실험 윤리위원회 심의 시스템과 사이버 보안	**유병천**	(주)아이티스텐다드

Symposium 4 (공모 2)

13:00-14:40 (오디토리움)

Recent trends in Microbiom Studies

Organizer : 이동우 (연세대학교) / Chair : 이동우 (연세대학교), 이근욱 (한림대학교)

Understanding human microbiome ecosystem as a holobiont	**김봉수**	한림대학교
Bidirectional translational metabolomics: connecting metabolomic & gut-microbial activities to host phenotype	**이도엽**	서울대학교
Understanding the host-microbiota interaction using an EAE animal model	**이윤경**	순천향대학교
Microbial metabolites crossing the blood-brain barrier: a direct mediator of the gut-brain axis?	**고아라**	포항공과대학교

Symposium 5 (공모 3)

13:00-14:40 (평창홀)

Health Impacts of Microplastics

Organizer : 이다용 (한국생명공학연구원) / Chair : 류충민 (한국생명공학연구원), 정진영 (한국생명공학연구원)

PET tracing of microplastics and assessment of biological toxicity	**김진수**	한국원자력의학원
Microplastics: an invisible danger to human brain health – neurological hazards of microplastic accumulation in the brain	**최성균**	대구경북과학기술원
Effects of microplastic on the animal nervous system	**정의만**	부산대학교
Biological effects of nanoplastics in CNS and metabolic system	**이다용**	한국생명공학연구원

포스터 발표 1

14:40-15:40

Chair : 오경진 (한국생명공학연구원)

Symposium 6

16:00-17:40 (오디토리움)

실시간 생체 내 이미지 분석을 통한 생명현상 연구 및 인공지능 기반의 3D 분석 기술

Organizer / Chair : 서원효 (이화여자대학교)

Intravital confocal & two-photon microscopy for in vivo cellular-level imaging of live animal model	**김필한**	KAIST
Holotomography and artificial intelligence: label-free 3D imaging, classification, and inference of live cells, tissues, and organoids	**박용근**	KAIST
In vivo visualization of cellular dynamics in living animals	**권형진**	IVIM Technology
Utilizing advanced cardiac imaging techniques to assess cardiac function in mice 우수신진연구자	**안수연**	서울아산병원
Non-clinical safety assessment for mRNA vaccine in mouse model 우수신진연구자	**안재훈**	서울대학교병원

Symposium 7 (IACUC)

16:00-17:40 (평창홀)

IACUC 심의 시 동물대체시험법 적용 사례를 어떻게 평가할 것인가?

Organizer : 석승혁 (서울대학교) / Chair : 홍정주 (한국생명공학연구원)

Advancing beyond animal testing: the global shift towards new approach methodologies	**윤석주**	안전성평가연구소
Reflection of alternative test principles onto 3R-focusing on immuntoxicological assessment	**허용**	대구가톨릭대학교
IACUC의 대체시험법에 대한 심의 기준 (IACUC review on the 3Rs alternatives literature searching of the Proposed animal protocol)	**이귀향**	(재)생명과학연구윤리서재
Achievements in the application of alternative testing methods through IACUC review	**김상화**	강원대학교

총회 및 환영만찬

17:40-20:00 (2F 그랜드볼룸)

PROGRAM

2025. 2. 7.(금)

Symposium 8
인공지능(AI)과 혁신의 만남: 신약개발 패러다임의 대전환

09:30-11:10 (오디토리움)

Organizer : 오경진 (한국생명공학연구원) / Chair : 김선 (서울대학교)

Introduction to how deep learning is used for antibody design and structure prediction, and Protac linker design	**김선**	서울대학교
구조기반 리간드 가상검색 및 인실리코 약물발굴	**신웅희**	고려대학교
AI in drug discovery and development	**신승우**	대웅제약
Spatiotemporal cellular dynamics of germinal center reaction in COVID-19 lung draining lymph node based on imaging-based spatial transcriptomics 우수신진연구자	**우영민**	한국생명공학연구원

Symposium 9
General Understanding of Histopathology in Animal Model Study

09:30-11:10 (평창홀)

Organizer : 김대용 (서울대학교), 최재훈 (한양대학교) / Chair : 김대용 (서울대학교), 이종권 (식품의약품안전평가원)

Overview of "quality control" in histopathology	**김대용**	서울대학교
Interpretation of background lesion in rodents	**한범석**	호서대학교
Mechanism-based histological characteristics of animal disease models and their applications in evaluating pharmaceutical effects	**윤병일**	강원대학교

Special Lecture

11:30-12:30 (오디토리움)

Organizer / Chair : 이근욱 (한림대학교)

실험실의 두 인류, 교수와 MZ	**최훈**	한림대학교

포스터 발표 2

13:00-14:00

Chair : 오경진 (한국생명공학연구원)

Symposium 10
A novel insight into neuronal interactions with peripheral organs

14:30-16:10 (오디토리움)

Organizer / Chair : 이찬희 (한림대학교)

Hypothalamic regulation of skeletal muscle	**김민선**	서울아산병원
GnRH signaling in aging and stress physiology	**김민수**	KIST
Cross-species insights into brain control of eating and obesity: from mice to monkeys to humans	**최형진**	서울대학교
Development of a non-human primate Parkinson's disease model induced by Lewy body pathology 우수신진연구자	**서진철**	한국생명공학연구원

Symposium 11 (실험동물기술원 교육강연 II)
실험동물의 생체 내 영상

14:30-16:10 (평창홀)

Organizer / Chair : 나이랑 (서울대학교병원)

In vivo imaging using IVIS: principles and applications (IVIS를 이용한 생체내 영상)	**김민영**	(주)바이오톡스텍
Application of radiologic techniques for preclinical experiments	**이승현**	서울대학교병원
Use of positron emission tomography in laboratory animal research	**백승호**	한국생명공학연구원

2025 동계심포지엄 회의 및 행사 안내

1. 개회식 (Opening Ceremony)

2월 6일(목) 09:40-10:00 / 1F 오디토리움
진 행 복진웅 총무위원장
개회사 이근욱 학술위원장
인사말 최양규 이사장

2. 총회 및 환영만찬 (General Meeting & Welcome Reception)

2월 6일(목) 17:40-20:00 / 2F 그랜드볼룸
진 행 복진웅 총무위원장

1) 총회 안건
① 2024년도 재무 결산 의결
② 2025년도 예산 의결
③ 기타

2) 학술상 시상식
① 실험동물연구장학생
시상 : 이정규 대표 (중앙실험동물(주))

구 분	성 명	소 속
그룹 I	박은서	부산대학교
	이지헌	건국대학교
	전동훈	연세대학교
	Ke Huang(황커)	경북대학교
	박강현	경북대학교
	엄찬양	연세대학교
	이주영	충북대학교
	강기수	서울대학교
그룹 II	손광희	대구경북첨단의료산업진흥재단

3) 감사패 전달

4) 환영만찬

3. 폐회식 (Closing Ceremony)

2월 7일(금) 16:20-17:00 / 1F 오디토리움
진 행 복진웅 총무위원장

1) 우수포스터상 시상
시상 : 이근욱 학술위원장

2) 경품추첨

3) 폐회사
인사말 : 최양규 이사장
폐회사 : 이근욱 학술위원장

4) 기념촬영

4. 관련위원회 회의 (Committee Meeting)

KALAS 실험동물기술원 인증위원회 총회
2월 5일(수) 14:30-16:30 / 1F 대관령룸 II
참석대상 I 한국실험동물학회 인증위원회

KALAS 평의원회
2월 5일(수) 17:00-18:00 / 1F 대관령룸 II
참석대상 I 한국실험동물학회 평의원
안 건 I ① 2024년도 재무 결산 심의
② 2025년도 예산안 심의
③ 기타

KALAS 이사회
2월 5일(수) 18:00-19:00 / 몽블랑
참석대상 I 한국실험동물학회 이사 및 감사
안 건 I ① 2024년도 재무 결산 의결
② 2025년도 예산안 의결
③ 기타

KALAS 산학협력 간담회
2월 7일(금) 10:00-10:30 / 1F 대관령룸 II
참석대상 I 한국실험동물학회 협력기업 대표 및 관계자

5. 점심식사 안내 (Luncheon Seminar)

런천세미나		기업명	장소	티켓 수령처
2/6(목) 11:40-12:10	LS 1	(주)쓰리샤인	1F 오디토리움	1F 오디토리움 (선착순 120명)
	LS 2	(주)아이티스텐다드	1F 평창홀	1F 평창홀 (선착순 100명)

※ 2/7(금)에는 런천세미나가 진행되지 않습니다. 런천 티켓은 등록데스크에서 수령하실 수 있습니다. (선착순 220명)

※ 런천티켓은 한정수량으로 조기 품절될 수 있습니다.

※ 런천티켓 수령 → 런천세미나 강연 청취 → 청취 후 퇴실 시 도장받기 → 지하 1층 썬큰가든으로 이동하여 식사
(목 : 갈비탕 / 금 : 황태해장국)

LS 1> (주)쓰리샤인
주제 : 실험동물실 오염예방을 위한 빌트인 장비 SOP
연자 : 박천귀 ((주)쓰리샤인)

LS 2> (주)아이티스텐다드
주제 : 동물실험 윤리위원회 심의 시스템과 사이버 보안
연자 : 유병천 ((주)아이티스텐다드)

6. 영상광고

운영방식 : 강연장과 전시장 휴게공간에서 TV와 빔프로젝트를 이용하여 제출된 기업 광고를 일정 시간 동안 상영하는 방식

신청기업 : (주)쓰리샤인

7. 실험동물연구장학생 (그룹 I) 포스터 발표

구분	실험동물연구장학생 포스터 발표
부착 시간	2월 6일(목) 09:00-12:00
발표 장소	평창 알펜시아 컨벤션센터 2F
발표 시간	2월 6일(목) 14:40-15:40
포스터 번호	PS-R-01 (해부생리) PS-R-02 (미생물) PS-R-03 (독성병리) PS-R-04 (독성병리) PS-R-05 (독성병리) PS-R-06 (해부생리) PS-R-07 (독성병리) PS-R-08 (유전자질환모델)
합계	총 8개
철거 시간	2월 7일(금) 16:20-17:00

※ 포스터 전시는 학술대회 기간인 2월 6일(목) ~ 7일(금) 이틀간 진행됩니다.

※ 부착은 2월 6일(목) 부착 시간 내에 반드시 진행하여야 하며, 미부착시 제재가 주어집니다.

※ 철거는 2월 7일(금) 16시 20분 이후부터만 가능하며, 반드시 17시까지 철거해 주시기 바랍니다.
철거하지 않은 포스터는 학회에서 보관하지 않고 임의로 철거한 후 폐기됩니다.

- 실험동물연구장학생 발표

포스터 발표는 좌장의 진행에 따라 포스터당 7분(5분 발표 + 2분 질의응답)으로 진행되며, 반드시 발표시간에 포스터 앞에 대기하여 주시기 바랍니다.

* 실험동물연구장학생 발표자는 총회 및 환영만찬에서 진행되는 시상식에 반드시 참석해야 합니다. (대리 수상 불가)

- 실험동물연구장학생 시상

2월 6일(목) 17:40-20:00 2F 그랜드볼룸 / 총회 및 환영만찬

8. 포스터 초록 (Poster Session) 발표

구분	포스터 발표 1	포스터 발표 2
부착 시간	2월 6일(목) 09:00-12:00	
발표 장소	평창 알펜시아 컨벤션센터 2F	
발표 시간	2월 6일(목) 14:40-15:40	2월 7일(금) 13:00-14:00
포스터 번호	PS-A-01~14 (해부생리) PS-B-01~18 (독성병리) PS-C-01~07 (미생물) PS-D-01~11 (유전자질환모델) PS-E-01~19 (시설운영 및 기타)	PS-A-15~27 (해부생리) PS-B-19~35 (독성병리) PS-C-08~13 (미생물) PS-D-12~22 (유전자질환모델) PS-E-20~37 (시설운영 및 기타)
합계	총 69개	총 65개
철거 시간	2월 7일(금) 16:20-17:00	

※ 포스터 전시는 학술대회 기간인 2월 6일(목) ~ 7일(금) 이틀간 진행됩니다.

※ 부착은 2월 6일(목) 부착 시간 내에 반드시 진행하여야 하며, 미부착 시 제재가 주어집니다.

※ 철거는 2월 7일(금) 16시 20분 이후부터만 가능하며, 반드시 17시까지 철거해 주시기 바랍니다.
철거하지 않은 포스터는 학회에서 보관하지 않고 임의로 철거한 후 폐기됩니다.

- 포스터 심사

포스터 발표는 좌장의 진행에 따라 포스터당 4분(3분 발표 + 1분 질의응답)으로 진행되며, 과학적 성과와 발표자의 발표력 등을 기준으로 우수포스터를 선정하여 시상하오니 반드시 발표시간에 포스터 앞에 대기하여 주시기 바랍니다. (해당 시간에 발표자가 없는 포스터는 우수 포스터상 심사 대상에서 제외)

- 미부착 포스터

포스터 보드에 포스터를 2회 이상(개수로 적용) 미부착 시, 교신저자(연구책임자)에게 향후 1년간 포스터 제출 불가의 제재가 주어집니다.

- 우수포스터상 시상

2월 7일(금) 16:20-17:00 1F 오디토리움 / 폐회식

우수포스터의 경우 폐회식에서 선정자를 호명합니다. 호명 시 자리에 없으면 다음 우수자에게 상이 수여되오니, 학술대회 종료일까지 학술대회에 꼭 참석해주시기 바랍니다. (상장과 상금 수여, 대리수상 불가)

9. 이벤트 및 경품추첨 안내 (Event & Giveaway)

1) 환영만찬 노래자랑 이벤트

진행일시 | 2월 6일(목) 17:40 2F 그랜드볼룸 / 총회 및 환영만찬

참여방법 | 이메일 및 등록데스크에서 사전접수 (선착순)

경　　품 | 백화점상품권 30/20/10/3/1만원권

2) 실험동물기술원 교육강연 퀴즈 이벤트

진행일시 | 2월 7일(금) 14:30 1F 평창홀 / KLAT Education Ⅱ 이후 진행

참여방법 | 스마트폰 앱/Play 스토어에서 퀴즈를 위한 **카훗(Kahoot) 앱 다운로드** 후 참여

경　　품 | 에어팟프로 2세대, 백화점상품권 10/5/3/1만원권

3) 폐회식 경품추첨

진행일시 | 2월 7일(금) 16:20 1F 오디토리움 / 폐회식

참여방법 | ① KALAS 2025 동계 App 다운로드
② 동계 심포지엄 설문지 작성
③ App을 열어 34개 부스 스탬프 투어 달성
④ 부스 투어 이벤트 마감 : 2/7(금) 14:30까지

경　　품 | 갤럭시탭 S10, 백화점상품권 30/10/5/1만원권

10. 알펜시아리조트 시설 이용 할인 안내

이용기간 | 학술대회 기간 (2월 5일(수) ~ 2월 8일(토)까지 할인요금 적용됨)

이용방법 | 결제 시 학술대회 등록 명찰 제시

구분	이용시설	할인요금
혜택	썰매	20%
	리프트	30%
	장비/의류 렌탈	30%

※ 카드사, 통신사 중복 할인 불가

KALAS Exhibition Hall 전시장 운영 규칙

- 전시장에서 입장 시에는 항상 명찰이 잘 보이도록 착용하여야 한다.
- 전시장에 참여한 단체의 활동은 배정된 구역 내에서 진행되어야 한다.
- 해당 소속 전시부스 이외의 타사 부스에 허락없이 들어갈 수 없다.
- 사진 촬영은 금지한다.
- 해당 부스의 전시 책임자의 허가 없이 타 참여사의 제품 혹은 장비를 사진, 동영상, 기타 방식으로 기록 및 보관할 수 없다.
- 전시장을 포함하여 컨벤션홀 내부 전체는 모두 금연이다.

Safety & Security

- 모든 참여사의 인원들은 전시장 내부에서 항상 명찰이 잘 보이도록 착용하여야 한다.
- 발급받은 명찰들은 어떠한 방식으로든 변경하거나 삭제할 수 없다.
- 참여 단체의 전시에 참여하는 인원은 해당 전시사의 허가 없이 타사 부스에 들어갈 수 없다.

KALAS 규정

- 전시장에 참여하는 참여사 인원과 학회 참가자는 모두 KALAS의 규정에 따라야 한다.
- 규정에 어긋나거나 학술대회 및 전시장에 심각한 문제를 일으키는 경우, KALAS의 권한으로 전시사 및 참가자는 패널티를 부여받을 수 있다.
- 패널티는 전시사나 참가자를 전시홀에서 퇴장시키거나 사전 공지 없이 전시 권한을 즉각 종료시키고 전시를 마감할 수 있으며, 위의 사항들은 중복되어 부여될 수도 있다.
- 모든 규정의 실행은 최종적으로 학회 심의위원회의 결정에 의거한다.

※ 발표장 내에 사진 촬영을 금지합니다.

교통 안내

[평창 알펜시아 리조트]

- 주소 : 강원도 평창군 대관령면 솔봉로 325
- 전화 : 033-339-0000
- 홈페이지 : www.alpensiaresort.co.kr

[교통안내]

1. KTX 진부역(오대산역) ▶ 알펜시아 리조트

1) 동계 시즌 무료 셔틀버스
   - 이용 대상 : 학회 참석자 이용 가능
   - 운행 구간 : 진부역 ↔ 알펜시아 리조트 (웰컴센터 앞) / 왕복
   - 시간표

진부역 ▶ 알펜시아 리조트		알펜시아 리조트 ▶ 진부역	
KTX 진부역 출발	알펜시아 리조트 도착	알펜시아 리조트 출발	KTX 진부역 도착
11:00	11:20	10:00	10:20
15:00	15:20	14:00	14:20

2) 택시
   - KTX 진부역 → 알펜시아리조트 : 약 20분 소요

2. 횡계 시외버스터미널

1) 동서울터미널(강변역) ▶ 횡계 시외버스터미널 : 약 2시간 30분 소요
2) 강릉 시외버스터미널 ▶ 횡계 시외버스터미널 : 약 30분 소요

※ 택시 : 횡계 시외버스터미널 → 알펜시아 리조트 : 약 15분 소요

3. 스키 셔틀버스

1) 예약 및 시간표 확인 (예매 페이지 참고)
   - 버스 예약 (노선 시간, 이용자 휴대폰번호) 선택 후 결제
   - 예약 후 핸드폰으로 모바일 예약티켓 수신 (버스 탑승 시 제시)
2) 문의처 : 경기대원고속관광 (02-2201-7710)

4. 공항버스

1) 예약 및 이용 안내
   - 인천공항 : 매표소 이용 / 알펜시아 리조트 : 무인자판기 이용 (웰컴센터 앞)
   - 운행구간 : 인천공항 2 터미널 → 인천공항 1 터미널 → 김포공항 → 알펜시아 리조트
2) 문의처 : 강원여객 (033-643-6123)

5. 승용차

- 대관령 IC ▶ 평창 알펜시아 리조트 : 약 15분 소요

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KALAS

2025
한국실험동물학회
동계심포지엄

Symposium 1

2025. 02. 06.(목) 10:00-11:40 / 오디토리움

In-Depth Understanding of Disease in the Multi-Omics Era: From Single Cell to System-Level Approach

Organizer : 정수명 (성균관대학교) / Chair : 황성순 (연세대학교)

1	Revealing somatic mutations as a novel cause of brain disorders: a multi-omics perspective from single cells to systems	김준호	성균관대학교
2	Systems biology of human – leveraging multi-omics power for the understanding of metabolic diseases	이선재	GIST
3	Integrative multi-omics analysis of medication-related osteonecrosis of the jaw: elucidating molecular mechanisms and developing predictive models	김윤학	부산대학교
4	Aquatic toxicology with Danio rerio and Daphnia magna: a data-driven approach	오창규	부산대학교

S1-1

Revealing somatic mutations as a novel cause of brain disorders: a multi-omics perspective from single cells to systems

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With advances in next-generation sequencing technologies, somatic mutation analysis has made great strides in establishing a comprehensive description of genomic changes in cancer over the past decade. International collaborative efforts such as The Cancer Genome Atlas and International Cancer Genome Consortium have been made to construct the landscape of somatic mutations in various cancer types, leading to unprecedented knowledge of the somatic mutations and their underlying mechanisms.

Recent analyses of somatic mutations have begun to be made in non-cancerous diseases, especially in brain disorders. Unlike cells in other tissues, differentiated neurons in the brain are rarely replaced and regenerated during the course of a person's life, so that somatic mutations in those cells may critically affect the function of neurons and even brain circuits. Recent studies have demonstrated that somatic mutations occurring during brain development do actually cause multiple neurodevelopmental diseases, supporting a new pathogenesis of brain disorders. However, due to the lack of specialized bioinformatic tools for detecting rare somatic mutations in tissues without clonal expansion, somatic mutations in brain have not been comprehensively explored yet.

In this talk, the speaker will discuss the difficulties associated with analyzing somatic mutations in the brain, as well as the current efforts aimed at tackling these challenges. The talk will cover different sequencing approaches and developed bioinformatic methods used to detect rare somatic mutations in low cell population or even in a single cell.

Key words : Somatic mutation, Brain disorder, Single cell genomics

S1-2

Systems biology of human - leveraging multi-omics power for the understanding of metabolic diseases

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Advances in various high-throughput technologies have enabled the generation of multi-omics data, including transcriptomics, genomics and metabolomics, in biology and medicine. Recent collaborative efforts have provided massive multi-omics data freely without limitation, with the help of several international consortiums, such as Human Protein Atlas (HPA), Genotype-Tissue Expression project (GTEx), The Integrative Human Microbiome Project (iHMP Data Portal), and recently, GUTSY Atlas (https://gutsyatlas.serve.scilifelab.se/). Integrating multi-omics data into clinical and biological questions, a speaker has investigated the underlying mechanism of metabolic diseases by systems biology, including insulin resistance, liver diseases and cancers. In this talk, he will explain about how systems biology has enabled him to explore dysregulated human metabolism in metabolic diseases and future perspective of integrating multi-omics and the use metabolomics big-data for the understanding disease mechanisms of many different metabolic diseases.

Key words : Systems biology, Human metabolism, Microbiome, Bioinformatics

S1-3

Integrative multi-omics analysis of medication-related osteonecrosis of the jaw: elucidating molecular mechanisms and developing predictive models

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This study investigates the molecular mechanisms of Medication-Related Osteonecrosis of the Jaw (MRONJ) in osteoporosis patients using a comprehensive multi-omics approach. Single-cell RNA sequencing of oral soft tissue samples from 5 osteoporosis patients and osteoporosis patients with MRONJ identified distinct cell populations, including T cells, B cells, plasma cells, NK cells, osteoblasts, osteoclasts, and fibroblasts. Comparative gene expression and immune signaling analysis revealed significant differences between the groups, with CellChat analysis demonstrating reduced osteoblast-endothelial cell interactions in MRONJ patients. Whole Genome Sequencing (WGS) was performed on 74 patients to analyze somatic and germline variants. Somatic variants were identified using Mutect2, while germline variants were processed using HaplotypeCaller, GenomicsDBImport, and GenotypeGVCFs, with annotations applied via Funcotator. Prioritized variants in MRONJ patients were used to develop a polygenic risk score. Logistic regression, support vector machine, and random forest models assessed the predictive potential of these variants, with performance validated through 5-fold cross-validation and receiver operating characteristic (ROC) curves. This integrative multi-omics analysis provides novel insights into MRONJ pathogenesis and facilitates prognosis prediction and personalized therapeutic interventions.

Key words : Osteoporosis, Medication-related osteonecrosis of the jaw (MRONJ), Whole-genome sequencing (WGS), Single-cell RNA sequencing (scRNA-seq)

S1-4

Aquatic toxicology with Danio rerio and Daphnia magna: a data-driven approach

Yejin Kim[1,2], Chang-Kyu Oh[1,2]*

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Most environmental microplastics are in an oxidized state, necessitating research into their real-world toxicity. To simulate this, we oxidized polyethylene (PE) and verified the oxidation using DLS, zeta potential, SEM, and FTIR. Toxicity assessments were conducted on zebrafish embryos and Daphnia magna. In Daphnia, oxidized polyethylene (OPE) caused distinct effects on body length and heart rate compared to unoxidized PE. To understand the molecular mechanisms underlying these differences, we performed bulk RNA sequencing on zebrafish embryos exposed to PE and OPE. The results showed that genes related to lipid metabolism were more significantly altered in OPE-treated embryos than in PE-treated or control embryos. These findings were further validated through in vivo experiments. Our study demonstrates that oxidized microplastics exhibit different toxicity profiles compared to commercially available microplastics. This highlights the need for more comprehensive studies focusing on the toxicological impacts of oxidized microplastics, which more accurately represent environmental microplastic pollution.

Key words : D. rerio, D. magna, Polyethylene, Toxicity, Oxidation

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2025 한국실험동물학회 동계심포지엄

Symposium 2 (실험동물기술원 교육강연 I)

2025. 02. 06.(목) 10:00-11:40 / 평창홀

실험동물의 고통관리

Organizer : 김동재 (대구경북과학기술원) / Chair : 제정환 (서울대학교)

1	마취제 작용 기전의 이해	유보경	제주대학교
2	진통제의 종류 및 작동원리	이진수	충남대학교
3	Pain and distress management in animal experiments using rodents	전현정	한국식품연구원
4	돼지와 토끼에서의 마취 및 통증관리	김종성	아주첨단의료 바이오연구원

S2-1

마취제 작용 기전의 이해

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Anesthesia involves the use of drugs to prevent the sensation of pain and is categorized into general and local anesthesia. General anesthesia refers to a state that meets five criteria: loss of consciousness, amnesia, analgesia, lack of reflexes, and muscle relaxation. This state is not akin to sleep but rather a controlled coma induced by drugs that suppress central nervous system functions. Therefore, understanding the mechanisms of anesthetics is essential for the safe management of anesthesia in laboratory animals. There are two primary methods to achieve general anesthesia: inhalational and injectable anesthesia. Various drugs such as isoflurane, desflurane, and sevoflurane can be used for inhalational anesthesia in laboratory animals. It is important to know the minimum alveolar concentration (MAC) for each drug and animal species to apply them appropriately according to the situation. On the other hand, injectable anesthetics such as propofol, ketamine, and Zoletil can be used. Unlike inhalational anesthetics, injectable anesthetics may not allow precise control over the anesthetic recovery; however, safe anesthesia management can be achieved through the appropriate use of balanced anesthesia techniques and antagonists. The suitable combination of drugs may vary depending on the physiological and pathological conditions of the laboratory animals. In contrast to the aforementioned general anesthesia techniques, local anesthesia induces analgesia in a specific area without causing unconsciousness. Sodium channel blockers such as lidocaine and bupivacaine are commonly used for this purpose. By accurately understanding the mechanisms of these anesthetics, safe management during the anesthesia of laboratory animals can be ensured.

Key words : Anesthesia, Mechanism, Inhalational anesthesia, Injectable anesthesia, Local anesthesia

S2-2

진통제의 종류 및 작동원리

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Pain is defined as an unpleasant sensory or emotional experience associated with actual or potential tissue damage. Pain management in laboratory animals is important for both ethical and scientific reasons. Effective analgesia is essential for maintaining animal welfare, minimizing suffering, and ensuring the validity of research data. Various classes of analgesics with different mechanisms of action are employed to effectively alleviate pain and enhance animal welfare. Non-steroidal anti-inflammatory drugs (NSAIDs) reduce pain and inflammation by inhibiting cyclooxygenase (COX) enzymes. Opioids are potent analgesics that act on opioid receptors in the central and peripheral nervous systems. Additionally, alpha-2 (♋2) adrenergic agonists produce potent analgesia, inducing sedation and loss of vigilance. Multimodal analgesia, combining different classes of analgesics, is often recommended to achieve optimal pain relief. Despite the availability of effective analgesics, there are limitations and considerations when using them in laboratory animals. The choice of analgesic, dose, and route of administration should be considered to the specific species, pain type, and experimental protocols. Furthermore, the potential impact of analgesics on research results, such as behavioral or physiological parameters, should be carefully considered. In conclusion, researchers must understand the available analgesics, their mechanisms of action, and limitations to effectively alleviate pain in laboratory animals while preserving research integrity.

Key words : Pain-killer, Non-steroidal anti-inflammatory drugs, Opioids, Alpha-2 adrenergic agonists, Animal welfare

S2-3

Pain and distress management in animal experiments using rodents

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The impact of pain, stress, and distress on the welfare of laboratory animals has been widely recognized. If not properly managed, pain and stress can progress into distress, which poses significant concerns in biomedical research involving rodents. Such conditions not only affect animal welfare but also compromise the validity of experimental results. Effective management requires accurately assessing the severity and duration of pain, as these factors can adversely influence both the animals and scientific outcomes.

Recognizing pain, stress, and distress in rodents is particularly challenging because they cannot verbally express their experiences. Consequently, researchers and technicians must rely on observed behaviors and physical indicators to evaluate their condition. Although eliminating pain and distress entirely is impossible, their impact can be significantly reduced through appropriate management practices.

Ongoing efforts to enhance assessment methods and refine management protocols are essential for maintaining the balance between ethical considerations in animal research and the pursuit of scientific progress. This presentation aims to introduce effective strategies for mitigating pain and distress in rodent-based experiments.

Key words : Rodents, Pain, Distress, Pain assessment, Welfare

S2-4

돼지와 토끼에서의 마취 및 통증관리

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Anesthesia and pain management in experimental animals are very important fields not only for reproducibility of research results but also for 3R animal welfare. Researchers need to understand the basic concepts of animal anesthesia and prepare available anesthetics and analgesics to ensure safer pain management. Considerations for anesthesia and pain management in pigs and rabbits are as follows.

- Normal physiological indicators (vital signs)
- Common inhalation anesthesia methods including endotracheal intubation
- Injection anesthesia methods and application cases
- Types and usage of anesthetic drugs and analgesics available
- Monitoring and related equipment during anesthesia
- Signs and evaluation of pain
- Anesthetic record

Key words : Anesthesia, Pain management, Pig, Rabbit, 3R

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Symposium 3 (공모 1)

2025. 02. 06.(목) 10:00-11:40 / 대관령 II

Transgenic method for xenotransplantation

Organizer : 김현일 ((주)옵티팜) / Chair : 윤익진 (건국대학교), 김현일 ((주)옵티팜)

1	How to make transgenic pig for xenotransplantation?	심주현	(주)옵티팜
2	Transgenic type of miniature pig for xenotransplantation	김현일	(주)옵티팜
3	The results of xenotransplantation for transgenic type	윤익진	건국대학교
4	Future transgenic type to improve the results of xenotransplantation	한규현	연세대학교

S3-1

How to make transgenic pig for xenotransplantation?

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Pig-to-human organ transplantation is a feasible solution to address the shortage of organ donors for patients awaiting transplantation. To overcome immunological rejection, the primary hurdle in pig-to-human xenotransplantation, various genetically engineered pigs have been developed. Gene-modifying techniques can also be utilized to mitigate the potential risk of transmitting pig viruses, such as Porcine endogenous retrovirus (PERVs), to humans. This talk introduces the methods for producing transgenic pigs for xenotransplantation.

Key words : Genetically engineered pigs, Xenotransplantation, Immunological rejection

S3-2

Transgenic type of miniature pig for xenotransplantation

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Clinical trials for xenotransplantation using genetically modified miniature pigs are currently being conducted in the United States and China. While organ transplantation from non-genetically modified wild-type pigs to humans is infeasible due to hyperacute immune responses, advancements in genetic modification technologies have enabled the control of such responses. Moreover, the use of immunosuppressants has further reduced immune rejection, making it possible to develop organs suitable for human transplantation.

Genetically modified pigs undergo gene knockouts to eliminate genes responsible for immune rejection. The Gal epitope, which triggers hyperacute immune responses, has been removed, along with other genes such as CMAH, B4GalNT2, and iGb3s. To enhance the long-term survival of transplanted organs, human genes are inserted to modulate immune responses. For example, hCD46 (MCP), hCD55 (DAF), and hCD59 are introduced to reduce complement activation. Additionally, human genes such as hCD39 and thrombomodulin are inserted to minimize organ damage caused by blood clotting. To suppress innate immune responses mediated by macrophages, genes such as CD47 and CD200 are incorporated. Furthermore, to increase tolerance to hypoxic conditions and reduce inflammatory responses in transplanted tissues, the human gene HO-1 is also introduced.

Xenotransplantation research, once considered nearly impossible, has progressed to the stage of clinical trials in humans due to these advancements in genetic engineering.

Key words : Miniature pig, Translational research, Transgenic pig, Xenotransplantation

S3-3

The results of xenotransplantation for transgenic type

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The development of Transgenic pigs is the most important turning point for the initiation of preclinical experiments for solid organ xenotransplantation. After the success of inhibiting the alpha Gal, which is the main antigen for pig to primate xenotransplantation, by galactosyltransferase knock-out (GalTKO), for the first time we can expect the long-term survival of xeno-organ. However, not as we are expecting, transgenic technique itself can't overcome the immunological, physiological xenotransplantation barrier alone. Theoretically, perfect transgenic change for the pig organs can perfectly adjust in the primate body. But this has not been performed yet. Instead, specialized immunomodulation and control of coagulation system are continuously mentioned. Since the late 2010, the American two companies, Revivicor and eGenesis, have produced 10 genetic modified pig and confirmed as the standard donor pig. However, the validity for the reason why these types and number of genes modified is not certified yet. Which type of gene should be included and how many number of gene transgenesis is necessary should be proved by scientific background. We should analysis and make scientific proof for the effective type and number of transgenic genes. I think optimal number for the gene modification should be found and which genes show best results if included. So, I don't think we can decide the American 10 genes modified pig as the optimal standard donor. I analysis our 15 years solid organ xenotransplantation preclinical studies and published world records and I will present the data.

Key words : Transgenic pig, Xenotransplantation, Kidney, Heart, Liver

S3-4

Future transgenic type to improve the results of xenotransplantation

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Xenotransplantation, the transplantation of organs or tissues between different species, offers a promising solution to the critical shortage of human donor organs. Despite notable progress, key challenges such as immune rejection and cross-species compatibility persist. Recent breakthroughs in transgenic technologies, including CRISPR-Cas9 and other gene-editing tools, are paving the way for innovative solutions to these issues.

This presentation highlights cutting-edge transgenic strategies aimed at enhancing xenotransplantation outcomes. We will explore methods for preventing hyperacute, acute, and chronic rejection by genetically modifying donor animals to express human-compatible antigens and suppress immune responses.

In addition, we will explore genetic modifications that strengthen the durability of transplanted organs, reduce coagulation-related complications, and lower the risk of cross-species infections. The role of multi-gene editing and the development of immune-privileged tissues will also be examined, showcasing how synthetic biology is revolutionizing the creation of optimized donor organisms. Furthermore, we will introduce novel gene candidates with the potential to enhance graft survival and regulate immune rejection, paving the way for more reliable and effective transplantation outcomes.

By addressing both immunological and functional barriers, these advancements could significantly improve the safety and success rates of xenotransplantation in clinical settings. This presentation aims to provide a clear and comprehensive overview of these innovations, fostering informed discussions on their transformative potential in regenerative medicine and organ transplantation.

Key words : Genetic modification, Graft survival, Immune rejection, Organ, Xenotransplantation

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런천세미나 1

2025. 02. 06.(목) 11:40-12:10 / 오디토리움

Organizer : (주)쓰리샤인 / Chair : 최연식 (한국폴리텍바이오대학)

실험동물실 오염예방을 위한 빌트인 장비 SOP	박천귀	(주)쓰리샤인

런천세미나 2

2025. 02. 06.(목) 11:40-12:10 / 평창홀

Organizer : (주)아이티스텐다드 / Chair : 이호 (국립암센터)

동물실험 윤리위원회 심의 시스템과 사이버 보안	유병천	(주)아이티스텐다드

Luncheon Seminar 1

실험동물실 오염예방을 위한 빌트인 장비 SOP

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최근 실험동물 사육시설에 있어서 출입장비류(빌트인장비: 에어샤워, 패스룸, 패스박스, 오토크리브, DBSC)의 표준작업지침서(SOP)의 부재 또는 실행 미비로 인한 오염발생이 종종 일어나고 있다.

이에 출입 빌트인 장비류의 소개와 행동요령, 유지방법에 대하여 발표하고자 한다.

특히 기계적인 문제점, 유지관리 방법, 출입자의 행동요령 등을 소개하여 무균실험동물실의 유지관리에 도움이 되고 실험결과에 대한 신뢰성, 안전성에 도움이 되도록 출입관련 빌트인장비류의 SOP에 대하여 논하고자 한다.

Luncheon Seminar 2

동물실험 윤리위원회 심의 시스템과 사이버 보안

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동물실험 윤리위원회 IACUC(Institutional Animal Care & Use Committee)의 투명하고 신속한 심의를 위하여 온라인 심의시스템을 사용하는 기관이 늘고 있다. 인터넷이 가능한 환경에서는 시간과 장소를 가리지 않고 심의를 진행할 수 있다는 장점이 있다. 웹을 기반으로 한 다른 시스템과 마찬가지로 심의시스템도 사이버 보안에 많은 주의를 기울여야 한다. 첫 째, 랜섬웨어는 데이터를 암호화하고 금전을 요구하는 악성 소프트웨어로 심각한 위협이 될 수 있다. 둘 째, 개인정보 유출로 인한 메신저 피싱은 신뢰할 수 있는 출처를 가장하여 민감한 정보를 탈취하는 수법이다. 셋 째, AI 기술의 발전으로 챗봇 등의 AI 시스템이 새로운 보안 위협으로 나타나고 있습니다. 전반적인 사이버 보안에 관한 사항을 알아보고 정보를 인질로 잡아 금전을 요구하는 랜섬웨어와 개인정보 유출로 인한 메신저 피싱 사례도 살펴본 후 AI시대에 해커가 아닌 인공지능 등 챗봇 등의 위험에 관하여 알아보려 한다. 랜섬웨어를 방어하는 방법으로는 정기적인 데이터 백업의 실시, 시스템을 최신 상태로 유지, 보안 교육 실시 등이 있고, 메신저 피싱을 대비하는 방법은 알 수 없는 발신자의 첨부파일이나 링크를 클릭하지 않고, 메신저의 보안 설정을 강화해야 한다. AI 시스템을 탑재한 챗봇은 관계형성 과정을 통하여 인식을 조작할 수 있다는 점을 인지하고 평소와 다른 요구를 할 때 대응할 수 있는 엄격한 가이드라인이 필요하다.

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Symposium 4 (공모 2)

2025. 02. 06.(목) 13:00-14:40 / 오디토리움

Recent trends in Microbiom Studies

Organizer : 이동우 (연세대학교) / Chair : 이동우 (연세대학교), 이근욱 (한림대학교)

1	Understanding human microbiome ecosystem as a holobiont	김봉수	한림대학교
2	Bidirectional translational metabolomics: connecting metabolomic & gut-microbial activities to host phenotype	이도엽	서울대학교
3	Understanding the host-microbiota interaction using an EAE animal model	이윤경	순천향대학교
4	Microbial metabolites crossing the blood-brain barrier: a direct mediator of the gut-brain axis?	고아라	포항공과대학교

S4-1

Understanding human microbiome ecosystem as a holobiont

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The role of microbiome in human health is significant, and perturbation of microbiome can influence the immune system and host metabolism. The association between microbial members and disease has been reported, and a range of techniques have been used to validate the influence of microbes on host metabolisms and immune responses in several studies. However, there is a lack of comprehensive understanding regarding the intricate microbiome-host crosstalk with ecological interpretation. Association studies are insufficient for the development of microbiome therapy. Here, I briefly introduce the factors to consider in human microbiome studies to understand ecosystem as a holobiont. In addition, I introduce our recent human microbiome studies in some diseases. The gut microbiome in infants with atopic dermatitis varied according to feeding types, and the development of gut microbiome was disordered. The dysbiosis of the gut microbiome could interact with host cell metabolism and immune systems. The gut microbiome of CRE colonizers differed from that of non-CRE colonizers. The shift of the gut microbiome differed between early- and late-decolonizers. Non-antibiotic drugs also influence on the risk of CRE colonization.

Key words : Microbiome, Ecosystem, Holobiont, Atopic dermatitis, CRE

S4-2

Bidirectional translational metabolomics: connecting metabolomic & gut-microbial activities to host phenotype

Jeong Seok Yu[1], Jieun Choi[1], Byoung Kook Kim[2], Ki Tae Suk[3], Do Yup Lee[1]*

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Understanding how gut microbiota and their metabolites influence host phenotypes is essential for targeted therapeutic strategies. This study explores the interplay between gut microbiota-derived metabolites and host phenotypes using multi-omics approach. Metabolomic and microbial profiles were analyzed in both NAFLD mice and human stool samples. Probiotic supplementation with Lactobacillus lactis and Pediococcus pentosaceus restored metabolic homeostasis, including SCFAs, bile acids, and tryptophan metabolites, and improved markers of non-alcoholic fatty liver disease (NAFLD) in mouse model. A six-metabolite biomarker panel demonstrated high accuracy (AUC 0.922) in diagnosing NAFLD, underscoring the potential of metabolite-driven interventions to modulate the gut-liver axis and improve host health.

Key words : Metabolomme, Microbiome, Fatty liver disease

S4-3

Understanding the host-microbiota interaction using an EAE animal model

Yun Kyung Lee

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The mammalian gastrointestinal tract contains a diverse, but well-balanced population of beneficial and potentially pathogenic microbes to maintain the complex gut ecosystem within the host. Recent understanding from numerous studies indicates that our health is highly dependent on the composition of intestinal microbiota. It has been suggested that alterations in the community and composition of microbiota contribute to the pathogenesis of extra-intestinal disease. Multiple Sclerosis (MS) is a devastating autoimmune disease leading to progressive deterioration of neurological function. Despite significant clinical and scientific efforts expended over decades, findings have not been sufficient to elucidate how the dysregulated holobiome in the gut correlates with the development and/or severity of MS. Here, we investigate the role of microbiota during the induction of experimental autoimmune encephalomyelitis (EAE), an animal model for MS. We observed that EAE mice harboring one of the human isolates show attenuated EAE symptoms and display an altered gut ecosystem. Furthermore, we reveal that gut microbiota-derived metabolites from the changed gut ecosystem by this human isolates reduce host susceptibility to central nervous system (CNS) autoimmunity using integrated metagenomics and metabolomics analysis.

Key words : Multiple sclerosis, Microbiota, Metabolite, Metagenomics, Metabolomics

S4-4

Microbial metabolites crossing the blood-brain barrier: a direct mediator of the gut-brain axis?

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Emerging evidence indicates that interactions between the gut microbiota, diet, and the host contribute to the development of various diseases, including intestinal diseases, metabolic disorders, and neurological conditions. Many studies investigating the role of microbiota in different diseases have revealed associations between host phenotypes and microbiota composition. However, the identification of disease-specific microbial signatures across regions and ethnicities remains challenging due to significant geographical heterogeneities in microbial composition. Nevertheless, the gut microbiome has been found to be functionally similar, even in samples from diverse geographical regions and between human and mice. Moreover, accumulating data suggest that the microbiota may influence host phenotypes through the production of metabolites, which could play a significant role in disease development and treatment. These bioactive microbial metabolites, sensitive fingerprints of microbial function, can act as inter-kingdom signaling messengers by penetrating the liver through the portal vein and entering the host's blood circulation and multiple tissues. Therefore, investigating microbial metabolites that reflect disease-associated changes in microbial function holds promise in overcoming the limitations of current microbiome research.

In this talk, I will focus on the microbially produced metabolite imidazole propionate and its potential contribution to the pathogenesis of type 2 diabetes and drug responses. Additionally, I will discuss our recent work on microbial metabolites that penetrate into the brain, potentially affecting brain pathology such as dopaminergic neuronal loss, neuroinflammation, and motor impairment, features observed in Parkinson’s disease.

Key words : Microbiome, Microbial metabolite, Type 2 diabetes, Parkinson’s disease

KALAS

2025 한국실험동물학회 동계심포지엄

Symposium 5 (공모 3)

2025. 02. 06.(목) 13:00-14:40 / 평창홀

Health Impacts of Microplastics

Organizer : 이다용 (한국생명공학연구원)
Chair : 류충민 (한국생명공학연구원), 정진영 (한국생명공학연구원)

1	PET tracing of microplastics and assessment of biological toxicity	김진수	한국원자력의학원
2	Microplastics: an invisible danger to human brain health – neurological hazards of microplastic accumulation in the brain	최성균	대구경북과학기술원
3	Effects of microplastic on the animal nervous system	정의만	부산대학교
4	Biological effects of nanoplastics in CNS and metabolic system	이다용	한국생명공학연구원

S5-1

PET tracing of microplastics and assessment of biological toxicity

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The increasing global concern over microplastics (MPs) has prompted research into their environmental persistence, bioaccumulation, and potential toxicity. This study investigates the use of positron emission tomography (PET) to trace and evaluate the biodistribution and biological effects of microplastics in murine models, with an emphasis on polystyrene and polyethylene particles. In a series of experiments, 64Cu-labeled micro- and nano-polystyrene particles were tracked in vivo using PET imaging, allowing real-time visualization of particle distribution in tissues, including the lungs and liver. Comparative biodistribution analysis between micro- and nano-sized particles revealed size-dependent variations in tissue accumulation and retention, indicating differential biological responses. Additionally, microplastic polyethylene exposure was associated with significant inner ear dysfunction, as well as renal toxicity, confirmed through 99mTc-DMSA and 99mTc-DTPA imaging techniques, which identified renal dysfunction linked to microplastic accumulation. Further studies demonstrated that pre/post-natal exposure to microplastics may also be a potential risk factor for neurodevelopmental disorders such as autism spectrum disorder (ASD). This work underscores the utility of PET imaging as a powerful tool for studying the biodistribution of microplastics and highlights their potential adverse effects on human health, particularly in vulnerable populations. Overall, our findings contribute to a growing body of evidence that suggests MPs may pose a significant risk to biological systems, necessitating further investigation into their long-term health implications.

Key words : PET, Tracing, Microplastic

S5-2

Microplastics: an invisible danger to human brain health - neurological hazards of microplastic accumulation in the brain

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Microplastics are defined as small plastic particles measuring less than 5 mm in size. They are primarily generated through industrial processes or the breakdown of larger plastic products and can also originate from sources such as synthetic microfibers released during washing, exfoliating beads in cosmetics, and decomposing plastic waste. Once introduced into the environment, microplastics are often mistaken for food by marine organisms such as fish and shellfish, leading to accumulation in their digestive systems. This accumulation has been reported to impair reproductive functions and growth in marine species while adsorbing harmful substances like heavy metals, which can bioaccumulate in humans through the food chain. Recent studies have detected microplastics in human placenta and blood, suggesting their potential as hazardous agents capable of disrupting lipid metabolism, causing cell damage, triggering inflammatory responses, and disturbing endocrine systems. Although research on the effects of microplastics on the brain remains limited, this study aimed to investigate these effects. Mice were orally administered microplastics for seven days. Results indicated that microplastics could cross the blood-brain barrier (BBB) and accumulate in microglial cells, the macrophages of the brain. Such accumulation significantly increased neuroinflammation and cell death, demonstrating the potential of microplastics to act as neurotoxic agents. Additionally, the researchers simulated the effects of weathered microplastics, which are altered by natural factors such as sunlight and waves, and orally administered them to mice for seven days. Proteomic analysis revealed that compared to non-weathered microplastics, weathered microplastics caused a significant increase in neuroinflammation and neuronal apoptosis. These findings highlight the enhanced toxicity of weathered microplastics in the human body.

Lastly, the study examined how microplastics bound to serum proteins influence their entry into the brain. Microplastics conjugated with serum proteins exhibited enhanced phagocytosis and significantly upregulated the expression of proteins associated with brain lesions, exacerbating neuronal damage. These results collectively suggest that microplastic exposure, facilitated by interactions with serum proteins, poses a significant risk of crossing the BBB and causing damage to brain cells.

Key words : Polystyrene microplastics, Weathering plastics, Brain, Immune response, Proteomics

S5-3

Effects of microplastic on the animal nervous system

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Genetic factors play a significant role in the majority of neurodevelopmental disorders. In recent years, there has been a rapid increase in the number of patients diagnosed with neurodevelopmental disorders. However, this increase cannot be solely attributed to genetic factors. Therefore, the impact of environmental factors on brain development was examined using nanoplastics (NPs) and microplastics (MPs) that are commonly encountered in daily life. NPs and MPs were administered to mice during pregnancy to assess their effects on neurodevelopment. Our study revealed that both NPs and MPs impair neurodevelopment, resulting in abnormal behaviors in treated mice. These findings suggest that perinatal exposure to NPs and MPs disrupts neurodevelopment and behavior in mice.

Key words : Neurodevelopmental disorders, Nanoplastics, Microplastics, Neurodevelopment

S5-4

Biological effects of nanoplastics in CNS and metabolic system

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As global plastic production continues to grow, nano- and microplastics released from the vast quantities of plastic waste have become a critical environmental concern. These nano- and microplastic particles are found in a wide range of living organisms across diverse ecosystems. In this study, we investigated the biological effects of nanoplastics on central nervous system (CNS) development and metabolism using cultured primary cells and mice exposed to nanoplastic particles during developmental stages. Our findings demonstrate that maternal exposure to nanoplastics during gestation and lactation induced alterations in brain function and abnormal body weight gain in offspring. We show that the abnormal brain development resulting from exposure to high concentrations of nanoplastics leads to impairments in cognition and social interaction. Finally, we demonstrate that nanoplastic-induced weight gain is associated with changes in the lipid composition (lysophosphatidylcholine/phosphatidylcholine ratio) of maternal breast milk and alterations in the gut microbiota of the offspring. These data suggest that environmental nanoplastics may serve as risk factors for brain diseases and obesogenic effects in childhood.

Key words : Nanoplastic, Brain development, Neural stem cell, Cognitive deficit, overweight, Lipid metabolism

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2025 한국실험동물학회 동계심포지엄

Symposium 6

2025. 02. 06.(목) 10:00-11:40 / 오디토리움

실시간 생체 내 이미지 분석을 통한 생명현상 연구 및 인공지능 기반의 3D 분석 기술

Organizer / Chair : 서원효 (이화여자대학교)

1	Intravital confocal & two-photon microscopy for in vivo cellular-level imaging of live animal model	김필한	KAIST
2	Holotomography and artificial intelligence: label-free 3D imaging, classification, and inference of live cells, tissues, and organoids	박용근	KAIST
3	In vivo visualization of cellular dynamics in living animals	권형진	IVIM Technology
4	Utilizing advanced cardiac imaging techniques to assess cardiac function in mice 우수신진연구자	안수연	서울아산병원
5	Non-clinical safety assessment for mRNA vaccine in mouse model 우수신진연구자	안재훈	서울대학교병원

S6-1

Intravital confocal & two-photon microscopy for in vivo cellular-level imaging of live animal model

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Intravital microscopy is a cutting-edge imaging technique to visualize various in vivo cellular-level dynamics such as cell trafficking, cell-to-cell or cell-to-microenvironment interactions within live animal models. Intravital imaging of cellular dynamics in their native in vivo microenvironment can provide novel insights in human diseases that are challenging to obtain through conventional histological observation of ex vivo sample or in vitro culture system. Over the past decade, the intravital microscopy has become an indispensable tool across diverse biomedical fields, including immunology, neuroscience, developmental and tumor biology. Furthermore, intravital microscopy serves as a versatile platform for the development of novel therapeutics and diagnostics. It can facilitate the direct observation of in vivo drug delivery and efficacy at the cellular level, enabling the detailed pharmacokinetic and pharmacodynamic analysis of biopharmaceuticals, including antibodies, cell and gene therapy, nucleic acids, and exosome, within complex in vivo microenvironments.

This talk will introduce a real-time intravital two-photon and confocal microscopy system extensively optimized for cellular-level imaging of various internal organs in live animal models of human diseases. It can acquire a real-time, multi-color, sub-micron resolution, microscopic image in a live animal model with automatic motion compensation. Intravital imaging analysis of complex in vivo microenvironment comprising diverse types of cells such as stromal cells, immune cells, vascular cells and extracellular matrix in various organs will be briefly introduced. Subsequently, recent studies employing the real-time intravital imaging technique to investigate dynamic cellular pathophysiology in human disease models and to develop novel therapeutic strategies will be introduced.

Key words : Intravital microscopy, Two-photon microscopy, In vivo imaging, Cellular imaging, Molecular imaging

S6-2

Holotomography and artificial intelligence: label-free 3D imaging, classification, and inference of live cells, tissues, and organoids

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Holotomography (HT) is a powerful label-free imaging technique that enables high-resolution, three-dimensional quantitative phase imaging (QPI) of live cells and organoids through the use of refractive index (RI) distributions as intrinsic imaging contrast1-3. Similar to X-ray computed tomography, HT acquires multiple two-dimensional holograms of a sample at various illumination angles, from which a 3D RI distribution of the sample is reconstructed by inversely solving the wave equation.

By combining label-free and quantitative 3D imaging capabilities of HT with machine learning approaches, there is potential to provide synergistic capabilities in bioimaging and clinical diagnosis. In this presentation, we will discuss the potential benefits and challenges of combining QPI and artificial intelligence (AI) for various aspects of imaging and analysis, including segmentation, classification, and imaging inference3-6. We will also highlight recent advances in this field and provide insights on future research directions. Overall, the combination of QPI and AI holds great promise for advancing biomedical imaging and diagnostics.

Key words : Label-free imaging technique, Three-dimensional quantitative phase imaging, Advancing biomedical imaging

S6-3

In vivo visualization of cellular dynamics in living animals

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In vivo imaging refers to the ability to observe biological processes in living organisms, providing a dynamic view of cellular and molecular interactions in real time. But in conventional way, researchers relied on fixed samples, which limited the ability to study the natural behavior and changes of living cells and tissues. This limitation led to the development of in vivo imaging technologies, such as intravital microscopy for direct observation of biological phenomena in their native environments.

This technique allows us to observe cell trafficking and interactions between cells and their microenvironment in real time. It provides unparalleled insights into the dynamic pathophysiology of human diseases, which are often difficult to access through conventional histological methods or in vitro culture systems.

Our advanced intravital microscopy system captures real-time, multi-color, sub-micron resolution images featuring automatic motion compensation within live mouse models implanted with windows for long-term visualization. These capabilities allow for getting idea about disease development or mechanism and analyzing the effectiveness of new biopharmaceuticals—such as antibodies, cell therapies, gene therapies, nucleic acids, and exosomes—within the complex in vivo environment.

Intravital imaging can yield results like the clinical trials, so we can expect that it would become the most crucial experimental platform in animal research. This will enable more precise and ethical studies, allowing data from animal models to be more accurately translated to human physiological contexts.

Key words : Intravital imaging, In vivo imaging, Intravital microscope, In vivo visualization

S6-4

Utilizing advanced cardiac imaging techniques to assess cardiac function in mice

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Background : This study utilizes high-resolution cardiac magnetic resonance imaging (CMR) to explore cardiac mechanics in murine models, focusing on myocardial strain and functional assessments. CMR and cardiac strain analysis are critical for detecting subtle functional changes in the mouse heart, which are often early indicators of significant pathophysiological study.

Methods : The advanced 7-Tesla preclinical MRI system with a specialized cardiac volume RF coil was employed. The Fast Low Angle Shot (FLASH) sequence, enhanced by retrospective gating, was used to optimize spatial and temporal resolution. Isoflurane anesthesia was administered, and physiological parameters were continuously monitored. Various functional and strain parameters were calculated using dedicated CMR image analysis software.

Study Design : We conducted a baseline study with ten-week-old male C57BL/6 mice (n=12) that received four weekly intraperitoneal doses of 5mg/kg doxorubicin for 4 weeks, divided into two groups: those receiving DOX and those receiving normal saline.

Results : The imaging protocol captured cardiac phases, enabling comprehensive cine loop creation and myocardial strain analysis. This approach allowed for precise myocardial border delineation, left ventricle segmentation and real-time cardiac function evaluations. Enhanced image reconstruction techniques refined the visualization of cardiac structures and functional indices. Quantitative strain analysis provided insights into ventricular functions, detecting early signs of heart dysfunction.

Conclusion : The sophisticated CMR techniques employed in this study provided detailed visualizations and assessments of cardiac function in mice, capturing high-fidelity representations of cardiac dynamics. The advanced cardiac imaging techniques in preclinical research offers a potent tool for understanding cardiac pathophysiology and bridging preclinical findings with clinical applications.

Key words : In vivo imaging, Cardiac magnetic resonance imaging, Cardiac function assessment, Myocardial strain analysis

S6-5

Non-clinical safety assessment for mRNA vaccine in mouse model

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The SARS-CoV-2 pandemic led to the rapid authorization of mRNA vaccines for human use, which is termed emergency use authorization (EUA). This expedited approval was driven not only by the urgent nature of the pandemic but also by the lack of pre-clinical toxicity test guidelines for mRNA vaccines. Of note, SARS-CoV2 mRNA vaccine-induced side effects have been extensively reported in the clinical field. However, the potential toxicity of mRNA vaccines has not been fully identified. To identify the potential toxicity of the mRNA vaccine, we assessed the comprehensive toxic phenotype of mRNA vaccine-injected mice (A SARS-CoV2 mRNA vaccine candidate, intramuscular injection, mRNA dose 100 μg/head, twice with two weeks intervals) and we found that the mRNA vaccine induces reversible histopathological changes in bone marrow tissue at the acute phase. In particular, erythroid cells were significantly reduced by mRNA vaccine injection, which led to an increase in the Myeloid/Erythroid ratio (M/E ratio). Single-cell RNA sequencing of bone marrow total cells revealed significant changes in cell clusters and pivotal differentially expressed genes were identified between control and mRNA vaccine-injected mice. Our study suggests that the mRNA vaccine can cause toxicological changes in bone marrow tissue. These findings indicate that mRNA vaccine-induced bone marrow toxicity should be cautiously considered in the pre-clinical developmental process of mRNA vaccine.

Key words : mRNA vaccine, Non-clinical safety assessment, Animal model

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2025
한국실험동물학회
동계심포지엄

Symposium 7 (IACUC)

2025. 02. 06.(목) 16:00-17:40 / 평창홀

IACUC 심의 시 동물대체시험법 적용 사례를 어떻게 평가할 것인가?

Organizer : 석승혁 (서울대학교) / Chair : 홍정주 (한국생명공학연구원)

1	Advancing beyond animal testing: the global shift towards new approach methodologies	윤석주	안전성평가연구소
2	Reflection of alternative test principles onto 3R-focusing on immuntoxicological assessment	허용	대구가톨릭대학교
3	IACUC의 대체시험법에 대한 심의 기준 (IACUC review on the 3Rs alternatives literature searching of the Proposed animal protocol)	이귀향	(재)생명과학연구윤리서재
4	Achievements in the application of alternative testing methods through IACUC review	김상화	강원대학교

S7-1

Advancing beyond animal testing: the global shift towards new approach methodologies

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The global landscape of animal testing alternatives is being revolutionized through New Approach Methodologies (NAMs), regulatory changes, and technological advancements. NAMs, encompassing any non-animal-based approaches including in vitro, in silico, and computational methods, are becoming central to modern toxicology and safety assessment. The European Union has championed this transformation with its 2013 ban on cosmetic animal testing, while the United States' FDA Modernization Act 2.0(3.0) explicitly recognizes NAMs as valid alternatives for drug development and safety evaluation. South Korea has aligned with these global trends through K-REACH implementation and Cosmetics Act modifications, with the Korean Center for the Validation of Alternative Methods (KoCVAM) leading NAMs validation efforts.

The technological landscape of NAMs includes advanced in vitro systems such as three-dimensional human tissue models, organ-on-chip platforms, and microphysiological systems. These are complemented by in silico approaches, including artificial intelligence-driven predictive models and QSAR (Quantitative Structure-Activity Relationship) analyses. The integration of these methodologies creates more comprehensive and human-relevant testing strategies than traditional animal models.

International collaboration has become crucial in advancing NAMs, with organizations worldwide cooperating on validation studies and standardization efforts. The OECD guidelines and various international frameworks facilitate the global acceptance of these new methodologies. Future developments in NAMs will likely incorporate emerging technologies such as bioprinting and high-throughput screening systems, supported by artificial intelligence and big data analytics.

However, challenges remain in validating NAMs and securing regulatory acceptance across different jurisdictions. The field must balance scientific rigor with practical implementation considerations, including cost-effectiveness and training requirements. Despite these challenges, the continued evolution of NAMs represents a paradigm shift toward more ethical, efficient, and scientifically advanced approaches to safety assessment.

Key words : Alternative testing methods, Regulatory framework, NAMs, Validation, International harmonization

S7-2

Reflection of alternative test principles onto 3R-focusing on immuntoxicological assessment

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Immunotoxicity has been defined as the adverse effects of xenobiotics including occupational or environmental toxicants, and ingredients for food, drug, or cosmetics. Considering the complexity of immune system, evaluation of immunotoxicity has been carried out through in vivo approach using rodent laboratory animals. Following 3R (reduction, refinement, replacement) paradigm for laboratory animal experiments, a broad spectrum of alternative assay methods has been validated and adopted by international validation agencies. Considering alternative assay methods for immunotoxicity area, the Local Lymph Node Assay: 5-bromo-2-deoxyuridine flow cytometry method (LLNA:BrdU-FCM) was acknowledged as a test guideline for assessment of skin sensitization by OECD. Even though the LLNA:BrdU-FCM is an in vivo method, the assay method is considered as an 3R-based alternative method due to reduction in number of animals used, refinement through no adjuvant use and no challenge induction, and replacement of superior animal species. The IMMUNOTOX-T assay method, a recently developed in vitro method, may be a substantial example for complete replacement of in vivo immunotoxicity evaluation since the IMMUNOTOX-T uses human dendritic cell line, THP-1. The present presentation will introduce the association between 3R and alternative test method, and give an idea how 3R principles has been reflected into development of alternative assay methods for immunotoxicity evaluation.
[Supported by grant #2022R1A2C1091555, National Research Foundation of Korea, and the Ministry of Environment-Chemical hazards and risk educational training program].

Key words : Alternatives, 3R, Immunotoxicity, In vivo, In vitro

S7-3

IACUC review on the 3Rs alternatives literature searching of the Proposed animal protocol

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Scientists planning research involving animal use are required by international and/or national law to examine the possibilities for implementing Replacement, Reduction and Refinement (the Three Rs principles of Russell and Burch) in experiments for research, testing, and education. They must provide the methods and sources used to determine that alternatives were not available to their Institutional Animal Care and Use Committee (IACUC). Russell and Burch defined alternative procedures as the Three Rs: the Replacement of animals with non-animal models or species lower on the phylogenetic scale, the Reduction of the number of animals used, and/or the Refinement of techniques to reduce or eliminate unnecessary pain or distress to laboratory animals. The National Agricultural Library's Animal Welfare Information Center (AWIC) of the United States provides guidance on building and conducting a 3Rs (replacement, reduction, refinement of animal use) alternatives literature search. The objectives of this presentation are to provide a brief overview of the current practice of the literature search for Replacement, Reduction and Refinement alternatives by researchers and IACUCs and to propose the consideration of quality assessment and continued education for finding 3Rs alternatives to assist individuals working with animals in research, testing, and teaching. Promoting and protecting laboratory animals is one of the core competencies of investigators exploring the ethical conduct of research and sound science. Educating scientists and IACUCs is key to helping them embrace alternatives and showing them that helpful information is available, which is a good place to start.

Key words : 3Rs alternatives, Databases and searching engines, IACUC review, Literature searching, Quality assessment

S7-4

Achievements in the application of alternative testing methods through IACUC review

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Researchers conducting animal experiments are required to record the results of their search for the latest alternative methods in their animal experiment protocols, in accordance with Article 47 of the Animal Protection Act, which outlines the principles of animal experiments (3Rs). This includes specifying the keywords, databases, and searchdates used to gather information on alternative methods, as well as indicating whether methods exist to replace the planned animal experiments. The USDA and the EC provide detailed guidelines to help researchers conduct comprehensive searches for information. However, if researchers do not fully understand the purpose, concept, and definition of alternative methods or lack the ability to assess the validity of their search results, it can be challenging for them to properly draft protocols and navigate the review process smoothly.

In a study conducted by Johan Lindsjö et al. in 2012, which investigated the awareness and implementation of the 3Rs among animal welfare bodies at eight universities in Sweden, it was found that the application and realization of the "replacement" principle were the most challenging, and there was ongoing confusion regarding the conceptualization of this principle. If the purpose of drafting alternative methods is not merely to expose researchers to general information but to encourage them to adopt and apply these methods, it is essential to clearly define and share the concept of alternative methods. Additionally, providing researchers with practical and in-depth education is crucial, and IACUC must thoroughly review the content described in protocols to ensure its appropriateness.

Currently, IACUC reviews primarily focus on guiding researchers on search methods. However, beyond this, IACUCs need to possess the expertise to critically evaluate the academic and technical aspects of the search results provided by researchers and to offer consulting on experimental design. To effectively introduce and implement alternative methods, strengthening collaboration between researchers and IACUC is required. Systematic and well-structured support mechanisms are indispensable to achieving the comprehensive and consistent realization of the 3R principles in animal research.

Key words : Animal protection act, 3Rs principles, Alternative methods, IACUC (Institutional Animal Care and Use Committee), Experimental potocols

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2025 한국실험동물학회 동계심포지엄

Symposium 8

2025. 02. 07.(금) 09:30-11:10 / 오디토리움

인공지능(AI)과 혁신의 만남: 신약개발 패러다임의 대전환

Organizer : 오경진 (한국생명공학연구원) / Chair : 김선 (서울대학교)

1	Introduction to how deep learning is used for antibody design and structure prediction, and Protac linker design	김선	서울대학교
2	구조기반 리간드 가상검색 및 인실리코 약물발굴	신웅희	고려대학교
3	AI in drug discovery and development	신승우	대웅제약
4	Spatiotemporal cellular dynamics of germinal center reaction in COVID-19 lung draining lymph node based on imaging-based spatial transcriptomics 우수신진연구자	우영민	한국생명공학연구원

S8-1

Introduction to how deep learning is used for antibody design and structure prediction, and Protac linker design

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This talk is to survey and explain deep learning technologies relevant to antibody research and give recent examples of deep learning models for antibody structure prediction. The first part of my talk will explain basic concept on deep learning technologies to antibody research: embedding presentations, attention, transformer, diffusion techniques as well as pre-training, transfer learning, few shot learning. The second part of my talk will explain recent deep learning models for antibody structure prediction: IgFold (Nature Comm 2023), RFdiffusion (Nature 2023) and its extension to antibody design (BiRxiv) and bio-inspired antibody language model (BALM) (Briefings in Bioinformatics 2024). If time permits, I will share our recent works on antibody and Protac design briefly.

Key words : Deep learning, Antibody, Pre-training, Structure, Biological sequence

S8-2

구조기반 리간드 가상검색 및 인실리코 약물발굴

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Structure-based virtual screening (SBVS) has been a prominent method since the late 1990s. As the name suggests, the method necessitates the receptor structure. Protein-ligand docking is one of the widely used SBVS techniques, which provides predicted binding poses and affinities. However, the limitation of computing power means that many docking programs depend on distance-based scoring functions and static images of the receptor molecule, leading to certain weaknesses. 1) Failure to consistently perform receptor structural changes, 2) Low correlation with experimentally observed binding affinities, and 3) Inability to handle libraries containing millions of compounds.

Recent breakthroughs in deep learning within the bioinformatics field have also had a transformative impact on SBVS. The use of AlphaFold2 and its followers has led to more precise models of receptor structures. Learning from large compound databases has also enabled faster molecule screening. This presentation will introduce an AI-enhanced SBVS methodology, including ensemble screening with multi-state modeling, graph-based binding affinity prediction, and docking of millions of compounds. The three methods introduced demonstrated superior or comparable performance to the state-of-the-art methods, likely increasing the likelihood of identifying hit molecules in SBVS results.

Key words : Structure-based drug discovery, Virtual screening, AlphaFold2, Binding affinity prediction, Ultra-large scale

S8-3

AI in drug discovery and development

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In recent years, artificial intelligence (AI) has emerged as a transformative technology in drug discovery and development. By mimicking human cognitive functions such as understanding, reasoning, and perception, AI has significantly enhanced the efficiency, cost-effectiveness, and success rates of pharmaceutical research. Traditional drug development processes, which typically span 10 to 15 years with an average cost of $2.2 billion, are now being compressed into timelines as short as 2 years with expenditures reduced to $500 million through AI-driven methodologies.

This presentation explores the paradigm shift of drug discovery introduced by AI, focusing on its application across multiple stages of drug discovery. Key highlights include :

1. Virtual Screening: Virtual screening is a key step in the drug development process using AI. We introduce three concepts for virtual screening using AI.
   - AI-based Advanced Virtual Screening (DAIVS)
   - Generative AI in Drug Discovery
   - DAIFRG (AI based Fragment-Based Drug Discovery)
2. AI based Docking Simulation: Analyzes the binding mode of proteins and ligands. Applying AI models like DiffDock and DynamicBind for precise docking simulations and stability analyses between protein-ligand complexes.
3. Molecular Dynamics Simulations: Evaluates the stability between drug candidates and proteins.
4. ADME/T Predictions: AI-driven platforms for absorption, distribution, metabolism, excretion, and toxicity predictions significantly mitigate late-stage clinical trial failures, a persistent bottleneck in drug development.
5. Other new drug discovery using AI

   This integration of AI into drug discovery not only accelerates timelines and reduces costs but also expands the scope of chemical space exploration and precision medicine. With numerous success stories in both preclinical and clinical settings, AI-driven drug discovery stands poised to revolutionize the pharmaceutical landscape.

Key words : New drug discovery, AI, AI based virtual screening

S8-4

Spatiotemporal cellular dynamics of germinal center reaction in COVID-19 lung draining lymph node based on imaging-based spatial transcriptomics

YoungMin Woo[1,2], Taehwan Oh[1], Green Kim[1], Bon-Sang Koo[1,2], Seung Ho Baek[1], Eun-Ha Hwang[1], You Jung An[1], Yujin Kim[1], Dong-Yeon Kim[1], Jung Joo Hong[1,2]*

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Although lymph node structures may be compromised in severe SARS-CoV-2 infection, the extent and parameters of recovery in convalescing patients remain unclear. Therefore, this study aimed to elucidate the nuances of lymphoid structural recovery and their implications for immunological memory in non-human primates infected with SARS-CoV-2. To do so, we utilized imaging-based spatial transcriptomics to delineate immune cell composition and tissue architecture formation in the lung draining lymph nodes during primary infection, convalescence, and reinfection from COVID-19. We noted the establishment of a germinal center with memory B cell differentiation within lymphoid follicles during convalescence accompanied by contrasting transcriptome patterns indicative of the acquisition of follicular helper T cells versus the loss of regulatory T cells. Additionally, repopulation of germinal center-like B cells was observed in the medullary niche with accumulating plasma cells along with enhanced transcriptional expression of B cell activating factor receptor over the course of reinfection. The spatial transcriptome atlas produced herein enhances our understanding of germinal center formation with immune cell dynamics during COVID-19 convalescence and lymphoid structural recovery with transcriptome dynamics following reinfection. These findings have the potential to inform the optimization of vaccine strategies and the development of precise therapeutic interventions in the spatial context.

Key words : Germinal center (GC), Lymphoid structure, Spatial transcriptomics, Cellular dynamics, Non-human primate

KALAS

2025
한국실험동물학회
동계심포지엄

Symposium 9

2025. 02. 07.(금) 09:30-11:10 / 평창홀

General Understanding of Histopathology in Animal Model Study

Organizer : 김대용 (서울대학교), 최재훈 (한양대학교)
Chair : 김대용 (서울대학교), 이종권 (식품의약품안전평가원)

1	Overview of "quality control" in histopathology	김대용	서울대학교
2	Interpretation of background lesion in rodents	한범석	호서대학교
3	Mechanism-based histological characteristics of animal disease models and their applications in evaluating pharmaceutical effects	윤병일	강원대학교

S9-1

Overview of "quality control" in histopathology

Dae-Yong Kim

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For scientists who are planning animal study including histological examination, proper understanding of the slide making process is very important and critical enough to ruin the study itself. Slide making process is very complex and each step must rely on standard operating process. The process consists of tissue sampling, trimming, processing, embedding on paraffin wax and finally hematoxylin & eosin staining. I would like to give a general introduction to each step so scientists can make a satisfiable slide. Tissue sampling and trimming process should follow the stand operating process issued by Korea Food and Drug Administration. However, trimming can be modified based on clinical relevance of certain organs such as brain. Tissue should be sampled in appropriate size (less 1 cm in thickness) and stored in clean 10% phosphate-buffered formalin. Gentle handling during all processes is critical. Specialized items (such as sponge or wooden tongue) are also available. After necropsy, all major parenchymal organs should be collected. During necropsy, any organ with any suspicious abnormal gross appearance should be weight and photographed. I hope this general introduction helps your future research with histopathological interpretation.

Key words : Animal study, Histopathology, Necropsy, Quality control, Standard operating process

S9-2

Interpretation of background lesion in rodents

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Background data refers to the baseline data of the control group, including values such as body weight, organ weight, hematological and serum biochemical changes, and histopathological examinations. These data can be indicated by upper and lower limits for individual values. The importance of background data lies in the fact that the effects of a test substance are mainly determined by comparing the treatment group with the control group and checking for statistical significance. However, even if the statistical significance between treatment group and control group is found, if the values of the measured parameters fall within the normal range, it is interpreted as having no significant effect. Therefore, to interpret and evaluate toxicity test results, background data with normal ranges are crucial. This is particularly important in long-term toxicological studies, such as repeated toxicity studies of more than 3 months and carcinogenicity studies, where background data on naturally occurring lesions that produce independently of the test substance are essential for proper interpretation of the results. This study introduce and interpret background lesions occurring in rats, presenting age-related variations in the proliferative and nonproliferative lesions through cases of spontaenous lesions observed in toxicological and carcinogenicity studies conducted both domestically and internationally. The study will also provide a description of their morphological characteristics and analyze the lesions that differ across strain of rat.

Key words : Background lesions, Histopathology, Rodents, Control data

S9-3

Mechanism-based histological characteristics of animal disease models and their applications in evaluating pharmaceutical effects

Byung-Il Yoon

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To date, a variety of animal disease models have been developed, associated with infectious diseases, acute injury, regeneration, cancer, autoimmunity, and degenerative and chronic diseases. In particular, murine disease models of human conditions are considered valuable for evaluating the pharmaceutical effects of various compounds, where pathological investigations play a significant role. These murine models are typically developed based on the mechanisms through which diseases occur, the cause-effect relationships, or by using chemical treatments or transplantation. The progressive pathogenesis of diseases eventually leads to morphological changes in target organs. Pathology-based evaluations of the pharmaceutical effects of compounds in animal disease models include both semiquantitative and quantitative assessments of cellular and histological changes by grading disease-related alterations in organs. In this presentation, several animal disease models are introduced to explain how morphological changes arise from disease mechanisms and how pathologists establish criteria for pathological evaluations of pharmaceutical effects in studies using animal disease models. The examples included will feature murine models of intestinal inflammation, liver diseases, pulmonary fibrosis, Wilson disease, neurofibromatosis type 2, and tumor transplantation.

Key words : Animal disease model, Intestinal inflammation, Liver diseases, Pulmonary fibrosis, Wilson disease

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Special Lecture

2025. 02. 07.(금) 11:30-12:30 / 오디토리움

Organizer / Chair : 이근욱 (한림대학교)

실험실의 두 인류, 교수와 MZ

최훈 (한림대학교)

Special Lecture

실험실의 두 인류, 교수와 MZ

Hoon Choi

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They appeared. A new kind of group that is difficult to understand. People named them the MZ generation. There have always been differences between generations, and the existing generations have always distinguished themselves from the new generation by calling them the new human race. However, the social change brought about by the MZ generation is so great and strong that it can be called a social phenomenon. And the aftermath of this is no exception to the university laboratory. In this lecture, I will analyze the psychological differences between generations in the Korean research environment in depth and explore the aspects of conflict and cooperation. The differences in psychological characteristics and behavior between the MZ generation and the older generation of professors will be examined, and the psychological causes of the conflicts caused by these differences will be analyzed based on the theory of expectation mismatch (Higgins, 1987) and the study of generational differences (Twenge et al., 2017). Furthermore, the possibility of intergenerational cooperation is explored using psychological approaches such as nonviolent communication (Rosenberg, 2003) and situational leadership model (Hersey & Blanchard, 1988). In conclusion, we propose ways to build healthy relationships and improve performance in the laboratory through improved mutual understanding and communication, and explore practical ways to design a laboratory model for intergenerational coexistence.

Key words : Generation differences, Expectation mismatch, MZ generation

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2025
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동계심포지엄

Symposium 10

2025. 02. 07.(금) 14:30-16:10 / 오디토리움

A novel insight into neuronal interactions with peripheral organs

Organizer / Chair : 이찬희 (한림대학교)

1	Hypothalamic regulation of skeletal muscle	김민선	서울아산병원
2	GnRH signaling in aging and stress physiology	김민수	KIST
3	Cross-species insights into brain control of eating and obesity: from mice to monkeys to humans	최형진	서울대학교
4	Development of a non-human primate Parkinson's disease model induced by Lewy body pathology 우수신진연구자	서진철	한국생명공학연구원

S10-1

Hypothalamic regulation of skeletal muscle

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Nicotinamide adenine dinucleotide (NAD+) is a critical coenzyme in various enzymatic reactions, and its depletion is closely related to aging. In mammalian cells, NAD+ biosynthesis largely relies on nicotinamide phosphoribosyl transferase (Nampt) activity. As NAD+ levels are known to decrease in the hypothalamus during the aging process, we tested the metabolic impact of NAD+ depletion in hypothalamic neurons. For this purpose, we generated hypothalamic AgRP neuron-specific Nampt knockout (NamptΔAgRP) mice. We found that NamptΔAgRP mice exhibited lower lean mass but unaltered fat mass compared to wild-type controls. These mice also displayed reduced muscle mass as well as reduced motor activity in treadmill and grip strength tests due to disrupted neuromuscular junctions. Using anterograde and retrograde viral tracing technology, we confirmed a single-synapse neuronal connection from AgRP neurons to spinal α -motor neurons. We also a significant reduction in AgRP axonal innervation to spinal α-motor neurons in NamptΔAgRP mice and normal aged mice. Our findings reveal that hypothalamic AgRP neurons critically affect skeletal muscle mass and function by regulating spinal motor neurons. Our study also provides evidence that reduced NAD+ levels in hypothalamic AgRP neurons may be a key underlying mechanism of aging-related sarcopenia.

Key words : Muscle, Hypothalamus, Ageing, Sarcopenia

S10-2

GnRH signaling in aging and stress physiology

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Gonadotropin-releasing hormone (GnRH) has a role in hypothalamic control of depression, but the underlying patterns and relationship with downstream reproductive hormones are still unclear. Here we report that hypothalamic GnRH pulse frequency and irregularity increase before GnRH pulse amplitude slowly decreases during social defeated stress models (SDS). While mice castrated and testosterone inhibited induced depression by conducting SDS, these mice led to anti-depression effects and affected by GnRH signaling, indicating that high-frequency GnRH pulses. Reprogramming the endogenous GnRH pulses of depressed male mice via an optogenetic approach revealed that increasing GnRH pulses frequency causes depression acceleration, while lowering the frequency of and stabilizing GnRH pulses can slow down depression. In conclusion, GnRH pulses are important for depression in male mice.

Key words : GnRH, Depression, Corticosterone, Hypothalamus

S10-3

Cross-species insights into brain control of eating and obesity: from mice to monkeys to humans

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Behavior is the core component that separates animals from other organisms. Through natural selection and evolution, animals have evolved to perform various behaviors to optimize survival (e.g., eating) and reproduction (e.g., mating). To orchestrate these complex behaviors optimally, multiple psychological components have evolved in advanced animals. Need, motivation, pleasure, and prediction for food are the distinct neural components that orchestrate eating to optimize survival. I will present my theoretical perspectives on why and how these multiple components are required and act to control eating. By studying mice, monkeys, and humans, I will present our experimental results that discovered each neural component that encodes need, motivation, pleasure, and prediction. Arcuate hypothalamus and lateral hypothalamus (AgRP, LH LepR) neurons encode the need and the motivation for food. Nucleus accumbens NPY neurons encode the pleasure of food. Dorsomedial hypothalamus GLP-1R neurons encode the prediction for food. These theoretical and experimental presentations will provide a comprehensive understanding of neural control of eating.

Key words : Eating, Hypothalamus, Neuron, Need, Motivation

S10-4

Development of a non-human primate Parkinson's disease model induced by Lewy body pathology

Jincheol Seo[1], Thi Hai Thanh Nguyen[1,2], Jinyoung Won[1], Chang-Yeop Jeon[1], Junghyung Park[1], Jiyeon Cho[1], Yu Gyeong Kim[1,2], Young-Ho Lee[3], Kyung Seob Lim[4], Youngjeon Lee[1,2]*

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Parkinson's disease (PD) is characterized by the accumulation of alpha-synuclein (αSN) proteins, leading to the formation of Lewy bodies. This study aimed to develop a non-human primate (NHP) model of PD induced by Lewy body pathology through the bilateral injection of αSN amyloid fibrils into the striatum. A rhesus monkey received bilateral injections of αSN amyloid fibrils into the putamen. Three months post-injection, the monkey's brain was examined using histological analysis. Histological analysis revealed the presence of αSN inclusions, changes in dopaminergic neurons, and glial activation in the striatum and substantia nigra, confirming the induction of Lewy body-like pathology. Furthermore, the spread of αSN inclusions was observed in the gray matter throughout the brain, indicating the progressive nature of PD pathology. The bilateral striatal injection of αSN amyloid fibrils effectively induced Lewy body pathology and PD-like symptoms in the NHP model. This pilot study demonstrates the feasibility of using αSN amyloid fibrils to create a PD model that closely mimics human disease, providing a valuable platform for studying disease mechanisms and testing new therapeutics.

Key words : Parkinson's disease, Non-human primate, Alpha-synuclein, Lewy body

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Symposium 11 (실험동물기술원 교육강연 II)

2025. 02. 07.(금) 14:30-16:10 / 평창홀

실험동물의 생체 내 영상

Organizer / Chair : 나이랑 (서울대학교병원)

1	In vivo imaging using IVIS: principles and applications (IVIS를 이용한 생체내 영상)	김민영	(주)바이오톡스텍
2	Application of radiologic techniques for preclinical experiments	이승현	서울대학교병원
3	Use of positron emission tomography in laboratory animal research	백승호	한국생명공학연구원

S11-1

In vivo imaging using IVIS: principles and applications

Min-young Kim, Sukmo Kang*

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In vivo imaging is an essential technique in preclinical research, enabling non-invasive monitoring and visualization of biological processes in living organisms. This presentation provides a comprehensive overview of in vivo imaging, beginning with the fundamental principles of fluorescence and luminescence imaging. The discussion introduces critical concepts such as the bioimaging window, a spectral range that minimizes tissue absorption and scattering, and autofluorescence, a common challenge in achieving high signal-to-noise ratios.

The session also addresses the methods for labeling test substances, emphasizing the selection of appropriate dyes and bioconjugation techniques to enhance imaging specificity and stability. Additionally, key steps in animal preparation, including species selection, hair removal, and the use of anesthesia, are outlined to ensure accurate and reproducible imaging outcomes.

A detailed explanation of device operation and data interpretation follows, highlighting techniques to optimize measurements and derive meaningful insights. Furthermore, examples of in vivo imaging applications, such as evaluating therapeutic efficacy, assessing cellular distributio and analyzing mRNA distribution, will also be introduced.

Key words : In vivo imaging, IVIS, Bioimaging, Bioconjugation, Biodistribution

S11-2

Application of radiologic techniques for preclinical experiments

Seunghyun Lee

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Preclinical translational research employing radiology offers the distinct advantage of enabling the objective assessment of emerging diagnostic or therapeutic agents and devices utilizing state-of-the-art equipment. In contrast to conventional radiology devices primarily capable of capturing static images, recent advancements have empowered radiology to replicate biological microenvironments via sophisticated imaging tools and contrast agents, explicitly focusing on the microenvironment within or surrounding tumors. This evolution positions radiology as an invaluable tool for formulating diagnostic and treatment strategies. Cutting-edge diagnostic modalities, encompassing multiparametric contrast-enhanced ultrasound augmented by microbubble contrast agents and diffusion/dynamic perfusion MRI, are instrumental in assessing in vivo microenvironments. These advanced techniques offer substantial assistance in clinical evaluation. Notably, the field is witnessing active research in theranostics, which involves concurrent diagnosis and treatment by incorporating anti-cancer drugs within micro/nanobubbles, such as ultrasound contrast agents.

To fully harness the potential of these cutting-edge medical imaging devices, it is imperative to foster collaborative relationships between researchers across various disciplines, thereby amalgamating radiological methodologies and the assessment of novel diagnostic and therapeutic tools. This interdisciplinary approach promises significant contributions to academic progress. Consequently, this lecture aims to impart fundamental knowledge regarding diverse biological tissue imaging methods using contemporary imaging techniques alongside insights from translational research, as seen through the lens of radiologists employing these techniques.

Key words : Radiology, Microenvironment, Translational research, Contrast agent, Interdisciplinary

S11-3

Use of positron emission tomography in laboratory animal research

Seung Ho Baek

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This presentation discusses the importance and applications of Positron Emission Tomography (PET) imaging in laboratory animal research. Initially, it introduces the fundamental principles of radionuclides and PET imaging, explaining how PET imaging is used to track the characteristics and in vivo pathways of radionuclides. It then explores the role of PET imaging in animal models, along with the scientific achievements and benefits derived from it. Representative research examples of PET imaging applications in laboratory animals include primate brain imaging for Parkinson's and Alzheimer's diseases, pulmonary inflammation imaging, and the use of PET as a platform for nanoparticle tracking and drug evaluation. Finally, the presentation emphasizes essential radiation safety regulations and guidelines within the PET imaging process, offering insights on how researchers can utilize this technology safely and effectively. This presentation aims to demonstrate the advancements in laboratory animal research through innovative PET imaging applications, emphasizing the importance of safety protocols to promote active research.

Key words : PET imaging, Laboratory animal, Radioisotope

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실험동물연구장학생 포스터 발표

2025. 02. 06.(목) 14:40-15:40 / 평창 알펜시아 컨벤션센터 2F

PS-R-01 (해부생리)	박은서 (부산대학교)
PS-R-02 (미생물)	이지헌 (건국대학교)
PS-R-03 (독성병리)	전동훈 (연세대학교)
PS-R-04 (독성병리)	Ke Huang(황커) (경북대학교)
PS-R-05 (독성병리)	박강현 (경북대학교)
PS-R-06 (해부생리)	엄찬양 (연세대학교)
PS-R-07 (독성병리)	이주영 (충북대학교)
PS-R-08 (유전자질환모델)	강기수 (서울대학교)

실험동물연구장학생 포스터 발표 안내

1. 포스터 발표 안내

발표 시간	2월 6일(목) 14:40-15:40	
발표 장소	평창 알펜시아 컨벤션센터 2F	
포스터 번호	PS-R-01 (해부생리) PS-R-02 (미생물) PS-R-03 (독성병리) PS-R-04 (독성병리)	PS-R-05 (독성병리) PS-R-06 (해부생리) PS-R-07 (독성병리) PS-R-08 (유전자질환모델)
합계	총 8개	
부착 시간	2월 6일(목) 09:00-12:00	
철거 시간	2월 7일(금) 16:20-17:00	

※ 포스터 전시는 학술대회 기간인 2월 6일(목) ~ 7일(금) 이틀간 진행됩니다.
※ 부착은 2월 6일(목) 부착 시간 내에 반드시 진행하여야 하며, 미부착 시 제재가 주어집니다.
※ 철거는 2월 7일(금) 16시 20분 이후부터만 가능하며, 반드시 17시까지 철거해 주시기 바랍니다.
철거하지 않은 포스터는 학회에서 보관하지 않고, 임의로 철거한 후 폐기합니다.

2. 포스터 발표 시상

- 포스터 발표 : 포스터 발표는 좌장의 진행에 따라 포스터당 7분(5분 발표, 2분 질의응답)으로 진행되며, 발표 시간에 포스터 앞에 대기하여 주시기 바랍니다.
- 실험동물연구장학생 시상 : 2월 6일(목) 17:40-20:00, 1F 오디토리움 / 총회 및 환영만찬
- 실험동물연구장학생 발표자는 총회 및 환영만찬에서 진행하는 시상식에 반드시 참석해야 합니다. (대리 수상 불가)
- 미부착 포스터 : 포스터 보드에 2회 이상(개수로 적용) 미부착 시, 교신저자(연구책임자)에게 향후 1년간 포스터 제출 불가의 제재가 주어집니다.

3. 포스터 작성 안내

- 포스터 보드의 크기는 95cm(가로) X 210cm(세로)이며, 특히 제목이 가로 너비를 초과하지 않도록 준비하여야 합니다.
- 모든 포스터는 지정된 날짜, 기간 동안에 지정된 보드에 부착하여야 합니다.
- 포스터 내용은 abstract, purpose, results(figures and tables), conclusions, references의 순서로 작성합니다.
- 전방 2m 위치에서 쉽게 읽을 수 있도록 굵고 명확한 글씨체를 이용하여 제작합니다.
- 모든 포스터의 부착 및 철거는 당일 지정된 시간에 발표자가 수행해주시기 바랍니다.

실험동물연구장학생 Poster

포스터 번호	제목	발표자
PS-R-01	Protective effects of Microsorum membranaceum (D. Don) Ching on dexamethasone-induced sarcopenia by regulating of protein degradation and synthesis pathways in C2C12 cells and C57BL/6 mice	Eun Seo Park
PS-R-02	Elimination of olfactory sensory neurons by zinc sulfate inoculation prevents SARS-CoV-2 infection of the brain in K18-hACE2 transgenic mice	Ji-Hun Lee
PS-R-03	Cleavage of IL-33 by mast cell protease deteriorates DMP-777-induced oxyntic atrophy leading to pyloric metaplasia.	Donghun Jeon
PS-R-04	Imatinib inhibits oral squamous cell carcinoma by suppressing the PI3K/AKT/mTOR signaling pathway	Ke Huang
PS-R-05	Silibinin alleviates small intestine damage induced by aerosol inhalation of ammonium sulfate and ammonium nitrate	Kanghyun Park
PS-R-06	Comparison of structural characteristics and molecular markers of rabbit skin, pig skin, and reconstructed human epidermis for an ex vivo human skin model	Chanyang Uhm
PS-R-07	BVN008, Diphtheria-tetanus-acellular pertussis combined vaccine has no effects on fertility and prenatal and postnatal developmental toxicity in female Sprague-Dawley rats	Joo-Young Lee
PS-R-08	Adipose-tissue macrophages expressing uncoupling protein 1 produce heat to facilitate lipolysis of the adipocytes	Gi-Sue Kang

PS-R-01

Protective effects of Microsorum membranaceum (D. Don) Ching on dexamethasone-induced sarcopenia by regulating of protein degradation and synthesis pathways in C2C12 cells and C57BL/6 mice

Eun Seo Park[1], Ji Eun Kim[1], Hee Jin Song[1], Ayun Seol[1], Tae Ryeol Kim[1], Ki Ho Park[1], Su Jeong Lim[1], Su Ha Wang[1], So Hae Park[1], Thet Thet Mar Win[2], Su Su Hlaing[3], Dae Youn Hwang[1]*

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Microsorum membranaceum (D. Don) Ching have excellent potential as a treatment for sarcopenia as one of muscle atrophy due to high antioxidant activity. To investigate the protective mechanism of *M. membranaceum* on the sarcopenia, alterations on the key parameters for sarcopenia phenotypes were analyzed in dexamethasone (Dex)-induced C2C12 cells and C57BL/6 mice after treatment of methanol extract of *M. membranaceum* (MEM). Fifteen active components were identified and high scavenging activity against 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2′-azino-bis-(3-ethylbenzothiazoline-6-sulfonic) acid (ABTS) radicals were detected in MEM. In pathway of protein degradation, MEM significantly suppressed the production of intracellular reactive oxygen species (ROS), transcription of muscle RING-finger protein 1(MuRF1) and muscle atrophy F-box protein-1 (Atrogin-1), and expression of microtubule-associated protein 1 light chain 3 beta (LC3B) and Beclin-1 in Dex+MEM treated C2C12 cells with dose-dependent manner. In pathway of protein synthesis, MEM treatment induced the phosphorylation of phosphatidylinositol 3-kinase (PI3K), protein kinase B (Akt) and mammalian target of rapamycin (mTOR) in Dex-induced sarcopenia of C2C12 cells. Also, these effects were successfully reflected in the increase of myotube diameter in Dex+MEM treated C2C12 cells. Furthermore, the anti-sarcopenia effects of MEM in C2C12 cells were verified in C57BL/6 model with Dex-induced sarcopenia. Significant recoveries effects on the muscle weight and function, and section area of calf muscle were detected in Dex+MEM treated C57BL/6 mice. Therefore, these results suggest that the MEM can protect the sarcopenia as one of muscle atrophy in Dex treated C57BL/6 mice through targeting protein degradation and synthesis pathway.

***Corresponding author :** Dae Youn Hwang

***Keywords :** Microsorum membranaceum, Sacorpenia, Protein metabolism, Antioxidant activity, Muscle function

PS-R-02

Elimination of olfactory sensory neurons by zinc sulfate inoculation prevents SARS-CoV-2 infection of the brain in K18-hACE2 transgenic mice

Ji-Hun Lee[1], Eun-Seon Yoo[1], Na-Won Kim[1], Won-Yong Shim[1], Han-Bi Jeong[1], Dong-Hyun Kim[1], Young-Jun Park[1], Sun-Min Seo[1], Yang-Kyu Choi[1]*

[1]Department of Laboratory Animal Medicine, College of Veterinary Medicine, Konkuk University, Seoul, Republic of Korea

Coronavirus disease-2019 (COVID-19), attributed to the severe acute respiratory syndrome-related coronavirus-2 (SARS-CoV-2), has posed global health challenges since it first emerged in 2019, and its impact continues to persist. The neurotropic nature of SARS-CoV-2 has been associated with long-term damage due to central nervous system infection. Unfortunately, a considerable portion of its neuropathology remains undisclosed, though researchers are proposing hypotheses on how the virus is transmitted to the central nervous system. One of the prevailing hypotheses is that SARS-CoV-2 travels through the olfactory nerve via the olfactory epithelium (OE). Using a K18-human angiotensin converting-enzyme 2 (hACE2) transgenic mouse model with impaired olfactory sensory neurons (OSNs) induced by zinc sulfate, we examined the role of the olfactory nerve in the brain invasion by SARS-CoV-2. Mice lacking OSNs exhibited reduced levels of viral transmission to the brain, leading to significantly improved outcomes following SARS-CoV-2 infection. Moreover, a positive correlation was observed between viral persistence in the OE and brain infection. These results indicate that early inhibition of the olfactory nerve pathway effectively prevents viral invasion of the brain, confirming the olfactory route of SARS-CoV-2. Furthermore, our study underscores the significance of the olfactory nerve pathway in the transmission of SARS-CoV-2 to the brain.

***Corresponding author :** Yang-Kyu Choi

***Keywords :** SARS-CoV-2, K18-hACE2 transgenic mice, Olfactory sensory neurons, Neuroinvasion, Zinc sulfate

PS-R-03

Cleavage of IL-33 by mast cell protease deteriorates DMP-777-induced oxyntic atrophy leading to pyloric metaplasia

Donghun Jeon[1], Hangdeung Jeong[1], Sung Hee Kim[1], Yura Lee[1], Donghwan Park[1], Jiseon Kim[1], Chanyang Uhm[1], Hee Ju Oh[1], Kyungrae Cho[1], Seongyu Choi[1], Yejin Cho[1], Ki Taek Nam[1]*

[1]Department of Biomedical Sciences, Brain Korea 21 PLUS Project for Medical Science, Yonsei University College of Medicine, Seoul, Republic of Korea

Mast cells play critical roles in gastrointestinal diseases like inflammatory bowel disease, chronic gastritis, and gastric cancer. Interestingly, a recent study has shown that mast-cell-specific serine proteases can activate IL-33 by cleaving its central domain, enhancing its ability to stimulate type 2 immune responses under the allergic inflammatory condition. IL-33 promotes metaplasia development by regulating macrophage M2 polarization. While mast cells are linked to gastric cancer progression, their role in early stages, such as metaplasia, remains unclear. This study investigates their contribution to metaplasia development using a mast cell knockout mouse model.
We utilized Cpa3$^{cre/+}$ mast cell KO mice, a model with an intact immune system, unlike other mast cell-deficient models carrying Kit mutations. These mice displayed no histological differences in the stomach compared to wild-type (WT) mice under normal conditions. To induce acute stomach injury, WT and Cpa3$^{cre/+}$ mice were treated with DMP-777 (350 mg/kg) via oral gavage for 1, 3, 7, or 14 consecutive days. The stomachs were isolated 24 hours after the final treatment.
Cpa3$^{cre/+}$ mice developed significantly milder lesions and parietal cell loss compared to WT mice, with a notable absence of systemic inflammation. Immunohistochemistry showed reduced infiltration of innate immune cells, including dendritic cells and macrophages, in the stomachs of Cpa3$^{cre/+}$ mice. Unlike WT mice, Cpa3$^{Cre/+}$ mice exhibited dramatically lower expression of Th2 cytokines including IL-4 and IL-13 and decreased levels of mast cell tryptase and cleaved IL-33. Consequently, the number of CD44 positive spasmolytic polypeptide-expressing metaplasia (SPEM) cells and CD163 positive M2 macrophages was significantly reduced in Cpa3cre/+ mice.
These findings demonstrate that mast cells are crucial in driving M2 macrophage polarization and IL-33 activation, highlighting their pivotal role in the development of early gastric metaplasia.

***Corresponding author :** Ki Taek Nam

***Keywords :** Mast cells, IL-33, DMP-777, Metaplasia

PS-R-04

Imatinib inhibits oral squamous cell carcinoma by suppressing the PI3K/AKT/mTOR signaling pathway

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Oral squamous cell carcinoma (OSCC) is a prevalent oral and maxillofacial cancer with high mortality as OSCC cells readily invade tissues and metastasize to cervical lymph nodes. Although imatinib exhibits potential anticancer and remarkable clinical activities that therapeutically affect several cancer types, its specific impact on OSCC has yet to be fully explored. Therefore, this study investigated the potential anticancer effect of imatinib on OSCC cells and the underlying mechanisms. The Cell Counting Kit-8 was used to determine the impact of imatinib on cell viability. Then, morphological cell proliferation analysis was conducted to examine how imatinib impacted OSCC cell growth. Moreover, OSCC cell migration was determined through wound-healing assays, and colony formation abilities were investigated through the soft agar assay. Lastly, the effect of imatinib on OSCC cell apoptosis was verified with flow cytometry, and its inhibitory mechanism was confirmed through Western blot. Our results demonstrate that imatinib effectively inhibited OSCC cell proliferation and significantly curtailed OSCC cell viability in a time- and concentration-dependent manner. Furthermore, imatinib suppressed migration and colony formation while promoting OSCC cell apoptosis by enhancing p53, Bax, and PARP expression levels and reducing Bcl-2 expression. Imatinib also inhibited the PI3K/AKT/mTOR signaling pathway and induced OSCC cell apoptosis, demonstrating the potential of imatinib as a treatment for oral cancer.

***Corresponding author :** Myoung Ok Kim

***Keywords :** Imatinib, Oral squamous cell carcinoma, Proliferation, PI3K/AKT/mTOR signaling pathway

PS-R-05

Silibinin alleviates small intestine damage induced by aerosol inhalation of ammonium sulfate and ammonium nitrate

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Particulate matter (PM), which is composed of extremely small molecules, is produced by industrialization and urbanization; from an environmental perspective, it is the most serious pollution of air pollution. Although several studies have investigated the side effects of PM in various organs, the aggravating factors of PM among numerous components are studied poorly. The major constituents of PM are $(NH_4)_2SO_4$ and artificially occurring NH_4NO_3, accounting for 50% of PM. Silibinin, a flavonoid compound extracted from milk thistle, has not been reported about therapeutic effects on PM-induced damage to the small intestine. Therefore, this study aimed to find out the toxicity of $(NH_4)_2SO_4$ and NH_4NO_3 by aerosol inhalation in mice and investigate the ameliorating effects of silibinin in the small intestine. In our study, the concentration of $(NH_4)_2SO_4$ and NH_4NO_3 studied was equal to the concentration of $(NH_4)_2SO_4$ and NH_4NO_3 of the Seoul atmosphere. Exposure of $(NH_4)_2SO_4$ and NH_4NO_3 by aerosol inhalation to mice increased the expression of pro-inflammatory cytokines and oxidative stress. The villus length was shortened and the distance between villi was widened with morphological changes in small intestine tissue. In addition, the tight junction of small intestine was collapsed by ammonium exposure. However, silibinin reduced the inflammatory mediator expression, oxidative stress, and tight junction injury. Overall, our results show that silibinin protected the small intestine against $(NH_4)_2SO_4$- and NH_4NO_3-induced inflammatory responses, oxidative stress, and tight junction injury through PI3K/AKT pathway.

Corresponding author : Myoung Ok Kim

Keywords : Air pollution, Ammonium, Silibinin, Small intestine, Particulate matter

PS-R-06

Comparison of structural characteristics and molecular markers of rabbit skin, pig skin, and reconstructed human epidermis for an ex vivo human skin model

Chanyang Uhm[1], Haengdueng Jeong[1], Sung Hee Kim[1], Yejin Cho[1], Mina Lee[1], Yura Lee[1], Jiseon Kim[1], Donghun Jeon[1], Heeju Oh[1], Kyung Rae Cho[1], Seongyu Choi[1], Ki Taek Nam[1]*

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The Organization for Economic Co-operation and Development (OECD) has approved the use of reconstructed human epidermis (RHE) models for in vitro skin irritation and corrosion tests as an alternative to animal testing in cosmetics. This step aligns with the European Union's ban on animal testing for cosmetics, which has been in effect since 2013. Despite their potential, RHE models have several notable limitations. These include high manufacturing costs, a relatively loose skin barrier, and the inability to fully simulate all cellular and non-cellular components of the human epidermis. As a result, there is a pressing need for the development of new, more accurate alternative skin models. In our study, we evaluated the structural similarities between the epidermis of pig skin, rabbit skin, a commercial RHE model (Keraskin), and human skin. We compared the thickness of each epidermal layer using specific molecular markers to assess structural similarity. Among the human skin surrogates analyzed, pig skin showed the closest resemblance to human skin in terms of epidermal thickness. In contrast, Keraskin exhibited thicker cornified and granular layers, while rabbit skin had thinner layers. Additionally, the proliferation indices of Keraskin and rabbit skin were higher than those observed in human skin. Based on these findings, we propose ex vivo pig skin as the most suitable model for skin irritation testing due to its close structural similarity to human skin.

Corresponding author : Ki Taek Nam

Keywords : Epidermis, Ex vivo skin, Reconstructed human epidermis, Skin irritation testing, Porcine

PS-R-07

BVN008, Diphtheria-tetanus-acellular pertussis combined vaccine has no effects on fertility and prenatal and postnatal developmental toxicity in female Sprague-Dawley rats

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Tdap is an acronym for tetanus(T), diphtheria(D), and acellular pertussis(aP), and is a preventive vaccine that combines vaccines against three diseases. BVN008 is a Tdap vaccine designed to protect against three diseases: diphtheria, tetanus, and pertussis. The lower-case “d” and “p” in Td and Tdap means these vaccines use smaller amounts of diphtheria and whooping cough. The lower doses are appropriate for adolescents and adults. The purpose of this study was to identify adverse effects in pregnant or lactating female Sprague-Dawley rats including maternal fertility and toxicity, and development of the embryos, fetus, and pups following intramuscular administration of BVN008. Two groups of 50 female Sprague-Dawley rats were administered four or five intramuscular injections of the vaccine (human dose of 0.5 mL at 4 and 2 weeks before pairing, on gestation day (GD) 8 and 15, and lactation day (LD) 7. A negative control group was administered 0.9% saline at the same dose four or five times. There were no adverse effects on fertility, reproductive performance, or maternal toxicity of the F0 females. There was no effect of developmental toxicity in F1 fetuses and pups including fetal body weight and morphology, postnatal growth, development, and behavior until weaning. Antibodies against tetanus, diphtheria, and pertussis were transferred to the F1 fetuses and F1 pups via placenta and milk. These results demonstrate that BVN008 had no detectable adverse effects in either the F0 female rats, the F1 fetuses or pups.

Corresponding author : Sang-Mi Lee, Yun-Bae Kim

Keywords : Tetanus, Diphtheria, Pertussis, Vaccine, Reproductive toxicity

PS-R-08

Adipose-tissue macrophages expressing uncoupling protein 1 produce heat to facilitate lipolysis of the adipocytes

Gi-Sue Kang[1], Young-Eun Kim[2], Ho Rim Oh[3], Seoyeon Bok[2], Yoon Kyung Jeon[4], Gi Jeong Cheon[3,5,6], Tae-Young Roh[7], Young-Tae Chang[8], Do Joong Park[9], G-One Ahn[1,6]*

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Uncoupling protein 1 (UCP1) is known to be involved in the thermogenesis of brown adipose tissues by uncoupling protons across the mitochondrial membrane. Recent evidence suggests that white adipocytes can express UCP1 under certain circumstances (such as exposure to cold or stimulation of β-adrenergic receptors), promoting them to adopt characteristics similar to brown adipocytes thereby becoming 'beige' adipocytes. In this study, we found that UCP1 can also be expressed in adipose-tissue macrophages (ATM) lacking functional hypoxia-inducible factor-1α (HIF-1α) and these ATM produced a significant heat to mediate lipolysis of white adipocytes. By utilizing our novel strain of myeloid-specific *Hif*-1α knockout (KO) mice, we observed that these mice were resistant to diet-induced obesity upon high fat diet and exhibited an improved thermogenic ability when challenged to cold. ATM isolated from the white adipose tissue (WAT) of these mice demonstrated not only increased in mitochondrial gene expression including *Ucp1* and mitochondrial functions but also increased M2 polarization and reduced glycolysis. To determine whether UCP1-expressing ATM could generate heat, we utilized ERthermAC, a temperature-sensitive fluorescent dye. We found indeed these UCP1-expressing ATM generate a significant amount of heat and this was necessary and sufficient to promote lipolysis of directly co-cultured adipocytes liberating free fatty acids. Importantly, we found that UCP1-expressing ATM exist in human WAT of gastric cancer patients undergoing gastrectomy and there was a strong inverse correlation between the number of UCP-1 expressing ATM infiltration into WAT and the body mass index of the human subjects. In conclusion, we believe that UCP1-expressing ATM are a novel population of immune cells that can regulate the diet-induced obesity in mice and humans.

Corresponding author : G-One Ahn

Keywords : Obesity, Uncoupling protein 1, Adipose tissue macrophage, Heat, Lipolysis

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2025
한국실험동물학회
동계심포지엄

포스터 발표

평창 알펜시아 컨벤션센터 2F

Chair : 오경진 (한국생명공학연구원)

포스터 발표 1 2월 6일(목) 14:40-15:40	포스터 발표 2 2월 7일(금) 13:00-14:00
PS-A-01~14 (해부생리)	PS-A-15~27 (해부생리)
PS-B-01~18 (독성병리)	PS-B-19~35 (독성병리)
PS-C-01~07 (미생물)	PS-C-08~13 (미생물)
PS-D-01~11 (유전자질환모델)	PS-D-12~22 (유전자질환모델)
PS-E-01~19 (시설운영 및 기타)	PS-E-20~37 (시설운영 및 기타)

포스터 발표 안내 (Poster Session)

1. 포스터 발표 안내

구분	포스터 발표 1	포스터 발표 2
발표 시간	2월 6일(목) 14:40-15:40	2월 7일(금) 13:00-14:00
발표 장소	평창 알펜시아 컨벤션센터 2F	
포스터 번호	PS-A-01~14 (해부생리) PS-B-01~18 (독성병리) PS-C-01~07 (미생물) PS-D-01~11 (유전자질환모델) PS-E-01~19 (시설운영 및 기타)	PS-A-15~27 (해부생리) PS-B-19~35 (독성병리) PS-C-08~13 (미생물) PS-D-12~22 (유전자질환모델) PS-E-20~37 (시설운영 및 기타)
합계	총 69개	총 65개
부착 시간	2월 6일(목) 09:00-12:00	
철거 시간	2월 7일(금) 16:20-17:00	

※ 포스터 전시는 학술대회 기간인 2월 6일(목) ~ 7일(금) 이틀간 진행됩니다.
※ 부착은 2월 6일(목) 부착 시간 내에 반드시 진행하여야 하며, 미부착 시 제재가 주어집니다.
※ 철거는 2월 7일(금) 16시 20분 이후부터만 가능하며, 반드시 17시까지 철거해 주시기 바랍니다.
철거하지 않은 포스터는 학회에서 보관하지 않고, 임의로 철거한 후 폐기합니다.

2. 포스터 발표 시상

- 포스터 발표 : 포스터 발표는 좌장의 진행에 따라 포스터당 4분(3분 발표, 1분 질의응답)으로 진행되며, 내용의 과학성, 연구 성과, 발표자의 발표력 등을 기준으로 심사위원이 평가하며 우스포스터를 선정합니다.
- 우수포스터상 시상 : 2월 7일(금) 16:20-17:00, 1F 오디토리움 / 폐회식
- 우수포스터의 경우 폐회식에서 선정자를 호명합니다. 호명 시, 자리에 없으면 다음 우수자에게 상이 수여되오니 학술대회 종료일까지 학술대회에 꼭 참석해주시기 바랍니다. (상장과 상금 수여, 대리 수상 불가)
- 미부착 포스터 : 포스터 보드에 2회 이상(개수로 적용) 미부착 시, 교신저자(연구책임자)에게 향후 1년간 포스터 제출 불가의 제재가 주어집니다.

3. 포스터 작성 안내

- 포스터 보드의 크기는 95cm(가로) X 210cm(세로)이며, 특히 제목이 가로 너비를 초과하지 않도록 준비하여야 합니다.
- 모든 포스터는 지정된 날짜, 기간 동안에 지정된 보드에 부착하여야 합니다.
- 포스터 내용은 abstract, purpose, results(figures and tables), conclusions, references의 순서로 작성합니다.
- 전방 2m 위치에서 쉽게 읽을 수 있도록 굵고 명확한 글씨체를 이용하여 제작합니다.
- 모든 포스터의 부착 및 철거는 당일 지정된 시간에 발표자가 수행해주시기 바랍니다.

해부생리 Poster

포스터번호	제목	발표자
PS-A-01	Branching morphology of the subclavian artery in cats	Young-Jin Jang
PS-A-02	Deodorizing effects of brown algae extracts on age-associated odor markers	Ji Eun Kim
PS-A-03	Evaluation of antioxidant and laxative activities of green pine cone (Pinus densiflora) methanol extracts in SD rats with loperamide-induced constipation	Ayun Seol
PS-A-04	Non-invasive diagnosis and monitoring of chronic inflammatory bowel disease using FAP-targeted PET	Sun Mi Park
PS-A-05	Feasibility of PET imaging with ROS-targeting radiotracers for skeletal muscle atrophy in an LPS-induced model	Joo Yeon Park
PS-A-06	Korean mistletoe (Viscum album var. coloratum) ethanol extracts alleviates dextran sodium sulfate-induced colitis by improving intestinal tight junction	Ye Jin Yang
PS-A-07	Water extract of Artemisia fukudo inhibits RANKL-inducted osteoclast differentiation and prevents bone loss in ovariectomized mice	Yun-Ji Lee
PS-A-08	Oleic acid attenuates inflammation via the MAPK and TLR3/4-NF-κB pathways	Soon-Young Lee
PS-A-09	Beneficial effects of aqueous extract from Vaccinium oldhamii in DNBS-induced colitis in rats	Hwa-Jin Kim
PS-A-10	Protective effects of KRG against renal injury in aged mice	Sang-Gon Lee
PS-A-11	Age-dependent decrease in apelin activity exacerbates renal fibrosis and the transition from AKI to CKD	Won-Seok Oh
PS-A-12	Evaluation of bone regeneration in an osteoporotic rat model	Yoon Beom Lee
PS-A-13	NEK2 plays an essential role in porcine embryonic development via the AKT signaling pathway	Se-Been Jeon
PS-A-14	The dual roles of NOX4 and MPO in regulating osteoblastogenesis and mineralization	Ka Young Ko
PS-A-15	Subthalamo-pallidal and pallido-subthalamic connectivity alterations in a 6-OHDA Parkinson's disease mouse model via 9.4T diffusion MRI	Ji-Yeon Suh
PS-A-16	Post-natal developmental values in common marmoset (Callithrix jacchus) offspring	Cheoljin Park
PS-A-17	Anatomical atlas of common marmoset (Callithrix jacchus) offspring for birth defects examination	Wonjun Jeong
PS-A-18	The effect of CXCL5/CXCL8 on neutrophilic inflammation in peri-implantitis	Chae Yeon Kim
PS-A-19	One-carbon metabolism is distinct metabolic signature for proliferative intermediate exhausted T cells of ICB-resistant cancer patients	Ye-Chan Park
PS-A-20	In-vitro fertilization and embryonic development using frozen rat sperm in BSA-supplemented mHTF medium	Hee Kyoung Kim
PS-A-21	Mitochondrial dysfunction of epithelial cell drives submucosal thickening through inflammatory fibroblasts in ulcerative colitis	Nahee Hwang
PS-A-22	Evaluation of memory improvement induced by erythritol in a beta-amyloid injection animal model	Jihye Lee

PS-A-23	Alleviating lysosomal impairment in macrophages mitigates the progression of nonalcoholic steatohepatitis	Seyeon Joo
PS-A-24	Effect of Taraxacum platycarpum solvent extract on hair growth	Eunhong Lee
PS-A-25	Exploring T cell-driven immune signaling pathways in the development of chronic obstructive pulmonary disease	Chae Min Lee
PS-A-26	Investigating the distribution and quantity of the red bone marrow in cynomolgus monkey (Macaca fascicularis)	Jinhyung Rho
PS-A-27	The influence of fasting start time on a rat model of ethanol-induced gastric ulcer	Suji Baek

독성병리 Poster

포스터번호	제목	발표자
PS-B-01	Combined exposure to aluminum, arsenic, and mercury on BDNF expression and cognitive function	Da Eun Lee
PS-B-02	Maternal ingestion of polyethylene microplastics results in reduced antiviral responses by dysregulating the immune system in their progeny	Subin Park
PS-B-03	Piperlongumine induces apoptosis via the MAPK/NF-κB pathway and activates autophagy in human breast cancer cells	Yun-Seo Jang
PS-B-04	Polymethyl methacrylate nanoplastic enhances the migration ability of brain microglia through the activation of the CXCR2 signaling pathway	Jahong Koo
PS-B-05	Anti-ulcer effect of green pine cone (Pinus densi flora) extract with high antioxidant activity in an ICR model of HCl/EtOH-induced gastric injury	Jin Hyang Hwang
PS-B-06	The role of the gut microbiome in colitis models using germ-free mouse	Seongyu Choi
PS-B-07	MAPK/JNK-mediated apoptosis and autophagy induction by gossypin HT-29 human colorectal cancer	Jun-Mo Moon
PS-B-08	Luteolin inhibits proliferation, induces apoptosis and autophagy, and regulates MAPK pathways in human oral cancer cell lines	Sang Woo Lee
PS-B-09	Uncovering a SARS-CoV2 mRNA vaccine-induced bone marrow toxicity in ICR mice by single-cell RNA-seq analysis	Jae-Hun Ahn
PS-B-10	Didecyldimethylammonium chloride-induced lung fibrosis may be associated with phospholipidosis	Wonkyun Jung, Eun-Jung Park
PS-B-11	Detection analysis of apoptotic bodies in rat liver using YOLOv8 object detection algorithm	Gyu Baek Kim
PS-B-12	Retinal immune responses as a potential non-invasive marker for brain inflammation in status epilepticus	Hyeyoon Goo
PS-B-13	Exploration of targeted Anti-inflammatory drugs using LPS- or MDP-Induced inflammation models	Heekyoung Yang
PS-B-14	Discovery and application of medical fluorophore 33: a novel theranostic agent for cancer therapy and imaging in mice of colorectal cancer	Kwang Hee Son
PS-B-15	Phosphatidylserine externalization in erythrocytes induced by polyhexamethylene guanidine phosphate promotes venous thrombus formation in a rat model	Sungbin Choi

PS-B-16	Ameliorative effects of Gastrodia elata Blume extract on inflammation of allergic contact dermatitis in mouse	Yeon Su Lee
PS-B-17	Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) mouse modeling	Juhyeok Hong
PS-B-18	Recombinant RAGE antagonist peptide Inhibits the damage of alveolar epithelial cells in emphysema	Jimin Jang
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PS-C-04	Antibacterial effect of Pinus densiflora essential oil against dental caries bacteria	Jeong Min Kim
PS-C-05	Diagnosis of clostridium difficile infection in common marmosets (Callithrix jacchus) using C. DIFF QUIK CHEK COMPLETE ®	Jina Kwak
PS-C-06	Gastric microbiota inhibits the development of gastric neoplasia by regulating cholesterol synthesis	Jiseon Kim
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PS-C-08	Effect of SARS-CoV-2 and Streptococcus pneumoniae co-Infection on immune response in the hACE2 transgenic mouse	Na-Won Kim
PS-C-09	Micheliolide ameliorates muscle wasting in cancer cachexia by restoring T cell activation and modulating gut microbiota	Hye-Young Youn
PS-C-10	Immunological defense mechanisms against Sendai virus infection in STAT1 knock-out mice	Eun-Seon Yoo
PS-C-11	Heat-killed lactobacillus plantarum NCHBL-004 suppresses tumor growth in a syngeneic melanoma mouse model through TLR2 activation	In Su Seo
PS-C-12	Effective TMAO regulation for kidney treatment	MuKyung Seo
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PS-D-10	Enhanced Purkinje cell survival via natural extracts in an MPTP mouse model of Parkinson's disease	Seo Hee Choi
PS-D-11	Preparation of animal models for osteoarthritis and treatment with Oleanolic acid curcumin co assembled nanoparticles	Chen Liu
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PS-D-13	All-in-one human MSTN gene micro-promoter vector as an additional measure for gene therapy	Young Chai Kim
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시설운영 및 기타 Poster

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PS-E-04	In vivo dynamics and statomics-based approach to discover biological mechanisms of anabolic resistance in sarcopenia: role of caveolin-1 as a key modulator	Yeongmin Kim
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PS-E-06	Primary culture of in vitro resources from cynomolgus macaque	Beom Jin Jeon
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PS-E-09	Protective role of Gentiana macrophylla P. as targets for antioxidant defense system on the blue light-induced macular degeneration	Su Ha Wang
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PS-E-30	Establishment of an infectious disease research platform in GLP-certified Animal Biosafety Level 3 (ABL3) facility	Ji Woo Shin
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PS-E-33	Establishment of a toxicity and efficacy evaluation system using IT-based 3D motion in beagle dogs and non-human primates	Ji Woon Kim
PS-E-34	Evaluation of the effects of the novel multivalent SARS-CoV-2 mRNA vaccine on the central nervous system, respiratory system, and cardiovascular system in Sprague-Dawley (SD) rats and beagle dogs	Seung Eui Min
PS-E-35	Peripheral nerve microcurrent stimulation: a novel approach to neuroprotection in a rat MCAO model	Eun Sang Kwon
PS-E-36	Hydroxyethyl starch-based cryopreservation of polymer-coated canine red blood cells	Baoji Lu
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PS-A-01

Branching morphology of the subclavian artery in cats

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The subclavian artery (SB) is a critical vascular structure supplying the neck, thoracic wall, and forelimb. In carnivores, SB branching patterns display significant interspecific and intraspecific variation. Despite the increasing importance of cats as experimental animals, detailed studies on feline SB branching patterns remain scarce. This study aimed to elucidate the branching morphology of the SB in cats and assess intraspecific morphological variations.
Silicone casts of the SBs were prepared from 35 cats (15 males and 20 females). Branching lengths and relative branching lengths were quantified for four major arteries: the vertebral artery, costocervical trunk, superficial cervical artery, and internal thoracic artery. The branching order and pairwise relationships of these arteries were analyzed, and differences between the left and right SB were statistically assessed.
A total of 33 distinct SB branching patterns were identified. The major branching pattern was the vertebral artery branching first, followed by the internal thoracic artery, then the costocervical trunk, and finally the superficial cervical artery. The four branches of the right SB exhibited longer branching lengths and a more distal distribution compared to the left. Across individuals, the vertebral artery, costocervical trunk, and superficial cervical artery followed a consistent branching order, while the internal thoracic artery exhibited variability in its order.
This study provides a detailed analysis of SB branching morphology in cats, highlighting significant intraspecific variation and a distinctive branching pattern. These findings enhance our morphological understanding of vascular diversity and provide a foundation for future experimental studies in animal models.

***Corresponding author :** Dongchoon Ahn

***Keywords :** Aortic arch, Branching pattern, Cat, Morphology, Subclavian artery

PS-A-02

Deodorizing effects of brown algae extracts on age-associated odor markers

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Body odor refer the various types of smells derived from the bodies of all animals including humans, mice and rats. It can be highly affected by various diseases and physiological conditions of animals although it is strongly genetic. Excessive or abnormal body odor is generally known to be the result of the decomposition of sweat by bacteria and yeast present in the skin, but various causes like aging are also involved. Because of these characteristics, the body odor has potential as an important indicator for the diagnosis of odor associated with aging. Therefore, in this study, we tried to study the possibility of body odor as markers for old person smell in old ICR mice. We investigated whether extracts from brown algae may have the deodorizing effect in novel odor marker for old person smell based on the increase of TMA concentration during aging of ICR mice. To achieve this, this analysis was analyzed after oral administering three doses (50, 100, and 200 mg/kg) of ethanol extracts of *Ecklonia cava* (EEEC) and *Surgassum fulvellum* (EESF). Seven volatile compounds including TMA, n-hexane, pyridine, toluene, 2-hexenal, 2-ethyl, cyclotrisiloxane, hexamethyl, and benzothiazole were significantly decreased in a dose-dependent manner after the administration of the two brown algal extracts, while total VOCs (volatile organic compounds) were decreased with a concentration-dependent manner in the same group. Also, similar decrease patterns in EEEC and EESF treated group were detected in the transcription levels of the gene encoding TMA monooxygenase. Furthermore, the treatment of EEEC and EESF was induced the improvement in the histological structure of the sweat glands including the lumen area and the secretory coil portions as well as transcription levels of the Na-K-APTase (NKA), aquaporin 5 (AQP5), and forkhead box a1 (FOXA1) genes. In conclusion, the results of this study demonstrate that brown algae extracts have the potential to be novel deodorants with a deodorization effect on odor associated with aging markers such as TMA.

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***Keywords :** Body odor, ICR mouse, Brown algae, Odor associated with aging, Aging

PS-A-03

Evaluation of antioxidant and laxative activities of green pine cone (Pinus densiflora) methanol extracts in SD rats with loperamide-induced constipation

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Oxidative stress is regarded as a key factor in the development and progression of various diseases linked to constipation. This study investigated the potential of green pine cones to alleviate constipation symptoms through their antioxidant properties. The study evaluated changes in key indicators of antioxidant activity and laxative effects in Sprague-Dawley (SD) rats with loperamide (Lop)-induced constipation following treatment with methanol extracts of green pine cones (MPC, immature fruits of *Pinus densiflora*). MPC was found to contain various bioactive compounds, including diterpenoids like dehydroabietic acid, taxodone, and ferruginol. Additionally, it demonstrated strong scavenging activity against 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) radicals. The effects of MPC were evident in the enhanced transcription of nicotinamide adenine dinucleotide phosphate (NADPH) oxidase, increased expression of superoxide dismutase (SOD), and phosphorylation of nuclear factor erythroid 2-related factor 2 (Nrf2) in the mid-colon of rats treated with Lop+MPC. Additionally, MPC treatment led to significant improvements in stool characteristics, gastrointestinal (GI) transit, intestinal length, and the histopathological structure of the mid-colon in rats with Lop-induced constipation. Other parameters, such as mucin secretion, aquaporin (AQP) transcription, muscarinic acetylcholine receptor (mAChR) signaling, and gastrointestinal (GI) hormone secretion associated with laxative effects, showed significant improvement in SD rats treated with Lop+MPC. These effects were further confirmed in primary rat intestinal smooth muscle cells (pRISMCs) treated with Lop+MPC by analyzing antioxidant defense mechanisms. In conclusion, these findings offer new scientific evidence suggesting that MPC could be considered a significant laxative for chronic constipation due to its antioxidant activity.

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***Keywords :** Constipation, Antioxidants, Green pine cones, Laxative effects, Stools

PS-A-04

Non-invasive diagnosis and monitoring of chronic inflammatory bowel disease using FAP-targeted PET

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Inflammatory bowel disease (IBD), including Crohn's disease and ulcerative colitis, is a chronic inflammatory condition that presents a significant clinical challenge. Current diagnostic and monitoring methods, such as endoscopy and tissue biopsy, are invasive, making them unsuitable for frequent monitoring or for patients unable to undergo repeated procedures. This limitation has driven the demand for non-invasive and repeatable diagnostic alternatives. Fibroblast activation protein (FAP), a protein highly expressed on activated fibroblasts during inflammatory responses, has emerged as a promising biomarker for diseases like IBD. FAP plays a critical role in inflammatory processes, makes it an ideal target for non-invasive imaging. Positron emission tomography (PET) imaging with FAP-targeting radiotracers provides a powerful tool to visualize and quantify an activated fibroblasts in real-time, offering a significant advantages over conventional invasive diagnostic methods. Therefore, this study investigated the feasibility of a FAP-targeted PET radiotracer, [^{68}Ga]FAPI-46, for the diagnosis and monitoring IBD in an experimental animal model. An IBD model was induced in mice by administering 2,4,6-trinitro-benzene sulfonic acid (TNBS) dissolved in 50% ethanol/saline into the colon via the anus. This approach triggered an inflammatory response in the intestinal mucosa, with ethanol facilitating TNBS entry by disrupting the mucosal barrier. Control mice (n = 4) received only 50% ethanol/saline. A chronic IBD model (n = 6) was established by initial skin sensitization with 1.0% TNBS to exclude mice exhibiting hypersensitivity reactions, followed by weekly incremental TNBS administration at concentrations of 0.75, 1.50, 2.50, 2.50, 2.50, 2.50%. Following the establishment of the chronic IBD model, [^{68}Ga]FAPI-46 PET imaging was performed and revealed the increased uptake value in the chronic IBD mice compared to controls (2.06 ± 0.14 %ID/g vs. 1.70 ± 0.17 %ID/g , p = 0.007). After PET imaging, the colon was dissected, and the inflammatory regions were confirmed visually, H&E staining, and IVIS imaging with L-012. Western blot analysis using TNF-α and IL-11 antibodies demonstrated a 1.9-fold increase in TNF-α levels and a 1.3-fold increase in IL-11 expression in the IBD group, thereby confirming the overexpression of fibrosis. A correlation was observed between PET-based quantitative evaluations and FAP expression levels. These findings suggest that FAP-targeted PET imaging offers a non-invasive and repeatable diagnostic tool with the potential to complement conventional invasive methods for diagnosis and monitoring IBD.

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***Keywords :** Inflammatory bowel disease, Positron emission tomography, Fibroblast activation protein, [68Ga]FAPI-46

PS-A-05

Feasibility of PET imaging with ROS-targeting radiotracers for skeletal muscle atrophy in an LPS-induced model

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Skeletal muscle atrophy, characterized by the loss of muscle mass and function, is primarily driven by oxidative stress, which disrupts the delicate balance between muscle protein synthesis (MPS) and muscle protein breakdown (MPB). This study investigated the feasibility of using a reactive oxygen species (ROS)-targeting radiotracer, [18F]ROStrace, with PET imaging as a non-invasive diagnostic tool for muscle atrophy in a mouse model. Systemic inflammation and muscle atrophy were induced in male mice via intraperitoneal administration of lipopolysaccharide (LPS). After 24 h, [^{18}F]ROStrace was intravenously injected, and static PET/CT images were acquired 60-80 minutes post-injection. Following imaging, hindlimb muscles from atrophic and control groups were harvested for further analysis. PET/CT imaging demonstrated that [^{18}F]ROStrace uptake was significantly higher in LPS-induced atrophic mice compared to controls (2.20 ± 0.27 %ID/g vs. 0.90 ± 0.17, p = 0.0001). Reverse transcription polymerase chain reaction (RT-PCR) analysis revealed a marked upregulation of muscle atrophy markers in the skeletal muscle atrophy group, with MuRF-1 mRNA expression increasing approximately 14-fold (23.9 ± 4.9 vs. 1.7 ± 1.2, p = 0.0001) and atrogin-1 expression rising 10-fold (14.0 ± 2.7 vs. 1.5 ± 1.1, p = 0.0001). Histological analysis using hematoxylin and eosin (H&E) staining showed a significant reduction in muscle fiber cross-sectional area (CSA) in the atrophy group compared to controls (2,832.2 ± 298.9 μm^2 vs. 1,896.2 ± 63.5 μm^2, p = 0.0061). Furthermore, dihydroethidium (DHE) staining and fluorescence microscopy confirmed that ROS levels were approximately two-fold higher in the skeletal muscle atrophy group than in controls (246.8 ± 67.7% vs. 100.0 ± 47.1%, p = 0.001). The increased uptake of [^{18}F]ROStrace in the skeletal muscle atrophy group correlated strongly with elevated mRNA expression levels of MuRF-1 and atrogin-1, reduced CSA, and heightened oxidative stress, all indicative of muscle degradation. These findings suggest that [^{18}F]ROStrace is a promising tool for detecting oxidative stress in muscle atrophy lesions and aligns with established molecular markers of muscle atrophy. While further validation across diverse muscle atrophy models is warranted, this study highlights the potential of [^{18}F]ROStrace PET/CT imaging to enhance our understanding of the role of ROS in muscle atrophy.

Corresponding author **:** Byung Seok Moon

Keywords **:** Muscle atrophy, Positron emission tomography, Reactive oxygen species, Lipopolysaccharide

PS-A-06

Korean mistletoe (Viscum album var. coloratum) ethanol extracts alleviates dextran sodium sulfate-induced colitis by improving intestinal tight junction

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Korean mistletoe (*Viscum album var. coloratum*, KML) has been reported to exert therapeutic effects on various diseases. However, its protective mechanism against ulcerative colitis (UC) has not been fully elucidated. This study aims to investigate the effects and potential molecular mechanisms of KML ethanol extracts (KMLE) focusing on intestinal barrier function and tight junctions (TJs) in a dextran sodium sulfate (DSS)-induced UC mouse model. The therapeutic potential of KMLE in DSS-induced UC mice was evaluated based on changes in body weight, disease activity index (DAI), colon length, histopathological features, inflammatory cytokines/chemokines, and TJ protein expression. KMLE was demonstrated to have excellent antioxidant activity. Furthermore, KMLE alleviated clinical symptoms such as body weight and DAI score, restored colon length, and reduced histopathological damage. Also, KMLE suppressed the expression of inflammatory cytokines in DSS-induced UC mice. And KMLE administration preserved the intestinal epithelial ultrastructure and upregulated TJ protein expression, including zonula occludens-1 (ZO-1) and occludin (OCLN). Additionally, it was identified six bioactive compounds in KMLE by liquid chromatography-tandem mass spectrometry (LC-MS/MS) analysis. In conclusion, KMLE ameliorates intestinal barrier dysfunction in both DSS-induced UC mouse models. Through this, it was confirmed that the protective effects of KMLE on the intestinal barrier are associated with its anti-inflammatory properties and its ability to restore TJ integrity. It suggests that KML might be a potential therapeutic agent against IBD and intestinal inflammation.

Corresponding author **:** Kwang Il Park

Keywords **:** Korean mistletoe (Viscum album var. coloratum), Intestinal barrier, Tight junction, Ulcerative colitis, Inflammatory bowel disease

PS-A-07

Water extract of Artemisia fukudo inhibits RANKL-inducted osteoclast differentiation and prevents bone loss in ovariectomized mice

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Osteoporosis, a disease often induced by menopause or aging, is characterized by abnormally increased osteoclast activity, leading to bone loss. This study aimed to investigate the inhibitory effects of water extract of *Artemisia fukudo* (WAF) on osteoclast differentiation and its potential therapeutic effects in an ovariectomy (OVX)-induced osteoporosis mouse model. WAF was shown to inhibit osteoclast differentiation in a dose-dependent manner as confirmed by TRAP staining, bone resorption assay, and F-actin ring formation analysis. Gene expression analysis revealed that WAF effectively suppressed osteoclast differentiation-related genes, including NFATc1, TRAP, cathepsin K, and DC-STAMP. Western blot analysis further demonstrated that WAF inhibited MAPK and NF-κB signaling pathways, which are upregulated in response to RANKL stimulation. In the OVX-induced osteoporosis mouse model, oral administration of WAF significantly ameliorated bone loss. We successfully isolated estafiatin using Medium-Pressure Liquid Chromatography (MPLC), and subsequent experiments, including TRAP staining, F-actin analysis, and bone resorption assays, demonstrated that estafiatin effectively inhibited RANKL-induced osteoclast differentiation. Furthermore, it was confirmed that estafiatin significantly reduced the expression of genes associated with osteoclast differentiation. These findings suggest that WAF and estafiatin, isolated from its extract, may serve as potential therapeutic agents for the treatment of osteoporosis.

Corresponding author **:** Jong-Hwan Park

Keywords **:** Osteoporosis, Artemisia fukudo, Osteoclast

PS-A-08

Oleic acid attenuates inflammation via the MAPK and TLR3/4-NF-κB pathways

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Inflammation is a commonly observed immune reaction. In 2010, reported that the prevalence of immune-mediated inflammatory diseases in Western countries reached 5–7%, and there are a lot of inflammatory disorders such as arthritis, asthma, atherosclerosis, colitis, dermatitis, and hepatitis. In this study, the anti-inflammatory effects of oleic acid were evaluated in LPS-induced RAW 264.7 model and ovalbumin-induced BALB/c model. A variety of analytical procedures, such as MTT, qPCR, ELISA, Western blotting, immunofluorescence, gene transfection, immunohistochemistry, and several staining methods (Diff Quik, H&E, PAS), were used to evaluate the effectiveness and mechanisms. Results from in vitro experiments showed that oleic acid could reduce the levels of inflammatory cytokines (TNF-α, IL-6, and IL-1β), and molecular docking studies suggested that oleic acid could interact with TLR3 and TLR4 proteins to form ligand-protein complexes, showing the good binding affinity. Additionally, oleic acid attenuated the expression of MAPK pathway components (JNK, p38 MAPK) and NF-κB pathway constituents (IκB, NF-κB, COX-2, PGE2). In vivo, results indicated that oleic acid mitigated the levels of inflammatory cells (WBC and eosinophils) and IgE activity. Oleic acid also alleviated OVA-induced pathological changes in the lung, such as epithelial cell proliferation, inflammatory cell infiltration, and mucus hypersecretion. In summary, oleic acid is a potential candidate for the treatment of inflammatory diseases by suppressing inflammation via the MAPK and TLR3/4-NF-κB pathways.

Corresponding author **:** Mina Lee, Seung-Sik Cho, Dae-Hun Park

Keywords **:** Oleic acid, Asthma, Immune balance, Inflammation

PS-A-09

Beneficial effects of aqueous extract from Vaccinium oldhamii in DNBS-induced colitis in rats

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Inflammatory bowel disease is caused by an uncontrolled immune response related to genetic, environmental, and intestinal microbiota imbalance. *Vaccinium oldhamii* (VO) is a wild blueberry widely used in traditional Korea and China medicine to treat inflammation, gonorrhea, vomiting, diarrhea, and skin eruptions. However, there is no scientific study that validates its clinical use as an anti-inflammatory in the intestine. The objective of this study was to evaluate the protective effect of aqueous extract from the fruit of VO (VOW) in a rat model of colitis induced by 2,4-dinitrobenzene sulfonic acid (DNBS). Sprague-Dawley rats pretreated with VOW (100, 200, or 400 mg/kg) or sulfasalazine (SSZ, 100 mg/kg) received single intracolonic instillation of DNBS in 50% ethanol (v/v). 24 hours posterior to DNBS administration, VOW or SSZ were administered daily by gavage injection. Seven days after colitis induction, VOW dose-dependently presented a protective effect against intestinal inflammation, with improvement in the macroscopic damage. DNBS-induced rats displayed significant weight loss, diarrhea, colon shortening, a significant increase in MPO activity and proinflammatory cytokine expression. VOW or SSZ significantly alleviated the above harmful symptoms such as colon inflammation. The protective effect of VOW was also confirmed in histological evaluation in H&E staining, showing preservation of the colonic cytoarchitecture. Furthermore, VOW treatment suppressed harmful intestinal bacteria and increased the number of beneficial bacteria by increasing the production of short chain fatty acids. The results obtained in this study suggest that VOW might be employed as nutraceutical tool for supporting relief to inflammatory bowel disease.

Corresponding author **:** Hwa-Jin Kim

Keywords **:** Vaccinium oldhamii, Intestinal inflammation, Colitis, DNBS, Rats

PS-A-10

Protective effects of KRG against renal injury in aged mice

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Chronic kidney disease (CKD) progresses to end-stage renal disease, accompanied by pathological features including tubular atrophy and interstitial inflammation, especially renal fibrosis. Aging exacerbates CKD the incidence of renal fibrosis. Korean Red Ginseng (KRG), a steamed and dried form of ginseng, is known for its antioxidant, anti-inflammatory, and autophagy-activating effects. However, the efficacy of KRG in aged mice with CKD remains largely unexplored. Therefore, this study aimed to investigate the mechanisms underlying age-related renal dysfunction and the therapeutic effects of KRG on CKD in an aged mouse model.
An aged mouse model of CKD was induced using unilateral ureteral obstruction (UUO), and KRG (50 and 200 mg/kg, P.O.) was administered for 4 weeks except control and UUO groups. The mice were divided as follows: 8-wk control, 8-wk CKD, 18-m control, 18-m CKD, 18-m KRG50, 18m-KRG200 administered KRG. Serum chemical, histopathological, and molecular biological analyses were conducted to assess the extent of CKD.
The levels of blood urea nitrogen (BUN) and creatinine were higher in the 18-month CKD-induced compared to the 8-wk CKD. Histologically, renal injury was more severe in the 18-m CKD compared to the 8-wk CKD. Additionally, the expression of and Kidney Injury Molecule 1 (KIM-1) was elevated in the 18-m CKD, suggesting that aging accelerates kidney damage. However, the amelioration of kidney injury following KRG treatment was confirmed by similar levels of BUN, creatinine, and KIM1 expression in the KRG-treated group compared to the control group
These findings suggest that the properties of KRG could delay the progression of renal fibrosis and protect kidney function. This study provides fundamental data supporting the potential use of KRG in the prevention and treatment of age-related chronic kidney disease.
Funding : This work was supported by the (2024) grant from The Korean Society of Ginseng.

Corresponding author **:** Geum-Lan Hong

Keywords **:** Chronic kidney disease (CKD), Renal fibrosis, Korean red ginseng (KRG), Aged mouse, Aging

PS-A-11

Age-dependent decrease in apelin activity exacerbates renal fibrosis and the transition from AKI to CKD

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Persistent acute kidney injury (AKI) is known to progress to chronic kidney disease (CKD), accompanied by renal fibrosis. The rate of transition to CKD is notably accelerated with aging; however, the reason driving this progression remain inadequately elucidated. This study aims to identify key factors associated with aging that accelerate the transition from AKI to CKD.
The transition of AKI to CKD was induced in 8-week-old and 19-month-old mouse via ischemia-reperfusion (IR) injury, achieved by clamping the renal pedicles bilaterally for 40 minutes, followed by reperfusion for 72 hours. To evaluate the potential therapeutic role of Apelin, the peptide was administered to a subset of 19-month-old mouse. Gene expression changes were analyzed using microarray, while renal function was assessed by measuring serum creatinine (SCr) and blood urea nitrogen (BUN) levels. Protein expression levels of fibrosis-related markers and Kidney Injury Molecule 1 (KIM-1) in renal tissue were evaluated. Cellular injury, collagen deposition and fibrosis were assessed.
Compared to 8-week-old mouse, 19-month-old mouse exhibited exacerbated renal injury, as evidenced by elevated BUN, SCr and KIM-1. Microarray analysis showed a significant reduction in expression of the apelin receptor early endogenous ligand (APELA) in 19-month-old mouse. Additionally, the gene expression of fibrosis-related proteins was increased, and fibrosis and collagen deposition confirmed through histological analysis. Apelin administration to see Apelin correlation significantly alleviated renal injury and fibrosis in 19-month-old mouse.
These findings suggest that age-related reduction in Apelin expression accelerates renal fibrosis following AKI. Furthermore, Apelin supplementation may attenuate these pathological changes, suggesting its potential as a mechanism to mitigate the conversion of AKI to CKD.
This research was supported by National Research Foundation of Korea (NRF) grant funded by the Korea government (MIST) (RS-2023-00212470)

Corresponding author **:** Geum-Lan Hong

Keywords **:** Acute kidney injury (AKI), Chronic kidney disease (CKD), Renal fibrosis, Aging, Apelin

PS-A-12

Evaluation of bone regeneration in an osteoporotic rat model

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This experiment aimed to evaluate the efficacy of experimental substances in bone regeneration following bone defect creation in ovariectomized female Sprague-Dawley (SD) rats with induced osteoporosis. Osteoporosis was induced in 8-week-old female SD rats through ovariectomy, and bone density was analyzed using MicroCT to confirm the onset of osteoporosis. Subsequently, a 4mm bone defect was created in the right radius, and experimental substances were applied to the defect site.
At 2, 4, and 8 weeks post-defect, Dual-Energy X-ray Absorptiometry (DXA) scans were performed to obtain X-ray images of the defect site and evaluate bone density. At week 12, the rats were euthanized, and MicroCT scans were performed to obtain both MicroCT images and bone density evaluation results.
The results showed that the ovariectomized group had a significant increase in body weight and a significant decrease in bone density compared to the control group by the end of the experiment. X-ray images of the right radius defect were obtained using DXA and MicroCT imaging devices, and the bone defect area was measured using the ImageJ program. The analysis revealed that the bone defect area in the experimental substance-treated group was significantly reduced compared to the control group.
This study confirms the efficacy of the experimental substances in promoting bone regeneration in an osteoporosis model and provides a methodology for creating osteoporosis and bone defect models, as well as evaluating bone regeneration experiments.

Corresponding author **:** GwangHoon Lee

Keywords **:** Osteoporosis, Ovariectomy, Bone regeneration

PS-A-13

NEK2 plays an essential role in porcine embryonic development via the AKT signaling pathway

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NIMA-related kinase2 (NEK2), a member of the serine/threonine kinase family, plays an important role in regulating the cell cycle and DNA damage response. In this study, we aimed to elucidate the mechanisms by which NEK2 inhibition affects porcine embryonic development. Treatment with JH295 (JH; a NEK2 inhibitor) significantly reduced the proportion of 2-cell, 4-cell, and blastocyst stage rates at 24, 48, and 144 h, respectively, compared to the control. Abnormal development was associated with decreased expression of zygotic genome activation-related genes (*ZSCAN4*, *UBTFL1*, *SUPT4H1*, and *IBSP*) and significantly reduced levels of EdU, EU, and OPP incorporation compared to the controls. Notably, the NEK2 inhibition significantly decreased the protein levels of p-AKT and AKT, as well as their mRNA expression levels. To investigate the relationship between NEK2 and AKT signaling pathways during porcine embryonic development, embryos were cultured with JH and/or the AKT activator SC79. Co-treatment with JH and SC79 significantly increased the proportions of 2-cell, 4-cell, and blastocyst rates at 24, 48, and 144 h, respectively, compared to the JH group. Moreover, the total cell number, which was reduced by NEK2 inhibition, was restored by SC79 co-treatment. Combined treatment with SC79 also restored the expanded blastocyst rate and the apoptosis rate to the control levels. Furthermore, SC79 co-treatment rescued the number of trophectoderm cells and the inner cell mass/trophectoderm ratio to the control levels. The inhibition of NEK2 was found to have a negative impact on DNA integrity, increasing DNA damage. Intriguingly, the increased DNA damage caused by NEK2 inhibition was restored by SC79 co-treatment. Consequently, NEK2 plays a crucial role in porcine embryonic development by regulating the AKT signaling pathway.
This research was supported by the Korea Research Institute of Bioscience and Biotechnology (KRIBB) Research Initiative Program (KGM4252533, KGM5382531), Republic of Korea.

***Corresponding author :** Bo-Woong Sim

Keywords : NEK2, Porcine embryonic development, Cell cycle, DNA damage, AKT signaling pathway

PS-A-14

The dual roles of NOX4 and MPO in regulating osteoblastogenesis and mineralization

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Bone formation involves three stages: proliferation, differentiation, and mineralization, crucial for maintaining bone structure and regeneration. Reactive Oxygen Species (ROS) significantly influence bone cell function and redox balance. Preliminary studies indicate that NOX4 deficiency-a primary ROS source-increases Myeloperoxidase (MPO) expression in bone marrow mesenchymal stem cells (BMSCs), enhancing endochondral ossification.
This study investigates the effects of NOX4 deficiency-induced MPO expression on osteoblastogenesis, specifically evaluating the impact of MPO inhibition with 4-Aminobenzoic Acid Hydrazide (4-ABAH) on each osteoblastogenesis stage.
Primary osteoblasts were isolated from the calvaria of 2–3-day-old wild-type (C57BL/6J) and NOX4-/- mice. Cells were treated with 4-ABAH at concentrations of 25, 50, and 100 μM. Proliferation was assessed using Toluidine Blue staining, differentiation by ALP activity and staining, and mineralization with Alizarin Red S and Von Kossa staining.
MPO inhibition impacted osteoblast generation in a dose-dependent manner. Significantly, proliferation decreased in the WT group with MPO inhibition, while the NOX4-/- group showed a weaker inhibitory response. During differentiation, ALP activity initially increased in the NOX4-/- group and was further elevated with MPO inhibition at later stages. In mineralization, WT osteoblasts showed significant inhibition with increased MPO inhibition, while NOX4-/- osteoblasts maintained relatively higher mineralization levels.
The study demonstrated that NOX4 deficiency and MPO inhibition influence osteoblastogenesis. MPO inhibition exerted a dose-dependent inhibitory effect on osteoblast proliferation, differentiation, and mineralization, which was mitigated in the NOX4-/- group. These findings underscore the critical roles of NOX4 and MPO in osteoblastogenesis and their potential as therapeutic targets for bone metabolic disorders.

***Corresponding author :** Sun Shin Yi

Keywords : NADPH oxidase 4 (NOX4), Myeloperoxidase (MPO), Osteoblastogenesis, Bone formation, 4-Aminobenzoic acid hydrazide (4-ABAH)

PS-A-15

Subthalamo-pallidal and pallido-subthalamic connectivity alterations in a 6-OHDA Parkinson's disease mouse model via 9.4T diffusion MRI

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Parkinson's disease (PD) is a progressive neurodegenerative disorder that primarily affects motor function. An important challenge in PD-based neuroscience and neuroimaging is to accurately understand brain circuits by mapping neuronal connectivity within the basal ganglia, a region crucial for motor control. Despite advancements, visualizing long-range anatomical connections and effectively mapping the basal ganglia connectome remains a significant hurdle in PD research. In this study, we analyzed the basal ganglia connectivity of 6-OHDA–induced PD models (n=5) and healthy controls (n=5) using high-resolution 9.4T diffusion tensor imaging (DTI). The 6-OHDA model, known to replicate basal ganglia circuitry and pharmacological changes similar to those observed in PD patients, has been recognized as an essential animal model for studying PD pathophysiology. Probabilistic tractography analysis was performed using FSL's PROBTRACKX, which calculates fiber trajectories based on voxel-wise orientations in segmented regions and determines the probability of these pathways. The results demonstrated that the PD model exhibited significantly enhanced subthalamo-pallidal and pallido-subthalamic motor-related connectivity compared to the control group. Combining high-field diffusion MRI with multi-fiber tractography techniques offers promising potential for optimizing deep brain stimulation (DBS) targets. This study contributes to a deeper understanding of basal ganglia connectivity and its role in brain network interactions, providing valuable insights into PD research.

***Corresponding author :** Hyeon-Man Baek

Keywords : Parkinson's disease (PD), Basal ganglia connectivity, 6-OHDA model, Diffusion tensor imaging (DTI), Probabilistic tractography

PS-A-16

Post-natal developmental values in common marmoset (Callithrix jacchus) offspring

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The common marmoset (Callithrix jacchus) is a small New World primate with a short gestation period (approximately 143 days) and high reproductive efficiency. Its physiological similarities to humans, particularly in neurobehavioral and reproductive development, make it a valuable model for studies on developmental and reproductive toxicity. Developmental toxicity studies assess the effects of potential toxicants or environmental factors on fetal and neonatal growth, development, and physiological function. Establishing normative developmental reference values is crucial for accurately evaluating the impact of potential toxicants. However, there is still a lack of information on developmental reference values for marmoset offspring. This study longitudinally assessed the developmental values of marmoset offspring over 98 days (14 weeks) to characterize early post-natal development traits. Representative post-natal development parameters, including crown-rump length, head circumference, long bone length, anogenital distance, body weight, body temperature, and grip strength, were periodically evaluated with sex differentiation. Results revealed rapid growth in crown-rump length, head circumference, and long bone length until postnatal day (PND) 28, followed by gradual increases. Anogenital distance exhibited significant sexual difference, with males showing a marked increase at PND 42. Body weight increased sharply until PND 42. Thermoregulation stabilized after PND 56, and grip strength showed significant differences between forelimbs and hindlimbs, particularly after PND 56. These findings establish normative post-natal developmental values in marmoset offspring, providing essential reference values for developmental toxicity studies with common marmoset.

***Corresponding author :** Chan-Wook Park, Jinsoo Lee, Kyoung-Sun Lee

Keywords : Common marmoset, Developmental toxicity, Physical development, Historical control data

PS-A-17

Anatomical atlas of common marmoset (Callithrix jacchus) offspring for birth defects examination

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The common marmoset (*Callithrix jacchus*) is the smallest non-human primate and is increasingly used in various biomedical research. Due to its anatomical, physiological, and genetic similarities to humans, the common marmoset serves as a valuable model for studying human diseases, physiology, pharmacology, and toxicology. These similarities make it a credible model for predicting clinical studies. Furthermore, its adult rat-like size, high reproductive efficiency compared to cynomolgus monkey (*Macaca fascicularis*), and relevance to human reproductive biology are suitable for non-clinical developmental and reproductive toxicology (DART) studies. However, there is a lack of data on the normal anatomical structures of common marmoset offspring, which is essential for evaluating birth defects in non-clinical DART studies. This study aims to present the external, visceral, and skeletal morphology of normal marmoset offspring collected from post-natal day 0 to 42. External appearance was observed after fixation in 70% ethanol. Visceral structures were observed after fixation in formalin, and skeletal structures were observed using alizarin red S staining following fixation in 70% ethanol. Cranial morphology was observed through serial sectioning after fixation in Bouin's solution following fixation in 70% ethanol. The results of this study are expected to contribute to the advancement of non-clinical DART studies for birth defects examinations using common marmosets.

Corresponding author **:** Chan-Wook Park, Jinsoo Lee, Kyoung-Sun Lee

Keywords **:** Morphological examinations, Offspring, Common marmoset, Non-human primate, Developmental and reproductive toxicology

PS-A-18

The effect of CXCL5/CXCL8 on neutrophilic inflammation in peri-implantitis

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Peri-implantitis (PI) refers to a pathological condition marked by inflammation of the tissues surrounding an implant. CXCL8, also recognized as IL-8, has one of its primary functions in recruiting neutrophils from the bloodstream to the infection site. CXCL5, also interacts with CXCR2 and induces neutrophil migration and activation. These neutrophilic inflammations are associated with chemokines such as CXCL groups. However, both CXCL8 and CXCL5 play important roles in leukocyte activation and the inflammatory response, but their expression patterns and functions is not yet known. This study investigated the role of CXCL8 and CXCL5 in inflammation for PI.
A total of 40 patients who visited the Department of Periodontology at Kyungpook University Dental Hospital participated in the study. The patients were classified into two groups: the healthy implant (HI) group (n = 20) and the peri-implantitis (PI) group (n = 20), based on their clinical condition. RNA libraries for control and test groups were prepared using the QuantSeq 3′ mRNA-Seq Library Prep Kit as per the manufacturer's instructions. Samples were pooled based on cytokine profiles from RNA sequencing and analyzed by RT-qPCR. Histological analysis, including H&E staining and IHC, was performed to assess gene expression and tissue morphology.
Heatmaps were used to analyze gene expression differences between the HI and PI groups. CXCL5 and CXCL8 showed the highest expression in the PI group, known to be involved in inflammation. RT-qPCR of gingival tissues revealed significantly increased mRNA levels of CXCL5/CXCL8 in the PI group, while IL36RN expression was decreased. IHC confirmed CXCL5/CXCL8 protein distribution and intensity. Increased CXCL5/CXCL8 levels promote inflammation, cell proliferation, migration, and invasion in peri-implant tissues via the PI3K/Akt/NF-κB pathway.
This study highlights the association of CXCL8 and CXCL5 with peri-implantitis (PI), suggesting that their expression induces a neutrophilic immune response. The elevated levels of these chemokines indicate their potential as diagnostic markers and targets for inflammation control in PI.

Corresponding author **:** Myoung Ok Kim

Keywords **:** CXCL8, CXCL5, Peri-implantitis (PI), RNA sequencing

PS-A-19

One-carbon metabolism is distinct metabolic signature for proliferative intermediate exhausted T cells of ICB-resistant cancer patients

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One-carbon metabolism (1CM) has been reported to promote cancer progression across various malignancies. While 1CM is critical for cell proliferation by enhancing nucleotide synthesis, its physiological roles within different cell types in the tumor immune microenvironment (TIME) still remain unclear. In this study, we analyzed bulk-RNA sequencing and single-cell RNA sequencing (scRNA-seq) data from lung adenocarcinoma (LUAD) patients to elucidate the functional roles of 1CM within the TIME. Moreover, we examined scRNA-seq data from patients treated with immunotherapy across various cancers, including LUAD, glioblastoma, renal cell carcinoma, colorectal cancer, and triple-negative breast cancer. Compared to other cell types, 1CM gene profiles are significantly enriched in a specific subset of T cells. Intriguingly, these high-1CM T cells are identified as proliferative intermediate exhausted T cells (Tex^{int}). Furthermore, these proliferative Tex^{int} received the most robust CD137 signaling. Consistently, analysis of scRNA-seq data from LUAD patients undergoing anti-PD1 immunotherapy demonstrated that proliferative Tex^{int} exhibited higher 1CM scores and increased CD137 signaling. This observation was particularly pronounced in non-responders to immunotherapy, where the Tex^{int} population was significantly expanded. We further established that 1CM is a prominent signaling pathway in proliferative Tex^{int} in patients resistant to immunotherapy across multiple cancer types. Collectively, we identify CD137 signaling as a distinctive pathway in proliferative Tex^{int} of LUAD patients who do not respond to immunotherapy. These findings propose that targeting 1CM may represent a novel therapeutic strategy to enhance the efficacy of immunotherapy by mitigating Tex^{int} proliferation in diverse cancers.

Corresponding author **:** Sungsoon Fang

Keywords **:** Cancer metabolism, Cancer immunity, Tumor microenvironment, Immunotherapy

PS-A-20

In-vitro fertilization and embryonic development using frozen rat sperm in BSA-supplemented mHTF medium

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The mHTF medium plays a pivotal role in in vitro fertilization (IVF) studies of mice and rats by providing an optimal environment for in-vitro fertilization and supporting early embryonic development. However, the limited IVF efficiency in rats has posed a significant challenge for their use as experimental animal models (Nakagata et al., 2019) Recent studies, such as Yamaga et al. (2024), have reported improved fertilization rates of frozen rat sperm in mHTF medium supplemented with high concentrations of bovine serum albumin (BSA). This study aims to evaluate the effects of high-concentration BSA-supplemented mHTF medium on the fertilization capacity of frozen rat sperm and early embryonic development. In this study, frozen rat sperm were pretreated in mHTF medium supplemented with BSA (8 mg/ml for 30 min, followed by 44 mg/ml for 120 min). IVF (44 mg/ml for 8 hr) and early-stage (before 2 cells) embryo culture (8 mg/ml for 24 hr) were subsequently performed. The early embryo culture prior to the 2-cell stage was conducted in two groups: one with BSA-supplemented mHTF and the other with BSA-free mR1ECM. From the 2-cell stage to the blastocyst stage, embryos were cultured in mR1ECM medium. Results showed that the 2-cell stage developmental rate was identical in both groups (95.7%). However, the blastocyst development rate was higher in the mHTF (8 mg/ml BSA) group (68.2%) compared to the mR1ECM group (50%). In conclusion, IVF using frozen rat sperm in BSA-supplemented mHTF medium demonstrated improved embryonic development rates than those cultured in mR1ECM medium. This study was supported by BK21 FOUR Future Veterinary Medicine Leading Education and Research Center, SRC 2021R1A5A103315714, IBS (#550-20240037) and SNU (#550-20240089).

Corresponding author **:** Goo Jang

Keywords **:** BSA (Bovine Serum Albumin), Embryo, Freezing, Rat, Sperm

PS-A-21

Mitochondrial dysfunction of epithelial cell drives submucosal thickening through inflammatory fibroblasts in ulcerative colitis

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Ulcerative colitis (UC) is a chronic inflammatory bowel disease characterized by chronic inflammation and ulcers in the colon and rectum. Although traditionally viewed as a mucosal disease, recent studies have revealed that submucosal thickening plays a significant role in UC pathology. However, the cellular and molecular mechanisms underlying this process remain poorly understood. In this study, we performed spatial transcriptomics analysis on colonic tissues from UC patients, including inflamed and non-inflamed regions, to investigate the drivers of submucosal remodeling. Our findings revealed pronounced mitochondrial dysfunction in epithelial cells, which became more severe with increasing inflammation. These dysfunctional epithelial cells interacted closely with fibroblasts in the submucosa through cytokine-mediated signaling pathways, leading to fibroblast activation and the upregulation of inflammatory gene signatures. This activation resulted in increased extracellular matrix remodeling and an accumulation of fibroblasts in inflamed regions, directly contributing to submucosal thickening. Additionally, our analysis suggested that these interactions dynamically reshape the submucosal environment, amplifying tissue remodeling and inflammation. These results highlight epithelial cell dysfunction and epithelial-fibroblast interactions as key contributors to submucosal remodeling in UC. By elucidating these mechanisms, this study provides new insights into chronic inflammation and identifies potential therapeutic targets to mitigate tissue damage and disease progression in UC.

***Corresponding author :** Sungsoon Fang

***Keywords :** Spatial transcriptomics, Inflammatory bowel disease, Ulcerative colitis

PS-A-22

Evaluation of memory improvement induced by erythritol in a beta-amyloid injection animal model

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Alzheimer's disease (AD) is characterized by cognitive decline and the accumulation of beta-amyloid plaques in the brain. This study aimed to evaluate the memory-enhancing effects of erythritol, a sugar alcohol, in a beta-amyloid-induced animal model. We hypothesized that erythritol might ameliorate cognitive deficits associated with beta-amyloid toxicity. To test this, we administered erythritol to mouse with beta-amyloid-induced memory impairments and assessed cognitive performance using three widely used behavioral tests: the Y-maze, passive avoidance test, and Morris water maze. In the Y-maze test, erythritol-treated animals demonstrated significantly higher spontaneous alternation rates compared to the control group, suggesting enhanced short-term working memory and reduced cognitive dysfunction. In the passive avoidance test, which assesses long-term memory and learning, erythritol-treated animals exhibited significantly increased latency to enter the dark compartment, suggesting improved retention of the learned avoidance behavior. The Morris water maze, a test for spatial learning and memory, further confirmed the cognitive benefits of erythritol. Erythritol-treated animals displayed faster escape latencies and spent significantly more time in the target quadrant compared to the control group, indicating enhanced spatial memory and learning ability. In conclusion, erythritol administration led to significant improvements in memory function in a beta-amyloid-induced animal model, as demonstrated by the Y-maze, passive avoidance, and Morris water maze tests. These findings suggest that erythritol may have therapeutic potential in alleviating cognitive impairments associated with Alzheimer's disease. Future studies are warranted to explore the underlying mechanisms and broader applicability of erythritol in neurodegenerative diseases.

***Corresponding author :** Ji Wook Jung

***Keywords :** Erythritol, Sweetener, Beta-amyloid, Memory, Cognition

PS-A-23

Alleviating lysosomal impairment in macrophages mitigates the progression of nonalcoholic steatohepatitis

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Nonalcoholic steatohepatitis (NASH), a leading cause of liver transplantation, is characterized by intracellular lipid accumulation triggering lysosomal stress, oxidative stress, and inflammation. This study investigated hepatic macrophage responses to NASH-induced lysosomal stress using single-cell RNA sequencing. Macrophages were identified and classified based on lysosomal stress markers, including Gene A and Gene B. High-stress macrophages exhibited increased expression of inflammation-associated genes, emphasizing the crucial role of lysosomal function in NASH progression. Gene ontology analysis revealed enrichment in oxidative stress and inflammatory response pathways in high-stress macrophages. These findings provide novel insights into the relationship between macrophage lysosomal stress and NASH progression, suggesting that targeting this stress could be a promising therapeutic strategy. Further research is needed to explore interventions modulating lysosomal function in hepatic macrophages to mitigate NASH severity.

***Corresponding author :** Sungsoon Fang

***Keywords :** Nonalcoholic steatohepatitis (NASH), Lysosomal stress, Macrophage, Single-cell RNA sequencing

PS-A-24

Effect of Taraxacum platycarpum solvent extract on hair growth

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Hair plays a critical role in protecting the scalp from external damage and significantly influences personal image in modern society. Unlike traditional perspectives that viewed hair loss as a natural sign of aging, recent trends indicate an increase in hair loss due to modern societal factors, such as imbalanced nutrition caused by Westernized diets and elevated stress levels from excessive workloads. While hair loss was previously considered a predominantly male issue, increasing social activities among women have led even young females in their 20s to become concerned about hair loss. *Taraxacum platycarpum* is rich in antioxidant and anti-inflammatory compounds, particularly flavonoids like luteolin, which are known to enhance blood flow by promoting vasodilation in the scalp. In this study, we extracted dandelion using water, 70% ethanol, and 100% methanol as solvents, and treated HDP cells with each extract to measure cell proliferation rates. The 70% ethanol and 100% methanol extracts showed the highest cell proliferation rates, with 70% ethanol extract demonstrating the highest flavonoid content and extraction yield. Subsequently, the 70% ethanol extract was applied to determine its effect on hair growth using C57BL/6N mice. Hair was shaved on 5-week-old mice, and the extract was applied for 4 weeks. Compared to the control group, the treated group exhibited a significantly larger area of hair regrowth.

***Corresponding author :** Ji Wook Jung

***Keywords :** Taraxacum platycarpum, Hair growth, Dermal papilla cell, C57BL/6 mice

PS-A-25

Exploring T cell-driven immune signaling pathways in the development of chronic obstructive pulmonary disease

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Chronic obstructive pulmonary disease (COPD) is characterized by alveolar destruction and increased inflammation, leading to respiratory symptoms. This study aimed to identify traits for COPD progression from mild to severe stages. Additionally, we explored the correlation between Coronavirus disease 2019 (COVID-19) and COPD to uncover overlapping respiratory patterns.
Bulk RNA sequencing was conducted on data from 43 healthy individuals and 39 COPD patients across one dataset (GSE239897) to distinguish COPD characteristics. Single-cell RNA analysis was then performed on samples from 7 mild patients, 7 moderate patients, and 3 severe patients from three datasets to analyze disease progression. Finally, single-nuclei RNA analysis was applied to data from 7 healthy individuals and 20 COVID-19 patients from one dataset to compare the two conditions.
Bulk RNA sequencing revealed enhanced inflammatory pathways in COPD patients, indicating increased inflammation. Single-cell RNA sequencing showed a stronger inflammatory response from mild to moderate COPD with a decrease from moderate to severe stages. COVID-19 displayed similar biological patterns to moderate COPD, suggesting that stage-specific COPD analysis could inform COVID-19 management.
The analysis identified immune responses increased from mild to moderate stages but declined in severe cases, marked by reduced pulmonary T cell activation. The overlap between moderate COPD and COVID-19 suggests shared therapeutic strategies, warranting further investigation.

Corresponding author **:** Sungsoon Fang

Keywords **:** T cell, Chronic obstructive pulmonary disease, COPD, Single cell RNA sequencing, COVID-19

PS-A-26

Investigating the distribution and quantity of the red bone marrow in cynomolgus monkey (Macaca fascicularis)

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Collecting bone marrow cells from nonhuman primates (NHP) has been challenging since it requires knowledge of the distribution of cells and expert skill. The distribution of bone marrow in primates has been a question, but the increased price of the experimental primate and increased ethics on experimental animals made the problem more difficult to solve.
Here, we analyzed the distribution and quantification of red bone marrow in the Cynomolgus monkey using magnetic resonance imaging (MRI), a noninvasive and high-throughput method. First, we obtained T1, T2, and STIR-weighted images of the femur, tibia, lumbar vertebra, sternum, and humerus of the Cynomolgus monkey. Then, the images were opened by the Python open-source pydicom. Based on morphology, the images were resized into the same size, and the region of interest (ROI) was selected using the scipy library. To investigate the distribution, the pixels that contained the red bone marrow was converted into 1 and the other was converted into 0 using the Otsu threshold. In addition, to investigate the quantification of the bone marrow in the area, the pixels were visualized into colormap.
The present study described methods for analyzing the distribution and quantification of red bone marrow using MR imaging and Python open source library. Further studies using more monkeys are required to establish statistical requirements.

Corresponding author **:** Hannah Suh

Keywords **:** Primate, Bone marrow, Python, MRI

PS-A-27

The influence of fasting start time on a rat model of ethanol-induced gastric ulcer

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Rats are widely used as laboratory animals in biomedical and pharmaceutical research. As primarily nocturnal animals, rats exhibit peak activity during the early morning but also engage in movement and feeding throughout the day. Additionally, their coprophagic behavior (feces consumption) can influence gastric experiments, fecal output measurements, and intestinal absorption studies. Therefore, these behavioral patterns must be carefully considered when designing experiments. This study aimed to evaluate the effects of fasting duration, housing conditions, and feces consumption on ethanol induced gastric ulcer in Sprague-Dawley rats. The rats were subjected to fasting under two housing conditions: one that prevented feces consumption and another that allowed it. Fasting was initiated either at 9 a.m. or 6 p.m. Following a 16- or 24-hour fasting period, ethanol was administered to induce gastric ulcer, and gastric tissues were collected for histopathological analysis using Hematoxylin and Eosin (H&E) and Periodic Acid-Schiff (PAS) staining. The occurrence of gastric lesions was inconsistent regardless of whether a metabolic cage was present. Notably, groups that initiated fasting in the evening, during their active phase, consistently developed uniform gastric lesions. H&E staining confirmed consistent mucosal injury, while PAS staining revealed that feces consumption influenced the integrity of the stomach's protective mucus layer. These findings highlight that the timing of fasting initiation is a critical factor in enhancing the reliability and reproducibility of ethanol-induced gastric ulcer models. Initiating fasting in alignment with the rats' active phase improves experimental consistency, providing a more dependable model for studying gastric injury and potential therapeutic interventions.

Corresponding author **:** Kang Pa Lee

Keywords **:** Rat, Ethanol-Induced gastric ulcer, Fasting, Gastric lesion, Histopathological analysis

PS-B-01

Combined exposure to aluminum, arsenic, and mercury on BDNF expression and cognitive function

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[Introduction] Aluminum (Al), arsenic (As), and mercury (Hg), harmful metals that are widely distributed in the environment, can cause damage to the central nervous system through long-term accumulation, even at low doses. These metals cross the blood-brain barrier (BBB) and accumulate in the brain, where they cause neurotoxicity through a variety of pathways. They have been linked to neurodegenerative diseases. Brain-derived neurotrophic factor (BDNF) is a key neurotrophic factor that promotes neuronal survival, growth, and synaptic plasticity, and plays an important role in learning and memory processes, particularly in the hippocampus. However, the effects of combined exposure to these metals on BDNF expression and neurotoxicity remain poorly understood. Therefore, this study evaluated the effects of single and combined exposure to Al, As, and Hg on learning and memory and investigated the changes in BDNF expression in the hippocampus.
[Methods] In this study, 50 C57BL/6 mice were divided into five groups. Each mice were single or combine exposed to Al, As, and Hg (Al 28 mg/L, As 2.5 mg/L, Hg 7.5 mg/L) via drinking water for 4 weeks. The animals' learning and memory were assessed using the Morris water maze test. Western blot analysis was also performed.
[Results and Discussion] The results of the Morris water maze test showed that the combined exposure group exhibited significant impairments in learning and memory compared to the control and single exposure groups. Furthermore, Western blot analysis showed that BDNF expression was downregulated in the combined exposure group. This decreased expression of BDNF suggests that it may be associated with impaired learning and memory.
[Conclusions] This study confirms that combined exposure to metals can reduce BDNF expression and impair learning and memory function. These results suggest that combined exposure to hazardous metals causes neurotoxicity and may play an important role in the pathogenesis of neurodegenerative diseases.

***Corresponding author :** Ki Sok Kim

***Keywords :** Aluminum, Arsenic, Mercury, Neurotoxicity, Learning impairment

PS-B-02

Maternal ingestion of polyethylene microplastics results in reduced antiviral responses by dysregulating the immune system in their progeny

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Increasing evidence highlights the potential risks of environmental microplasticsto human health. Among various types of plastics, polyethylene is the most prevalent in the environment due to its widespread use in manufacturing a variety of plastic products. However, the biological effects ofpolyethylene microplastics(PEMPs)remain underexplored. In this study, we investigated the biodistributionand biological effects of PEMPs during developmental stages using the female mice treated with rhodamine-labeled PEMPs during gestation and lactation. We found that PEMPs ingested by lactating females were transferred to their progeny via maternal breast milk and ultimately accumulated in the intestine and the spleen of progeny. In the developing progeny exposed to PEMPs, we observed disruptions in immune cell distributionin the spleen, leading to impaired antiviral responses against pandemic H1N1 influenza A virus infection.

***Corresponding author :** Jinyoung Jeong, Haiyoung Jung, Da Yong Lee

***Keywords :** Microplastic, Polyethylene, Intergenerational transmission, Immune dysfunction, Antiviral response

PS-B-03

Piperlongumine induces apoptosis via the MAPK/NF-κB pathway and activates autophagy in human breast cancer cells

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Piperlongumine (PL), major alkaloid isolated from long pepper (Piper longum L.), known to treat tumors, malaria, bronchitis, and asthma; however, research on breast cancer is lacking. Therefore, this study aimed to investigate the mechanism of anticancer effects of PL in the human breast cancer cell lines SK-BR-3 and T47D *in vitro*. Breast cancer subtypes are classified based on the expression of estrogen receptors (ER), progesterone receptors (PR), and human epidermal growth factor receptor 2 (HER-2). SK-BR-3 cells showed positive HER-2 but negative ER and PR, while T47D cells exhibited positive ER and PR but negative HER-2. This study demonstrated that PL inhibits cell viability by inducing apoptosis and autophagy in human breast cancer cell lines. PL decreased the survival rate of human breast cancer cells, as shown by MTT assay, increase in apoptotic cells by DAPI staining and annexin V/propidium iodide (PI) staining. PL induced apoptosis by decreasing the expression of the anti apoptotic protein Bcl 2 and increasing that of the pro apoptotic proteins cleaved PARP and Bax. Also, PL treatment induced the activation of extracellular signal-regulated kinase (ERK), c-Jun N-terminal kinase (JNK), and p38 in the mitogen-activated protein kinase (MAPK)/nuclear factor-kappa B (NF-κB) signaling pathways contributed to PL-induced apoptosis. In addition, Autophagy was detected when characteristic acidic vesicular organelles (AVO). Increases in autophagy-related proteins, Beclin-1 and LC3II, and decreases in p-mTOR indicate autophagy induction. These proteins were confirmed by western blot. Collectively, this study suggests that PL induces apoptosis and autophagy through the MAPK/NF-κB pathway in human breast cancer.

***Corresponding author :** Ji-Youn Jung

***Keywords :** Piperlongumine, Human breast cancer, Apoptosis, Autophagy, MAPK/NF-κB pathway

PS-B-04

Polymethyl methacrylate nanoplastic enhances the migration ability of brain microglia through the activation of the CXCR2 signaling pathway

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As plastic pollution continues to pose a growing threat to various ecosystems, the potential harmful effects of microplastics and nanoplastics have become an increasing area of concern, particularly regarding their impact on biological systems. While most research on the biological effects of nanoplastics has focused on polystyrene (PS), it is important to note that environmental plastic waste is a complex mixture, including not only polystyrene but also other plastics such as polypropylene (PP), polyethylene, polyvinyl chloride, and polymethyl methacrylate (PMMA). This study aims to compare the biological effects of nanoplastics derived from three different types of plastics (PS, PP, and PMMA) on the functions of microglia, which are the primary immune cells in the brain with macrophage-like functions. Using cultured primary rat microglia, our findings show that exposure to PMMA nanoplastics (PMMANP) resulted in the highest M1 phase activation compared to PS and PP nanoplastics. Furthermore, we observed that PMMANP significantly enhanced the migration ability of microglia by increasing the expression of chemokines, such as CXCL1 and CXCL2, both in vitro and in vivo. These results suggest that PMMANP exposure may contribute to neurological disorders by promoting the recruitment of microglia and peripheral immune cells across the blood-brain barrier, particularly under neuropathological conditions, potentially exacerbating neuroinflammation.

***Corresponding author :** Da Yong Lee

***Keywords :** Nanoplastic, Polymethyl methacrylate, Microglia, Inflammation, Chemotaxis

PS-B-05

Anti-ulcer effect of green pine cone (Pinus densi flora) extract with high antioxidant activity in an ICR model of HCl/EtOH-induced gastric injury

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Gastric ulcers, a prevalent gastrointestinal disorder, are caused by the disruption of the stomach's mucosal barrier, leading to irritation, inflammation, and potential adhesion of the gastric epithelium. Conventional treatments often come with significant side effects, necessitating the exploration of alternative therapies. This study investigates the protective effects of methanol extract of green pine cones (MPC), recognized for its potent antioxidant and anti-inflammatory properties, on HCl/ethanol-induced gastric ulcers in ICR mice. The experimental design involved dividing mice into normal and gastritis groups, with the gastritis group further subdivided into control and MPC treatment groups receiving 50, 100, or 200 mg/kg of MPC. MPC or water was administered orally for two weeks, followed by induction of gastric ulcers using 70% ethanol in 150 mM HCl. Key parameters assessed included stomach weight, gastric lesion area, histopathological alterations, inflammatory cytokine expression, and mucin production. Bioactive compounds such as dehydroabietic acid, ferruginol, abietic acid, and other phenolic compounds were identified in MPC. These compounds are known for their gastroprotective properties. MPC treatment resulted in a significant reduction in gastric lesion size and improved histopathological markers, including decreased inflammatory cell infiltration, reduced submucosal edema, and preserved gastric epithelial integrity. Enhanced mucin production was also observed, contributing to the protective mucosal barrier. Further, MPC demonstrated robust anti-inflammatory effects by downregulating pro-inflammatory cytokines such as IL-6, TNF-α, and IL-1β, and modulating the MAPK signaling pathway in gastric tissues. Similar anti-inflammatory effects were confirmed in LPS-stimulated RAW264.7 macrophage cells, supporting the systemic anti-inflammatory potential of MPC. Our results suggest that MPC may protect against gastric ulcers and alleviate symptoms through regulation of inflammation and mucin production, though further clinical studies are needed.

***Corresponding author :** Dae Youn Hwang

***Keywords :** Gastric ulcer, Green pine cone, Inflammation, Mucin production

PS-B-06

The role of the gut microbiome in colitis models using germ-free mouse

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The gut microbiome is related to maintaining immune homeostasis and intestinal barrier function. However, the disruption of such homeostasis and intestinal inflammation are encountered in inflammatory bowel disease (IBD). Dextran sodium sulfate (DSS), oxazolone, and trinitrobenzene sulphonic acid (TNBS) are well-known as IBD animal models. However, studies on the microbiome in these models have not yet been well studied. Therefore, we compared SPF mice and GF mice in three models to compare the differences in the degree of lesions developed in each model. DSS causes epithelial cell death, impairing barrier function and causing subsequent inflammation. DSS-treated GF mice showed rectal bleeding as early as 5 days, and the rectal bleeding score was higher than SPF. When comparing body weight change, GF was reduced more than SPF, and comparing survival rates, it was shown that GF was lower than SPF. The histopathological score was more severe in GF than in SPF. For lamina propria cellularity, SPF is more severe than GF, but for architectural damage and epithelial abnormalities, GF is more severe than SPF. In the DSS-induced colitis model, the microbiome has a protective effect. Colitis induced by oxazolone and TNBS, known as hapten reagents results in T-cell-mediated inflammation. Only TNBS-treated SPF mice were observed hemoccult. When comparing the body weight change of oxazolone-treated mice, SPF was reduced more than GF and there was no difference in body weight change of TNBS-treated mice. When comparing the survival rate of oxazolone-treated mice, GF was lower than SPF, and TNBS-treated mice were lower in SPF than in GF. The inflammation occurred both in GF and SPF, but SPF mice showed a more severe inflammatory signature. Our findings reveal that the degree of lesions varies depending on the presence or absence of the microbiome in each colitis model.

***Corresponding author :** Ki Taek Nam

***Keywords :** Germ-free (GF), Microbiome, DSS, Oxazolone, TNBS

PS-B-07

MAPK/JNK-mediated apoptosis and autophagy induction by gossypin HT-29 human colorectal cancer

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Gossypin, a flavonoid found in *Hibiscus vitifolius*, exhibits antioxidant, antidiabetic, anti-inflammatory, and anticancer effects. We investigated its potential to induce apoptosis and autophagy in HT-29 human colorectal cancer cells and its association with the mitogen-activated protein kinase (MAPK)/JNK pathway. The results revealed increased apoptotic bodies and apoptosis rates as well as enhanced autophagy in gossypin-treated HT-29 cells. Moreover, we observed increased cleaved PARP, decreased Bcl-2, and increased Bax levels, indicative of apoptosis induction. Regarding autophagy, decreased p-mTOR, and increased Beclin 1 and LC3-II levels were observed. To investigate autophagy during cell death, the effects of the early autophagy inhibitor 3-methyladenine (3-MA) and late inhibitor hydroxychloroquine on cell viability were assessed. Significant increases in cell viability were observed with 3-MA pretreatment, in addition to alterations in Bax and Bcl-2 expression. Analysis of MAPK pathway proteins revealed significant increases in p-JNK and p-p38 levels. A JNK inhibitor was used to confirm the role of the JNK pathway in gossypin-induced apoptosis and autophagy. There were also changes in Bax, Bcl-2, and LC3-II expression. Moreover, gossypin reduced the volume of HT-29 tumors, and apoptosis expression in the tumors was also confirmed. Finally, the expression of cleaved PARP, Bax, Bcl-2, Beclin 1, and LC3-II, was assessed to confirm apoptosis and autophagy induction in the tumors. Collectively, The study suggest that Gossypin induces MAPK/JNK-mediated apoptosis and autophagy in HT-29 colorectal cancer cells, highlighting its potential as an anticancer agent.

***Corresponding author :** Ji-Youn Jung

***Keywords :** Gossypin, Apoptosis, Autophagy, Colorectal cancer, MAPK/JNK pathway

PS-B-08

Luteolin inhibits proliferation, induces apoptosis and autophagy, and regulates MAPK pathways in human oral cancer cell lines

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Oral cancer is a major cause of mortality worldwide. Conventional treatments for oral cancer are limited by their inability to target solid tumors, resulting in severe side effects. Consequently, there has been a recent focus on the development of chemotherapy using naturally derived drugs with low toxicity, high efficiency, and fewer side effects. Luteolin, a flavonoid ubiquitously present in vegetables and fruits such as celery, carrots, and parsley, exerts antioxidant, anticancer, and neuroprotective effects. However, its impact on oral cancer has been scantily studied. In this study, we sought to investigate the anticancer effects of luteolin in vitro using human oral cancer cells MC-3 and HSC-4. The 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay revealed that MC-3 and HSC-4 cells treated with luteolin exhibited a significant decrease in cell viability compared to the control group. This decline in viability is likely attributable to apoptosis, a hypothesis that can be validated through 4′,6-diamidino-2-phenylindole (DAPI), and annexin V/propidium iodide (PI) staining. In addition, luteolin treatment induced apoptosis by increasing the expression of the pro-apoptotic proteins cleaved-poly (ADP-ribose) polymerase (PARP) and cleaved-caspase compared to the control group. Luteolin also induced apoptosis through the Mitogen-Activated Protein Kinases (MAPK) pathway in MC-3 and HSC-4 cells by regulating the phosphorylation of MAPK pathway proteins extracellular signal-regulated kinase (ERK), c-jun N-terminal kinase (JNK), and p38. These proteins were confirmed by western blot. Furthermore, the number of acidic vesicular organelles was increased in MC-3 cells treated with luteolin by acridine orange staining. also, autophagy induced by 1A/1B-light chain 3 (LC3), p62 and mTOR expression was investigated by western blot. These results suggest that luteolin, a natural product, has potential as a treatment for oral cancer.

***Corresponding author :** Ji Youn Jung

***Keywords :** Luteolin, Apoptosis, Autophagy, MAPK pathway, Human oral cancer

PS-B-09

Uncovering a SARS-CoV2 mRNA vaccine-induced bone marrow toxicity in ICR mice by single-cell RNA-seq analysis

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SARS-CoV2 mRNA vaccine-induced side effects have been extensively reported in the clinical field. However, the potential toxicity of mRNA vaccines has not been fully identified.
To identify the potential toxicity of the mRNA vaccine, we assessed the comprehensive toxic phenotype of mRNA vaccine-injected ICR mice (A SARS-CoV2 Omicron variant mRNA vaccine candidate, intramuscular injection, mRNA dose 100 μg/head, twice with two weeks intervals) and we found that the mRNA vaccine induces reversible histopathological changes in bone marrow tissue at the acute phase (Two days post final injection). In particular, erythroid cells were significantly reduced by mRNA vaccine injection, which led to an increase in the Myeloid/Erythroid ratio (M/E ratio). Single-cell RNA sequencing of bone marrow total cells revealed significant changes in cell clusters and pivotal differentially expressed genes were identified between control and mRNA vaccine-injected mice.
Our study suggests that the mRNA vaccine can cause toxicological changes in bone marrow tissue. These findings indicate that mRNA vaccine-induced bone marrow toxicity should be cautiously considered in the pre-clinical developmental process of mRNA vaccine. We anticipate that our results contribute to clarifying the potential side effects of the mRNA vaccine.

Corresponding author **:** Byeong-Cheol Kang

Keywords **:** Single cell RNA seq, MRNA vaccine, SARS-CoV2, TOXICITY, Bone marrow

PS-B-10

Didecyldimethylammonium chloride-induced lung fibrosis may be associated with phospholipidosis

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When exposed didecyldimethylammonium chloride (DDAC) for 28 days (5, 10, 50, and 100 μg/head), all the mice in the 50 and 100 μg/head groups died since Day 2 after the third dosing. Edema, necrosis of bronchiolar and alveolar epithelium, and fibrinous exudate were observed in the lungs of all the dead mice, and chronic inflammatory lesions were observed in the lung tissues of alive mice. When dosed for 13 weeks, the total number of pulmonary cells and the pulmonary levels of pro- and anti-inflammatory cytokines significantly increased, and chronic inflammatory lesions were detected with the production of collagen, collagen fibers, and lamellar body-like structures. Swelling of the nuclear envelope and nucleoplasmic components and generation of lipid droplets were also notably observed in the lung tissues of DDAC (8 μg/head)-treated mice. Furthermore, transcriptomic analysis performed using human bronchial epithelial cells showed that DDAC affected the expression of DNA damage, ER stress, lipid metabolism, and transcription regulation-related genes at 6 h after treatment, as it did 24 h treatment and that early growth response factor 1 gene was added to a list of the most up-regulated genes. Meanwhile, cytokines that are associated with the pathology of chronic lung diseases were slightly increased in the lung of DDAC-treated mice, and only the pulmonary level of CCL-2, but not CXCL-1 and CCL-3, increased in both sexes of mice. More importantly, the GM-CSF level increased dose-dependently in the lungs of both sexes of mice exposed to DDAC. Considering that the wound-healing process can take several weeks to complete, we suggest that DDAC-induced pulmonary fibrosis may be attributable to disruption of the wound-healing process due to continuous exposure to DDAC. We also hypothesize that the formation of lamellar bodies may be attributable to lysosomal accumulation of phospholipids separated from the destroyed lung tissue membrane.

Corresponding author **:** Eun-Jung Park

Keywords **:** Quaternary ammonium compounds, Phospholipidosis, Lamellar bodies, Lipid metabolism, Fibrosis

PS-B-11

Detection analysis of apoptotic bodies in rat liver using YOLOv8 object detection algorithm

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With advancements in high-resolution scanners and high-performance computers, the use of whole slide images (WSI) in digital pathology has significantly increased. These advancements have helped overcome limitations previously faced in traditional pathology. In the pathology diagnostic process, glass slides prepared for analysis are often transported for peer review, either by courier or in person. During this process, glass slides can be damaged, and long-term storage may lead to discoloration, making them unsuitable for reliable data use. However, WSIs are created by scanning glass slides into a computer, enabling diagnostic interpretation without the risk of damage or discoloration. Additionally, WSIs enable remote peer reviews, eliminating the need for physical slide transportation. Furthermore, advancements in artificial intelligence (AI) have advanced research applications in pathology. This study utilized the YOLOv8 deep learning model, a cutting-edge object detection model, to train pathological knowledge for detecting apoptotic bodies, which are commonly observed in the livers of rodents. YOLOv8 effectively identifies specific objects within images. A total of 2,036 images containing apoptotic bodies were extracted from 46 WSIs of rat livers, combined with 478 images derived from glass slides, resulting in 2,524 images used for model training. To avoid overfitting, epochs were set to 300. The model's performance in detecting apoptotic bodies was evaluated, yielding a mAP50 score of 0.882. While this result cannot be considered very high for diagnosing a single lesion, it is noteworthy considering the microscopic size of apoptotic bodies compared to hepatocytes. It is anticipated that increasing the volume of training data could further improve accuracy. Therefore, the findings of this study are expected to help reduce the workload, cost, time, and resources required for toxicologic pathologists to carry out their diagnostic tasks.

Corresponding author **:** Beom seok Han

Keywords **:** Toxicopathology, Apoptosis, Artificial intelligence, YOLOv8

PS-B-12

Retinal immune responses as a potential non-invasive marker for brain inflammation in status epilepticus

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Status epilepticus (SE) is one of the most common serious neurodegenerative diseases, triggered by abnormal electrical activity and leading to severe and widespread cell loss in the brain, often associated with an immune response. SE can induce a plethora of symptoms that are typically correlated with the function or dysfunction of the affected brain region and may present differently across individuals. Among these symptoms, characteristic ophthalmologic signs such as visual hallucinations, visual field loss, and retinal detachment can be observed. However, it remains unclear whether SE-induced changes extend to remote areas of the brain, such as the eyes. Therefore, we investigated the effects of immune responses after SE on the retina. Seven-week-old C57BL/6 male mice were injected with scopolamine and pilocarpine to induce SE. After 30 minutes, temporal status epilepticus occurred, and the brain and eyes were analyzed 1 and 2 weeks later using biochemical and immunohistochemical methods. Immunohistochemical analysis demonstrated hippocampal neuronal apoptosis and astrocyte activation in SE-induced mice. Furthermore, changes were observed in retinal cell layers, including the Nerve Fiber Layer (NFL), Ganglion Cell Layer (GCL), and Outer Nuclear Layer (ONL), along with astrocyte activation in the inner retina. Additionally, increased levels of TNF-α and the cytokine interleukin-1β were detected. Our findings provide evidence that SE induces an immune response in the retina. This has the potential to become a novel non-invasive tool for detecting brain inflammation through the eyes.

Corresponding author **:** Jin-Chul Ahn

Keywords **:** Status Epilepticus, Visual loss, Retina, Astrocyte

PS-B-13

Exploration of targeted Anti-inflammatory drugs using LPS- or MDP-Induced inflammation models

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The regulation of immune response activity is a crucial factor in developing novel therapeutics for immune or inflammatory-related diseases. The innate immune system, the most evolutionarily conserved part of the immune system, intersects the pathways of microbial recognition, inflammation, and cell death, offering various therapeutic targets. Innate immunity recognizes microorganisms through a limited number of pattern-recognition receptors (PRRs). Toll-like receptors (TLRs) and Nod-like receptors (NLRs) are representative PRRs that recognize microbial components known as pathogen-associated molecular patterns (PAMPs). Although the molecular signatures of TLR and NLR responses share commonalities, detailed differences exist, making it important to understand these differences for developing targeted therapies for inflammatory-related diseases. Therefore, we investigated the differences in inflammatory responses and intracellular signaling upon the activation of TLR2/4 and nucleotide binding oligomerization domain containing 2 (NOD2) in mice. After intraperitoneal injection of various doses of lipopolysaccharide (LPS; 5 and 10 mg/kg) and lipophilic derivative of muramyl dipeptide (L18-MDP; 2.5 and 5 mg/kg), we collected the blood samples via the abdominal vena cava and obtained peritoneal fluid in different time-points (1, 2, and 4 hours). We then separated serum and peritoneal cells to detect pro-inflammatory cytokine levels and intracellular signaling by ELISA and Western Blot, respectively. The elevation of pro-inflammatory cytokines such as TNF-α, IL-6, and IL-1β in serum was observed in LPS or L18-MDP injected mice, with different increase patterns between the two agonists. Additionally, although NF-κB pathway activation was commonly observed in peritoneal cells exposed to LPS or L18-MDP, the activation of specific TLR and NLR downstream signals varied depending on the ligand. Furthermore, the anti-inflammatory responses, such as the reduction of pro-inflammatory cytokine secretion and modulation of PRR downstream signaling following the administration of targeted inhibitors for TLR4, NOD2, and receptor interacting serine/threonine kinase 2 (RIPK2), appeared differently in each inflammation mouse model induced by LPS or L18-MDP. In conclusion, we suggest that the appropriate mouse model should be selected and used for the discovery of anti-inflammatory drugs targeting specific signaling pathways. These models will also be useful for evaluating the pharmacodynamics of targeted inflammation-related therapeutics.

***Corresponding author :** Eun-Kyung Ahn

***Keywords :** Inflammatory response, Inflammatory signaling pathway targeted therapy, TLR, NLR, PAMPs

PS-B-14

Discovery and application of medical fluorophore 33: a novel theranostic agent for cancer therapy and imaging in mice of colorectal cancer

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Fluorescent dyes have garnered significant attention as theranostic platforms owing to their inherent characteristics. In this study, we present the discovery of Medical Fluorophore 33 (MF33), a novel and potent theranostic agent with a phenaleno-isoquinolinium salt structure that can serve as a cancer therapeutic strategy. The synthesis of MF33 is readily achievable through a simple Rh(III)-catalyzed reaction. Moreover, MF33 displayed strong fluorescence signals, excellent microsomal stability, and high biocompatibility in vivo. It induces significant apoptosis in cancer cells via the p53/p21/caspase-3 signaling pathway, leading to selective cytotoxicity in various cancer cells. In vivo fluorescence imaging with MF33 enabled the visualization of sentinel lymph nodes in living mice. Notably, repeated intraperitoneal administration of MF33 resulted in antitumor activity in mice with colorectal cancer. Collectively, our findings suggest that phenaleno-isoquinolinium salt-based MF33 is a viable theranostic agent for biomedical imaging and cancer treatment.

***Corresponding author :** Yong Hyun Jeon

***Keywords :** theranostic , Phenaleno-isoquinolinium salt, Fluorescence, Colorectal cancer

PS-B-15

Phosphatidylserine externalization in erythrocytes induced by polyhexamethylene guanidine phosphate promotes venous thrombus formation in a rat model

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Polyhexamethylene guanidine phosphate (PHMG-p), a chemical used as a humidifier disinfectant (HD), caused an unforeseen environmental disaster in South Korea. In addition to causing fatal lung injuries, the application of HDs has also led to extra-pulmonary diseases. Although the polymeric characteristics of PHMG-p initially made it challenging to confirm its absorption in the lungs, recent studies have demonstrated its potential to be absorbed through the pulmonary system. This finding highlights the need for further research into the toxicological mechanisms underlying extra-pulmonary diseases. In this study, we investigated whether PHMG-p could elevate the risk of thrombosis by enhancing the pro-coagulant activity of erythrocytes. Prior to conducting animal experiments, we initially evaluated the toxicological effects of PHMG-p on human erythrocytes. Under sub-hemolytic conditions, phosphatidylserine (PS) externalization and microvesicle generation have been observed in erythrocytes exposed to PHMG-p. PS externalization was facilitated by the activation of scramblase through alterations in intracellular mediators, such as calcium ions and oxidative stress. These alterations facilitated generation of thrombin and adhesion of erythrocytes to vascular endothelial cells, leading to enhanced pro-coagulant activity of erythrocytes. Next, animal experiments were performed to ascertain whether changes in erythrocytes induced by PHMG-p may indeed result in thrombus formation. *In vitro* investigations demonstrated that there was no significant interspecies difference in reactivity between rat and human erythrocytes. Changes have been observed following the intratracheal instillation (ITI) of PHMG-p, considering the actual exposure route of HDs. ITI of PHMG-p promoted PS externalization and thrombin generation in erythrocytes. Moreover, PHMG-p instilled into the lungs significantly promoted thrombus formation in a rat venous thrombosis model. Collectively, our findings demonstrated that PHMG-p significantly promotes thrombotic risk by inducing PS externalization in erythrocytes.
Funding Source: This research was supported by a grant from the National Research Foundation of Korea (NRF-2022R1A24001434 and RS-2023-00217123) and the Manufacturing Human Cell-based Artificial Blood and Platform Technology Development for Transfusion, funded by the Multi-Ministrial Research Project, Republic of Korea (RS-2023-KH140699), and from the Technology Development Project for Safety Management of Household Chemical Product Program (2020002970001).

***Corresponding author :** Ok-Nam Bae

***Keywords :** Polyhexamethylene guanidine phosphate (PHMG-p), Erythrocytes, Phosphatidylserine, Thrombosis, Intratracheal instillation

PS-B-16

Ameliorative effects of Gastrodia elata Blume extract on inflammation of allergic contact dermatitis in mouse

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Allergic Contact Dermatitis (ACD) is a type IV hypersensitivity reaction characterized by erythema, edema, and epidermal hyperplasia resulting from a T cell-mediated immune response triggered by contact allergens. This study investigated preventive effects of *Gastrodia elata* Blume extract in a DNCB-induced ACD model. Six-week-old male BALB/c mice were randomly divided into the following four groups: i) Control (CON) group, ii) Allergic contact dermatitis (ACD) group, iii) ACD + Low concentration GEB-treated (ACD + L-GEB) group, and iv) ACD + High concentration GEB-treated (ACD + H-GEB) group. Sensitization was performed by shaving the fur on the back of the mice the day before the experiment and applying 200 μL of 1% DNCB to the entire back of the mice three times on days 1, 4, and 7 of the experiment. Elicitation was performed by applying 20 μL of 0.5% DNCB to the left ear of the mice at 3-day intervals, starting on day 14 of the experiment, one week after the last sensitization, to induce ACD. From day 8 to day 29 of the experiment, the GEB groups were orally administered low and high concentrations of GEB extract once daily, while the CON and ACD groups received distilled water instead of GEB extract. Histological analysis using Hematoxylin & Eosin and Masson trichrome staining revealed that the DNCB-induced ACD model exhibited significant epidermal and dermal hyperplasia, increased collagen deposition, and pronounced inflammatory cell infiltration. These pathological changes were notably attenuated in the GEB-treated groups. Immunohistochemical analysis further demonstrated that GEB extract effectively modulated inflammatory responses by reducing the infiltration and activation of cytotoxic T cells, suppressing the expression of pro-inflammatory cytokines such as Interleukin-6 (IL-6) and IL-17, and mitigating myeloperoxidase activity. These findings suggest that GEB extract exhibits anti-inflammatory and immunomodulatory properties in a DNCB-induced model of ACD.
Acknowledgement: This project was supported by the Rural Development Administration business (RS-2022-RD009980).

***Corresponding author :** Jae-Ho Shin

***Keywords :** Gastrodia elata Blume, Allergic Contact Dermatitis, Mouse, Anti-inflammation

PS-B-17

Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) mouse modeling

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Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) significantly impacts patient mortality and morbidity. However, current experimental models face limitations in replicating both chronic structural changes and acute inflammatory responses characteristic of human AECOPD. This study aimed to develop and validate a novel mouse model that effectively reproduces key pathological features of AECOPD. Male C57BL/6 mice received intratracheal administration of porcine pancreatic elastase (PPE, 50U/kg) followed by lipopolysaccharide (LPS, 0.5mg/kg) on day 13. The model was evaluated through histological analysis, inflammatory cell counts in bronchoalveolar lavage fluid (BALF), lung injury scoring, and measurement of inflammatory cytokines in both serum and BALF. The AECOPD model exhibited significant increases in lung weight-to-body weight ratio and the inflammatory cell infiltration, particularly macrophages and neutrophils. Histological examination revealed severe alveolar wall destruction with large bullae formation, accompanied by increased mean linear intercept and lung injury scores. Analysis of inflammatory markers showed elevated levels of pro-inflammatory cytokines (IL-1β, IL-17, TNF-α, MIP-1α, IL-6) in both serum and BALF, while anti-inflammatory IL-10 decreased and TGF-β increased, indicating complex inflammatory modulation. This PPE-LPS combination model successfully replicates both chronic structural destruction and acute inflammatory responses characteristic of AECOPD. The model's relatively simple methodology, cost-effectiveness, and shorter experimental duration offer practical advantages over existing approaches. This standardized protocol may serve as a valuable tool for investigating AECOPD pathogenesis and evaluating potential therapeutic interventions.

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***Keywords :** AECOPD, COPD, PPE, LPS, Inflammatory cytokine

PS-B-18

Recombinant RAGE antagonist peptide Inhibits the damage of alveolar epithelial cells in emphysema

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Chronic obstructive pulmonary disease (COPD) progression is characterized by irreversible lung damage and persistent inflammatory responses. Despite various alternative treatments, the specific contribution of alveolar epithelial cells to COPD pathogenesis remains inadequately understood. Additionally, the link between emphysema and DAMP-RAGE signaling in COPD patients is poorly characterized. In this study, we investigated the therapeutic potential of a previously identified RAGE antagonist peptide (RAP) in COPD. Using GEO data, we evaluated the expression levels of RAGE ligands and their associated signaling pathways in COPD patients. A PPE-induced emphysema mouse model and AGER-/- mice were utilized alongside RAP treatment. The involvement of RAGE in emphysema development was assessed through H&E staining and western blot analysis of lung tissues and BALF. To further explore oxidative stress and inflammatory damage, human alveolar epithelial A549 cells were treated with CSE and RAP. Our findings revealed that inhibiting RAGE reduces emphysema severity by attenuating inflammation and MMP activity. Targeting RAGE in alveolar epithelial cells led to significant alleviation of lung injury independent of macrophage infiltration. Additionally, RAP effectively mitigated CSE-induced oxidative stress, inflammation, and cell cycle arrest in human alveolar epithelial cells. These results demonstrate that RAGE inhibition in alveolar epithelial cells reduces lung damage and emphysema by suppressing oxidative stress-induced inflammation and MMPs, while promoting cell proliferation. Blocking the DAMP-RAGE interaction with RAP may serve as a promising therapeutic strategy for treating emphysema.

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***Keywords :** Alveolar epithelial, COPD, MMP, Oxidative stress, RAGE

PS-B-19

Nighttime limited fiber supplementation ameliorates metabolic dysfunction-associated fatty liver disease in mice via gut microbiota modulation

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Metabolic dysfunction-associated fatty liver disease (MAFLD), affecting roughly a quarter of the global population, lacks effective therapeutic strategies due to limited mechanistic understanding. Disrupted circadian rhythms are implicated in various metabolic disorders. This study investigates the chronobiological influence of fiber consumption on gut microbiome composition and its potential to improve MAFLD outcomes. C57BL/6J mice were fed a high-fat/high-fructose (HFHF) diet for 6 months to induce MAFLD. Subsequently, mice were randomized to receive either a chow diet, continued HFHF diet, daytime limited feeding (DF), or nighttime limited feeding (NF) with fiber supplementation for 12 weeks. Liver and plasma samples were collected for histological analysis, clinical phenotyping, and molecular analyses. Cecum samples were analyzed to assess gut microbiome composition. The NF group displayed significantly reduced body weight, liver weight, adipose tissue mass, and hepatic lipid accumulation compared to the HFHF group. NF group significantly attenuated HFHF-induced elevations in hepatic triglyceride and total cholesterol. Liver fibrosis markers were lower in the NF group, suggesting an anti-fibrotic effect. qPCR analysis revealed changes in gene expression associated with inflammation, lipid metabolism, and fibrosis in the NF group. Notably, the NF group exhibited significant alterations in gut microbial diversity and composition. Nighttime limited fiber supplementation demonstrated significant efficacy in mitigating MAFLD progression in mice, potentially through modulation of the gut microbiome. A subsequent study using a specific bacteria (Bacteriodetes Satorri) identified from this study is being investigated using the HFHF disease model.

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***Keywords :** Fiber diet, Circadian rhythm, MASLD, HFHF

PS-B-20

Parkinson's disease progression revealed by astrocyte changes in a lewy body pathology–Induced non-human primate model (pilot study)

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Parkinson's disease (PD) is featured by phosphorylated alpha-synuclein (p-a-syn) deposition, typically as Lewy bodies, accompanied by changes of dopaminergic neurons and glial cells. Here we established a non-human primate PD model by injecting bilaterally of alpha-synuclein amyloid fibril into striatum of the Rhesus monkey. After three months of injecting, histological analyses were performed to observe the presence of p-a-syn inclusions and degeneration of dopaminergic neurons as well as the changes of glial cells, especially astrocytes. We found that bilateral injection of alpha-synuclein amyloid fibril into striatum induced PD pathology with spread of Lewy body-like p-a-syn inclusions to other brain regions. Interestingly, the result of astrocyte detection by GFAP staining revealed the presence of many undefined vacuoles along the substantia nigra (SN). This pilot study illustrates the feasibility of the alpha-synuclein amyloid fibril model in mimicking human PD, hence facilitating comprehensive investigation on the PD mechanisms. Simultaneously, the result might reveal the progression of the disease through the changes of astrocytes in the SN.
Acknowledgements: This research was supported by Basic Science Research Program through the National Research Foundation of Korea(NRF) funded by the Ministry of Education [RS-2024-00449397]; the Korea Research Institute of Bioscience and Biotechnology Research Initiative Program [KGM4562532] .

***Corresponding author :** Youngjeon Lee

Keywords : Parkinson's disease, Non-human primate, Alpha-synuclein, Lewy body, Astrocytes

PS-B-21

Study on AI-based lesion diagnosis and severity criteria in forestomach squamous cell hyperplasia of rat

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Squamous cell hyperplasia, a spontaneous lesion occurring in the forestomach of rodents, is characterized by excessive squamous cell proliferation, leading to thickened layers. However, objective diagnostic criteria for this lesion have not been established, and differences in tissue preparation processes among nonclinical testing institutions make it challenging to maintain diagnostic consistency among pathologists. This study standardized the diagnostic and grading criteria for squamous cell hyperplasia in the rat forestomach. Additionally, the deep learning model YOLOv8 was employed to segment forestomach regions and detect lesions. Experimental resources included 1,793 normal stomach WSIs and 229 squamous cell hyperplasia WSIs collected from the Korea National Toxicology Program (KNTP) of the National Institute of Food and Drug Safety Evaluation. To establish criteria for squamous cell hyperplasia, the diameters of normal and hyperplastic tissues were measured separately in the non-keratinized (non-keratin layer) and keratinized (keratin layer) layers. To minimize differences in tissue preparation across nonclinical testing institutions, the same methodology was applied to Institutions A and B. The diameter measurement results from both institutions were integrated to derive the final average values. As a result, using the limiting ridge part as a reference, the diameter ranges were established as follows: normal (143–173 μm), minimal (173–191.5 μm), slight (191.5–210 μm), moderate (210–228.5 μm), and severe (228.5–247 μm). For efficient detection of squamous cell hyperplasia using YOLOv8, forestomach regions were segmented into four layers: keratin layer, non-keratin layer, mucosa-muscular layer, and glandular layer. A total of 400 images were labeled, and 40 test images were used to calculate the mean Average Precision (mAP). The YOLOv8 model demonstrated high performance with an mAP of 0.990. This study is expected to contribute to improving diagnostic consistency for squamous cell hyperplasia and enhancing the reliability of lesion detection, thereby expanding the applicability of artificial intelligence in the field of toxicopathology.

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Keywords : Toxicopathology, Artificial intelligence, Squamous cell hyperplasia

PS-B-22

Rhein inhibits AKT/mTOR signaling pathway in oral cancer cell by inducing apoptosis and ROS

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Oral cancer continues to be a predominant cause of mortality globally. Rhein, a bioactive compound derived from the traditional Chinese medicinal herb rhubarb, has exhibited therapeutic potential across various malignancies. However, the anticancer effects of rhein on oral carcinoma remain to be fully elucidated. This study aimed to explore the potential anticancer properties and the underlying molecular mechanisms of rhein in oral cancer cell lines. The antiproliferative effects of rhein in oral carcinoma cells were assessed through cell viability assays, soft agar colony formation, and metastatic ability was evaluated by migration and invasion assays. Apoptosis and reactive oxygen species (ROS) generation were analyzed using flow cytometry. The molecular mechanisms underlying rhein's action in oral cancer cells were investigated via immunoblotting. The in vivo antitumor efficacy was further evaluated using oral cancer xenograft models. Rhein markedly suppressed oral cancer cell proliferation by promoting apoptosis. It attenuated the migration and invasion of oral carcinoma cells by modulating proteins associated with epithelial–mesenchymal transition (EMT). Additionally, rhein triggered the accumulation of reactive oxygen species (ROS) in oral cancer cells, leading to the inhibition of the AKT/mTOR signaling cascade. Rhein demonstrated significant anticancer activity both in vitro and in vivo by inducing apoptosis and enhancing reactive oxygen species (ROS) production in oral carcinoma cells, primarily through inhibition of the AKT/mTOR signaling pathway. These findings suggest that rhein holds promise as a potential therapeutic agent for the treatment of oral cancer.

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Keywords : Oral cancer, Rhein, Apoptosis, MTOR, Xenograft model

PS-B-23

The effects of 6-shogaol on oral squamous cell carcinoma through the AKT signaling pathway

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Oral squamous cell carcinoma (OSCC) is a common type of cancer that leads to significant mortality, becoming an increasing global concern. The prognosis for OSCC patients remains poor, largely due to the lack of effective chemotherapy options. 6-shogaol, a bioactive compound found in ginger, is known for its diverse therapeutic properties and has been used to treat a variety of ailments. However, its potential effects on oral cancer have not been fully explored. In this study, we investigated the anticancer effects of 6-shogaol on human OSCC cell lines, focusing on cell proliferation, migration, invasion, apoptosis, and the underlying mechanisms.The effect of 6-shogaol on OSCC cell growth was evaluated by conducting cell viability and soft agar colony formation assays. Migration and invasion assays were performed to examine its impact on metastasis. Apoptosis was quantified using flow cytometry, and the mechanisms responsible for the anti-growth effects of 6-shogaol in OSCC cells were explored by western blotting.In this study, 6-shogaol was found to suppress OSCC cell proliferation and anchorage-independent growth, while also inducing apoptosis via modulation of apoptosis-related proteins like p53, Bax, Bcl-2, and cleaved caspase-3. The migration and invasion of OSCC cells were inhibited through the regulation of E-cadherin and N-cadherin. Moreover, 6-shogaol treatment resulted in a significant inhibition of the PI3K/AKT signaling pathway.The results of this study provide compelling evidence for considering 6-shogaol as a potential therapeutic approach in oral cancer.

***Corresponding author :** Myoung Ok Kim

Keywords : 6-shogaol , Oral squamous cell carcinoma, PI3K/AKT signaling pathway

PS-B-24

Silibinin causes oral cancer cell apoptosis and reactive oxygen species generation by activating the JNK/c-Jun pathway

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Background : Oral cancer is among the most common malignant tumors globally. Silibinin has demonstrated therapeutic potential in various cancer models, yet its precise mechanism of action in oral cancer remains to be fully understood. This study aimed to investigate the molecular pathways through which silibinin exerts its effects on oral cancer, both in vitro and in vivo, and to evaluate its potential anticancer properties. Additionally, we examined the molecular mechanisms that underlie the observed outcomes of silibinin treatment in oral cancer models.
Methods : To assess the impact of silibinin on oral cancer cell growth, proliferation, and anchorage-independent colony formation assays were performed using YD10B and Ca9-22 oral cancer cell lines. Transwell assays were used to evaluate the effects of silibinin on cell migration and invasion. Flow cytometry analysis was conducted to investigate apoptosis, cell cycle distribution, and reactive oxygen species (ROS) accumulation. Immunoblotting was employed to explore the molecular mechanisms behind silibinin's anticancer effects. In vivo efficacy was assessed using a Ca9-22 xenograft mouse model.
Results : Silibinin significantly inhibited the proliferation and colony formation of YD10B and Ca9-22 cells in a dose-dependent fashion. Treatment with silibinin led to G0/G1 phase cell cycle arrest, apoptosis, and increased ROS production. Silibinin also suppressed the migration and invasion of YD10B and Ca9-22 cells by modulating proteins involved in the epithelial-mesenchymal transition process. Western blotting revealed that silibinin reduced the expression of SOD1 and SOD2 and activated the JNK/c-Jun pathway in oral cancer cells. In the xenograft mouse model, silibinin markedly suppressed tumor growth without noticeable toxicity.
Conclusions : Silibinin effectively inhibited the progression of oral cancer cells by promoting apoptosis, inducing G0/G1 phase arrest, generating ROS, and activating the JNK/c-Jun signaling pathway. Moreover, silibinin demonstrated significant antitumor activity in vivo by reducing xenograft tumor growth. These findings suggest that silibinin may serve as a promising candidate for the prevention and treatment of oral cancer.

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***Keywords :** Oral cancer, ROS, Silibinin, JNK, Xenograft

PS-B-25

Evaluation of immunotoxic effects of lead exposure during pregnancy and lactation on neonates in an autism-like mouse model

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Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by impaired social communication and repetitive behavioral patterns. The prevalence of ASD has been increasing over the past two decades. While genetic, environmental, and immunological factors have been implicated, the precise mechanisms underlying ASD remain unclear.
Humans have been exposed to lead (Pb) throughout history. In the past, lead exposure occurred primarily through sources such as paint and water supply pipes. In modern times, exposure arises from everyday environmental sources, including battery manufacturing, lead-containing imported products, and consumption of food from contaminated soil. This study investigates the toxic effects of lead exposure during critical developmental periods on mothers and offspring.
For the experimental model, BTBR mice, commonly used in ASD research, were selected as the experimental group, while B6 mice, known for their high sociability, were used as the control group. Mice were divided into three exposure groups: those consuming distilled water (DW) throughout the gestation and lactation periods, those exposed to lead only during the lactation period, and those exposed to lead during both gestation and lactation. Lead-containing drinking water was provided ad libitum.
On postnatal day 21, behavioral assessments were conducted using the passive avoidance test over two consecutive days. Subsequently, mice were sacrificed to collect spleen, blood, and brain tissues. Cytokine levels, including TNF-alpha, IFN-gamma, IL-4, and IL-17, were measured in spleen and blood samples using sandwich ELISA. Immunoglobulin levels (IgG1 and IgG2a) were also analyzed.
In the passive avoidance test, the BTBR mice exhibited a shorter latency time compared to the B6 mice, with the group exposed to lead (Pb) during both gestation and lactation showing a further decrease in latency compared to the group that consumed distilled water (DW). When analyzing cellular immunity, the level of TNF-α was lower in the Pb-exposed BTBR mice, indicating that the inflammatory response was suppressed. The IFN-γ/IL-4 ratio was higher in the group exposed to Pb during both gestation and lactation, suggesting a predominance of Th1 responses. The level of IL-17 was lower in the BTBR mice exposed to distilled water, indicating that Th17 immune responses were suppressed. In terms of humoral immunity, the IgG2a/IgG1 ratio was higher in the group exposed to Pb during both gestation and lactation, reflecting a shift towards a Th1-type immune response.
Therefore, this study suggests that lead exposure during pregnancy and lactation has behavioral, immunological, and neuroimmunological toxic effects on both the mothers and offspring in the autism-like BTBR mouse model.
This researched was approved by the NRF(National Research Foundation of Korea) [Assignment number:RS-2023-00212281] and This researched was conducted with support from the Graduate School of Chemical Safety Management funded by the Korea Environment Institute.

***Corresponding author :** Chang Yul Kim

***Keywords :** Autism spectrum disorder, BTBR mouse, Lead, Behavior test, Cellular immunity&humoral immunity

PS-B-26

Axl signaling suppression by 20(S)-Ginsenoside Rh2: a therapeutic strategy for colorectal cancer

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Background : Colorectal cancer (CRC) continues to be a leading contributor to global morbidity and mortality. 20(S)-Ginsenoside Rh2 (G-Rh2), an active compound isolated from ginseng, has shown potent anticancer activity in various malignancies. This study examines the impact of ginsenoside Rh2 (G-Rh2) on colorectal cancer (CRC) cells and elucidates its molecular mechanisms of activity through comprehensive in vitro and in vivo analyses.
Methods : The effects of G-Rh2 on CRC cells were evaluated using assays to measure cell proliferation, migration, invasion, apoptosis, and cell cycle distribution. Western blotting was performed to analyze signaling pathways, and a pull-down assay confirmed the interaction between G-Rh2 and Axl. Transfection and infection experiments were used to explore Axl's role in CRC, while xenograft models were employed to examine the effect of Axl knockdown induced by G-Rh2 on tumor growth in vivo.
Results : G-Rh2 effectively inhibited CRC cell proliferation, migration, and invasion, induced apoptosis, and caused cell cycle arrest at the G0/G1 phase. The compound is directly bound to Axl, suppressing its downstream signaling. Silencing Axl significantly reduced CRC cell growth and invasion in vitro and slowed tumor growth in vivo. In contrast, Axl overexpression amplified these cancer-promoting effects. G-Rh2 treatment significantly suppressed tumor progression in xenograft models without notable toxicity.
Conclusions : This study highlights the anticancer potential of G-Rh2 in CRC by targeting the Axl signaling pathway. G-Rh2 could represent a promising therapeutic candidate for CRC prevention and treatment.

***Corresponding author :** Myoung Ok Kim

***Keywords :** 20(S)-ginsenoside Rh2, Axl, Colorectal cancer, Xenograft

PS-B-27

Differences in DSS-induced inflammatory bowel disease between C57BL/6 and KWM/Hym

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Inflammatory bowel disease (IBD) is a multifactorial disorder that presents a growing global health burden. Despite recent advances in IBD research, existing laboratory mouse strains lack the genetic diversity observed in humans, limiting their translational relevance. To address this limitation, we utilized a newly developed inbred strain, KWM/Hym, and compared it with the widely used C57BL/6 strain. Treatment with 2.5% dextran sulfate sodium (DSS) resulted in less weight loss and a smaller increase in the disease activity index (DAI) in the KWM/Hym group compared to C57BL/6. Following DSS treatment, KWM/Hym mice exhibited a greater increase in spleen weight-to-body weight ratio and a longer colon length-to-body weight ratio compared to C57BL/6 mice. Histological analysis revealed that intestinal tissue damage was less severe in KWM/Hym mice. Furthermore, calprotectin levels were significantly lower in KWM/Hym mice compared to C57BL/6 mice, indicating reduced inflammation. Dynamic changes in the gut microbiota were observed following DSS treatment. Both inbred strains showed a decrease in *Bacteroidetes* and an increase in *Firmicutes*. At the family level, *Ruminococcaceae* levels remained unchanged in C57BL/6 but increased by 3% in KWM/Hym. *Lachnospiraceae* increased by 2% in C57BL/6 but increased more substantially (15%) in KWM/Hym. Notably, *Porphyromonadaceae,* which constituted less than 1% of the microbiota in C57BL/6, increased to over 6% in KWM/Hym. In conclusion, the KWM/Hym strain demonstrated increased resistance to DSS-induced IBD compared to C57BL/6. Further studies will focus on the differences in gut microbiota diversity and histological characteristics between these strains to elucidate the mechanisms underlying the enhanced resistance observed in KWM/Hym mice.

Corresponding author **:** Jun Gyo Suh

Keywords **:** Inflammatory bowel disease, KWM/Hym, C57BL/6, Microbiome

PS-B-28

Parishin A inhibits oral squamous cell carcinoma by modulating the AKT/mTOR signaling pathway

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Background : Oral squamous cell carcinoma (OSCC) is an aggressive cancer with limited treatment options. Parishin A, a natural compound derived from Gastrodia elata, possesses multiple therapeutic properties. However, its effects on OSCC remain unexplored. Purpose: This study explores the anti-cancer potential of Parishin A on OSCC and its mechanisms.
Methods : OSCC cell lines YD-10B and Ca9-22 were treated with varying Parishin A concentrations. Cell viability was detected using the CCK-8 assay, and colony formation was evaluated in agarose gel. Migration and invasion ability were assessed through wound healing and Matrigel invasion assays. The protein expression levels involved in the PI3K/AKT/mTOR signaling pathway and epithelial–mesenchymal transition (EMT) markers were examined via Western blotting.
Results : Parishin A inhibited OSCC cell viability in both dose- and time-dependent manners, with significant reductions at 20, 40, 60, and 80 μM, without affecting normal human gingival fibroblasts. Colony formation decreased substantially at ≥40 μM higher Parishin A concentrations in a dose-dependent manner. Also, migration and invasion assays showed significant suppression by Parishin A treatment concentration ≥40 μM in a dose-dependent manner, as evidenced by decreased wound closure and invasion. Western blot analyses revealed increased E-cadherin levels and decreased N-cadherin and vimentin levels, suggesting EMT inhibition. Parishin A also decreased the phosphorylation levels of PI3K, AKT, and mTOR.
Conclusion : Collectively, these findings support the potential of Parishin A as an anti-OSCC agent.

Corresponding author **:** Myoung Ok Kim

Keywords **:** Oral squamous cell carcinoma, Parishin A, PI3K/AKT/mTOR pathway, Anticancer, EMT

PS-B-29

Targeting AKT with costunolide inhibits colorectal cancer cell proliferation and promotes apoptosis in vitro and in vivo

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Background : Colorectal cancer (CRC) is a malignant tumor that presents clinical challenges on a global scale. Costunolide (CTD), a sesquiterpene lactone and natural substance, has been shown to have anticancer properties. The exact target and regulatory mechanism of this drug in CRC are yet unknown, though. By specifically targeting AKT, we discovered that CTD suppressed the growth of CRC cells both in vitro and in vivo.
Methods : The effects of CTD on colon cancer cell growth in vitro were assessed using annexin V-staining analysis, migration and invasion, propidium iodide, and cell proliferation tests. Phosphoprotein-specific antibody arrays, Costunolide-sepharose conjugated bead pull-down studies, and knockdown approaches were used to identify the targets of CTD. Utilizing western blot tests, immunofluorescence labeling, and ubiquitination, we examined the fundamental processes of CTD. The anti-tumor effects of CTD were evaluated in vivo using immunohistochemistry and cell-derived tumor xenografts (CDX) in naked mice.
Results : CTD inhibited the proliferation, anchorage-independent colony expansion, and epithelial-mesenchymal transformation (EMT) of CRC cells, including HCT-15, HCT-116, and DLD1. Additionally, at the G2/M phase, the CTD promoted cell apoptosis and cell cycle arrest. By preventing MDM2 ubiquitination through the inhibition of AKT phosphorylation in vitro, the CTD activates and induces p53 stability. Through its target AKT, p53 activation may contribute to the anticancer action of CTD, which inhibits cell growth in a p53-independent way. Lastly, the CTD suppressed the expression of the AKT-MDM2-p53 signaling pathway in xenograft tumors and decreased the volume of CDX tumors without causing a drop in body weight.
Conclusions : Our research demonstrated that AKT is a direct target of CTD and revealed the mechanism for its biological action in colon cancer. These findings all suggested that CTD may be a novel AKT inhibitor for the treatment of colon cancer, and that it merits more investigation in preclinical and clinical studies.

Corresponding author **:** Myoung Ok Kim

Keywords **:** Colorectal cancer, Costunolide (CTD), AKT/MDM2/p53 pathway, Ubiquitination, Xenograft model

PS-B-30

Comprehensive evaluation of joint kinematics, histopathology and inflammatory markers in a standardised canine osteoarthritis model using ACLT

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Canine osteoarthritis (OA) is a progressive degenerative disease that has challenged comprehensive research and treatment development. Current animal clinical trials aim to demonstrate the safety and efficacy of potential treatments, but their typically short duration and focused objectives limit their ability to fully explore the mechanisms underlying OA. The primary objective of this research was to develop a standardized canine model of OA and a corresponding evaluation methodology. This model was aimed to create a reliable and reproducible model the underlying mechanisms of OA progression. The study employed two key components: Anterior cruciate ligament transection (ACLT), Regular treadmill training. Gait analysis at 12 weeks post-ACLT showed that the OA group had reduced knee range of motion and irregular gait patterns compared to the pre-operative group. The OA group also showed significantly narrower medial joint space compared to the sham group. Macroscopic and microscopic examination using the International Osteoarthritis Research Society (OARSI) scoring system identified defects in the left femur and tibia. Chondral degeneration was observed, particularly in the medial condyle due to joint instability. The OA group also had increased scores in cartilage structure and chondrocyte pathology compared to the sham group, which was supported by histopathological examination of superficial cartilage erosion and left hindlimb fissures. Similar to natural OA, increased levels of cytokines and chemokines associated with inflammation and cartilage degradation were observed in the synovial membrane and fluid of the ACLT-induced OA model. mRNA analysis confirmed synovial fluid (SF) and SF-treated canine macrophage activation with increased M1 dominance and inflammatory factors. We suggest that experimental canine OA models and evaluation methods are critical for assessing early and chronic canine OA changes and for evaluating the potential efficacy and toxicity of treatments in naturally occurring canine OA.

Corresponding author **:** Jeong Ho Hwang

Keywords **:** Canine osteoarthritis, Gait analysis, Clinical trial phase 2, Inflammation, Macrophage

PS-B-31

Evaluation of inhibitory effects of A-01 as an oral inverse agonist targeting estrogen-related receptor γ on 2,4-dinitrochlorobenzene (DNCB)-induced atopic dermatitis

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Purpose : Estrogen-related receptor γ (ERRγ) has been reported to regulate various inflammation-related diseases. In this study, we attempted to evaluate the effects of A-01 as a modulator for ERRγ in mice with 2,4-dinitrochlorobenzene (DNCB)-induced atopic dermatitis (AD).
Methods : Levels of mRNA and protein expression for ERRγ were evaluated in normal and DNCB-induced AD-diagnosed skin. The effects of A-01 on expression of chemokines as well as AKT/MAP pathway signaling was investigated in TNF-α/IFN-γ -stimulated human keratinocyte (HaCaT) cells. To evaluate the therapeutic effects of A-01, mice with DNCB-induced AD were administered new drug intraperitoneally at doses of 1mg/kg and 10 mg/kg mg/kg for 10 days. Epidermal thickness at the dorsal aspect of the inflamed skin, spleen index, serum IgE levels, and proinflammatory cytokine levels in the skin lesions were measured. Histopathological evaluations, including assessments of epidermal hyperplasia, dermal inflammation, hyperkeratosis, folliculitis, and mast cell counts, were performed to confirm diagnostic features.
Results : Significant increases of ERRγ expression at the RNA and protein levels were found in DNCB-induced AD lesions. A-01 suppressed chemokine expression and inhibited AKT/MAPK signaling pathway in TNF-α/IFN-γ-stimulated HaCaT cells. Treatment with A-01 alleviated DNCB-induced AD symptoms presented such as decreasing the number of scratches, dorsal skin thickness, and spleen index. The histopathological score and number of infiltrated mast cells was also decreased significantly in new drug-treated mice compared with those in DNCB-induced AD mice. Consistently, A-01 reduced the serum IgE level and mRNA expression of IL-6 and TNFα in AD-diagnosed skin.
Conclusion : Taken together, our findings indicated that ERRγ is the feasible therapeutic target for control of AD and A-01 can be a useful therapeutic agent in treating AD.

***Corresponding author :** Yong Hyun Jeon

***Keywords :** Atopic dermatitis, Estrogen-related receptor gamma (ERRγ), DNCB

PS-B-32

Sustained BDNF delivery mitigates secondary injury and enhances recovery in a rodent model of traumatic brain injury

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Traumatic brain injury (TBI) is one of the leading causes of death and disability worldwide, with no current pharmacological treatment available. The role of brain-derived neurotrophic factor (BDNF) in neural repair and regeneration is well-documented and has been a focal point of TBI research. Additionally, neuroinflammation is one of the most critical processes in secondary injury following TBI. However, it remains unclear how the sustained supply of BDNF impacts recovery during the progression from primary to secondary injury in TBI. To address this unmet need, we developed a controlled cortical impact (CCI) injury model in 12-week-old adult female rats to induce TBI, resulting in reduced cognitive and motor functions. Our TBI model exhibited significant impairments in motor and cognitive functions, while the sustained delivery of BDNF mitigated these deficits. Moreover, our TBI model revealed notable secondary injury, including astrogliosis (GFAP activation) and microgliosis (Iba1 activation). This study provides an opportunity to investigate the mechanisms by which BDNF prevents brain injury in rodent models and establishes a reliable paradigm for testing BDNF-based therapeutic strategies for TBI treatment.

***Corresponding author :** Jin-Chul Ahn

***Keywords :** Traumatic brain injury, Brain-derived neurotrophic factor, Astrogliosis, Microgliosis

PS-B-33

Therapeutic effects of photobiomodulation in MPTP-induced Parkinson's disease animal model

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Parkinson's disease (PD) is a degenerative neurological disorder affecting over 10 million individuals worldwide, with a prevalence of approximately 1% in people over 65 years of age, rising sharply to 4–5% in those over 85. This study explored the potential of a novel non-invasive treatment approach using photobiomodulation (PBM) in a PD animal model induced by intraperitoneal administration of probenecid and MPTP. PBM involves the application of light at specific wavelengths and low intensities to tissues, stimulating cellular metabolism and promoting tissue repair. When applied to the abdomen, PBM can engage the brain-gut axis to provide neuroprotection and alleviate Parkinsonian symptoms. In this study, PBM at wavelengths of 630 nm, 740 nm, and 850 nm was applied to the abdomen of the PD animal model. Behavioral tests (Open Field, Rota-Rod, Y-Maze, Cylinder) revealed that 630 nm PBM produced the most significant improvements in motor and cognitive functions, followed by 740 nm and 850 nm. Fecal samples were collected on days 7 and 43 post-drug administration, before and after PBM application, to analyze changes in gut microbiota composition and their correlation with the alleviation of PD symptoms. This study highlights the wavelength-specific effects of PBM and its interaction with the brain-gut axis, suggesting its potential as an innovative therapeutic approach for neurodegenerative diseases such as PD.

***Corresponding author :** Jin-Chul Ahn

***Keywords :** Parkinson's disease, Photobiomodulation, 1-methyl-4-phenyl-1, 2, 3, 6-tetrahydropyridine, Motor function, Cognitive function

PS-B-34

Enhanced cinnamaldehyde cytotoxicity via oxidative stress through inhibition of aldehyde dehydrogenase activity in breast cancer cell lines

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A hallmark of cancer stem cells (CSCs) is their elevated aldehyde dehydrogenase (ALDH) activity. In this study, we hypothesized that targeting ALDH could enhance the therapeutic potential of cinnamaldehyde by inhibiting its conversion to cinnamic acid. We investigated the effects of ALDH inhibition on the cytotoxicity of cinnamaldehyde in human breast cancer cell lines MDA-MB-468 and MDA-MB-231, which exhibit high and low ALDH activity, respectively. ALDH inhibition was achieved using DEAB, an ALDH inhibitor, and its effects were evaluated in combination with cinnamaldehyde treatment.
Our results showed that co-treatment with cinnamaldehyde (100 μM) and DEAB (100 μM) significantly reduced the viability of MDA-MB-468 cells (from 100.9% to 50.06%), indicating an enhanced cytotoxic effect. In contrast, the combination treatment in MDA-MB-231 cells showed no significant increase in cytotoxicity. In MDA-MB-468 cells, reactive oxygen species (ROS) generation was significantly increased when cinnamaldehyde (30 μM) and DEAB were co-administered, compared to cinnamaldehyde treatment alone. The ROS scavenger N-acetyl-L-cysteine effectively rescued cells from cinnamaldehyde/DEAB-induced cytotoxicity.
HPLC analysis revealed that DEAB inhibited the degradation of cinnamaldehyde when reacted with MDA-MB-468 cell lysates. These findings suggest that inhibition of ALDH activity enhances the cytotoxic effect of cinnamaldehyde via oxidative stress. Our results highlight the potential of targeting ALDH activity in cancer stem cells, particularly in breast cancer, and suggest that ALDH inhibition could be a promising strategy for cancer stem cell therapy using aldehydes.

***Corresponding author :** Jin Won Park

***Keywords :** Cinnamaldehyde, Aldehyde dehydrogenase (ALDH), Breast cancer, Reactive oxygen species (ROS), Cancer stem cells (CSCs)

PS-B-35

Preventive effects of 1050nm LED irradiation on xerostomia in a Sjögren's syndrome-like mouse model

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Xerostomia, or dry mouth, is characterized by a decrease in salivary secretion, which can lead to oral problems such as mouth pain, bad breath, periodontal disease, and dental caries. Xerostomia can be caused by systemic factors such as Sjögren's syndrome, anemia, diabetes, nutrient deficiencies, and aging. The purpose of this study focused on the preventive effect of light irradiation for xerostomia. Sjögren's syndrome (SS) is an autoimmune disease that affects multiple organ systems. Dry mouth and dry eyes, resulting from the involvement of salivary and lacrimal glands, are the most common clinical manifestations of this syndrome. In this study, an animal model of Sjögren's syndrome was used to evaluate the preventive effect on xerostomia. To induce an SS-like disease in female C57BL/6 mice, they were injected with 5,6-Dimethylxanthenone-4-aetic acid (DMXAA), a murine STING protein cell-permeant ligand. Light-emitting diode (LED) modules at wavelengths of 850 nm and 1050 nm were used to assess the stimulation effect on the tongue and salivary glands. Saliva was collected by administering the parasympathetic stimulant pilocarpine, and histological examination of the tongue and salivary glands was carried out using H&E staining. The results revealed an increase in saliva production during 1050nm irradiation, along with an increase in keratin levels in the tongue. Immunohistochemistry confirmed epithelial cell proliferation, providing conclusive evidence of the stimulating effect on salivary glands at 1050nm. Furthermore, we investigated the potential to modulate the functions of taste buds through light irradiation, taking into account that abnormal neurological functions may play a role in the development of xerostomia. Based on these results, non-invasive light irradiation treatment appears to induce changes in the nerve endings of the taste buds. Therefore, non-invasive light irradiation treatment shows promising potential as a practical approach for xerostomia.

Corresponding author : Jin-Chul Ahn

Keywords : Xerostomia, Sjögren's syndrome, 5, 6-Dimethylxanthenone-4-aetic acid, Light-emitting diode

PS-C-01

Leveraging germ-free transgenic mice to define microbiome-host stem cell interactions under intestinal homeostasis and injury conditions

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Leucine-rich repeat-containing G protein-coupled receptor 5 (Lgr5) was first traced in 2007, and its identity as a marker of intestinal stem cells (ISCs) was revealed. Since then, recent studies have established newly generated mouse ($Lgr5^{DTR}$, $Lgr5^{2A\text{-}Cre}$) systems and organoid cultures to reveal $Lgr5^+$ stem cell behavior. However, due to the lack of elaborated tools other than antibiotics to understand microbiome-host stem cell interaction, only a few specific microbiota and their effects on the $Lgr5^+$ adult stem cells have been studied. The effect of microbiomes on ISC activity in homeostatic and injury contexts remains unclear, demanding further research.
While germ-free (GF) mouse models are generally considered the gold standard for microbiome studies, herein we compared and described the interaction between the gut microbiome and $Lgr5^+$ crypt stem cells by generating novel GF $Lgr^{5EGFP\text{-}IRES\text{-}creERT2}$-$Rosa26^{tdTomato}$ mice. Intestinal injury was induced using 5-fluorouracil (5-FU) and dextran sulfate sodium (DSS) to assess the effects of the microbiome on crypt regeneration and the restoration of homeostasis in murine intestinal epithelium.
During homeostasis, GF mice displayed divergence in the intestinal tract. $Lgr5^+$ ISCs are known to reside in a specific region called the crypt of Lieberkühn. $Lgr5^+$ ISC-derived differentiation was altered in the GF mice, and we also observed reduced cellular migration along the crypt-villus axis, as indicated by the lineage tracing of $Lgr5^+$ cells and their progeny labeled with tdTomato. These results were validated in vivo through antibiotic treatment of specific pathogen-free (SPF) mice. Although injury induced by 5-FU and DSS caused only mild impairment of $Lgr5^+$ ISCs in the crypt, crypt regeneration and the emergence of $Lgr5^+$ ISCs following acute injury were diminished. Overall, GF mice exhibited decelerated proliferation and epithelial turnover rates compared to SPF $Lgr5^{EGFP\text{-}IRES\text{-}creERT2}$-$Rosa26^{tdTomato}$ mice under both homeostasis and injury conditions.
This study contributes to advancing our knowledge of the interplay between $Lgr5^+$ stem cells and the microbiome, providing a nuanced perspective on the factors influencing tissue health and repair. The findings have the potential to guide future research directions and inspire the development of novel therapeutic approaches.

Corresponding author **:** Ki Taek Nam

Keywords **:** Germfree, GEM, Microbiome, Stem cell, Tissue regeneration

PS-C-02

Using a hamster infection model to predict vaccine escape mutations in SARS-CoV-2

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SARS-CoV-2 infections have continued to occur in vaccinated individuals. In this report, we assess the vaccine escape mutations of SARS-CoV-2 using a hamster model. The hamsters were vaccinated with synthetic peptides at doses of 0.01μg, 0.1μg, and 1μg. These peptides were designed to target the gene encoding the entire spike protein of the Wuhan-1. Three weeks following vaccination, the animals were intranasally infected with the delta variant of SARS-CoV-2. At 5 days post-infection, the virus was isolated and titrated from nasal swabs and lung samples. In a follow-up experiment, animals within each group were inoculated with nasal samples that had been previously collected from their respective groups during the initial experiment. Ultimately, viable virus was isolated only from the samples of the positive control group and the group vaccinated with 0.01μg in the second experiment. Single nucleotide polymorphism (SNP) analysis was performed on the entire genome of SARS-CoV-2 isolates. In one individual animal from the vaccination group, 18 SNPs were identified in the receptor binding domain (RBD) region of SARS-CoV-2 isolated from a nasal sample. Among these SNPs, 17 were correlated with the defining mutations of the Omicron variants, encompassing a total of 16 amino acid motifs: R408S, K417N, N440K, V445P, G446S, L452R, L455F, N460K, T478K, E484A, F486P, F490S, R493Q, Q498R, N501Y, and Y505H. These mutations in RBD regions were not present in samples isolated from other animals in the positive control and vaccination groups. In regions outside the spike protein, the limited number of SNPs exhibited a correlation with Omicron variants. In conclusion, the anticipation of vaccine-induced virus mutations is feasible through the use of preclinical models, including SNP analysis, which accurately simulate real-world transmission routes. These animal experiment models offer valuable insights for predicting the emergence of new variants following the introduction of novel vaccines.

Corresponding author **:** Bon-Sang Koo

Keywords **:** SARS-CoV-2, Hamster, Vaccine escape mutations, SNP analysis

PS-C-03

Innovative approach to develop antibodies for early detection of Alzheimer's disease using phage display in human synthetic scFv libraries

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A critical challenge in developing effective diagnostic tools for Alzheimer's disease lies in detecting the aggregated forms of amyloid β peptide (Aβ) and tau protein, which are key pathological markers of the disease. The ideal diagnostic antibodies must not only demonstrate high specificity but also precisely differentiate between the subtle amino acid variations of Aβ1-40 and Aβ1-42. Leveraging the power of phage display, a pivotal technology in antibody engineering, we have devised an innovative approach for generating human monoclonal antibodies. Our study integrates advanced bio-panning techniques and scFv ELISA assays targeting Aβ and tau proteins. To ensure accuracy, phages were pre-adsorbed on bovine serum albumin (BSA) to eliminate non-specific binders, followed by selective enrichment using immobilized antigens. Six rounds of bio-panning, including stringent washing and incubation protocols, successfully isolated enriched antibody binders. A total of 1,400 individual colonies from the fifth and sixth rounds underwent ELISA screening and DNA sequencing. These antibodies hold significant promise for early detection and will undergo further validation using clinical samples from Alzheimer's patients. This method underscores the potential of synthetic scFv libraries for advancing diagnostic solutions in neurodegenerative diseases.

Corresponding author **:** Sang-In Park

Keywords **:** Novel anti-human antibody, Phage display, Human synthetic scFv library, Alzheimer's disease

PS-C-04

Antibacterial effect of Pinus densiflora essential oil against dental caries bacteria

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Streptococcus mutans (S. mutans) decomposes sucrose and produces biofilm and organic acids, which cause dental caries. To prevent dental caries, we are looking for natural products that inhibit the growth and glucosyltransferase (GTase) activity of S. mutans. In this study, we analyzed the cariogenic effect of Pinus densiflora leaf essential oil on S. mutans. The inhibitory effect of P. densiflora on cariogenic characteristics of S. mutans, such as growth, acid production, and biofilm formation, was evaluated. The inhibitory effect on biofilm formation was confirmed by safrani staining on artificial teeth and 35 mm dishes, and observed using scanning electron microscopy (SEM). The effect of each concentration (0.25 - 2 mg/mL) of P. densiflora leaf essential oil on the growth of S. mutans was inhibited at 0.5 mg/mL or higher. The pH change due to organic acid production was 6.17±0.03 at 0.25 mg/mL, which was higher than the critical pH of 5.5, indicating a caries prevention effect. At 0.5 mg/mL or higher, the inhibitory effect on bacterial biofilm formation was visually reduced. These results show that the essential oil of P. densiflora can inhibit the growth of S. mutans, a dental caries-causing bacterium, and the acid production and biofilm formation, which are caries-causing factors.

Corresponding author **:** Yong Ouk You

Keywords **:** S. mutans, Dental caries, GTase activity, P. densiflora, Scanning electron microscopy (SEM)

PS-C-05

Diagnosis of clostridium difficile infection in common marmosets (Callithrix jacchus) using C. DIFF QUIK CHEK COMPLETE ®

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The diagnosis of *Clostridium difficile* (*C. difficile*) infection in common marmosets (Callithrix jacchus) is crucial as it can cause diarrhea, gastrointestinal disorders, intestinal mucosal ulcers, and bleeding. The conventional culture-based methods are effective, but time-intensive and require specialized equipment. To address this gap, we applied the C. DIFF QUIK CHEK COMPLETE® diagnostic kit by TECHLAB, a rapid membrane enzyme immunoassay originally developed for human patient, for detecting *C. difficile* infections. This kit detects *C. difficile* glutamate dehydrogenase (GDH) antigen and toxins A and B in a single reaction well. Four kinds of fecal samples from marmosets, confirmed via culture were used as follows: (1) Fecal sample without pathological bacteria detection (negative control), (2) *C. difficile* positive sample (positive control), (3) Both C. dfficile and *Clostridium perfringens* (*C. perfringens*) positive sample (to assess false-negative reaction, (4) *C. perfringes* positive sample (to assess cross-reactivity). As we expected, the results demonstrated that samples (1) and (4) yielded negative results, while samples (2) and (3) were positive. Notably, despite sample (3) from the marmoset showing signs of diarrhea, no toxin A or B was detected. This diagnostic kit offers several advantages, including ease of sample preparation, a total assay time of under 30 minutes, and straightforward interpretation of results. These trials suggest that the C. DIFF QUIK CHEK COMPLETE® kit can be a valuable tool for monitoring *C. difficile* infections in marmosets and potentially other non-human primates. Future studies involving larger sample sizes and toxin-positive cases are necessary to further validate its efficacy and expand its applications in veterinary diagnostics.

***Corresponding author :** Byeong-Cheol Kang

***Keywords :** Microbiological monitoring, Common marmoset, Diagnostic Kit

PS-C-06

Gastric microbiota inhibits the development of gastric neoplasia by regulating cholesterol synthesis

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The gut microbiome contributes to diverse biological functions, including metabolism, immune response, and epithelial cell development. While previous studies have examined the role of metabolism in carcinogenesis, recent findings have highlighted the microbiome's role in regulating metabolism, offering new insights into cancer development. However, the interplay between the microbiome and metabolic pathways in gastric cancer progression remains underexplored. Here, we utilized germ-free (GF) mice to investigate differences from specific-pathogen-free (SPF) mice under various conditions, including homeostasis, chronic gastritis induced by *Helicobacter felis* infection, and gastric tumor induced by N-methyl-N-nitrosourea (MNU), employing bulk-RNA sequencing and pathological analysis. Principal component analysis showed that the transcripts of the fundus of normal GF and SPF mice were discriminated. Gastric lineages differed between the GF and SPF fundus under homeostasis. In the chronic gastritis model, *H. felis* infection was more prevalent in the GF gastric tissue. But no pathological differences were observed in the later stages of infection. Gastric tumorigenesis was also increased in MNU-treated GF mice, at 20 weeks after MNU treatment. Oxidative stress was observed in gastric epithelial pit cells, along with increased expression of tumorigenesis and cholesterol biosynthesis related genes in gastric tissues. Also, regulation of intracellular cholesterol synthesis related genes were significantly upregulated, while the expression of the negative regulator PPAR gamma was reduced. Comparison of cholesterol levels in gastric tissues revealed that, while MNU treatment increased cholesterol levels in SPF mice, cholesterol levels were even higher in tissues from MNU-treated GF mice. At 44 weeks, GF mice exhibited a high tumor incidence, with gastric adenocarcinomas occurring six times more frequently than in SPF mice. Notably, gastric tumors in the fundic region were exclusively observed in GF mice. Our results suggest that the microbiome can play a protective role in gastric cancer development by regulating cholesterol synthesis in gastric neoplastic cells.

***Corresponding author :** Ki Taek Nam

***Keywords :** Gastric microbiome, Germ-free mice, Gastric tumor, Helicobacter felis, N-Methyl-N-Nitrosourea (MNU)

PS-C-07

Novel Bacillo221002 strain promoting muscle growth

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Bacillus subtilis Bacillo221002(Patent Number 10-2724550, KCTC 15300BP) is a newly identified strain known for its superior protein degradation capabilities compared to other Bacillus subtilis strains. By efficiently breaking down proteins, this strain enhances amino acid absorption, which in turn supports muscle growth. Bacillo221002 is particularly useful in preventing and treating muscle loss, such as sarcopenia. As interest in muscle development rises, the demand for effective solutions, including protein supplements, has grown. However, probiotics that aid in protein digestion and absorption have not been widely explored. Bacillus subtilis, known for secreting digestive enzymes like proteases, shows great potential for supporting muscle health and preventing muscle-related disorders. Bacillo221002, isolated from traditional Korean fermented soybean paste, demonstrates exceptional protease activity, making it a promising candidate for muscle growth and maintenance.

***Corresponding author :** Sang O Park, Hwa Gyun Oh, Byeong Chun Lee

***Keywords :** Bacillus, Muscle growth

PS-C-08

Effect of SARS-CoV-2 and Streptococcus pneumoniae co-Infection on immune response in the hACE2 transgenic mouse

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In this study, the aim was to explore the immunological mechanisms involved in the interaction between SARS-CoV-2 infection and bacterial pneumonia. In this experiment, three groups were formed. One group was infected with only SARS-CoV-2, another group was infected with bacteria alone, and the third group was infected with both SARS-CoV-2 and bacteria. The bacteria used for the infection were Streptococcus pneumoniae, a strain commonly observed in bacterial pneumonia. The mice were intranasally infected with the SARS-CoV-2 virus. Six days after infection, bacteria were infected by intubation-mediated intratracheal instillation. Necropsy was performed three days after the bacterial infection. The co-infected group with both SARS-CoV-2 and S. pneumoniae exhibited a significant decrease in body weight compared to the group infected with SARS-CoV-2 only. Histopathological analysis the co-infection group, demonstrated more severe pneumonia, with significant neutrophil infiltration around the bronchioles. Flow cytometry analysis of pulmonary immune cells revealed a significant increase in CD4+FOXP3+ROR-γt+ and CD11B+Ly6G+ cells in the co-infection group. In summary, the combination of SARS-CoV-2 and S. pneumoniae is thought to induce an immunosuppressive state, and the pulmonary inflammatory response is indicated to be neutrophil-driven. Therefore, this study is expected to provide the a foundation for understanding the effects of co-infection with SARS-CoV-2 and S. pneumoniae on the respiratory system.

***Corresponding author :** Yang-Kyu Choi

***Keywords :** SARS-CoV-2, Streptococcus pneumoniae, Co-infection, HACE2 mouse, Pulmonary immune cell

PS-C-09

Micheliolide ameliorates muscle wasting in cancer cachexia by restoring T cell activation and modulating gut microbiota

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Cancer cachexia is a debilitating syndrome characterized by involuntary weight loss and muscle wasting. This study investigated the therapeutic potential of micheliolide (MIC), a compound derived from *Michelia champaca*, in mitigating muscle wasting in murine models of cancer cachexia and elucidated the underlying mechanisms. Murine models of colon and lung cancer cachexia were established using CT26 and LLC tumor cells, respectively. Integrative analyses of systemic T cell responses and gut microbiome were conducted to identify associations between cachexia-related traits, T cell responses, and microbial species. MIC effectively alleviated muscle wasting in both CT26 and LLC models without affecting tumor growth. Mechanistically, MIC modulated T cell activation by reducing the abundance of immunosuppressive T_{regs} and the frequency of activated $CD4^+$ T cells, which were elevated in both cancer cachexia models. Furthermore, MIC restored gut microbial diversity and composition, particularly by increasing the abundance of *Phocaeicola vulgatus* and reducing the levels of pathogenic bacteria like *Enterococcus faecalis* and *Streptococcus acidominimus*. We found that *E. faecalis* and *S. acidominimus* were positively correlated with muscle wasting and negatively correlated with T cell activation, while *P. vulgatus* exhibited a protective effect. These findings provide novel insights into the mechanisms underlying cachexia and highlight the potential of MIC as a therapeutic agent for muscle wasting.

***Corresponding author :** Myungsuk Kim

***Keywords :** Cancer cachexia, Micheliolide, T cell activation, Gut microbiota, Phocaeicola vulgatus

PS-C-10

Immunological defense mechanisms against Sendai virus infection in STAT1 knock-out mice

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This study was designed to investigate the immunological protection when STAT1 KO mice were repeatedly administered lipopolysaccharide (LPS) and then infected with Sendai virus. 6-week-old female STAT1 KO and wild-type mice were administered LPS via intubation-mediated intratracheal instillation (IMIT), and then Sendai virus was inoculated both LPS-administered group and virus-only group. As a result of the body weight change, in the case of wild-type mice, the virus-only group decreased body weight compared to the LPS-administered group, and in the case of STAT1 KO mice, the two groups had similar body weights. We performed quantitative PCR to measure the virus titer from the lung. The result showed that LPS-administered group had a significantly lower virus titer than the virus-only group in wild-type mice. When qPCR was performed to lung cytokines, TNF-α and IL-6 increased in the LPS administration group compared to the virus-only group, which was the same as in wild-type and STAT1 KO mice. In contrast, IL-10 and IL-12 decreased in the LPS administration group compared to the virus-only group in the case of wild-type mice, they increased in the STAT1 KO mice. In addition, for IFNγ and IL-1β, there was no difference between the groups in STAT1 KO mice, but this was not observed in wild-type mice. And histopathological findings showed that lung inflammation caused by a virus reduced in the LPS-administered group compared to the virus-only group. Therefore, this experiment confirmed that when LPS was repeatedly administered to wild-type mice and then infected with the Sendai virus, immunological changes occurred, resulting in a decrease in viral infection. These results are thought to be the protective effect against viral infection via the IFN-STAT1 pathway.

***Corresponding author :** Yang-Kyu Choi

***Keywords** : Sendai virus, Lipopolysaccharides, Intubation-mediated intratracheal instillation, C57BL/6N, STAT1

PS-C-11

Heat-killed lactobacillus plantarum NCHBL-004 suppresses tumor growth in a syngeneic melanoma mouse model through TLR2 activation

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This study aimed to assess the anti-tumor effects of heat-killed lactobacilli, specifically *L. plantarum*, *L. kunkeei*, and *L. reuteri*, isolated from the honey bee intestine in a syngenic mouse melanoma model. The strains were administered via intraperitoneal injection starting 10 days post-implantation of the murine melanoma cell line B16F10 in C57/BL mice.
Results revealed a significant reduction in tumor size and weight in the *L. plantarum* group compared to the PBS group, while *L. kunkeei* and *L. reuteri* groups did not exhibit the same effect. Increased IFN-γ^+ $CD4^+$ cell populations were observed in the *L. kunkeei* group, and *L. plantarum* demonstrated an increase in IFN-γ^+ $CD4^+$, IFN-γ^+ $CD8^+$, and IFN-γ^+ $NK1.1^+$ cell populations, along with the highest cytotoxic T lymphocyte activity. *In vitro* studies on murine bone marrow-derived dendritic cells stimulated with the strains showed that *L. plantarum* induced the highest IL-12/IL-10 cytokine ratio and increased populations of IFN-γ^+ $CD4^+$, IFN-γ^+ $CD8^+$, and IFN-γ^+ $NK1.1^+$ cells compared to other groups.
Remarkably, anti-tumor effects of *L. plantarum* were abolished in a TLR2 knock-out mouse melanoma model, indicating that the anti-tumor capacity of *L. plantarum* is attributed to TLR2 ligands present in the bacterial wall.
In summary, our findings affirm that heat-killed *L. plantarum* possesses potent anti-tumor effects on melanoma, mediated through the stimulation of host TLR2. This suggests that purified TLR2 ligands from *L. plantarum* hold promise as potential therapeutic agents for melanoma treatment.

***Corresponding author :** Jong Hwan Park

***Keywords** : Melanoma, Heat-killed lactobacilli, Bone-marrow derived dendritic cell, Tumoricidal lymphocyte

PS-C-12

Effective TMAO regulation for kidney treatment

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The Bacillus amyloliquefaciens Bacillo221003 strain demonstrates exceptional degradation abilities for TMA and TMAO. This strain effectively reduces the concentrations of TMA and TMAO in the subject. It shows potential for preventing, improving, or treating TMA-related conditions such as Trimethylaminuria, as well as TMAO-related diseases, including atherosclerosis and chronic kidney disease.
The figure is a schematic illustrating the absorption and biosynthesis pathways of TMA and TMAO, as well as the prevention of TMA and TMAO accumulation in the body through the Bacillo221003 strain.

***Corresponding author :** Sang O Park, Hwa Gyun Oh, Byeong Chun Lee

***Keywords :** TMAO, CKD (Chronic Kidney Disease)

PS-C-13

Dual role of neutrophil induction in SARS-CoV-2 infection

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Neutrophils, a key component of the innate immune system, serve as the first line of defense against infections by migrating to inflamed tissues and eliminating pathogens through phagocytosis. Studies on COVID-19 have reported neutrophil infiltration and the formation of neutrophil extracellular traps in lung tissues, along with an elevated neutrophil-to-lymphocyte ratio in the blood, which is considered a marker of disease severity. However, the precise role of neutrophils during viral infections remains unclear. In this study, we investigated the effects of neutrophil induction on lung damage caused by respiratory viral infections. K18-hACE2 mice with induced neutrophilia were intranasally infected with SARS-CoV-2, and viral titers, immune cell dynamics, and histopathological changes were assessed. Neutrophil induction did not affect body weight compared to the control group during infection. However, viral titers were significantly reduced on day 2 post-infection in neutrophil-induced mice. Additionally, neutrophil induction prior to infection significantly increased activated monocytes in the blood on day 7 post-infection compared to controls. In the lungs, the proportion of neutrophils among immune cells markedly increased, while eosinophil levels decreased on day 28 post-infection. Histopathological analysis revealed a significant increase in lung damage severity in the neutrophil-induced group compared to controls. These findings suggest that while neutrophil induction facilitates viral clearance during the early stages of infection, it may contribute to increased lung damage over time.

Corresponding author : Jung Joo Hong, Hanseul Oh

Keywords : Neutrophils, Covid-19, Lung damage

PS-D-01

Non-genetic mouse models of neuropsychiatric disorders in inheritable metabolic diseases

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Inheritable metabolic diseases (IMDs), also known as inborn errors of metabolism (IEMs), are genetic disorders caused by mutations in a single gene that encodes an enzyme involved in a specific metabolic pathway. Although the abnormal accumulation of substrates and their metabolites causes multiorgan dysfunction, the most serious and common outcomes in patients with IMDs are neuropsychiatric disorders, including intellectual disability, autism, hyperactivity, depression, and anxiety. However, developmental delay, high lethality, or physical abnormalities in transgenic mouse models of IMDs hinder the understanding of disease mechanisms related to neurological and psychiatric complications in IMDs. Non-genetic mouse models of brain-specific metabolic diseases provide opportunities to understand the pathological mechanisms and develop effective medications for neuropsychiatric disorders in IMDs. Here, we show that L-Phe challenge and intraventricular perfusion of L-Phe recapitulate brain phenylalanine (Phe) levels and behavioral phenotypes in phenylketonuria (PKU) model mice (Pah^{enu2}). Pah^{enu2} mice exhibit elevated Phe concentrations in both the serum and brain, impaired learning and memory, and decreased anxiety. Intraperitoneal administration of L-Phe in wild-type (WT) mice increases Phe levels in both the serum and CSF, inducing impairment in learning and memory. Continuous intraventricular perfusion of L-Phe using osmotic minipumps selectively increases brain Phe levels in WT mice without affecting serum Phe levels. Similar to Pah^{enu2} mice, continuous brain infusion of L-Phe induces anxiolytic behaviors in WT mice. These results suggest that the elevation of Phe in the brain is a major cause of neuropsychiatric complications in PKU and that non-genetic mouse models may open new avenues for developing effective medications for brain dysfunction in IMDs.

Corresponding author **:** Myoung-Hwan Kim

Keywords **:** Inheritable metabolic diseases (IMDs), Inborn errors of metabolism (IEMs), Phenylketonuria (PKU), Non-genetic mouse models

PS-D-02

Interleukin-10 constrains inflammatory responses in the female reproductive tract

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Genital infections and pelvic inflammation can cause female infertility. Although clinical studies have identified a significant association of uterine cervix abnormalities with inflammatory bowel disease (IBD), the impact of gut inflammation on female reproductive disorders remains unclear. In this study, we analyzed the histopathology and immunophenotype of the female reproductive tract in interleukin-10 knockout (*Il10* KO) mouse, a widely used animal model for studying the pathogenesis of IBD. *Il10* KO female mice displayed chronic colitis symptoms, including loose stools, diarrhea and rectal prolapse. Of note, the distance from the cervix to the vulva in *Il10* KO mice was markedly shorter compared to littermate control mice. Histological analysis revealed widespread inflammation extending from the cervix to the vulva, accompanied by significant morphological changes, such as thickening and induration of the vaginal tissue. Furthermore, crypt herniation and cyst formation were observed in the cervix and vaginal wall of *Il10* KO mice. Flow cytometry analysis showed increased γδ T cells and conventional CD4 T cells in the cervicovaginal tissues of *Il10* KO mice, consistent with elevated levels of IFN-γ and IL-17A in the vaginal lavage. We are also investigating the relationship between the gut microbiota and female reproductive inflammatory diseases. Our data suggest that *Il10* KO mouse is a valuable animal model for studying the extra-gut inflammation of IBD, in the absence of infectious pathogen.

Corresponding author **:** Keunwook Lee

Keywords **:** Colitis, Female reproductive tract, Interleukin-10, T cell, Extra-gut inflammation

PS-D-03

Markerless deep learning gait analysis to evaluate chemogenetic neuromodulation in non-human primate stroke model

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Gait analysis in non-human primates (NHPs) is important for understanding the neural mechanisms of locomotor control in quadrupedal animals. Typical methods rely on costly motion tracking systems with markers placed on bony landmarks, which may disturb natural locomotion. This study aimed to evaluate markerless deep learning for gait analysis using video in an NHP ischemic stroke model. Photothrombotic capsular lesioning was employed to selectively target and destroy the posterior limb of the internal capsule (PLIC), creating a precision model that induces persistent motor deficits. This model provides a robust platform for investigating post-stroke recovery mechanisms. Clozapine-induced chemogenetic neuromodulation (CLZ-ChemoNM) targeting the sensory-parietal cortex was performed to improve motor recovery. To measure the motor recovery following chemogenentic neuromodulation, Markerless deep learning software (SLEAP) was utilized to track joint coordinates and analyze gait at three time points: pre-stroke, post-stroke, and post-chemogenetic therapy, over a 9-week period. Gait phases were divided into swing and stance phases, with each cycle identified by the contact and liftoff of the right hindlimb. To evaluate gait abnormalities, kinematic variables such as distance at hip, step length, hip height, joint angle, joint angular distance, and angle excursion were calculated. Results showed the most severe gait impairments at 1 week post-stroke, reflecting significant locomotor deficits. Partial recovery was observed at 3 weeks, suggesting natural recovery mechanisms. While CNO administration demonstrated a tendency toward recovery in gait parameters, the changes were not statistically significant. This study established an NHP ischemic stroke model to advance stroke understanding and develop translatable treatments. It demonstrated the utility of a cost-efficient markerless deep learning approach for assessing gait abnormalities and evaluating locomotor disease treatments.

Corresponding author **:** Hyoung-Ihl Kim, Youngjeon Lee

Keywords **:** Markerless pose estimation, Non-human primate, Stroke, Chemogenetic neuromodulation, Deep learning-based gait analysis

PS-D-04

Induction and imaging evaluation of renal artery thrombosis in pig

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This study aims to induce a disease model of renal infarction in pigs. The incidence of renal infarction has steadily increased over the past 10 years. It also has a gender characteristic in that male patients are more than twice as many as female patients. For this purpose, 70 kg male pigs similar to adult male blood vessels were assigned. First, femoral artery puncture was performed using an ultrasound device, and the right renal artery was accessed using a guide wire and an Advantage catheter. Coagulated blood was injected into the blood vessel below the right renal artery for 10 minutes, and angiography was performed to confirm occlusion after 5 and 10 minutes. After the induction of thrombosis was completed, angiography and CT(Computed Tomography) scans were performed to evaluate the induction of renal infarction on days 7, 14, and 21. On day 21, necropsy was performed to evaluate occlusion by histopathology. Infarction of the right kidney was confirmed through angiography and CT(Computed Tomography) 3D scans, and 30% occlusion of the entire kidney was confirmed compared to the left kidney in the control group. We were able to complete the model of renal infarction by confirming vascular occlusion through histopathology. In the future, it is necessary to confirm whether the model is suitable for medical device development through vascular stent insertion surgery.

Corresponding author **:** Sung Jin Park

Keywords **:** Ranal infarction, Disease model, Angiography, Occlusion, Thrombosis

PS-D-05

Generation of a mouse model expressing Naa10 225 and 235 isoform

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Naa10 is a subunit of N-terminal protein acetyltransferase that plays a role in many biological process, such as cell division, proliferation, and tumorigenesis. It is known that Naa10 has several isoforms, each with distinct cellular functions, and it is divided into $Naa10^{225}$ and $Naa10^{235}$ based on the number of amino acids. In human, only the $Naa10^{235}$ is expressed, while in mice, both the $Naa10^{225}$ and $Naa10^{235}$ orthologues are present by alternative splicing at exon 8. Since it has been reported that $Naa10^{225}$ and $Naa10^{235}$ have opposite roles in development of tumors, it is important to investigate their functions in mouse in vivo. The purpose of our study is to generate a mouse model that expresses only $Naa10^{225}$ or $Naa10^{235}$ by introducing mutations at alternative splicing sites that block the expression of $Naa10^{235}$ or $Naa10^{225}$, respectively, in order to reveal the function of each isoform in vivo. Here, we generated mice expressing only $Naa10^{235}$ or $Naa10^{225}$ using CRISPR/Cas system. A mutation at c.471,2 AG>TC (intron 7 splice acceptor site) of Naa10 was designed to prevent splicing for $Naa10^{225}$, resulting in $Naa10^{235}$ expression. Additionally, for $Naa10^{225}$, a mutation at c.561 A>T (alternative 3′ splicing site) was introduced into Naa10, which disrupts the splicing of $Naa10^{235}$. Cas9, sgRNA targeting splicing site of $Naa10^{225}$ or $Naa10^{235}$ and ssODN were introduced to zygote by electroporation, followed by transfer to pseudo-pregnant female ICR mouse at the 2-cell stage. In the $Naa10^{235}$ and $Naa10^{225}$ model, 8/42 F0 pups and 13/56 F0 pups were produced with a maximum HDR efficiency of 99%, respectively. Currently, germline transmission to the F1 mouse has been confirmed through mating with C57BL/6N male mouse, and F2 generation breeding is ongoing. We expect that this novel mouse model would be useful for studying the function of Naa10 isoforms.

Corresponding author **:** Mi-Ni Lee

Keywords **:** Naa10 isoform, CRISPR/Cas9, HDR, Alternative splice

PS-D-07

Establishment of RB1 gene-mutated porcine embryo using prime editor

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The retinoblastoma gene (*RB1*) gene is crucial in retinoblastoma development, a pediatric eye tumor caused by bi-allelic *RB1* inactivation. Current treatments are not curative and carry a high recurrence risk, underscoring the need for improved therapeutic strategies. While RB1 knockout mice have advanced research and are already established, their limitations impede further progress. Developing large animal models is essential to overcome these challenges and bridge the gap between preclinical findings and clinical applications. Here, we confirm RB1 mutation in porcine somatic cell and blastocysts stage using Prime Editor, providing a foundational step toward the production of a porcine model for retinoblastoma. Prime Editor candidates were designed to introduce a stop codon in *RB1* exon 18, and the most efficient candidate was selected through in vitro cell test. Gene editing was then performed on in vitro fertilized embryos using either microinjection or electroporation. Compared to the control group, which showed a blastocyst development rate of 15.6%, embryos subjected to microinjection exhibited a development rate of 12.0%, while those subjected to electroporation demonstrated 20.5% While the number of mutated blastocysts was relatively low in the electroporation groups, microinjection resulted in a significantly higher mutation efficiency, with 40.0 ± 8.18% of the 12 blastocysts exhibiting the desired mutation. In conclusion, the use of Prime Editor at the zygote stage demonstrated higher efficiency with microinjection. These findings are expected to contribute to the establishment of a large animal model for retinoblastoma. This study was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (RS-2023-00260968) and SNU-550-20240013.

Corresponding author **:** Goo Jang

Keywords **:** RB1, Human disease modeling, Porcine, Prime editing

PS-D-06

Evaluation of new 99mTc-labeled PSMA-binding ligand in nude mice bearing PC-3 and LNCaP prostate cancer xenografts

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Objective : Prostate-specific membrane antigen (PSMA) is a valuable biomarker for imaging of prostate cancer (PC) due to its upregulation during disease progression. This study aimed to explore novel derivatives of EuK with aromatic amino acids for PSMA targeting and compare the binding properties with L-/D-isomers. Specially, we investigated the potential of the EuK-based derivatives to develop novel PSMA targeted theranostics.
Method : EuK-based derivatives including L-/D-aromatic amino acids were evaluated by molecular docking simulations with crystal structure of PSMA, followed by in vitro competitive binding assay with ^{125}I-MIP-1095. The authentic compound and radiotracer were synthesized by incorporating $^{185/187}$Re-/^{99}mTc-$(CO)_3$ into the precursor (IDA-EuKfG). Specific cellular uptake and efflux assays of ^{99m}Tc-IDA-EuKfG were conducted using PC cells. In vivo kinetics and tumor imaging properties of ^{99m}Tc-IDA-EuKfG were evaluated in nude mice bearing PC-3 and LNCaP PC xenografts using SPECT/CT imaging.
Results : EuKf derivative exhibited the highest binding affinity (IC_{50} = 2.3 nM) and thermodynamic binding free energy (− 68 kcal/mol). Similarly, Re-IDA-EuKfG showed high binding affinity (IC_{50} = 3.0 nM) to PSMA. ^{99m}Tc-IDA-EuKfG was prepared with high radiochemical yield (>80%) and molar activity (>3.7 TBq/mmol). Compared to ^{68}Ga-PSMA-11, ^{99m}Tc-IDA-EuKfG demonstrated increased accumulation (42%) and internalization (12%) within PC cells after 1-hour incubation. Moreover, tumor uptake of ^{99m}Tc-IDA-EuKfG was comparable to that of ^{68}Ga-PSMA-11, while showing negligible uptake in salivary glands.
Conclusion : Our study identified the significance of chirality in determining the PSMA binding properties of EuK-based ligands. Furthermore, we demonstrated the potential of the novel PSMA imaging ligand, ^{99m}Tc-IDA-EuKfG, as an effective tool for PC diagnosis. The favorable binding potency, cellular internalization, and tumor accumulation properties of ^{99m}Tc-IDA-EuKfG underscore its potential as a promising imaging agent for PC.

Corresponding author **:** Byung Chul Lee

Keywords **:** PC3 prostate cancer xenograft, LNCap prostate cancer xenograft, PSMA

PS-D-08

Liver cancer progression in choline-deficient, L-amino acid-defined, high-fat diet (CDAHFD)-fed Leptin KO/Korl mice

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The global incidence of liver cancer is largely attributed to chronic liver conditions, with non-alcoholic fatty liver disease (NAFLD) known as a significant contributing factor. In this study, we investigated the effects of CDAHFD on liver cancer progression in a Leptin KO/Korl mouse model. Six-week-old male Leptin KO/Korl mice were fed a CDAHFD (Lep KO-CDA) for 38 weeks to evaluate tumor development and associated biomarkers. The Lep KO-CDA group showed continuous body weight gain, whereas the Leptin KO group fed a chow diet (Lep KO) showed a slight decrease in body weight by the end of the feeding period. No significant differences were observed between the two groups in liver weight or liver weight/body weight ratio. The Lep KO mice fed a chow diet developed steatosis without tumor formation, while the Lep KO-CDA group showed a significantly higher incidence of liver tumors, with hepatocellular carcinoma (HCC) and hepatocellular adenoma (HCA) development. Additionally, serum levels of AFP and LCN2 were significantly increased in the Lep KO-CDA group, indicating tumor progression. Furthermore, levels of TNF-α, IL-6, and MCP-1 were significantly increased, indicating hepatic inflammation. Hydroxyproline and TGF-β1 levels were significantly increased, indicating fibrosis progression. Sirius Red staining revealed increased collagen accumulation in the Lep KO-CDA group. These findings suggest that a CDAHFD-fed Leptin KO/Korl mouse model could be used as a useful resource for studying liver cancer progression.
This research was supported by a grant (24211MFDS257) from the National Institute of Food and Drug Safety Evaluation (NIFDS), Republic of Korea, in 2025.

Corresponding author **:** Jong Kwon Lee

Keywords **:** Leptin KO/Korl mice, CDAHFD, Liver cancer

PS-D-09

Natural substances suppress oxidative stress and enhance neurogenesis in an MPTP-induced Parkinson's disease model

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Parkinson's disease (PD) is a neurodegenerative disorder characterized by the loss of dopaminergic neurons, oxidative stress, inflammatory responses, and mitochondrial dysfunction. Resveratrol (RES) enhances neuronal survival by activating the Sirtuin1 pathway. Saffron (SFN), with active components like crocin and crocetin, alleviates oxidative stress and inflammation. Similarly, Passiflora incarnata (PI) provides neuroprotection by regulating the GABA system, along with its antioxidant and anti-inflammatory properties. This study evaluated the neuroprotective effects and hippocampal neurogenesis of RES, SFN, PI, and their combination (RES+SFN+PI) in an MPTP-induced PD mouse model.
Mice (C57BL/6J) were administered MPTP (30 mg/kg) intraperitoneally for 4 weeks, followed by oral administration of the natural substances (50 mg/kg) alone or in combination. Immunostaining and Western blot analyses indicated reductions in NOX4, MPO, and OPN levels, and increases in BrdU/NeuN co-labeling, Ki67, and DCX expression, which signified reduced oxidative stress, enhanced neuronal differentiation, and increased proliferation. Expressions of PSD95 and Synaptophysin suggested improvements in synaptic plasticity and density, while decreased GFAP expression indicated mitigation of astrocyte activation and neuroinflammation. Behavioral assessments further confirmed significant motor function improvements in groups treated with natural substances compared to the MPTP-only group.
In conclusion, natural substances demonstrated significant potential in reducing oxidative stress and inflammation, enhancing neurogenesis, and improving synaptic plasticity, thereby contributing to recovery from PD pathology. RES and PI consistently showed substantial effects on neurogenesis (BrdU/NeuN, DCX, Ki67) and synaptic plasticity (PSD95, Synaptophysin), with reductions in oxidative stress and inflammation markers (NOX4, MPO, OPN). SFN showed limited effects on neurogenesis in immunohistochemistry (DCX, Ki67) but demonstrated increased DCX expression in Western blot analysis, suggesting a potential contribution to neurogenic recovery. Combination treatment integrated the advantages of individual substances, showing stable and balanced improvements across all markers.

Corresponding author **:** Sun Shin Yi

Keywords **:** Parkinson's disease (PD), Neurogenesis, Oxidative stress, Natural extracts (Resveratrol, Saffron, Passiflora incarnata), Synaptic plasticity

PS-D-11

Preparation of animal models for osteoarthritis and treatment with Oleanolic acid curcumin co assembled nanoparticles

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Curcumin (Cur) is a natural polyphenol that is one of the most valuable natural products. However, its use as a functional food is limited by low water solubility, chemical instability and poor bioavailability. In this study, a supramolecular co-assembly strategy was used to construct an oleanolic acid-curcumin (OLA-Cur) co-assembly composite nano-slow-release treatment system. As a co-assembled compound, OLA is a widely present pentacyclic triterpenoid compound with multiple biological activities in the plant kingdom, which is expected to jointly alleviate the damaging effects of papain-induced mouse osteoarthritis model. The OLA-Cur NPs shows the solid core-shell structure, which can effectively improve the water solubility of Cur and OLA, and has good stability and sustained release characteristics. The analysis results show that the two compounds are mainly assembled through hydrogen bonding interactions, hydrophobic interactions, and π - π stacking interactions. The OLA-Cur NPs can inhibit the release of pro-inflammatory cytokines TNF-α, IL-6, and IL-1β induced by LPS in RAW264.7 mouse macrophages, promote the secretion of anti-inflammatory cytokine IL-10, and improve the oxidative stress index of hydrogen peroxide induced human rheumatoid arthritis synovial fibroblasts. In addition, it has a certain improvement effect on cartilage and subchondral bone damage in mouse osteoarthritis models. These findings suggest that constructing co-assembled composite nanoparticles based on pure natural compounds may break through the limitations of a variety of important nutritional ingredients in functional foods.

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Keywords **:** Co-assembly, Drug delivery, Multifunctional nanoparticles, Natural products, Oteoarthritis

PS-D-10

Enhanced Purkinje cell survival via natural extracts in an MPTP mouse model of Parkinson's disease

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Parkinson's disease (PD) is a neurodegenerative disorder characterized by dopaminergic neuron loss and motor dysfunction. While most research focuses on cerebral pathology, emerging evidence highlights the cerebellum's role in motor deficits. This study explored the neuroprotective effects of natural extracts—Resveratrol (RES), Saffron (SFN), and Passiflora incarnata (PI)—on cerebellar dysfunction in an MPTP-induced mouse model of PD.
C57BL/6J mice received MPTP (30 mg/kg, intraperitoneally) to induce PD-like symptoms, followed by 4 weeks of oral treatment with RES, SFN, PI, or their combination (50 mg/kg). Motor performance was assessed through Rotarod and Grip strength tests, while Immunofluorescence and Western blot analyses evaluated Fetuin-A expression and Purkinje cell survival.
Results showed that these natural extracts significantly enhanced Fetuin-A expression and increased Purkinje cell survival compared to MPTP-only controls. Elevated Fetuin-A levels correlated with reduced apoptosis and improved motor performance, suggesting Fetuin-A-dependent neuroprotection. These findings underscore the potential of natural extracts to target cerebellar dysfunction and alleviate motor deficits in PD.
Future research will involve primary cultures of embryonic Purkinje cells treated with natural extracts and Fetuin-A siRNA to confirm whether Purkinje cell survival relies on Fetuin-A. This in vitro model aims to further clarify the neuroprotective mechanisms underlying natural extracts, offering new insights into therapeutic strategies for cerebellar dysfunction in PD.

Corresponding author **:** Sun Shin Yi

Keywords **:** Parkinson's disease, Fetuin-A dependent Purkinje cell survival, Resveratrol, Saffron, Passiflora incarnata

PS-D-12

Machine learning-driven analysis of blood-based biomarkers for non-invasive diagnosis of Canine Cognitive Dysfunction Syndrome (CCDS)

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Canine Cognitive Dysfunction Syndrome (CCDS) is a progressive neurodegenerative disorder observed in senior dogs, exhibiting symptoms analogous to Alzheimer's disease in humans. Early diagnosis of CCDS is critical for timely intervention and improving the quality of life in affected animals. However, existing diagnostic methods lack precision and objectivity, emphasizing the need for reliable biomarkers. This study integrates machine learning (ML) algorithms with blood-based biomarkers to develop a non-invasive diagnostic tool for early CCDS detection with clear and objective indicators. Blood samples were collected from aging dogs, categorized by Canine Cognitive Dysfunction Rating (CCDR) scores reflecting various stages of cognitive impairment. Blood from dogs with CCDR scores exceeding 25 was analyzed, and key biomarkers—retinol-binding protein 4 (RBP4), C-X-C chemokine ligand 10 (CXCL10), and NADPH oxidase 4 (NOX4)—were validated about neurodegenerative models. These biomarkers are associated with inflammatory cytokines, amyloid precursor protein metabolites, and oxidative stress markers, all of which play a role in the pathophysiology of CCDS. Notably, lower levels of these biomarkers were correlated with higher CCDR scores, indicating greater cognitive decline. Advanced machine learning models, including random forest and support vector machine (SVM) classifiers, were employed to analyze the biomarker data. The combination of RBP4 and NOX4 with the SVM algorithm demonstrated the highest diagnostic accuracy, confirming their potential as reliable biomarkers for CCDS. These models effectively differentiated CCDS stages, establishing a robust diagnostic framework. Blood-based biomarkers can significantly enhance the early detection and management of CCDS, offering implications for neurodegenerative disease management in both veterinary and human medicine. This approach enables early detection and the development of personalized treatment strategies in veterinary practice, while also contributing to comparative neurodegenerative research, with CCDS serving as a model for Alzheimer's disease. Further studies involving larger canine populations are needed to validate the clinical reliability and scalability of this approach.

Corresponding author **:** Sun Shin Yi

Keywords **:** CCDS, CCDR, CXCL10, NOX4, RBP4

PS-D-13

All-in-one human MSTN gene micro-promoter vector as an additional measure for gene therapy

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Progression of recombinant adeno associated virus (rAAV) based genetic therapy has been an emerging area of focus. However, the 4.7kb rAAV packaging limitation discouraged expressions of larger transgenes or all-in-one vectors as frequently used SpCas9(~4.2kb) and SaCas9 (~3.2kb) are considerable in size, requiring an exploration in promoter engineering. Our preliminary bovine 5' regulatory region *MSTN* gene isolated promoter M243, -59 to -302 consisting a proximal promoter region conserved across species, has exhibited activities in ubiquitous cells (Eom et al.2024). In this study, M243 has been modified to the equivalent core region in the human *MSTN* gene for a further suitable use in human gene therapy, contemplating immune risk reduction and contribution of targeted and regulated gene expressions. Subsequently, regarding rAAV packaging limitations, universal *MSTN* micro-promoters of 158 (M158), 108 (M108), and 50 (M50) base pairs were generated through promoter mutagenesis. These micro-promoters were contrasted with the widely utilized 204 base pair cytomegalovirus (CMV) promoter in various human tissue cells demonstrating ubiquitous expressions of reporter genes. Such descriptions were observed through human cervical, prostate, and liver cancer cells. In addition, these micro-promoters were inserted in an all-in-one vector containing Cas9 (4.2kb), GFP (0.7kb), and a sgRNA cassette (0.2kb), further demonstrating themselves as a ubiquitous promoter. *MSTN* micro-promoters M158, M108, and M50 will ensure rAAV therapeutic treatments requiring large transgenes and all-in-one vectors through the provision of additional capacity. In further studies, the all-in-one micro-promoter vectors excluding GFP are anticipated to be accompanied by rAAV packaging as to propose an alternative opportunity for genetic disease therapy.
This study was supported by BK21 FOUR Future Veterinary Medicine Leading Education and Research Center, NRF-2021R1A5A1033157 and Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry (IPET) through High Value-added Food Technology Development Program, funded by Ministry of Agriculture, Food and Rural Affairs (MAFRA) (RS-2024-00402798).

***Corresponding author :** Goo Jang

***Keywords :** All-in-one vector, Gene Therapy, Micro-promoter, MSTN

PS-D-14

Neurodevelopmental and immunological impacts of polyethylene microplastic exposure in an Autism-like mouse model

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Autism spectrum disorder (ASD) is a chronic neurodevelopmental condition characterized by impairments in social interactions, communication, and repetitive behaviors. Despite the rising prevalence of ASD globally, its pathogenesis remains incompletely understood. Emerging evidence has highlighted the potential role of environmental pollutants, including microplastics (MPs), in neurodevelopmental disorders. This study investigates the impact of polyethylene microplastic (PE-MPs) exposure during pregnancy and lactation on neurodevelopment and immune responses in the BTBR T+Itpr3tf/J (BTBR) autism-like mouse model, using the C57BL/6J (B6) mouse as a control group.
Pregnant female BTBR and B6 mice were exposed to PE-MPs (1,000 μg/L in drinking water) during pregnancy, lactation, or both, while control groups received distilled water. Offspring exposure to PE-MPs occurred via placental transfer and breastfeeding. Behavioral analysis was conducted on postnatal day 21 using the passive avoidance test to assess learning and memory. Serum immunoglobulin E (IgE) levels, cytokine profiles (TNF-α, IFN-γ, and IL-4) in splenocytes, and brain-derived neurotrophic factor (BDNF) levels in brain homogenates were quantified using enzyme-linked immunosorbent assays (ELISA).
The results demonstrated impaired learning and memory in BTBR mice compared to B6 controls, with PE-MPs exposure exacerbating cognitive deficits in both strains, particularly in BTBR mice. Elevated IgE levels and a Th2-skewed immune response were observed in BTBR mice, which were modulated by PE-MPs exposure. In contrast, PE-MPs exposure increased IgE and pro-inflammatory cytokines in B6 mice. Moreover, PE-MPs exposure reduced BDNF levels in BTBR mice, indicating neurodevelopmental disruptions.
These findings reveal that maternal PE-MPs exposure during critical developmental periods adversely affects offspring neurodevelopment, immune responses, and cognitive function, particularly in autism-like BTBR mice. The study highlights the potential neurotoxic effects of MPs and emphasizes the need to minimize environmental pollutant exposure during pregnancy and lactation to mitigate the risk of neurodevelopmental disorders such as ASD.
[This researched was approved by the NRF(National Research [Assignment number:RS-2023-00212281] and This researched was conducted with support from the Graduate School of Chemical Safety Management funded by the Korea Environment Institute.]

***Corresponding author :** Chang Yul Kim

***Keywords :** Autism spectrum disorder, Behavior test, BTBR, Microplastic, Humoral

PS-D-15

Lycopene enhances epigenetic reprogramming and zygotic genome activation to improve Porcine PA and SCNT embryo development

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Excessive reactive oxygen species (ROS) from *in vitro* culture (IVC) and somatic cell nuclear transfer (SCNT) have been linked to preimplantation developmental defects and epigenetic alterations. Lycopene, a red carotenoid, has strong antioxidant properties and is an effective scavenger of free radicals. Thus, this study investigated whether incorporating lycopene into parthenogenetically activated (PA) and SCNT embryos during IVC could improve embryonic development and epigenetic stability. We cultured porcine PA embryos in IVC medium supplemented with lycopene (0, 0.02, 0.2, and 2 μM) for 6 days to determine the optimal concentration. Supplementation with 0.2 μM lycopene significantly enhanced developmental competence, as evidenced by an increase in 4–5 cell cleavage rates, blastocyst rates, total and trophectoderm (TE) cell numbers, and a decrease in apoptosis rates compared to the control group. Similarly, in SCNT embryos, lycopene treatment improved the 4–5 cell cleavage rates, blastocyst rates, and cell survival rates and increased the number of total and TE cells. This lycopene treatment also reduced ROS levels, upregulated the expression of antioxidant enzyme-related genes (*CAT, SOD1, SOD2,* and *HO-1*), and enhanced mitochondrial membrane potential and autophagy in 4-cell embryos. lycopene treatment in PA and SCNT embryos significantly reduced the levels of H3K4me3, H3K9me3, and 5mC in 4-cell embryos and blastocysts. Lycopene treatment also downregulated the expression levels of methyltransferase-related genes (*ASH2L, SUV39H2, DNMT1, DNMT3A,* and *DNMT3B*), while upregulating the expression levels of zygotic genome activation (ZGA)-related genes (*ZSCAN4, UBTFL1, SUPT4H1, MYC,* and *ELOA*). These results suggest that lycopene treatment in porcine PA and SCNT embryos enhances mitochondrial and autophagic activities, and regulates epigenetic reprogramming, thereby promoting ZGA and improving embryonic developmental potential. This research was supported by the Korea Research Institute of Bioscience and Biotechnology (KRIBB) Research Initiative Program (KGM4252533) and the National Research Foundation of Korea (NRF) grant funded by the Ministry of Science and ICT (MSIT) (2021M3H9A1096895), Republic of Korea.

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PS-D-16

KLF10 as a regulator of macrophage activation and inflammation

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This study investigates the regulatory role of KLF10 in macrophage differentiation and activation, particularly under inflammatory conditions. Macrophages are key players in the immune response and their dysregulation is linked to various metabolic diseases. We hypothesize that KLF10 negatively regulates M1 differentiation and cytokine production in macrophages. To explore this, bone marrow-derived macrophages (BMDM) were isolated from KLF10 knockout (KO) mice and treated with lipopolysaccharide (LPS) to induce M1 polarization. Comparative analysis through quantitative PCR revealed increased expression of M1-specific cytokines in KLF10 KO macrophages. Notably, signaling analysis showed an enhanced NF-κB activation in the absence of KLF10. Furthermore, in RAW 264.7 cells, silencing KLF10 similarly resulted in augmented M1 cytokine expression and NF-κB activity. In contrast, KLF10 overexpression reduced NF-κB activity, confirming its negative regulatory role. These findings suggest that KLF10 modulates inflammatory responses in macrophages by regulating M1 differentiation and function, potentially representing a therapeutic target for managing macrophage-related metabolic disorders. Future inquiries will focus on elucidating the detailed mechanisms by which KLF10 influences NF-κB signaling pathways in the context of inflammatory diseases. This work was funded by the Ministry of Education, Science, and Technology [2022R1A2C1012833] to J-YC.

***Corresponding author :** Ji-Young Cha

***Keywords :** KLF10, Bone marrow-derived macrophage, Inflammatory cytokines, Macrophage differentiation, NF-κB

PS-D-17

Mouse models carrying human Naa10 syndrome pathogenic mutation generated by CRISPR/Cas9 mediated HDR

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NAA10 (N-alpha-acetyltransferase 10) is one of the essential genes involved in amino-terminal acetylation as a catalytic subunit of NatA, which plays significant role on many developmental processes, especially in the brain and the heart. Mutations in this gene can cause NAA10 syndrome, a rare genetic disease characterized by various clinical features, including intellectual disability, facial dysmorphism, congenital anomalies, and developmental delays. Here, we generated two novel mouse models with the pathogenic point mutations of human NAA10 syndrome (p.Ser37Pro and p.Arg83Cys) using CRISPR/Cas9-mediated HDR. Each single guide RNA (sgRNA) was designed to target Naa10 gene in the mouse genomic DNA, in which corresponds to human pathogenic mutation S37P and R83C respectively. Cas9 RNP and ssODN were introduced into C57BL/6N mouse zygotes via electroporation, and embryos were transferred to pseudo-pregnant female ICR mouse at 2cell stage. For Naa10 S37P mouse, 68 pups were born after ET, and 13 among them were carrying p.Ser37Pro mutation on their Naa10 gene. For Naa10 R83C mouse, 28 pups were born after ET, and 10 among them were carrying p.Arg83Cys mutation on their Naa10 gene. F0 male mouse with high HDR rate were selected and mated with C57BL/6N female mouse, and F1 heterozygous female pups were obtained (9 for S37P, 24 for R83C). In this study, mouse models carrying two different pathogenic mutations of NAA10 syndrome have been generated. We expect that these mouse models would better mimic the human NAA10 syndrome than Naa10 knock out mouse, thus potentially could be used for studying human disease.

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***Keywords :** Naa10, CRISPR/Cas9, HDR, Point mutation, Human disease mouse model

PS-D-18

Role of death-associated protein kinase 3 in pancreatic cancer

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Pancreatic cancer is the third leading cause of cancer-related mortality worldwide, with a dismal 5-year survival rate of only 13%. Early diagnosis is critical for effective treatment, highlighting the need for molecular studies to identify novel diagnostic and therapeutic markers. Death-associated protein kinase 3 (DAPK3) is a calcium/calmodulin-dependent serine-threonine kinase involved in diverse cellular processes such as apoptosis, proliferation, transcription, and translation. While DAPK3 is known to function as a tumor suppressor in various cancers, including prostate, ovarian, and colon cancers, its role in pancreatic ductal adenocarcinoma (PDAC) remains poorly understood.
In this study, we investigated the functional role and mechanisms of DAPK3 in PDAC. Using CRISPR/Cas9 technology, we generated DAPK3 knockout cell lines and performed transient overexpression of DAPK3 in PDAC cell lines. Loss of DAPK3 significantly enhanced colony formation and cell migration, whereas DAPK3 overexpression attenuated these processes. Moreover, experiments using kinase-dead DAPK3 mutants revealed that its kinase activity is essential for its cellular functions. Flow cytometry analysis further demonstrated that DAPK3 depletion reduces apoptosis, while DAPK3 overexpression markedly enhances apoptotic processes.
These findings suggest that DAPK3 serves as a critical regulator of cell proliferation and apoptosis in pancreatic cancer. Therefore, DAPK3 holds potential as a therapeutic target for PDAC treatment and tumorigenesis prevention.

***Corresponding author :** Ho Lee

***Keywords :** Pancreatic cancer, tumor suppressor, Cell death

PS-D-19

Deficiency of Themis prevents atopic dermatitis by enhancing Treg homeostasis

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Themis, a molecule specific to T cell lineage involved in TCR signaling and thymocyte selection, has a well-documented role in thymocyte development. However, its function in peripheral T cells and Tregs is less understood. We assessed the function of Themis in Tregs using an ovalbumin (OVA)-induced atopic dermatitis (AD) mouse model. Themis KO mice presented milder AD symptoms, with skin tissues showing reduced Th2 type cytokines (IL-4, IL-5) and pro-inflammatory cytokines (TNF-a, IFN-g) implicated in AD pathogenesis. Moreover, Themis KO mice exhibited lower neutrophil and eosinophil infiltration. The milder AD in Themis KO mice correlated with an increased presence of Tregs in skin and draining lymph nodes (dLN), and higher levels of inhibitory receptors (CTLA-4, GITR, ICOS) on Tregs. These KO Tregs also demonstrated more active suppression, indicated by elevated chemokine expression, which facilitates efficient recruitment of immune cells. Additionally, Themis KO Tregs maintained stability when exposed to inflammatory cytokines (IL-4, IL-6). Collectively, these findings underline Themis's essential role in enhancing Treg-mediated suppression, contributing to the mitigation of AD.

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***Keywords :** Treg, Themis, Treg stability

PS-D-20

Simultaneous loss of Abhd14a and Tmem115 synergistically promotes gastric carcinogenesis and confers vulnerability to WNT inhibition

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(Background) Gastric cancer (GC) is a prevalent and lethal malignancy. Despite advancements in genome sequencing that have identified frequently occurring mutations, the functional roles of these candidate driver genes in GC remain largely unvalidated. In our previous study, we identified 22 genes that exhibit frequent mutations in diffuse-type human GC tissues.
(Aim) In this study, we performed CRISPR-Cas9 knockout (KO) screening using mouse stomach organoids for the functional validation of driver gene mutations associated with gastric carcinogenesis.
(Results) In the first round of screening, we introduced 44 gRNAs targeting 22 genes into Trp53 KO mouse stomach organoids expressing Cas9, followed by implantation into NSG mice. Tumors formed at 50% of the injection sites (11/22), with enriched gRNAs targeting known driver genes such as *Fbxw7, Tgfbr1, Smad4, and Cdh1*. In the second round, 36 gRNAs targeting 18 remaining genes were used, leading to tumors in 18% of sites (2/11). Among these, *Cxcr3, Tmem115,* and *Abhd14a* gRNAs showed significant enrichment. On TCGA data, *ABHD14A* and *TMEM115* exhibit deep deletions on Chromosome 3p21.1, mutually exclusive with known driver mutations. Double KO of *Abhd14a* and *Tmem115* in organoids induced tumor formation in 50% of injections (4/8), whereas single KOs did not (0/10). RNA sequencing and reporter assays confirmed Wnt signaling activation in double KO organoids, which also exhibited increased sensitivity to Wnt inhibitors.
(Conclusion) This study identifies the simultaneous loss of *Abhd14a* and *Tmem115* as a novel driver gene combination in GC, promoting tumorigenesis via Wnt pathway activation and conferring vulnerability to Wnt inhibition. These findings provide a promising foundation for targeted therapeutic strategies tailored to this driver gene combination.

***Corresponding author :** Jun Won Park

***Keywords :** Chromosome 3p21.1, CRISPR-Cas9 KO screening, Driver gene, Exome sequencing, Gastric cancer

PS-D-21

WFDC2 exacerbates metabolic dysfunction associated steatotic liver disease

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WAP 4-disulfide core domain protein 2 (WFDC2), also known as human epididymis protein 4(HE4), is a small secretory protein. Overexpression of WFDC2 has been reported in fibrosis and human cancers, including lung, ovary and stomach and it has been useful biomarker for ovarian cancer. Recent studies have shown correlation between WFDC2 and gastric metaplasia, and cohort study also showed association with WFDC2 in idiopathic pulmonary fibrosis. Recent study revealed serum WFDC2 has association with severity and outcome of hepatic fibrosis. We hypothesized WFDC2 might have correlation in liver steatosis and fibrosis. In this study we aimed to investigate the role of WFDC2 in various liver diseases.
In order to identify the role of WFDC2 molecule in MASLD, we generated WFDC2 knock out (KO) mice and compared pathologically with wild type (WT) mice in various damage models. To identify the expression level of WFDC2, immunohistochemistry (IHC) staining was performed on tissue microarray slides derived from human liver with various liver diseases. IHC of human tissue microarray slides showed higher expression of WFDC2 in liver disease patients. Hepatocytes and bile ducts cells were positive for WFDC2 in liver TMA. In CDA-HFD induced MASLD model, WT mouse liver showed higher NAFLD activity score, lipid droplet area, Sirius red positive area than WFDC2 KO mouse. WT mouse had higher AST, ALT levels indicating liver damage. In BDL surgery induced fibrosis models, WFDC2 KO mouse had significantly less fibrotic, necrotic region and less apoptotic cells after BDL surgery compared to WT mouse. WT mouse had higher AST, ALT, bilirubin levels. Quantitative PCR showed increased level of WFDC2 in WT damage models and hepatocytes and bile duct cells were positive from RNA In situ hybridization in WT damage models. Collectively we confirmed upregulation of WFDC2 in human liver tissue and WT mouse had severe damage than KO mouse in various damage models. Through these findings we suggest WFDC2 can promotes MASLD and fibrogenesis in liver

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***Keywords :** MASLD, Fibrogenesis, WFDC2

PS-D-22

Optimal development method for transgenic pigs using endogenous promoter-mediated expression via knock-in for xenotransplantation

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Xenotransplantation is a valuable alternative to address the shortage of organ for transplantation. Using pig as xenotransplantation model is feasible due to the similarity of organ size, physiology, and anatomy to human. However, gene modification of pig is essential to control immunological rejection following pig to human transplantation. Pig alpha-gal epitopes synthesized by GGTA1 gene cause hyperacute rejection because anti-alpha gal antibodies are abundantly present in human. Similarly, Neu5Gc synthesized by CMAH gene and Sda antigen synthesized by B4GalNT2 gene expressed on pig cell occur antigen-antibody mediated acute rejection. To reduce these hurdles in xenotransplantation, xenoantigens (GGTA1, CMAH and B4GalNT2) knock-out pigs has been produced as development of xenotransplantation research. Nevertheless, immunological rejection such as complement response, thrombosis and activation of immune cells in recipient has been still barrier to xenotransplantation. To overcome various immune rejection, optimization of transgenic method is crucial for xenotransplantation model. Ablation of target gene became more accessible by advanced gene editing tools. However, the transgenic technology to induce effective and stable expression of transgenes has not been standardized yet. To develop optimal transgenic pig with efficient and stable gene expression, we aimed to use a knock-in strategy where the expression of transgenes is under control endogenous promoter. The knock-in vector was constructed that homologous arms to target exon4 of GGTA1 gene to ablate alpha-gal, and human CD55/CD39 fragment was conducted to be between homologous arms that these transgenes would be controlled by endogenous promoter of GGTA1 gene. Using the knock-in vector, GGTA1 knock-out(KO)/CD55/CD39 pig was successfully generated. We also generated GGTA1/CMAH/B4GalNT2 KO with CD55/CD39 transgenic pig using CRISPR/Cas9 system and knock-in strategy. The transgenic pig using our knock-in strategy showed that abundantly and stable expression of human CD55 and CD39 by GGTA1 endogenous promoter, and ablation of alpha-gal epitopes. Moreover, antibody-mediated rejection was greatly reduced by knock-out of xenoantigens, and complement response and platelet aggregation were inhibited by expression of human CD55 and CD39. Consequently, the endogenous promoter-mediated knock-in strategy used in this study is an ideal approach as it simultaneously eliminates alpha-gal epitopes, a cause of hyperacute immune rejection, and induce stable and effective expression of the transgenes.
This research was supported by a grant of Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number: RS-2023-KH135861).

***Corresponding author :** Joohyun Shim

***Keywords :** Xenotransplantation, Immunological rejection, Xenoantigens, CD55, CD39

PS-E-01

Cellular study of the protective effect on sensorineural hearing loss using cyclophilin D inhibitor

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Mitochondria are important organelles that not only produce bioenergy but also control apoptosis and calcium homeostasis. When a stressful environment leads to an imbalance in calcium homeostasis in cells, calcium is transported from the endoplasmic reticulum to the mitochondria. Under conditions of calcium overload and increased reactive oxygen species (ROS) production in the mitochondria, mitochondrial permeability transition pores (mPTPs) open to release mitochondrial calcium as well as proapoptotic factors, leading to cell death. One of the diseases resulting from mitochondrial calcium overload and ROS overproduction is sensorineural hearing loss, which can be an adverse effect of the chemotherapeutic drug cisplatin. Because cisplatin is a widely used anticancer drug, I investigated the use of a drug that inhibits cyclophilin D (cypD), which regulates mPTP function, to protect against cisplatin-induced ototoxicity and apoptosis. The drug showed a protective effect of approximately 40% against cisplatin-induced apoptosis, and I confirmed a reduction in the increased level of total ROS and restoration of the mitochondrial membrane potential. Thus, I concluded that cisplatin-induced apoptosis was reduced, and cypD inhibition exerted a protective effect against ototoxic hearing loss.

***Corresponding author :** Un-Kyung Kim, Tae-Jun Kwon

***Keywords* :** Mitochondrial permeability transition pores, Sensorineural hearing loss, Cyclophilin D

PS-E-03

Potential improvement of skin barrier function by Artemisia capillaris Thunb. water extract (ACTE) in HaCaT cells

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The water extract of ACTE (*Artemisia capillaris* Thunb. extract) demonstrates significant antioxidative and anti-inflammatory properties with promising effects on skin barrier integrity. In vitro assays reveal that ACTE exhibits potent free radical scavenging activity, as evidenced by DPPH and ABTS assays. UPLC-QTOF/MS analysis identified key bioactive compounds, including L-arginine, dihydrosyringin, hypericin, and scoparone, which contribute to these properties. Quantitative analysis confirmed that scoparone, an indicator substance in ACTE, was present at 48.168 ppm within a 100 ppm sample. Furthermore, ACTE effectively downregulated pro-inflammatory cytokines and nuclear factor kappa B (NF-κB) in TNF-α/IFN-γ-induced HaCaT keratinocytes. Western blot and immunofluorescence analyses confirmed ACTE's role in maintaining skin barrier function by upregulating tight junction proteins ZO-1 and occludin under inflammatory conditions. These findings were further supported by TEER (transepithelial electrical resistance) measurements, indicating improved intestinal barrier function. This study highlights the potential of ACTE as a therapeutic agent for enhancing skin barrier integrity and reducing inflammation, it offers promising potential as a cosmetic ingredient.

***Corresponding author :** Kwang Il Park

***Keywords* :** Artemisia capillaris Thunb., Skin barrier, Inflammationm, Tight juction

PS-E-02

Activation of a hypothalamus-habenula circuit suppresses cocaine-induced locomotion via presynaptic release of glutamate and orexin.

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Acute or chronic exposure to cocaine causes addictive behaviors by reducing GABAergic input to dopaminergic neurons in the Ventral Tegmental Area (VTA) and increasing dopamine release in Nucleus Accumbens (NAc). A circuit comprising of lateral hypothalamus (LH) and lateral habenula (LHb) mediates aversion behaviors by acting on mesolimbic dopaminergic system. Therefore, we investigated whether an LH-LHb circuit modulates cocaine-induced locomotor activity and which neuropeptides mediates the LH-LHb modulation of cocaine behaviors. Optogenetic activation of LH-LHb strongly inhibited cocaine-enhanced locomotor activity, which was prevented by local injection of either glutamate or orexin receptor antagonist into LHb. In vivo extracellular recordings proved that optogenetic activation of LH-LHb increased single-unit discharges from LHb neurons and the evoked activities were prevented by local injection of either glutamate or orexin receptor antagonist into LHb. Our findings revealed that the reduction of cocaine-induced locomotion by LH-LHb stimulation was mediated by glutamate and orexin in LH.
Acknowledgement: This work was supported by the National Research Foundation of Korea(NRF) Grants funded by the Korea government (MSIT) RS-2023-00262398 and RS-2024-00413858.

***Corresponding author :** Hee Young Kim

***Keywords* :** LH-LHb circuit, Cocaine-induced locomotor activity, Glutamate, Orexin

PS-E-04

In vivo dynamics and statomics-based approach to discover biological mechanisms of anabolic resistance in sarcopenia: role of caveolin-1 as a key modulator

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Purpose : Sarcopenia, the age-related loss of muscle mass and function, is best characterized by anabolic resistance, a diminished muscle protein synthesis response to anabolic stimuli such as resistance exercise. Here we aimed to explore mechanisms underlying anabolic resistance.
Materials and methods : Young (8-week-old) and aged (24-month-old) C57BL/6J mice completed 12 weeks of resistance exercise training (RT), with or without supplementation of dietary essential amino acids. To determine anabolic responsiveness (i.e., gains in muscle mass and muscle protein synthesis, MPS) to RT, we assessed functional muscle mass using D_3-creatine dilution principle, and muscle proteome kinetics and contractile and mitochondrial MPS using D_2O labeling and mass spectrometry. To search for potential molecular mechanisms, RNA sequencing (i.e., static-snapshot, statomics) was performed. To confirm the role of the candidate gene, C2C12 myotubes were contracted by electrical pulse stimulation to stimulate MPS with/out knockdown (KD) of the candidate gene. Further, to dissect metabolic mechanisms, we performed ^{13}C metabolic flux analysis (MFA) to determine alterations in intracellular metabolic fluxes using [U-$^{13}C_{16}$]palmitate and [U-$^{13}C_6$]glucose.
Results : Unlike young mice, aged mice exhibited no significant increase in (functional) muscle mass, and MPS after 12-wk RT, indicating anabolic resistance. Proteome kinetics analysis revealed that individual protein synthesis rates (91% of 159 total proteins detected) were lower in aged mice vs. young mice. RNA sequencing analysis suggests muscle Cav-1 as a potential key gene that may contribute to anabolic resistance. In line, Cav-1 KD attenuated myotube hypertrophy, MPS, and muscle glucose uptake rate during and after RT-mimicking muscle contraction. ^{13}C MFA revealed that Cav-1 KD impaired intracellular metabolic fluxes, including glycolysis flux and ATP production rate.
Conclusion : This study identified alterations in Cav-1 expression as a key contributor to anabolic resistance through impairing energy metabolism and thus MPS, highlighting Cav-1 as a potential therapeutic target for mitigating anabolic resistance in sarcopenia.

***Corresponding author :** Il-Young Kim

***Keywords* :** Anabolic resistance, Sarcopenia, Functional muscle mass, Metabolic flux analysis, Muscle proteome kinetics

PS-E-05

A novel tumor measurement method using artificial intelligence in breast cancer disease models

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In this study, we experimented with MDA-MB-231 cells, a triple negative breast cancer cell most commonly used in breast cancer disease models, by creating a xenograft model. In this study, we propose a new tumor measurement method using artificial intelligence and the nu/nu mouse animal model xenografted with MDA-MB-231 cells, and a dataset was built and used from the first day of implantation.
Existing measurement methods in breast cancer disease models are prone to errors due to subjective factors and measurement methods. In contrast, this study used a computer vision technology, Convolutional Neural Network (CNN), and an object detection algorithm, YoloV6, to automatically detect and measure tumor boundaries. In the data annotation process, the boundaries of each tumor were manually reviewed by experts to accurately mark the boundaries and used as training data. The experimental results showed that the AI-based tumor measurement method maintained a tumor detection rate of more than 80% and an intersection over union (IOU) of more than 0.8, which is an indicator of prediction accuracy.
The method proposed in this study can be objectively evaluated, making it easy to monitor the timing of drug administration and the effectiveness of treatment when a certain tumor size is reached. This precise method of measurement can reduce the amount of effort required by researchers to take measurements and is expected to help in the development of personalized treatments.
This study has shown the potential of using AI to measure tumor size in breast cancer research and is expected to contribute to the diagnosis and treatment of various cancers in the future.

Corresponding author **:** Sung Gurl Park

Keywords **:** Artificial intelligence, Breast cancer, Tumor, Xenograft model

PS-E-06

Primary culture of in vitro resources from cynomolgus macaque

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Animal models such as mice, rats, and pigs are widely used to mimic human physiology; however, non-human primates are the most similar to humans in terms of genetic and physiological characteristics. Among them, the cynomolgus macaque is particularly advantageous over the rhesus macaque due to its more practical size for tissue sampling and its higher sensitivity in reproductive and developmental toxicology studies. As a result, cynomolgus macaques are frequently employed in a variety of research areas, including medication toxicity and efficacy evaluations. Nevertheless, conducting in vivo research using non-human primates presents significant challenges, such as high maintenance costs, smaller litter sizes, and prolonged gestation and postpartum recovery periods, making them less accessible than other animal models in *in vivo* studies. To overcome these limitations, we collected multiple tissues from a euthanized cynomolgus macaque and successfully cultured diverse biological resources for *in vitro* research. Specifically, tissues from the lung, endometrium, and small intestine were sampled and used to establish primary 3D organoids. Additionally, endometrial stromal cells were isolated and cultured, along with fibroblasts from the ear and myoblasts from muscle tissue. These initially cultured 2D cells and 3D organoids are expected to serve as powerful tools for drug toxicity assessment, particularly in reproductive toxicity studies. Furthermore, when combined with advanced technologies such as gene editing, these resources have the potential to expand research opportunities in diverse fields, including genetics, molecular biology, and physiology.
This work was supported by Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry (IPET) through High Value-added Food Technology Development Program, funded by Ministry of Agriculture, Food and Rural Affairs (MAFRA) (RS-2024-00402798).

Corresponding author **:** Goo Jang

Keywords **:** Cell culture, Cynomolgus monkey, Organoid, Resources

PS-E-07

Oxidative and carbonyl stress-induced age-related macular degeneration and anti-AMD effect of codonopsis lanceolata

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Age-related macular degeneration (AMD) is one of the leading causes of blindness. AMD is currently incurable; the best solution is to prevent its occurrence. To develop drugs for AMD, it is crucial to have a model system that mimics the symptoms and mechanisms in patients. It is most important to develop safer and more effective anti-AMD drug. In this study, Codonopsis lanceolata, a culinary/medicinal material in Asia, was evaluated for its anti-AMD effect. The experimental groups included a control group an AMD group treated with A2E and blue light, a lutein group treated with 25 mM lutein after AMD induction, and three groups treated with different doses of C. lanceolata (10, 20, and 50 mg/mL) after AMD induction. Intrinsic apoptotic pathway (Bcl-2 family), anti-oxidative system (Keap1/Nrf2/HO-1 antioxidant response element), and anti-carbonyl effect (4-hydroxynonenal [4-HNE]) were evaluated using immuno-fluorescence, MTT, TUNEL, and western blotting analyses. Codonopsis lanceolata dose-dependently prevented cell death which was induced by A2E and blue light. The antiapoptotic effect of that was caused by activating Keap1/Nrf2/HO-1 pathway, suppressing 4-HNE, and modulating Bcl-2 family proteins like increase of antiapoptotic proteins such as Bcl-2 and Bcl-XL and decrease of proapoptotic protein such as Bim. Based on these findings, C. lanceolata shows promise as an anti-AMD agent.

Corresponding author **:** Seung-Sik Cho, In-Chul Jeon, Dae-Hun Park

Keywords **:** AMD, Codonopsis ianceolata, Oxidative/Carbonyl stress, Keap1/Nrf2/HO-1 pathway, Apoptosis

PS-E-08

2023년 국내 동물실험윤리위원회 구성·운영에 관한 실태 분석

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본 연구는 동물보호법 제58조에 따라 국내 동물실험윤리위원회 설치기관에 대해 동물보호법 제53조부터 제57조까지의 규정 사항을 지도·감독하여 국내 동물실험윤리위원회의 실태를 분석하고, 향후 실험동물의 복지 향상을 위한 기초자료로 활용하고자 실시하였다.
2023년 동물실험윤리위원회 설치기관 550개 기관(국·공립기관 82, 대학 130, 의료기관 37, 일반기업체 301) 중 자체점검 24개소를 포함하여 총 84개소(국·공립기관 3, 대학 30, 의료기관 3, 일반기업체 48)에 대해 위원회의 구성 및 운영, 특히 개정 동물보호법 준수사항을 반영한 7개 분야 113개 항목에 대하여 감독 및 분석하였다.
84개 기관 중 개선명령을 18개소에, 보완·권고를 40개소에 실시하였고 동물실험계획 변경을 미심의한 기관도 확인되었다. 주요 개선명령 사유는 위원장 호선 필요(8건)였고, 주요 보완·권고사항은 윤리위원회 자체 규정 미흡으로 나타났다
특히 2024년은 신규제도 이행사항 중점 확인을 통한 관련 제도의 안정적 운영 유도를 위해 해당 기관의 자율점검과 맞춤형 현장 컨설팅 병행으로 기관별 능력 향상을 유도하도록 하였다.

Corresponding author **:** Seongeun Jang

Keywords **:** IACUC, Animal protection act, Animal experiment

PS-E-09

Protective role of Gentiana macrophylla P. as targets for antioxidant defense system on the blue light-induced macular degeneration

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Age-related macular degeneration (AMD) is a progressive ocular disease primarily caused by reactive oxygen species (ROS). Its prevalence is rising with the aging population and increased exposure to ultraviolet (UV) and blue light (BL). Given the side effects associated with current AMD treatments, there is growing interest in natural products with potent antioxidant properties as potential preventive or therapeutic strategies. To evaluate the protective effects of the methanol extract of *Gentiana macrophylla* P. (MEG) against AMD, oxidative stress, mitochondrial function, and inflammatory responses were analyzed in MEG-treated bis-retinoid N-retinyl-N-retinylidene ethanolamine (A2E)-laden ARPE-19 cells under BL exposure. Additionally, retinal tissue changes were assessed through Hematoxyling and Eosin (H&E) staining of eyeballs extracted from BALB/c mice that were orally administered MEG and exposed to BL, focusing on alterations in retinal thickness. MEG demonstrated strong antioxidant activity, effectively scavenging DPPH and ABTS radicals. Pretreatment with MEG reduced ROS and NO production, enhanced superoxide dismutase (SOD) expression, and promoted phosphorylation of nuclear factor erythroid 2–related factor 2 (Nrf2) in A2E-laden ARPE-19 cells under BL exposure. It also mitigated BL-induced cell damage by regulating caspase-3 activation and the expression of apoptosis-related proteins, including BAX/BCL-2 and p62. Furthermore, MEG treatment suppressed the COX-2/iNOS pathway, reduced inflammatory substance activity, and decreased the expression of inflammatory cytokines in BL-exposed A2E-laden ARPE-19 cells. In vivo, MEG enhanced retinal thickness in Balb/c mice with BL-induced retinal degeneration. These findings indicate that MEG holds promise as a potential therapeutic candidate for preventing AMD and alleviating its symptoms. However, further clinical studies are required to validate its effectiveness and safety.

Corresponding author **:** Dae Youn Hwang

Keywords **:** Macular degeneration, Gentiana macrophylla P., Blue light, Oxidative stress

PS-E-10

National primate infrastructure for biomedical and basic science

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Primates are valuable resources for different research fields including genetics, evolutionary biology, biomedical research, neuroscience, regenerative research, microbiology, vaccine development and pharmacology. Because primates have more biological and behavioral similarities and closer genetic relationship to humans than other animal models. However, primate resources are limited to access for individual researchers. In 2005, Republic of Korea government established National Primate Research Center (NPRC). First purpose of NPRC is production and supply of specific pathogen free (SPF) primate in Republic of Korea. Second purpose is supporting the regenerative medicine (bio organ transplantation, stem cell and gene therapy). The last one is supporting the basic biomedical research and basic science. Recently, NPRC established primate resource bank with various primate samples (Tissue deoxyribose nucleic acid (DNA), Blood DNA, ribose nucleic acid (RNA), cDNA, paraffin blocks (brain), etc) from crab-eating monkey, marmoset monkey, rhesus monkey, African green monkey, and squirrel monkey. And also, we established cutting edge medical imaging technique using 3 Tesla magnetic resonance imaging (3T-MRI), positron emission tomographic-computed tomographic (PET-CT), micro PET-CT, and angiography imaging system. Therefore, researchers who want to access the primate resources and use the imaging analysis with primate for research purpose could get various national primate infra service, easily (http://portal.kribb.re.kr/primate).

Corresponding author **:** Jea-Won Huh

Keywords **:** Basic science, Biomedical, Infrastructure, Monkey, Primate

PS-E-11

Evaluation of the effects of a dietary supplement in dogs with osteoarthritis

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Arthritis is a significant problem in dogs that may occur at any age but is particularly older individuals. Dietary supplement (BYVET JOINT HEAL) consists of extracts of Green-Lipped Musse and Type_II collagen, which are known to improve the osteoarthritic symptoms in dogs. This study was designed as randomized, multisite clinical trial using mixed breed/sex dog(1-13 y old) that had exhibited varying degrees of osteoarthritic sings and tested with BYVET JOINT HEAL supplement only without other surgical procedure or clinical medicine. All aspects of the study were conducted in accordance with IACUC in EreBon Corp. (approval No. Ere-IACUC 2024-001). In this clinical trial, after 8 weeks of BYVET JOINT HEAL supplement in 30 dogs, the total joint score (sum of visual score and manipulation score) was evaluated. Each dog was visually scored for mobility impairments as an average of individual scores for lameness in walking, trotting, and climbing stairs (visual score) on a scale of 0 to 4. Then, individual joints of each limb were clinically scored for degree of pain, swelling, crepitus, and reduction in range of movement (manipulation score). The summation of the mobility and individual joint scored for each dog comprised as their total arthritis score. As a result, the total joint score was improved in 24 dogs (80.0%) after BYVET JOINT HEAL and 4 dogs (13.3%) remained same scored. This supplemented diet appears to be potentially alleviating osteoarthritic signs in dogs. This study is supported by EreBon Co. Ltd.

Corresponding author **:** Sang O Park

Keywords **:** BYVET JOINT HEAL, Pet food supplement, Osteoarthritis, Visual Score, Manipulation score

PS-E-12

BYVET IMMUNE HEAL alleviates cyclophosphamide-induced immunosuppression in Balb/c mice

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Because of the increase in awareness of the impact of pet food on animal health, there has been a significant shift in the interest of consumers towards petfood that improves immune health and issue of safety. Therefore, before commercially selling functional food for dogs, it is necessary to test newly developed dog functional food, BYVET IMMUNE HEAL (BIH) on rodents for safety and immune-modulating potency. The potential BIH is unclear, so we evaluated the immunomodulatory effects of BIH in cyclophosphamide-induced immunosuppressed mice. BALB/c mice were randomly divided into three groups: a negative control, immunosuppression model group (CPA), and BIH treatment group (CPA+ BIH). BIH is prescribed for dogs to consume 1 gram per 5 kg of body weight, the dose was changed considering body surface area per body weight of mice according to FDA guideline. BIH was orally administered to CPA induced immunosuppressed mice every day for 3 weeks, whereas equal quantities of distilled water were given to the control group and CPA group. Then, splenocyte proliferation and serum chemistry were measured after 3 weeks treatment. The number of white blood cells including lymphocyte, monocyte and granulocyte were measured with interval of 7 days after immunosuppression induction. When conA and LPS were used as mitogens, splenocyte proliferation of CPA+ BIH group were significantly improved compared to the CPA. WBC was significantly higher in the CPA+ BIH group than in the CPA group at 8th, 15th, and 22nd days after immunosuppression. However, there was no significant difference in lymphocytes on the 8th and 15th days after immuno-suppression, but on the 22nd days, the CPA+ BIH group was significantly lower than the CPA group. Simultaneously, administration of BIH didn't affect to serum chemistry levels including BUN, Creatine, ALP and ALT related to kidney and liver function. Taken together, these finding suggest that BIH could be used to enhance health and immunity in immunosuppressed conditions without effect to kidney and liver function. This study is supported by EreBon Co. Ltd.

Corresponding author **:** Sang O Park, Byeong Chun Lee

Keywords **:** Immune, Pet food, Safety, Blood test, BYVET IMMUNE HEAL

PS-E-13

The first report of over 6-month survival in pig-to-monkey xenogeneic heart transplantation in Korea

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Introduction : To initiate clinical trials, a minimum survival period of 6 months is required for pig-to-monkey xenogeneic heart transplantation. While this survival benchmark has been achieved in orthotopic transplantation, it is also required for heterotopic heart transplantation to exceed the 6-month survival period in order to assess the immunological efficacy of the xenograft. This study reports the achievement of a 6-month survival period in a heterotopic pig-to-monkey xenotransplantation model.
Methods : On February 16, 2024, a pig-to-monkey xenogeneic heart transplantation was performed. The transplantation was heterotopic, with vascular anastomoses between the transplanted heart and the recipient's abdominal aorta and inferior vena cava (IVC). The donor was a transgenic pig of the QKO (GGTA1/CMAH/iGb3s/B4GalNT2)+iCD46+TBM type, weighing 4.5 kg with a heart weight of 40 g. The recipient was a rhesus monkey, also weighing 4.5 kg. The cold ischemic time was 79 minutes. Immunosuppressive therapy included anti-CD154, Rituximab, ATG, Advagraft, MMF, Solumedrol, and Abatacept. Anticoagulation was achieved using Cobra venom factor, Aspirin, and Enoxaparin. For anti-inflammatory treatment, Etanercept was administered, and Erythropoietin was used as a hematopoietic factor.
Results : The survival period has reached 190 days. The viability of the transplanted heart was monitored by palpating the heart's pulsation in the monkey's abdomen. Echocardiographic evaluations were conducted on POD 8, POD 17, POD 82, and POD 150, confirming the ongoing function of the transplanted heart. Blood chemistry and hematological parameters, including cardiac biomarkers such as CK, LDH, and troponin I, have remained stable throughout the study.
Conclusions : Establishing a minimum survival period is a crucial initial step in the clinical application of xenogeneic heart transplantation. While the survival outcomes of orthotopic transplantation are critical for clinical trial criteria, the survival of heterotopic heart transplantation is also significant in assessing the success and immunological response of xenotransplantation.

***Corresponding author :** Ik Jin Yun

***Keywords :** Xenotransplantation, Heart, Pig to monkey, Heterotopic, Immunosuppressive

PS-E-15

IGF-1 promotes the development of pig embryos, including trophectoderm cell proliferation, by activation of the Wnt/β-catenin pathway

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Insulin-like growth factor 1 (IGF-1) influences various aspects of embryogenesis, including embryonic development. This study investigated the effects of IGF-1 on early embryonic development in pig embryos, focusing on its interaction with the Wnt/β-catenin signaling pathway, a key regulator of cell adhesion and proliferation. IGF-1 treatment during the early stages of embryonic development significantly enhanced developmental parameters, in particular blastocyst formation rates. Interestingly, IGF-1 increased trophectoderm (TE) cell proliferation. The TE is an essential component of the blastocyst, maintaining its structure. Successful development of pig embryos was dependent on the proper formation and function of the TE. IGF-1 upregulated the expression of functional proteins related to TE differentiation and tight junctions. Notably, these effects were more pronounced when IGF-1 treatment was performed during the last 3 days of embryonic development (days 3-6) compared to the first 3 days (days 0-3). In addition, we found that IGF-1 promoted activation of the Wnt/β-catenin signaling pathway, including increasing β-catenin levels and related gene expression. To confirm the interaction between IGF-1 signaling and the Wnt/β-catenin pathway in TE development, embryos were cultured with picropodophyllin, an IGF-1 receptor inhibitor. Picropodophyllin suppressed developmental parameters, β-catenin levels, TE cell differentiation, and tight junction formation. These effects were successfully rescued by IGF-1 and the Wnt/β-catenin signaling activator ChiR99021. Our findings provide new insights into the interaction between IGF-1 and the Wnt/β-catenin signaling pathway during embryogenesis and highlight the potential of IGF-1 to improve reproductive outcomes by enhancing TE formation and quality. This research was supported by the Korea Research Institute of Bioscience and Biotechnology (KRIBB) Research Initiative Program (KGM4252533) and the National Research Foundation of Korea (NRF) grant funded by the Ministry of Science and ICT (MSIT) (2021M3H9A1096895), Republic of Korea.

***Corresponding author :** Bo-Woong Sim

***Keywords :** IGF-1, Early embryonic development, Trophectoderm, Wnt/β-catenin signaling pathway, Porcine

PS-E-14

Prostate cancer-targeting albumin nanoparticles for real-time intraoperative imaging in prostatectomy

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Background : While radical prostatectomy is the standard treatment for localized prostate cancer, positive surgical margins occur in 20-48% of cases, leading to a biochemical recurrence rate of 32-38% within five years [1]. This study developed prostate cancer-targeting albumin nanoparticles for real-time imaging during prostatectomy to achieve negative surgical margins.
Material and methods : Human serum albumin (Alb) was functionalized with DBCO-NHS ester (DBCO) and Gluatamate-Urea-Lysine-N_3 (GUL) ligands to target prostate-specific membrane antigen (PSMA), overexpressed in prostate cancer cells. MALDI-TOF analysis confirmed degrees of functionalization (DOFs). The conjugated Alb-GUL was mixed with indocyanine green (ICG), forming Alb-GUL/ICG complex. In vitro cellular uptake was tested across PSMA-positive and PSMA-negative prostate cancer cells. Following radiolabeling with Cu-64, in vivo PET scans and IVIS were performed to evaluate biodistribution and tumor-targeting efficiency in PSMA-positive 22Rv1 xenograft models. Then, tumors were excised to assess ex vivo tissue uptake using confocal microscopy.
Result : DOFs for DBCO and GUL were 11.2 and 5.3, respectively. In vitro studies revealed that Alb-GUL/ICG demonstrated 10.4-fold higher fluorescence in PSMA-positive C4-2 cells compared to Alb/ICG but showed minimal uptake in PSMA-negative PC-3 cells. Quantified PET results showed that [^{64}Cu]Cu-Alb-GUL/ICG achieved a tumor-to-blood ratio (TBR) 38% higher than [^{64}Cu]Cu-Alb/ICG at 24 hours post-injection. Similarly, IVIS imaging indicated 36% greater fluorescence for [^{64}Cu]Cu-Alb-GUL/ICG over [^{64}Cu]Cu-Alb/ICG post-skin removal. Ex vivo analysis further confirmed a 5.22-fold higher tumor uptake of [^{64}Cu]Cu-Alb-GUL/ICG compared to [^{64}Cu]Cu-Alb/ICG.
Conclusion : Alb-GUL/ICG exhibited specific PSMA-targeting and enhanced tumor visualization in vitro and in vivo, demonstrating its potential as a real-time imaging agent to improve surgical precision during prostatectomy.

***Corresponding author :** Yun-Sang Lee

***Keywords :** Prostate cancer, Albumin, Indocyanine green, Fluorescence-guided surgery, Positive surgical margin

PS-E-16

Resolvin E1 improves the porcine oocyte maturation by suppressing oxidative stress through activation of Nrf2 pathway

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Resolvin E1 (RvE1), a member of the specialized pro-resolving mediator (SPM) family of bioactive lipids, has been reported to be found in both follicular fluid and serum and is also secreted by cumulus cells during cell culture. However, the role of RvE1 in mammalian oocyte maturation is poorly understood. In this study, we investigated the antioxidant role of RvE1 in meiotic progression and the underlying mechanisms. RvE1 supplementation during *in vitro* maturation significantly increased the proportions of complete cumulus cell expansion and metaphase II oocytes compared to the control group. Following parthenogenetic activation, RvE1-treated oocytes showed enhanced developmental competence, with higher cleavage, blastocyst formation, and cell survival rates, along with increased total cell numbers. The findings indicate that RvE1 increases Nrf2 protein levels and the expression of antioxidant- related genes (*CATALASE, SOD1, SOD2, HO-1*, and *NRF2*), while reducing Keap1 protein levels and ROS in porcine cumulus cells and oocytes. Furthermore, RvE1 treatment increased mitochondrial membrane potential and decreased cytochrome c and cleaved caspase 3 expression in apoptotic cumulus cells and oocytes. . To explore the link between RvE1's effects and the Nrf2 signaling pathway, porcine oocytes were treated with RvE1 and brusatol, an Nrf2 inhibitor, during maturation. The positive effects of RvE1 on oocyte development were negated by brusatol, confirming the role of Nrf2. The beneficial effects of RvE1 on developmental competence were reversed by brusatol treatment. This study's results suggest that activation of the Nrf2 signaling pathway with RvE1 improves oocyte quality by boosting cumulus cell viability and preventing apoptosis. These findings provide new insights into the mechanisms of RvE1 that govern oocyte maturation. This research was supported by the Korea Research Institute of Bioscience and Biotechnology (KRIBB) Research Initiative Program (KGM4252533, KGM5382531), Republic of Korea.

***Corresponding author :** Bo-Woong Sim

***Keywords :** Resolvin E1, Porcine oocyte, Nrf2 signaling, Maturation, Developmental competence

PS-E-17

Perilla frutescens extract: neuroprotective and anti-inflammatory potential against neuronal Damage

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The 60% ethanol extract of *Perilla frutescens* demonstrated robust neuroprotective and anti-inflammatory effects in LPS-induced BV2 cell. The extract significantly enhanced neuronal survival and inhibited apoptosis by regulating the expression of key apoptosis-related proteins, including bax, bcl-2, PARP1, and caspase-3. It effectively suppressed pro-inflammatory mediators such as NO, IL-6, and TNF-α, along with inflammation-associated enzymes COX-2 and iNOS, primarily through modulation of the MAPK signaling pathway. Moreover, the extract partially restored ChAT expression, indicating its potential to regulate neurotransmitter metabolism and maintain neuronal communication, which are essential for cognitive function. Enhanced synaptic plasticity was observed, as evidenced by the activation of CREB and increased BDNF expression, supporting its role in strengthening synaptic connections and facilitating memory formation. Additionally, the extract exhibited strong antioxidant activity by elevating SOD2 expression, thereby mitigating oxidative stress, preserving mitochondrial function, and maintaining cellular homeostasis. These comprehensive effects underscore the therapeutic potential of *Perilla frutescens* in combating neuronal damage by addressing key pathological processes, including apoptosis, inflammation, and oxidative stress, while also promoting cognitive enhancement through improved neurotransmitter regulation and synaptic connectivity. Collectively, the findings suggest that the 60% ethanol extract of Perilla frutescens could serve as a promising candidate for the prevention and treatment of neurodegenerative diseases and cognitive decline.

Corresponding author **:** Ji Wook Jung

Keywords **:** Perilla frutescens, Neuroprotection, Neuroinflammation, Synaptic plasticity, Oxidative stress

PS-E-18

Alternative methods for rabbits unsuitable for social housing in regulatory toxicity study

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Refinement is one of the 3Rs principles that should be followed by improving the method or means of experiments when planning and executing animal study to make the animals more comfortable and avoid unnecessary suffering. In recent years, environmental enrichment programs and social housing become important component of toxicity study to improve housing conditions of animals. According to the literature, wild rabbits are known to be social animals. Our institute has tried to apply social housing to study animals. However, due to the nature of the toxicity test resulted in most rabbits experienced difficulty adjusting to social housing after randomization, even animals that demonstrated a positive response to social housing during the acclimation period. To address this problem a transparent partition provided, enabling visual stimulation between the two rabbits after switching from social housing to single housing. Furthermore, variety of environmental enrichment items were reviewed and made a stainless-steel ball that would elicit a comparable effect to a mirror while also providing a source of interactive stimulation for the rabbit. Despite transparent partition's function as an environmental enrichment, but to complement the rabbit's social nature several holes were drilled to allow controlled contact. Given the specificity of the experiment, this alternative to social housing is considered a viable option, as it would provide minimal interaction for individually housed rabbits.

Corresponding author **:** Hwang Jin Jeon

Keywords **:** Rabbit, Toxicity study, Environmental enrichment, Single housing, Controlled contact

PS-E-19

Investigation of antioxidant effects in a Panax ginseng, Centella asiatica, Houttuynia cordata, and Lonicera japonica Mixture

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Reactive oxygen species (ROS) cause oxidative stress and act as a cause of various chronic diseases. Antioxidants play an important role in preventing cell damage by neutralizing these reactive oxygen species. In this study, four natural products, *Panax ginseng, Centella asiatica, Houttuynia cordata,* and *Lonicera japonica,* were mixed in a ratio of 3:2:2:1 and extracted with 60% ethanol to evaluate the antioxidant activity. To evaluate the antioxidant activity, experiments were conducted to analyze DPPH and ABTS radical scavenging activity, reducing power, total polyphenol, and total flavonoid contents. As a result of the antioxidant activity test, the mixture showed 56.47±5.11% in DPPH radical scavenging activity at a concentration of 100μg/mL, while the positive control group showed 50.66±3.48%, which was better activity than the positive control group, ascorbic acid. Both ABTS radical scavenging activity and reducing power analysis showed antioxidant activity that increased in a concentration-dependent manner. The total polyphenol and flavonoid contents were measured as 155.8±11.91 mg TAE/g and 185.7±10.68 mg QAE/g, respectively, showing excellent antioxidant activity. The results of this study suggest that a mixture of ginseng, centella asiatica, Houttuynia cordata, and Lonicera japonica has antioxidant activity and can be expected to be developed as a natural cosmetic material.

Corresponding author **:** Ji Wook Jung

Keywords **:** Panax ginseng, Centella asiatica, Houttuynia cordata, Lonicera japonica, Antioxidant activities

PS-E-20

Study on the antioxidant and whitening effects of different parts of cotton

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Cotton is mainly known as a fiber, but recently, research on the antioxidant properties of cotton has been actively conducted. In this study, it was shown that the major antioxidant components of cotton seeds, leaves, roots, flowers, bark, flower buds, and fruits, such as polyphenols and flavonoids, play an important role in suppressing active oxygen and preventing cell damage. In addition, it has been reported that antioxidant substances extracted from cotton have various physiological effects such as reducing inflammation, preventing aging, and promoting cardiovascular health. These antioxidant properties have the potential to expand the utilization of cotton byproducts and contribute to the development of new natural antioxidants. The results of the study on the antioxidant activity and whitening effect of cotton are as follows. First, in order to verify the antioxidant activity, the electron donating ability assay and ABTS radical scavenging activity were measured, and excellent activity was observed in all parts of cotton. In addition, in the SOD-like activity assay, cotton leaves showed an activity of 33.58±5.51% at a concentration of 1000 μg/mL. Second, when measuring the polyphenol and flavonoid contents, the leaves showed the highest polyphenol and flavonoid contents, with 305.0±21.93 mg TAE/g and 1130±55.46 mg QAE/g, respectively, at a concentration of 100 μg/mL. Third, in the tyrosinase inhibition activity experiment to confirm the whitening effect, the flower buds showed the highest activity, with 71.61±5.39, at a concentration of 2000 μg/mL. These results suggest that cotton can be utilized as a potential resource with antioxidant and whitening effects.

Corresponding author **:** Ji Wook Jung

Keywords **:** Gossypium hirsutum, Antioxidant, Whitening, Cotton

PS-E-21

Polycan ameliorates osteoarthritis through anti-inflammatory and cartilage-protective potential in MIA-induced mice

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As modern society continues to age rapidly, bone metabolic diseases have become a significant public health issue. Among these, osteoarthritis (OA) is a degenerative joint disorder characterized by progressive cartilage degradation, leading to pain and reduced joint functionality. Inflammatory mediators and immune responses play central roles in OA pathogenesis. Current treatments, including steroids, aim to control inflammation but often come with severe side effects. Polycan, a β-1,3/1,6-glucan extracted from black yeast, has demonstrated immunomodulatory properties in previous studies, including the inhibition of Prostaglandin E2 (PGE2) in vitro. This study systematically evaluates the effects of Polycan on joint health using an OA animal model and explores its potential as a functional health food ingredient.
OA was induced in mice via monosodium iodoacetate (MIA) injection. Experimental groups included a normal control group, an OA control group (MIA control), a Polycan treatment group (MIA + Polycan), and a positive control group receiving the anti-arthritic drug indomethacin (MIA + Indomethacin). The study assessed inflammatory mediators (PGE2, TNF-α, IL-1β) using ELISA, paw thickness for inflammation and swelling, and bone density and cartilage integrity using DEXA scanning. Polycan treatment significantly reduced levels of PGE2, TNF-α, and IL-1β compared to the OA control group, with high-dose Polycan showing effects comparable to those of indomethacin. Furthermore, DEXA scanning revealed notable improvements in bone density and cartilage integrity in Polycan-treated mice.
These findings demonstrate that Polycan exerts significant anti-inflammatory effects and enhances cartilage and bone health in an OA animal model. As a result, Polycan shows promise as a functional health food ingredient for the prevention and management of OA, particularly in aging populations.

***Corresponding author** : So-Young Park

Keywords **:** Osteoarthritis, Polycan, Inflammation, PGE2, Cartilage health

PS-E-23

Sleep-enhancing effects of pine extract oil powder containing α-Pinene in non-human primates

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Pine tree essential oils, containing α-Pinene as a major component along with other constituents, have been associated with sedative effects. Most preclinical sleep studies are conducted on nocturnal rodents, whose sleep patterns differ from diurnal humans. This study investigated the sleep-enhancing effects of pine extract oil powder containing α-Pinene in diurnal non-human primates (NHPs). The α-Pinene containing pine extract oil was extracted and formulated into a water-soluble, microencapsulated powder. Three cynomolgus macaques were orally administered Red Pine extract oil powder repeatedly over three consecutive nights, 1 hour before lights-off. Sleep parameters, including sleep latency, sleep efficiency, and the duration of each sleep — wake, transitional sleep, and relaxed sleep—were evaluated using actigraphy and videography. Actigraphy data were obtained from the average acceleration counts across all three movement axes (X, Y, and Z). Videography analysis utilized a 24-hour continuous infrared camera system and a custom-built transparent sleep experiment cage to monitor sleep behavior. Additionally, deep-learning based animal pose tracking software was used to analyze activity trajectories. Results showed that pine extract oil powder significantly reduced sleep latency and wake durations while enhancing relaxed sleep and overall sleep efficiency. Furthermore, activity trajectories were markedly decreased, indicative of improved sleep stability and depth. To assess the safety of pine extract oil powder, hematological and biochemical parameters were measured before and after oral administration. Results indicated that parameters remained within acceptable ranges, with no evidence of administration-related adverse effects. In conclusion, this study provides a non-invasive approach for assessing sleep in non-human primates and demonstrated pine extract oil powder's potential as a natural supplement for sleep enhancement.

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Keywords **:** Non-human primate, Sleep, Pine extract oil powder, Alpha-pinene, Sleep efficiency

PS-E-22

Minimizing test errors and enhancing reliability in laboratory animal research

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Laboratory animal research employs a variety of testing methods, including hematological, biochemical, urinalysis, histopathological, and immunohistochemical assays, to evaluate the conditions of body fluids, blood, and tissues. These methods play a critical role in evaluating the physiological and pathological states of laboratory animals. However, errors in the testing process can negatively impact the reliability and reproducibility of results, thereby compromising the accuracy of experimental interpretations. This study aims to analyze the key factors contributing to test errors in laboratory animal research and to propose strategies to enhance the reliability of experimental outcomes. The major sources of errors include environmental conditions, blood sampling procedures, stress and anesthesia, and sample handling methods. The effects of these factors on experimental outcomes were reviewed through literature and case studies. Environmental variations, such as changes in temperature, humidity, and microbial contamination, were found to increase physiological fluctuations and variability in test results. Improper blood sampling techniques result in coagulation and cellular damage in samples, while stress and anesthesia caused significant biochemical alterations. Differences in serum and plasma handling methods also contributed to variability in analyte concentrations. To mitigate these errors, rigorous management of environmental conditions, adherence to standardized sample handling guidelines, and implementation of regular quality control programs are essential. These measures can ensure the reliability of test results and maximize the efficiency of laboratory animal research, ultimately improving the quality and credibility of experimental findings.

***Corresponding author** : Yong Lim

Keywords **:** Accuracy, Preclinical study, Quality control, Reliability, Reproducibility

PS-E-24

FAP-targeted radioligand therapy combined with immune checkpoint blockade enhances antitumor efficacy in immunosuppressive tumors

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Immune checkpoint blockade (ICB) has transformed cancer treatment, yet its efficacy remains limited by the immunosuppressive tumor microenvironment (TME). Cancer-associated fibroblasts (CAFs), major drivers of the TME, promote tumor progression, resistance, and metastasis. Fibroblast activation protein (FAP), overexpressed in over 90% of human epithelial tumors, is a promising target for theranostics strategy with radioisotopes. In this study, LNC1004 (Evans Blue-conjugated FAP inhibitor) was utilized as part of this theranostics approach. This study investigates the effects of FAP-targeted radionuclide therapy (RLT) with ICB on overcoming resistance and improving therapeutic outcomes.
Bioluminescence imaging demonstrated that immune cells effectively migrated to LLC tumors but showed limited infiltration into B16F10 tumors. Western blot analysis also showed that B16F10 had higher expression of FAP than LLC. LLC and B16F10 cell lines were implanted into the left and right flank of C57BL/6 mice, respectively. PET imaging with [^{68}Ga]Ga-EB-FAPI showed significant uptake on B16F10 tumor than LLC tumor. Next, B16F10 cell line was implanted into the right flank of C57BL/6 mice, which were divided into four groups (n=3/group): Vehicle (PBS and saline), anti-PD-L1 monotherapy (10 mg/kg), RLT monotherapy (55.5 MBq), and combination therapy (anti-PD-L1 200 μg + RLT 55.5 MBq). Tumors were harvested and analyzed using flow cytometry (FACS) and immunohistochemistry (IHC). Combination therapy significantly reduced tumor size and improved survival ($p=0.0005$). IHC revealed increased infiltration of CD45+ immune cells and CD8+ T cells, while FACS demonstrated elevated CD8+ T cells and reduced PMN-MDSCs ($p < 0.05$). These findings indicate that the combination therapy modulates the TME to favor immune activation.
In conclusion, FAP-targeted RLT with ICB offers a novel therapeutic strategy to enhance anti-tumor immunity and overcome resistance in Immunosuppressive Tumors, providing a promising pathway for cancer immunotherapy.

***Corresponding author** : Gi Jeong Cheon, Hyewon Youn

Keywords **:** Fibroblast activation protein (FAP), Cancer-associated Fibroblasts (CAFs), Radionuclide therapy (RLT), Tumor microenvironment (TME), Immune checkpoint blockade (ICB)

PS-E-25

Immunotherapy strategies for clinical approval in solid organ xenotransplantation

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Introduction : Among the major drugs that contributed to the success of the preclinical experiments of xenotransplantation, the anti-C10, which has not been clinically approved, and Cobra Venom Factor(CVF), which cannot be used in humans, are hurdle to the clinical approval. Therefore, immunomodulation strategy should be changed to obtain clinical xenotransplantation approval and we will testnew immune modulation drugs in the experiments
Methods : There may be two ways to correct the results by using drugsthat have not been clinically approved. One is a method of using drug consisted with the previously developed drugs and the other is to develop a new drug that can be approved. Between two strategies, we choose the method that can receive clinical approval as a new drug instead of finding currently used drugs for the allotransplantation.
Results : n a recent study, PG-405 was used instead of antibody C10, which has not received clinical approval. PG-405 is the same Fab as C10, but is a substance bound to Interleukin-10(IL-10), a known immunosuppressive cytokine. PG-405 is a drug expected to induce regulatory T-cell activity and have immunosuppressive effects by IL-10. MD-3(anti-ICAM-1) is a new drug that regulates immunosuppression in transplanted organs by suppressing T-cell differentiation and regulating dendritic cells. Crovalimab, used instead of CVF, is known as Complement 5(C5)-Inhibitor and is known to be an antibody treatment that targets and inhibits C5. In three recent studies, the graft survival rate of kidneys wa 61 and 34 days when PG-405+MD-3+Crovalimab was used in transgenic pigs. Treatments under development include anti-CD154/CD28 double antibodies and CAR-Treg-cell-therapy that overcome side effects such as thrombosis.
Conclusions : The development of new immunotherapy treatments and clinical xeno-transplantation approval will not only enable xenograft clinical trials to be approved, but may also have the effect of developing new immunomodulation protocols extended to allotransplantation.

Corresponding author **:** Ik Jin Yun

Keywords **:** Xenotransplantation, Immunomodulation strategy, Preclinical experiments, Clinical xenotransplantation , Solid organ xenotransplantation

PS-E-27

Laboratory Animal Resources Bank; the digital pathology images and retained resources

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National Institute of Food and Drug Safety Evaluation (NIFDS) has established and operated the Laboratory Animal Resources Bank (LAREB) to activate the sharing culture of laboratory animal-derived resources and minimizing the number of animals used experiments since 2018.
The LAREB collects laboratory animal-derived resources used for experiments such as food and drug safety/efficacy evaluation and biological research, and shares them for utilizing into newly other research purposes. Additionally, the LAREB has cooperated with Seoul National University Hospital (SNUH) as a primate resources partner and with Korea Medical Develop Innovation (K-MEDI) hub as a partner for laboratory animal resources. The LAREB has collected the laboratory animal-derived resources such as frozen organs, cells, serum, wet-tissues, paraffin-embedded blocks and slides, which were used by researchers. Besides, the LAREB has recently focused on digital pathology image resources and made whole slide images (WSI) from toxicology, pharmacology, and biological studies.
Until now, approximately 13,000 animal-derived resources have been distributed to other researchers. They utilized these resources for new researches and published 4 papers, applied for 8 patents, and made 1 technology transfer. Currently, various digital WSI resources are stored, including non-human primate resources, untreated rodent resources and inhalation toxicity research resources and can be used.
The LAREB contributes to supporting 4Rs, which means Replacement, Reduction, Refinement, and Recycling of laboratory animals used through the collection and distribution of research resources.

Corresponding author **:** Jong Kwon Lee

Keywords **:** Laboratory Animal Resources Bank, Laboratory animal-derived resource, Non-human primate resource, Inhalation toxicity research resource, 4Rs

PS-E-26

Preoperative imaging and metastasis targeting in endometrial cancer via a folate-conjugated albumin/ICG nanoplatform

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Endometrial cancer, which originates in the uterus lining, can metastasize to areas like the lymph nodes. Fluorescence-guided surgery using indocyanine green(ICG) for sentinel lymph node removal is standard in uterine cancer staging, but it faces issues with targeting and washout. This study aims to develop a contrast agent with better in vivo compatibility and cancer-targeting abilities to improve diagnostic accuracy and reduce extensive resection.
Folate was conjugated to albumin via click chemistry(Alb-Fol^3) and quantified by MALDI-TOF. The optimal ICG concentration was mixed with Alb-Fol^3(Alb-Fol^3/ICG) and analyzed using IVIS. In vitro binding assays were conducted with KB cells to measure folate binding affinity. For in vivo studies, [^{64}Cu]Cu-Alb/ICG and [^{64}Cu]Cu-Alb-Fol^3/ICG were injected into a mouse model with peritoneal tumors, and IVIS and PET images were taken at various intervals. Tumors were excised after 24 hours, and pre- and post-surgery images were compared. Ex vivo imaging of tumor tissues was performed using confocal microscopy.
The optimal degree of functionalization of folate was 3, and Alb-Fol^3/ICG showed the highest uptake in cell experiments, with a Kd value of 36.9 nM. In vivo, fluorescence and PET imaging revealed signals in metastatic cancers within the abdominal cavity. After tumor excision, fluorescence signals were absent in organs. Ex vivo, Alb-Fol^3/ICG showed 8 times higher signal than Alb/ICG in SC model tumors and 8.3 times higher in metastatic liver and ovarian tumors in the IP model.
In this study, an optimized Alb-Fol^3/ICG complex was developed to specifically target primary and lymph node metastatic endometrial cancer, aiming to minimize resection surgery. In a peritoneal metastasis model, it was observed that the retention time increased compared to conventional ICG and Alb/ICG complexes. Particularly, Alb-Fol^3/ICG was found to be concentrated at the tumor site after 24 hours, suggesting its potential for effective operation using fluorescence imaging

Corresponding author **:** Yun-sang Lee

Keywords **:** Endometarial cancer, Pre-operative agent, Indocyanin green, Albumin nanoplatform, Fluorescence agent

PS-E-28

Effect of Korean native black goat supplementation on gut microbiome in aged dogs

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Currently several studies have reported that gut microbiome affects host health. For that reason, probiotics has been commonly used as a health supplement to support immune system. Korean native black goat (KBBG) has been known to strength stamina. In this study we tested whether KBBG could affect on gut microbiome which is related to aged dog's health. The study was conducted to assess the functional benefits of dog's food containing Korean native black goat meat on gut microbiome. The experimental diets were prepared as follows: a Chicken meat-based diet (CON, 20.80% crude protein and 3,849 ME kcal/kg DM) and a KNBG meat-based diet (KNBG, 22.66% crude protein and 3,989 ME kcal/kg DM). All experimental diets were similarly formulated between chicken and KNBG diets to meet the nutritional requirements for dogs as suggested by the AAFCO. The experiment was conducted over a period of 4 weeks with twelve senior dogs (all spayed females, aged 14 years). Six dogs were fed a chicken meat-based diet and the other dogs were fed KNBG meat-based diet. After four weeks fresh feaces were collected, extracted gDNA and constructed 16s rRNA sequencing library. In the analysis of taxanomic profiling Chicken and KNBG diets induced difference in beta diversity not in alpha diversity. In KNBG group Bacteroidota(phylum), Bacteroidaceae(family) and Bacteroides(genus) that induce mucus membrane damages in gut were significantly decrease. Meanwhile Lachnospiraceae(family) that enhances the mucus layer of intestine was increased in KNBG($P<0.05$). These results suggest that KNBG meat would be beneficial to aged dogs by modulate gut microbiome.

***Corresponding author :** Ju Lan Chun

***Keywords :** Korean native black goat, Dogs, Pet food, Microbiome

PS-E-29

A computerized method for measuring xenograft tumor volume enhances the accuracy and consistency of tumor size assessment in xenograft cancer models

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The translation of basic biological concepts into therapeutic drug strategies in oncological research relies heavily on transgenic, orthotopic, and xenograft models, which enable the longitudinal tracking of tumor development, pathological manifestations, and the examination of biochemical characteristics and changes following drug administration. However, current methods for monitoring tumor growth and responses to drug therapy are often biased and not straightforward. Manual tumor size determination methods can be influenced by the test administrator's handling of measuring equipment, while tumor sites may be inaccessible, leading to premature termination of experiments and requiring the use of larger animal models to complete the study. To overcome these limitations, we have developed a photometric technique based on three-dimensional image acquisition, extraction, and region-based segmentation to estimate tumor size and volume. This method allows for accurate determination of the tumor-tissue boundary and precise quantification of tumor volume, especially in tumors with irregular growth patterns.

***Corresponding author :** Bohwan Jin, Jong sung Ra, Sangyong Jung

***Keywords :** Xenograft, Tumor measurment, Computer sensor

PS-E-30

Establishment of an infectious disease research platform in GLP-certified Animal Biosafety Level 3 (ABL3) facility

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The emergence of epidemics and pandemics of contagious diseases in the 21st century: SARS (2002), H1N1 Influenza (2009), MERS (2015), and COVID-19 (2019), has accelerated vaccine R&D projects in South Korea. However, there remains a critical shortage of specialized facilities for safety evaluation. The continuous emergence of SARS-CoV-2 variants, persisting even after the pandemic, emphasizes the urgent need for dedicated safety evaluation facilities. In response, we established the first Animal Biosafety Level 3 (ABL3) facility within a GLP-certified institution in South Korea in December 2022. The facility is a state-of-the-art 245.28 m^2 ABL3 research facility capable of conducting aerosol exposure studies with various pathogens including SARS-CoV-2 and Highly Pathogenic Avian Influenza (HPAI) virus. The facility maintains differential negative pressures (-70Pa to -10Pa) between laboratory zones with inter-zone pressure differences of 10-15Pa and more than 10 air changes per hour to prevent pathogen release, while ensuring stable operation through an Uninterruptible Power Supply (UPS) system with a 30-minute capacity. Since its operation in 2023, utilizing this advanced infrastructure, we have completed eight GLP-compliant studies. These studies include various SARS-CoV-2 animal studies and other contagious diseases, such as evaluations of therapeutic candidates and immunogenicity assessments for vaccine development. Notably, we have standardized the intranasal administration method for rodents, enabling accurate and reliable research results. The establishment of this GLP-certified ABL3 research facility marks a significant milestone in South Korea's infectious disease research. The facility is expected to play a crucial role in advancing Korea's infectious disease control system and reducing dependence on overseas therapeutic and vaccine evaluations. Furthermore, it will serve as a proactive response platform for future emerging infectious diseases (Disease X), contributing to the enhancement of national infectious disease research capabilities.

***Corresponding author :** Jeong Ho Hwang

***Keywords :** Animal biosafety level 3 (ABL3), Good laboratory practice (GLP), Infectious diseases, SARS-CoV-2, Safety evaluation

PS-E-31

Current status of pig to monkey partial thickness corneal transplantation and non-clinical trials conditions for initiation of clinical trial

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Introduction : The use of transgenic pigs for partial corneal transplantation has already demonstrated enough survival rates in non-clinical primate studies with minimal immunosuppression using steroids corresponding to allograft transplantation. The purpose of this study is to investigate the research status to proceed into the clinical trials of partial corneal transplantation.
Method : From 2016 to the present, we performed 21 non-clinical partial corneal transplants using the corneas from transgenic pigs based on αGal-knockout(GTKO). there were 2 cases of knock-out(KO) alone, 10 cases of 1 knock-in(KI), 8 cases of 2 KI, and 1 cases of 4 KI. Immunosuppression using steroids was administered in all cases. Immunosuppression is used by adjusting according to corneal conditions.
Results : Of the total experiments, 5 cases had long-term survival of more than 1 year. Of long-term survival, 5 cases were 1 KI with membrane cofactor (CD46), 3 cases were 3 KO or 4 KO and 2 KI including thrombomodulin(TBM). More modification is helpful for extended survival. Of the 8 recently transplanted cases, 3 showed survival over 6 months, of which 2 survived over 1 year. Three out of the recent five cases were applicable, and it seemed highly likely to satisfy the conditions as transplants progressed in the future.
Conclusions : The research results show that the long-term survival rate of over 6 months is close to half. The Research to enter clinical trials is already using minimal immunosuppressive therapy, so primate trials are being performed to improve further survival rate and obstruct the infection route.

***Corresponding author :** Ki Cheul Shin

***Keywords :** Xenotransplantation, Cornea, Partial thickness, Pig-to-monkey, Immunosuppression

PS-E-32

Targeting the insular cortex for neuropathic pain modulation: insights into synaptic and neuronal mechanisms

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Neuropathic pain, caused by nerve damage, greatly affects quality of life. Recent research proposes modulating brain activity, particularly through electrical stimulation of the insular cortex (IC), as a treatment option. This study aimed to understand how IC stimulation (ICS) affects pain modulation. In a rat neuropathy model, researchers used optogenetic and ICS techniques to evaluate changes in mechanical allodynia and synaptic changes, focusing on glutamate receptors (AMPAR, NR2A, NR2B). Optogenetic inhibition of IC neurons relieved pain without altering synaptic plasticity. However, repetitive ICS combined with optogenetic activation diminished pain-relieving effects of ICS and increased AMPAR and NR2B receptor levels. Additionally, activating inhibitory neurons also reduced pain, while repetitive activation of excitatory neurons lessened effectiveness of ICS and was associated with heightened receptor expression. These findings suggest that inhibiting excitatory neurons or activating inhibitory neurons in the IC could help modulate pain in neuropathic conditions, shedding light on how ICS can influence pain management through changes in synaptic plasticity.
Acknowledgement: This study was supported by the Basic Research Program of the National Research Foundation (NRF) funded by the Ministry of Science, ICT and Future Planning (NRF-2020R1A2C3008481 and RS-2023-00238538)

Corresponding author **:** Myeounghoon Cha, Bae Hwan Lee

Keywords **:** Neuropathic pain, Insular cortex stimulation, AMPAR, NR2B, Neural plasticity

PS-E-33

Establishment of a toxicity and efficacy evaluation system using IT-based 3D motion in beagle dogs and non-human primates

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This study aimed to establish a toxicity and efficacy evaluation system for new drug candidates using 3D motion capture equipment in beagle dogs and non-human primates. Currently, the guidelines for neurological toxicity evaluation are primarily based on rodents models and in vitro methods. However, neurotoxicity evaluation in rodents is limited by their slower metabolic activity and differences in metabolic pathways compared to humans, leading to reduced clinical predictability and lower accuracy and predictive value in behavioral assessments. In contrast, non-rodent animal models offer advantages due to their closer resemblance to human organ size and function. Particularly, non-human primates share not only physiological aspects but also highly similar central nervous system structures, movements, behavioral patterns, and metabolic processes with humans, making preclinical evaluations using primates highly advantageous for toxicity and efficacy assessments.Therefore, this study aimed to propose a non-invasive, behavior-based toxicity and efficacy evaluation methodology using non-rodent animals.
First, an arthritis model was developed in beagle dogs by excising the meniscus and anterior cruciate ligament. Markers were attached to the bodies of normal beagle dogs, and their behavior was recorded using 3D motion capture systems for behavioral assessment. Subsequently, the same behavioral assessment was conducted on beagle dogs five weeks after the induction of arthritis When comparing the gait patterns between the two groups, a decrease in walking speed was observed in the beagle dogs with induced arthritis, although no statistical significance was found. Furthermore, a reduction in knee angle was observed in the beagle dogs with arthritis, and statistical significance was confirmed. This may be attributed to the increased inflammation and pain in the joint areas, as well as the occurrence of cartilage damage, following the induction of arthritis.
Additionally, normal non-human primates were equipped with custom-designed suits tailored for filming, onto which markers were attached. Their natural movements were captured using 3D motion capture equipment, and evaluations were conducted for ascending, descending, and gait parameters. Markers were also placed on the wrist, elbow, shoulder, ankle, knee, and hip joints to assess the range of motion of the elbow and knee joints.
In conclusion, this study established an evaluation method for quantifying behavioral differences associated with the presence of arthritis by measuring and comparing gait speed and knee angles between normal and arthritic beagle dogs. Additionally, a baseline for the natural behavior of normal non-human primates was successfully constructed. Based on this study, it is anticipated that quantitative behavioral evaluations provide highly reliable toxicity and efficacy assessments for new drug candidates

Corresponding author **:** Gwang-Hoon Lee

Keywords **:** Non-Human Primate, Beagle, 3D motion, Arthritis Model, Toxicity and Efficacy evaluation

PS-E-34

Evaluation of the effects of the novel multivalent SARS-CoV-2 mRNA vaccine on the central nervous system, respiratory system, and cardiovascular system in Sprague-Dawley (SD) rats and beagle dogs

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The mRNA vaccine is a new and innovative method that allows for rapid development, helping us combat the COVID-19 pandemic. However, with this rapid growth, safety concerns have emerged, highlighting the urgent need for safety evaluations. In this study, safety pharmacology study of a novel multivalent mRNA-encapsulated lipid nanoparticle (LNP) vaccine (RGV-DO-003) were evaluated using neurobehavioral, respiratory, and cardiovascular system assessments in Sprague-Dawley (SD) rats and beagle dogs. The route of administration was intramuscular, and the vaccine dose is 50 μg/250 μL/head, and the vehicle control and LNP dose was 0 μg/250 μL/head. To study the effects on the central nervous system, neurobehavioral and body temperature studies were conducted in SD rats. In neurobehavioral and body temperature studies, no abnormalities were observed in the LNP and vaccine administration group. In the respiratory study in SD rats, no significant toxicological changes were observed in respiratory rate and minute volume following the administration of LNP and the vaccine during the 24-hour observation period. A statistically increase in tidal volume was confirmed 24 hours after administration in the LNP and vaccine administration group. In the study of the cardiovascular system in beagle dogs, no adverse effects were observed in blood pressure, heart rate, PR, QRS, RR, QT, and QTcV intervals in the LNP and vaccine administration groups. In conclusion, the RGV-DO-003 mRNA vaccine did not cause any major adverse effects on the central nervous system, respiratory system, and cardiovascular system, which indicates its potential as a candidate for human clinical trials.
Funding Source: This research was supported by the Bio & Medical Technology Development Program of the National Research Foundation (NRF) & funded by the Korean government (MSIT) (No. 2022M3A9J1072296) and the Korea Institute of Toxicology (No. 2710008772).

Corresponding author **:** Kang-Hyun Han

Keywords **:** SARS-CoV-2, MRNA vaccine, Central nervous system, Respiratory system, Cardiovascular system

PS-E-35

Peripheral nerve microcurrent stimulation: a novel approach to neuroprotection in a rat MCAO model

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Objective : This study aims to investigate the neuroprotective benefits of peripheral nerve microcurrent stimulation therapy in a rat model of middle cerebral artery occlusion (MCAO).
Materials and Methods : This experiment involved twenty male Sprague-Dawley rats, aged eight weeks and weighing between 300 and 330 grams, categorized into four groups: Group-A (Control) remained untreated as the healthy baseline. Group-B (Disease) underwent MCAO without further intervention. Group-C (Treatment Post-MCAO) was administered microcurrent therapy immediately following MCAO for one week. Group-D (Prevention and Recovery) was treated with microcurrent therapy for a week before and after MCAO. Comprehensive assessments included gross morphological inspections, motion behavior analytics, histological analyses, immunohistochemical evaluations, and protein expression analysis via Western blot.
Results : The application of microcurrent therapy markedly diminished ischemic injury and preserved pyramidal cells in the hippocampal CA1 area. H&E staining revealed no infarction and a pyramidal cell count of 261.78±3.82 in Group-A, 28.55%±1.05%/94.51±6.35 in Group-B, 17.35%±0.83%/184.13±4.66 in Group-C, and 5.40%±0.50%/237.80±3.65 in Group-D (*p < 0.05). Behavioral testing showed total movement distances of 1945.24 cm (Group-A), 767.85 cm (Group-B), 1781.77 cm (Group-C), and 2122.22 cm (Group-D) (*p < 0.05). Average movement speeds were 6.48 cm/s (Group-A), 2.50 cm/s (Group-B), 5.43 cm/s (Group-C), and 6.82 cm/s (Group-D) (*p < 0.05). Levels of inflammatory markers such as CD68, IL-6, and TNF-α were significantly reduced in the treatment groups (*p < 0.01). Western blot results indicated a decrease in proteins associated with inflammation, oxidative stress, and apoptosis, and an increase in angiogenesis markers and MAPK pathway activity in groups receiving therapy.
Conclusion : Peripheral nerve microcurrent stimulation therapy is a potent intervention that significantly reduces ischemic injury, enhances recovery, lowers inflammation, and alters protein expressions, demonstrating significant promise as a treatment modality for ischemic stroke.

***Corresponding author :** Dong Rak Kwon

Keywords : Neuroprotection, Peripheral nerve stimulation, Microcurrent therapy, Middle cerebral artery occlusion, Stroke recovery

PS-E-36

Hydroxyethyl starch-based cryopreservation of polymer-coated canine red blood cells

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Blood transfusion is a critical lifesaving intervention for humans and companion animals during emergencies. Like humans, animals have different blood types, and receiving incompatible blood can cause transfusion reactions or even death. To prevent hemolytic reactions, polymer-based coatings can be applied to incompatible donor or xenogeneic red blood cells (RBCs), masking antigens on the red blood cell membrane and reducing their antigenicity. This study evaluates cryoprotectants for the long-term storage of polymer-coated canine RBCs. Among the tested cryoprotectants, 25% (w/v) hydroxyethyl starch (HES; 12.5% final concentration) provided the highest recovery rates, preserving approximately 70% of normal RBCs and 53% of coated RBCs post-thaw. Scanning electron microscopy revealed that coated RBCs treated with 12.5% HES retained normal size and shape both before and after freezing. Moreover, thawed coated RBCs maintained their immune camouflage properties, verified through agglutination tests. These results highlight HES as an effective non-permeable cryoprotectant for preserving polymer-coated canine RBCs for long-term.

***Corresponding author :** Hee Young Kim

Keywords : Cryopreservation, Universal blood, Hydroxyethyl starch

PS-E-37

Tracing alterations in metabolic fluxes behind fructose-induced insulin resistance: therapeutic role of exercise

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Purpose : High fructose consumption disrupts glucose and lipid metabolism, leading to clinical conditions such as insulin resistance, hepatic steatosis, and hypertriglyceridemia. It was shown that essential amino acids (EAAs) and endurance training (ET) independently enhance disrupted metabolism of glucose and lipids, yet their combined effect and underlying metabolic mechanisms (i.e., metabolic fluxes) remain unclear. Here we employed various stable isotope tracer techniques to dissect the metabolic mechanisms during basal and acute exercise states.
Materials and Methods : Seven-week-old C57BL/6 male mice were assigned to five groups for an 8-week intervention: normal chow (CON), fructose (FRU), FRU + ET (incremental treadmill running, 5 times/week), FRU + EAA (EAA-enriched chow), and FRU + EAA + ET. To explore metabolic mechanisms behind, we used stable isotope tracer techniques in conjunction with mass spectrometry. Briefly, mice received primed constant infusion of [U-$^{13}C_3$]propionate, [6,6-D_2]glucose, [D_5]glycerol, and [U-$^{13}C_{16}$] palmitate) to determine systemic, organ/tissue, and intracellular metabolic flux rates with use of dual artery-vein catheterization. This dual catheterization allows simultaneous blood collection during the tracer infusion with minimal metabolic disruptions even during exercise. Further, to determine changes in tissue protein synthesis rate, heavy water tracer (^2H_2O, deuterium oxide) was administered during the infusion.
Results : All treatments reversed FRU-induced body weight and functional changes vs. FRU. In vivo ^{13}C metabolic flux analysis revealed that EAA+ET normalized FRU-induced hyperglycemia by suppressing hepatic glucose production rate. ET and EAA+ET normalized the altered fluxes of palmitate and its contribution into TCA cycle, with improvements linked to enhanced lipolytic sensitivity (lipolysis rate/lean mass) during exercise. Additionally, heavy water labeling indicated that ET and EAA+ET normalized FRU-suppressed protein fractional synthesis across organs.
Conclusion : This study underscores the power of stable isotope tracers in unraveling complex metabolic interactions, providing a comprehensive framework to dissect the therapeutic mechanisms of EAA and ET against fructose-induced metabolic dysfunction.

***Corresponding author :** Il-Young Kim

Keywords : metabolic flux, stable isotope tracer, metabolic dysfunction, essential amino acids

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달러 자산으로, 당신의 미래도 **달라**집니다

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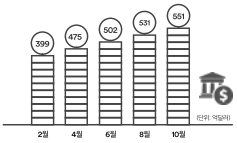

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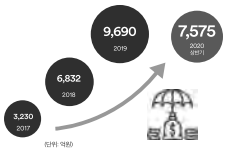


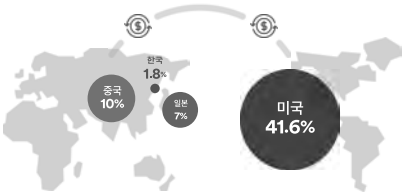
매년 증가하는 달러보험 판매액,
2020년 1조원 이상 예상

*지분: 외화보험 수입보험료 추이, 금융감독원

달러, 어떤 화폐일까요?

당신의 소중한 재산을 원화자산으로만 준비하시겠습니까?

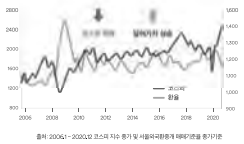
전세계 증시 시가총액 89조 달러 중 1.8%로 작은 한국 시장,
원화와 함께 달러자산으로 분산 해야 하는 이유



달러, 어떤 화폐일까요?

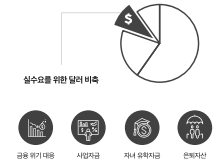
달러, 고액자산가일수록 분산투자 관점에서 꼭 포함시키는 필수 자산

달러와 국내 주식자산의 분산투자효과



출처: 2006.1 ~ 2020.12 코스피 지수 종가 및 서울외국환중개 매매기준율 종가기준

다양하게 활용되는 달러



MetLife

준법감시인 확인필 6033-2105-387409

ORIENT
ORIENT BIO

MSRSII

Maximum Safety Research Space

병원체 교차오염방지 완전 밀폐형 개별공조 Cage System

Mini Rack Model

Double Rack Model

Single Rack Model

2005 산업자원통상부 세계일류상품 인증
2017 한국 특허취득(등록번호 10-1693742)
2018 미국 특허취득(등록번호 9,992,969)
2018 일본 특허취득(등록번호 6431470)
2020 한국 특허취득(등록번호 10-2094411)
2020 유럽, 중국, 인도 특허진행 중

우정바이오

IVC for Rat Social housing

TECNIPLAST
innovation through passion

ER1050

바닥 면적 증가
동물의 편안함 향상
동물 밀도 증가

연구 성과
전 세계 연구자의 경험을 토대로
동물복지 및 연구 요구사항 충족

케이지 밀도 향상
HD racks를 통해 약 2m 높이에서
최대 8열까지 케이지 밀도 향상

사용자 친화적인 환경
Smart Top & ERGO Rack Vision+
인체공학 설계 적용 및 투명한 시야로
더 쉬운 데일리 건강 체크

수용 밀도 향상
컴팩트 디자인과 바닥면적 확장으로
일반크기 동물 추가유치 가능
케이지 면적: 1050 cm^2 / 163 in^2

동물 복지
실험 시 긍정적인 행동 특성 촉진,
동물의 자연 습성 표현하기 위한
풍부하고 복잡한 환경 조성 가능

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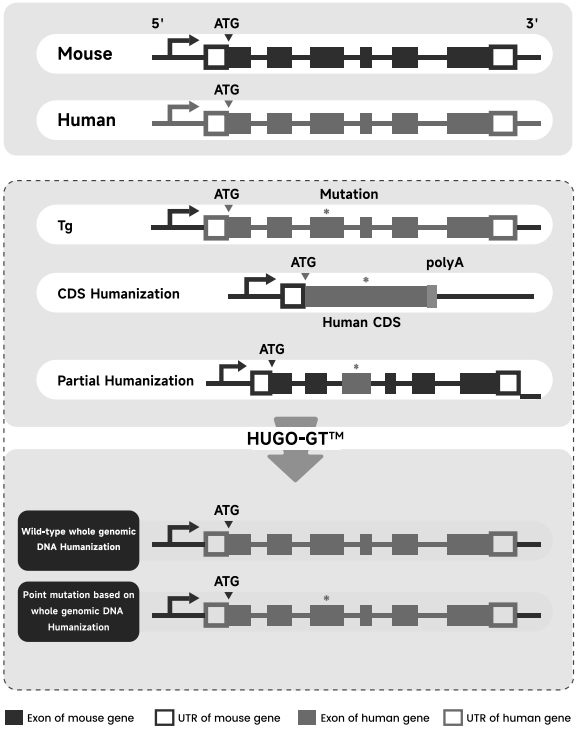
cyagen

010-5575-9973 service-apac@cyagen.com www.cyagen.kr

HUGO-GT™ 전체 게놈 DNA 인간화 모델



- 인간화 마우스 모델은 기존 일반 동물 모델에 비해 인간의 생리학적 및 병리학적 특성을 더 잘 요약할 수 있는 모델이며 인간의 질병을 연구하고 잠재적인 치료제의 효능과 안전성 평가 등에 널리 사용되고 있습니다.

- 그러나 Transgenic(Tg) 마우스와 coding sequence(CDS), single-exon 인간화 마우스와 같이 기존 일반 인간화 모델은 인간 유전자의 일부를 마우스 게놈에 삽입할 수 있습니다.

  질병 메커니즘 연구와 관련 약물 개발의 발전을 촉진하기 위해 게놈 인간화 마우스 모델을 사용해야 합니다. 그러나 전체 게놈 DNA 서열 대체를 달성하는 데는 기술적인 문제를 일으킵니다.

- 위와 같은 요구에 따라 Cyagen은 HUGO-GT™ (Humanized Genomic Ortholog for Gene Therapy) 프로그램을 출시했습니다. 타겟 마우스 내재유전자의 in-situ replacement를 달성하고 더 넓은 범위의 대상을 포함하는 full-length genomic sequence 인간화 마우스 모델을 성공적으로 구축했습니다.

  HUGO-GT™ 마우스는 보다 효율적인 대단위 백터 융합 기술을 사용하여 타겟 돌연변이 발생 맞춤화 서비스를 위한 다용도 템플릿 역할을 하며 실제 생물학적 메커니즘에 밀접하게 정렬된 임상모델을 제공합니다.

HUGO-Ab™

Revolutionizing Antibody Discovery

Proprietary 기술
HUGO-Ab™ 마우스를 제작하는 데 사용된 Cyagen의 TurboKnockout® 기술은 FTO(Freedom to Operate) 분석을 제공하여 약물 개발에서 발생할 수 있는 잠재적인 문제를 줄여줍니다.

우수한 인간화
이러한 마우스 모델은 완전 인간화 항체를 생성하여, 자가 면역 거부 반응을 최소화합니다(이는 현재 기존 마우스 모델에서 유래한 일부 항체 치료법이 직면하고 있는 문제입니다).

향상된 다양성
인간 유래 VH, Vκ 및 Vλ 유전자의 완전한 서열은 항체 서열의 다양성을 향상시키고 인간 면역 시스템의 자연적인 다양성을 모방합니다. 이는 타겟 항원에 대한 고친화도 항체 후보를 발견할 가능성을 높입니다.

강력한 면역 반응
인간화 항체 생성에도 불구하고, HUGO-Ab™ 마우스 모델은 wild-type 마우스 모델과 유사한 면역 반응을 유지하여 면역 접종 시 효율적인 항체 생성을 보장합니다.

고친화도 항체
HUGO-Ab™ 유래 항체는 picomolar(pM) 수준의 높은 친화도에 도달할 수 있으며, 이는 타겟 분자에 대한 강력한 결합 친화도를 의미하며 보다 강력한 치료법으로 이어질 수 있습니다.

유연한 비즈니스 모델
Cyagen은 라이센스 및 공동 개발을 포함한 다양한 협업 모델을 제공하여 특정 연구 요구에 맞출 수 있습니다.

25초 Scan으로 8가지의 정확한 체성분 결과치 얻을 수 있습니다.

정확성 Micro CT, NMR의 정확성

편의성 DXA의 편의성, 빠른 측정시간

고해상도 DR의 이미지 해상도

BMD / BMC / Bone Area / fat(%)
fat(g) / Lean(g) / Total weight

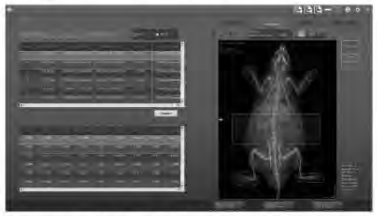
In Vivo Imaging

X-Ray Image

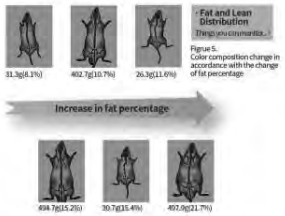
BMD Image

Fat/Lean Color Mapping Image

Longitudinal Measurement In Vivo



Measurement Window for each ROI
약 25초 Scan으로 3가지 Type의 영상과 8가지의 값이 산출됩니다. (BMD, BMC, Bone Area, fat(%), fat(g), Lean(g), Total weight)



History Analysis for Each ROI
INSIGHT VET DXA는 실험동물의 희생 없이 In-Vivo 상태에서 체성분 및 골밀도 변화의 추적 관찰이 가능하며 다양한 영상을 통해 약물, 운동요법 처치, 기능성 식품 등의 처치 이후 뼈, 연골 부위, 지방분포, 근육 변화를 일단위, 주 단위, 월 단위로 추적 관찰이 가능합니다.

Special Feature

DXA Features	Description
Non-Invasive Analysis	고비용, 에너지 집약적이던 기존 확학적 성분분석 방식이 아닌, 비침습적 분석방식을 통한 비용 및 노동력 절감 효과의 극대화
Longitudianl in-Vivo F/U	실험동물의 희생 없이 In-Vivo 상황에서의 체성분 및 골밀도 변화의 추적관찰이 가능
Accurate Results for Lean/Fat/Bone (< CV 1%, R^2 > 0.99)	Bone 기준, 1% 이내 측정오차 제공 (Precision Error % Accuracy Error in Static Condition) Chemical 성분분석 방식과 비교 시 R^2 0.99 이상의 정밀도
Fast Scan (< 25 Sec.)	피사체를 '긁는' 방식으로 스캔하는 Fan Beam 타입 기술이 아닌, 한 번에 피사체를 포착하는 Cone Beam 타입 기술로, Lab DXA장비 중 최단시간 내 스캔 완료
Quick & Easy Pre-Treatment	실험동물을 해부할 필요 없이, 단순 주사/흡흡 마취만 필요, 전 처리에 소요되는 시간 및 노동력 절감 효과의 극대화
No Radiation for Researcher & Minumum Dose for Animal	캐비닛 형식의 완전 차폐를 통한 연구자의 피폭 원천차단, Micro CT 대비 동물 피폭선량의 최소화
High Resolution (Pixel Size of 100um)	100um급 a-Si TFT Flat Panel Detector 적용을 통해, 3.5lp/mm 수준의 일반 DR보다 더 우수한 16lp/mm의 고해상도 이미지 제공 (4 배율 확대 모드 기준)
DR Images for Bone/Cartilage, Fat, Lean Distribution Analysis	고해상도 영상을 통해, 약물 / 운동요법 처치 / 기능성식품 등의 처치 이후 뼈 / 연골 부위, 지방분포, 근육 변화의 일단위, 주 단위, 월 단위 이미지 변화 추적 가능
Wide Scan Area (16.5cm x 25.5cm)	넓은 스캔 영역의 확보를 통해 500g까지의 소형동물 측정 가능

iNSiGHT DXA vs NMR vs Micro CT

Function	iNSiGHT	NMR	Micro CT
3D Image	N/A	N/A	YES
Slice Image	N/A	N/A	YES
2D DR Image	YES	N/A	YES
BMD (g/cm²)	YES	N/A	PARTLY YES (By Gray Scale Mapping, Not by DXA's Material Analaysis. Less Accuarate Than DXA)
BMC (g)	YES	N/A	YES (By Gray Scale Mapping, Not by DXA's Material Analaysis. Less Accuarate Than DXA)
FAT (g)	YES	YES	OPTIONAL (Depends on Device)
LEAN (g)	YES	YES	OPTIONAL (Depends on Device)
FAT (%)	YES	YES	N/A
Bone Area (cm²)	YES	N/A	N/A
Free Body Fluid (Water)	N/A	YES	N/A
Heavy Animal (500g) Measurement	YES	N/A	N/A
Price	LOW	MIDDLE	HIGH

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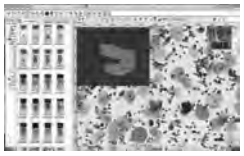
MORE THAN MICROSCOPY

AUTOMATIC TISSUE SLIDE SCANNER



Stoelting

SINCE 1886

STEREOTAXIC INSTRUMENTS

#51500D
Digital New Standard Stereotaxic, Rat and Mouse

#51730
Just for Mouse Stereotaxic instrument

#53850D
Stoelting Rodent Warner Control Box X2 w/cable

#53311
Quintessential Stereotaxic Injector (QSI)

#51500
New Standard Stereotaxic, Rat and Mouse

#51700
Motorized Lab Standard Stereotaxic., Rat,

#51625
Mouse and Neonatal Rat Adaptor

#51725
Just for Mice Stereotaxic Instrument

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FINE SCIENCE TOOLS

MOST POPULAR ITEMS

Vannas Spring Scissors

Cutting Edge: 2.5mm
Tip Diameter: 0.05mm
Length: 8cm

No. 15000-08

Extra Fine Bonn Scissors

Straight
Sharp/Sharp: 8.5 cm

Curved
Sharp/Sharp: 8.5 cm

No. 14084-08 / 14085-08

Fine Iris Scissors

Straight
Sharp/Sharp: 10.5 cm
Cutting Edge: 23mm

No. 14088-10

Tungsten Carbide Fine Scissors

Straight
Sharp/Sharp: 9 cm
No. 14568-09

Straight
Sharp/Sharp: 11 cm
No. 14568-12

Friedman-Pearson Rongeur

Straight: 14 cm
Curved: 14 cm

No. 16220-14

Friedman Rongeur

Curved
2.5 mm Cup
13 cm

No. 16000-14

Dumont #5 Fine Forceps

Biology tip
0.05 x 0.01 mm
Inox
11 cm

No. 11254-20

Suture Tying Forceps

Angeld 45°
Platform
Tip width: 0.4 mm
9 cm

No. 11063-07

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FAX : 02)2647-6687
E-mail : kimnfriends@hanmail.net
knfsales@hanmail.net

Korea Model animal Priority Center

Our Service

모델동물 제작
CRISPR-Cas9 등 최신 기술로 맞춤형 마우스 제작

질환 특성 분석
대사, 운동, 감각기 질환 표현형 분석

Germ-free 마우스 연구 지원
Gnotobiotic &
Humanized Microbiome Models

감염병 전임상시험 지원
감염병 치료제·백신 효능 평가

모델동물 정보포탈
MOP(종합 서비스 마우스 포탈), KAMA(모델동물 자원 통합 포탈)를 통한 자원과 정보 공유

Bio Portal by KMPC

MOP
mouseinfo.kr
종합 서비스 마우스 포탈

KCreZoo
crezoo.kr
Cre 마우스 정보 포탈

KAMA
animalmodel.kr
모델동물 자원 통합 포탈

infection Animal Model
infection.animalmodel.kr
감염병 전임상 시험 신청 포탈

Animal Model 감염병 전임상 데이터 포털
preclinical.kr
감염병 전임상 데이터 포탈

S-AM
school.animalmodel.kr
모델동물 자원 교육 포탈

DBL

SINCE 1993

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실험동물 · 설비 컨설팅 문의 : info@dbl.kr

From Animal Science to Human Healthcare

바이오헬스케어의 **새로운 기준**을 제시하여 사람과 동물의 건강하고 행복한 동행을 실현합니다

동물진단
(Animal Diagnostics)

이종장기
(Xenotransplantation)

동물약품
(Animal Drug)

VLP 백신
(VLP Vaccine)

메디피그
(Experimental Mini-pig)

박테리오파지
(Bacteriophage)

OPTIPHARM

50년 !
품질을 파는 정직한 기업

STEAM Sterilizer

모든 의료용품의 완벽한 멸균 관리는 고도의 의료시술 만큼 매우 중요한 사안입니다.

PLASMA Sterilizer
Low Temperature

저온 플라즈마 멸균기는 열과 압력, 습기에 민감한 의료용품을 안전하고 신속하게 멸균하는데 사용됩니다.

STEAM Sterilizer
Vertical Type

전동식 자동문, 레토르트제품 전용 사이클로 더욱 편리하고 안전하게 멸균작업을 실행합니다 !

EO Gas Sterilizer
Ethylene Oxide Gas

가스멸균은 높은 온도나 습기에 취약하여 증기멸균 방법을 적용할 수 없는 의료 기자재를 멸균하는데 사용됩니다.

Blood & Pharmaceutical Refrigerator

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편리한 온라인 동물실험 관리 시스템

그동안 복잡한 동물실험계획서 심의업무 번거롭고 불편하셨죠? 이제부터 편리하고 사용하기 쉬운 온라인 동물실험관리 시스템을 경험하세요!

❶ 온라인 심의

- 온라인 심의 시스템 (자동 이메일, SMS 발송)
- 복잡한 심의 과정 간소화
- 심의 단계별 현황 파악 용이
- 심의 기간 단축 및 비용 절감 효과

❷ 온라인 신청

동물구매, 반입, 반출, 실험실예약
실험연장, 공동기기 사용신청,
시료 신청, 소모품 신청 등
각종온라인 신청 시스템

❸ 온라인 교육

- 동물보호법 및 실험동물에 관한 법률관련, 이용자교육 등의 각종 온라인 교육 시스템
- 동영상 교육자료 열람 후 문제은행 랜덤 출제방식 등 구현

❹ 온라인 정산

사육비, 구매비, 실험실사용료
기술지원, 사체처리비 등
각종 온라인 정산 시스템

❺ 온라인 사육 및 개체관리

- 설치류 현황 등록 관리
- 중대형동물 개체 관리
- 사육시설 등록 관리
- Rack cage 관리

❻ LMO 관리

- 시설등록, 취급자, 책임자 선정
- 시설현황 점검표 작성
- 보관 / 운반 / 관리 대장 작성
- 책임자에게 제출, 책임자 확인
- 총괄 관리자 현황 모니터링

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외 다수의 고객들이 있습니다.

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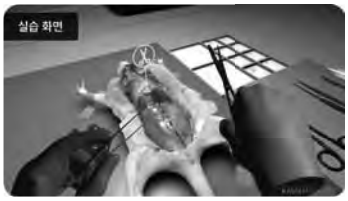
위 로고는 고객의 해당 사이트에서 공개파일로 사용함을 밝힙니다.

고객상담 02)2253-1670 (상담시간 9:00 ~ 18:00)
Web _www.itstandard.co.kr
E.mail _bcyoo@itstandard.co.kr

언제 어디서나 반복 가능한 실제와 같은 실습

메타버스 기반 실습 전문 플랫폼 라온 메타데미는 언제, 어디서나 반복 가능한 실제 같은 실습을 개별부터 그룹까지 참여할 수 있도록 지원합니다.



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- 국내 최초 XR 기반 실험동물 부검실습으로 특허 출원(국내 및 US)
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실제 동물 해부 없이도 생생하게 체험하는 실험동물 부검 전 과정

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각 단계별로 제공되는 상세한 가이드와 피드백을 통해 전체 과정에서 발생할 수 있는 실수를 미리 예방하고 개선할 수 있습니다.
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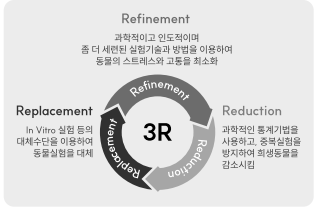

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