KOREA DRUG DEVELOPMENT FUND

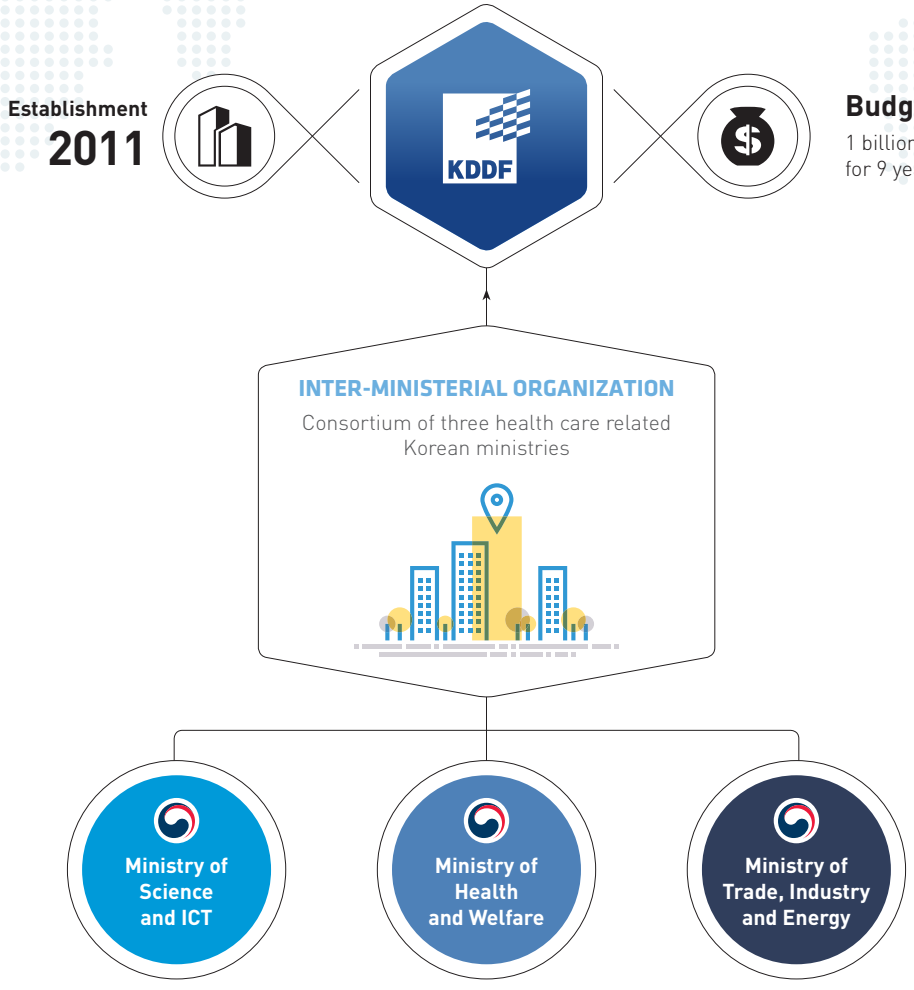
KDDF
Korea Drug Development Fund

ABOUT KDDF

Korea Drug Development Fund (KDDF) is a government funded organization with one billion USD budget over nine years period of time to accelerate innovation activities in Korean pharmaceutical R&D communities.

KDDF has

- Top-notch proposal selection system
- Value focused project management system
- Large pool of excellent domestic and foreign experts in various drug development field
- International and domestic network in business development field
- More than 136 pipeline in various therapeutic areas from lead stage to clinical trial stage

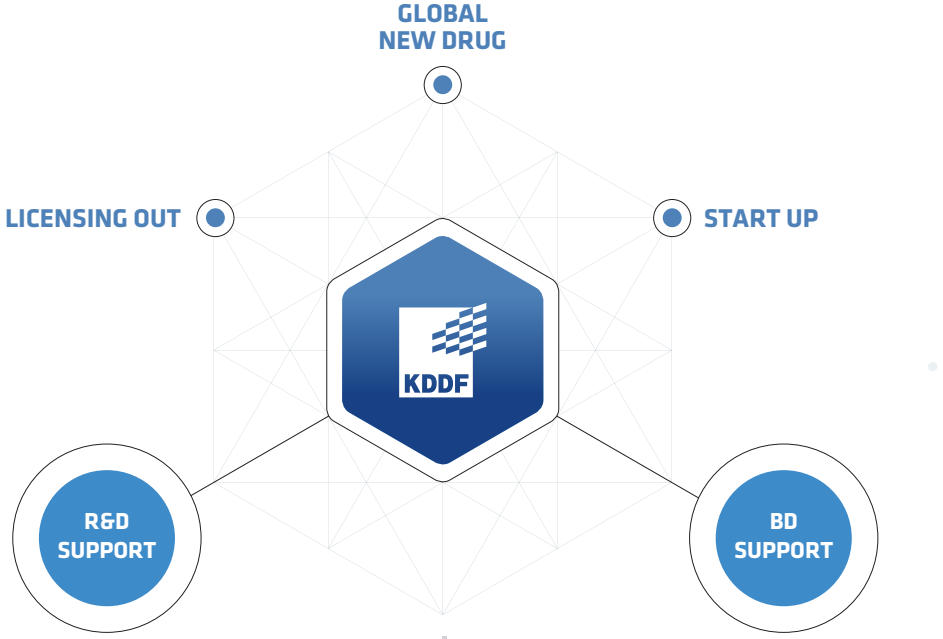


BUSINESS MODEL

KDDF selects and manages portfolio in alignment with Global Big Pharmaceutical companies' interests who are capable of commercializing the asset globally.

What we do

KDDF funds and manages the innovative drug development projects from lead to clinical stage, covering academia, research institute, biotech, and pharmaceutical companies. KDDF does not only fund drug development project, but also supports business development, including out-licensing of the funded projects and in-sourcing drug seeds from abroad.



Grant & Project Management
Bridge program, Innovative program

Collaboration Platform
Joint R&D program

ACT
Clinical trial consulting program

LPG
Licensing out supporting program

Global C&D
Drug Seed discovery program

R&D PROGRAM

KDDF has three R&D tracks and one consulting program.

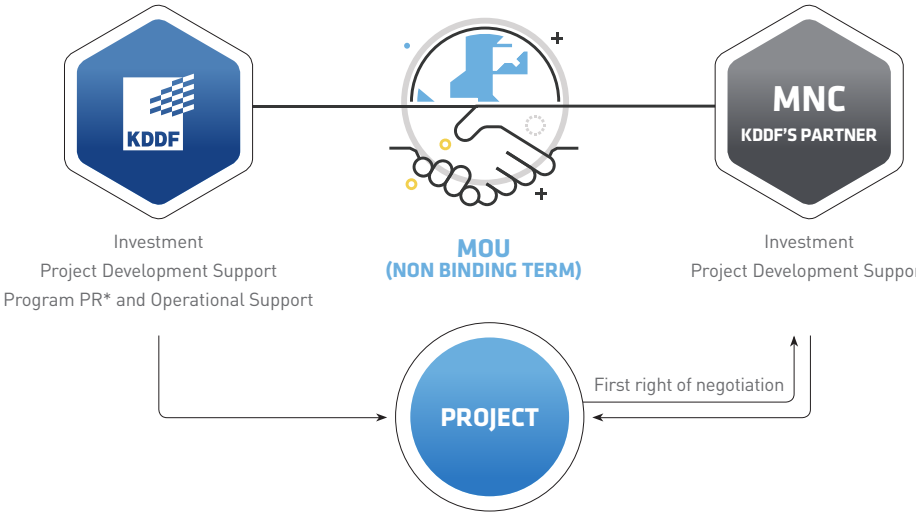
Innovative Track

Innovative track is a bottom up model to find and support novel and innovative drug candidates in Korea. KDDF calls for proposals to Korean drug development communities and selects program through science and investment committee.

PROPOSAL	PROJECT PRESENTATION	DUE DILIGENCE	INVESTMENT DECISION	MILESTONE AND BUDGET ADJUSTMENT	PROJECT MANAGEMENT	END OF MILESTONE
R&D organizations submit a proposal to KDDF quarterly basis	Applicants present their proposals and external scientific review committee evaluates the proposals	Internal & external reviewers group perform on-site due diligence to validate the data integrity	Investment committee reviews and selects projects with a business perspective	Key milestones and budget are adjusted to improve the project success	To ensure project success, KDDF manages project progress & milestones every month, and provides R&D consulting and trouble-shooting if necessary	Go or No-Go decision is made by external evaluation team for "Fast fail and Fail Cheap" strategy

Joint R&D Track

Joint R&D track is a top-down collaboration model, partnered with Global Big Pharmaceutical companies. Call for proposal of Joint R&D Track specifically focuses on certain disease area and mode of action requested by the partner. Through this program the partner is able to find projects to enrich their pipeline.



Investment
Project Development Support
Program PR* and Operational Support

MOU
(NON BINDING TERM)

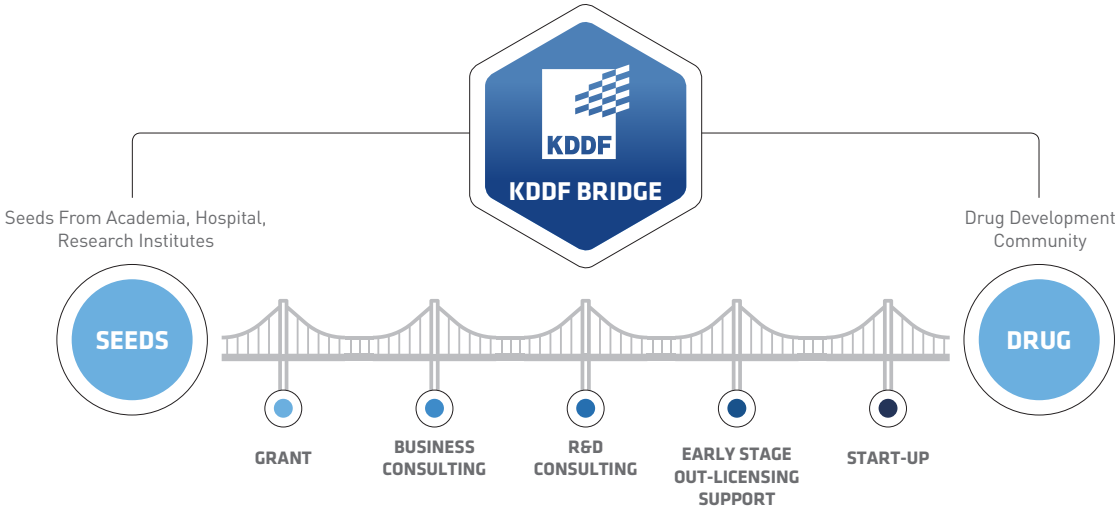
Investment
Project Development Support

Biopharmaceutical R&D organization in Korea
(Academia, Research Institutions, Companies)

*PR: Public Relations

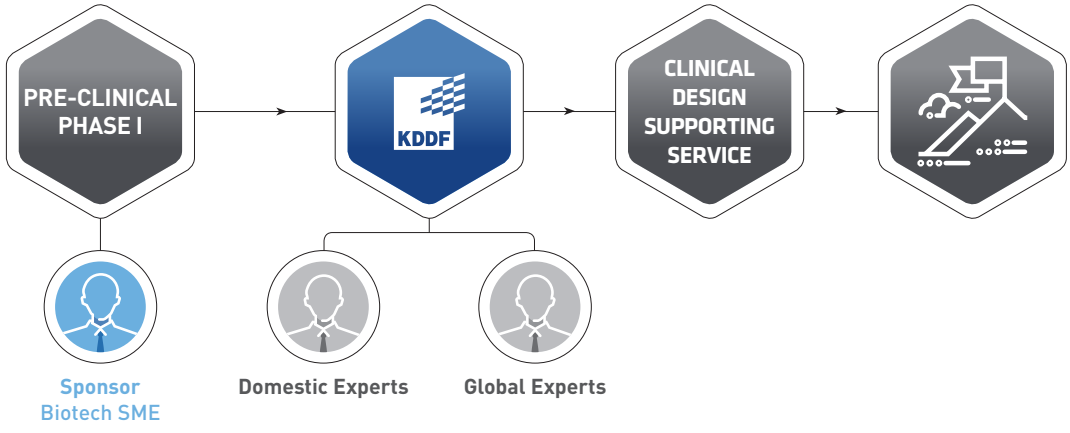
BRIDGE Track

BRIDGE Track is specially designed to bridge very early stage drug discovery to clinical development. In BRIDGE Track, KDDF will co-manage the funded project from the very start to the commercialization, by providing not only grant but also proficient development consulting services, utilizing all the public drug development resources.



ACT
(Advancing Clinical Trial)

- ACT program offers significant benefits for biotech and pharmaceutical companies looking to reduce clinical attribution rate and to increase success rate for their clinical program.
- In-depth clinical trial protocol design consulting service provided by top class clinical experts.
- Advising on study design including appropriate endpoints, statistical methods for analysis, sample size calculations, surrogate biomarkers.



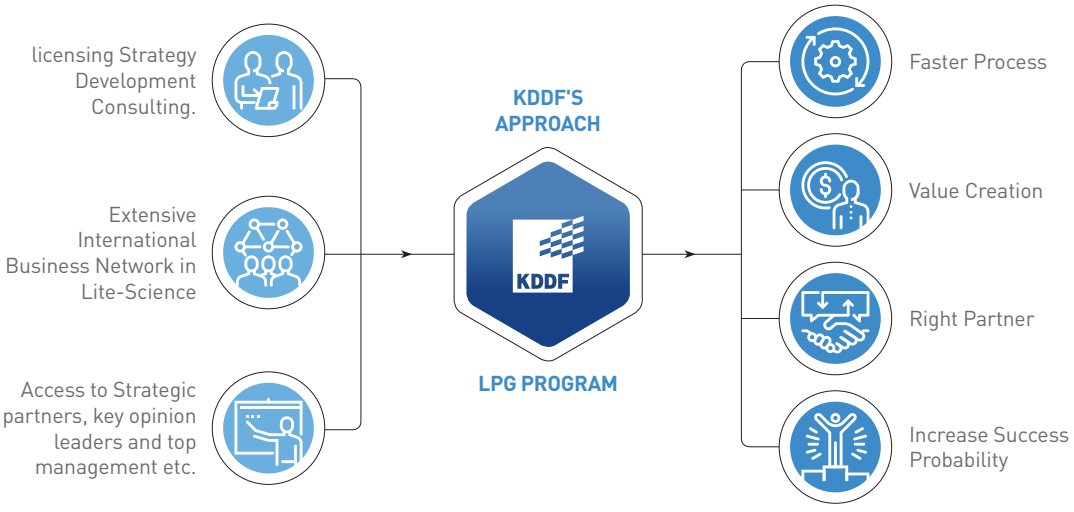
BUSINESS SUPPORTING PROGRAM

KDDF does not only work as a granting agency for new drug development organizations, but also supports their business development through LPG program and Global C&D program.

LPG

(Licensing Partnering for Globalization)

- Business development consulting services for Korean drug development communities.
- Acceleration of licensing activities via KDDF's global network, with consulting service covering all business areas necessary, including from evaluation of licensing value to finding out fittest licensee.



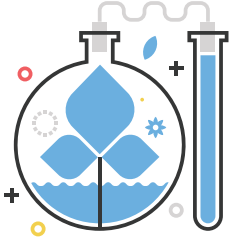
Global C&D

C&D program is to improve R&D productivity by providing open innovation platform to Korean drug development communities, facilitating their in-sourcing novel drug seeds from worldwide.

Pipeline Sourcing

If your seed has a potential, KDDF is able to connect the seed to appropriate development organizations

Farming



Korean Pharmaceutical industry incubate and develops the seed

Biotech, Research Institutes,Pharma Companies, Research Grant (KDDF)

Harvesting

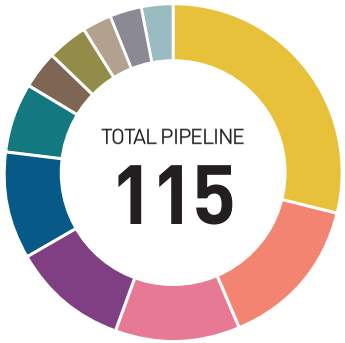
Value added and Global Drug Project

Reverse licensing, Value creation, IPO, M&A, etc.

R&D PIPELINE

KDDF covers broad range of drug development fields.

For more information, please contact us.
- http://eng.kddf.org
- kddf@kddf.org



CANCER	36
CNS DISEASE	18
IMMUNE DISEASE	11
INFECTIOUS DISEASE	14
METABOLIC DISEASE	11
CARDIOVASCULAR DISEASE	8
GASTROINTESTINAL DISEASE	4
OPHTHALMIC DISEASE	5
HEMATOLOGIC DISEASE	2
RESPIRATORY DISEASE	3
OTHERS	3

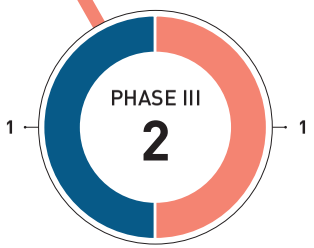
- Duchenne Muscular Dystrophy — **Korea University**
- NASH — **Asan Medical Center**
- Diabetes — **Ewha womans University**
- Diabetes — **GIST**
- Osteoporosis — **Yonsei University**
- Diabetes — **Medytox**

- Hemophilia — **Alteogen**
- Glaucoma — **HANDOK**
- Diabetic retinopathy — **Ajou University**
- Acute renal failure — **Shinpoong Pharmaceutical**
- Heart failure — **KRICT**
- Aortic valvular Stenosis — **Ulsan University**
- Thrombosis — **ST Pharm**
- Heart failure — **Chungnam National University**
- Diabetes — **Aptamer Science**
- Diabetes — **Hanmi pharmaceutical**
- Diabetes — **Ewha womans University**
- Hepatitis B — **Konkuk University**
- Tuberculosis — **ip-Korea**
- Infectious Disease — **Aeonmedix**
- Rheumatoid arthritis — **Sookmyung women's Univeristy**
- Allo Islet Transplantation — **Dinona**
- Depression — **KIST**
- Alzheimer's Disease — **ADEL**
- Parkinson's Diesease — **ABL bio**
- Alzheimer's Disease — **KIST**

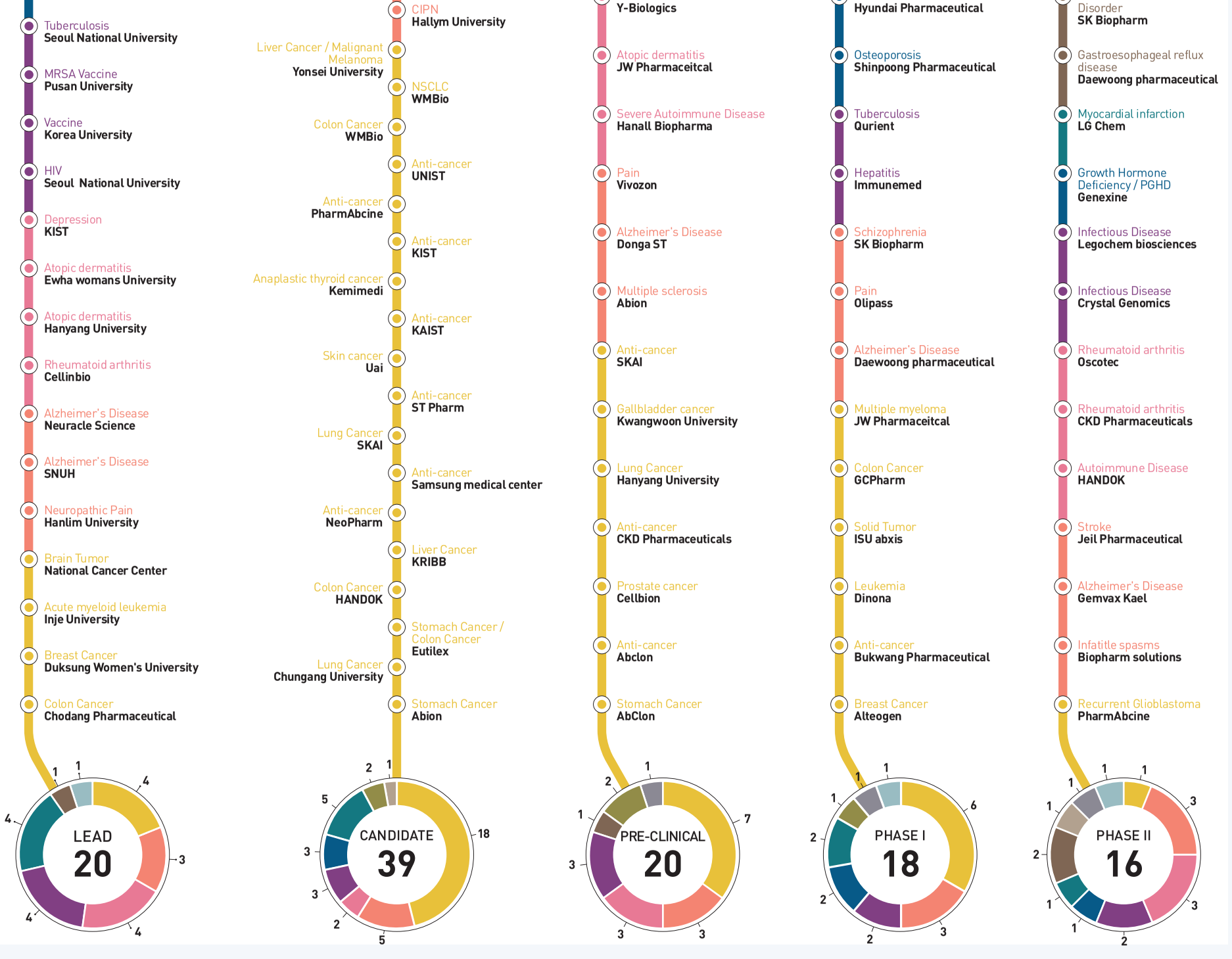
- IPF — **Bioneer**
- Macular disease — **Taejoon Pharmaceutical**
- Blindness — **Chungnam National University**
- GERD — **Cj Healthcare**
- Infectious Disease — **LegoChem biosciences**
- Hepatitis C — **ip-Korea**
- Infectious Disease — **Hoseo Peptide**
- Autoimmune Disease

- Scar — **Olix**
- Asthma — **Dongwha Pharmaceutical**
- Macular degeneration — **Hanlim Pharmaceutical**
- Thrombosis — **GCPharm**
- Dyslipidemia — **CKD Pharmaceuticals**
- Diabetes

- Diabetes — **Hanmi pharmaceutical**
- Epilepsy — **SK Biopharm**



- Degenerative disc — **Yuhan Corporation**
- COPD — **YungJin Pharmaceutical**
- Neutropenia — **Enzychem Lifesciences**
- Functional Gastrointestinal


Tuberculosis
Seoul National University
MRSA Vaccine
Pusan University
Vaccine
Korea University
HIV
Seoul National University
Depression
KIST
Atopic dermatitis
Ewha womans University
Atopic dermatitis
Hanyang University
Rheumatoid arthritis
Cellinbio
Alzheimer's Disease
Neuracle Science
Alzheimer's Disease
SNUH
Neuropathic Pain
Hanlim University
Brain Tumor
National Cancer Center
Acute myeloid leukemia
Inje University
Breast Cancer
Duksung Women's University
Colon Cancer
Chodang Pharmaceutical
LEAD
20
CIPN
Hallym University
Liver Cancer / Malignant Melanoma
Yonsei University
NSCLC
WMBio
Colon Cancer
WMBio
Anti-cancer
UNIST
Anti-cancer
PharmAbcine
Anti-cancer
KIST
Anaplastic thyroid cancer
Kemimedi
Anti-cancer
KAIST
Skin cancer
Uai
Anti-cancer
ST Pharm
Lung Cancer
SKAI
Anti-cancer
Samsung medical center
Anti-cancer
NeoPharm
Liver Cancer
KRIBB
Colon Cancer
HANDOK
Stomach Cancer / Colon Cancer
Eutilex
Lung Cancer
Chungang University
Stomach Cancer
Abion
CANDIDATE
39
Y-Biologics
Atopic dermatitis
JW Pharmaceitcal
Severe Autoimmune Disease
Hanall Biopharma
Pain
Vivozon
Alzheimer's Disease
Donga ST
Multiple sclerosis
Abion
Anti-cancer
SKAI
Gallbladder cancer
Kwangwoon University
Lung Cancer
Hanyang University
Anti-cancer
CKD Pharmaceuticals
Prostate cancer
Cellbion
Anti-cancer
Abclon
Stomach Cancer
AbClon
PRE-CLINICAL
20
Hyundai Pharmaceutical
Osteoporosis
Shinpoong Pharmaceutical
Tuberculosis
Qurient
Hepatitis
Immunemed
Schizophrenia
SK Biopharm
Pain
Olipass
Alzheimer's Disease
Daewoong pharmaceutical
Multiple myeloma
JW Pharmaceitcal
Colon Cancer
GCPharm
Solid Tumor
ISU abxis
Leukemia
Dinona
Anti-cancer
Bukwang Pharmaceutical
Breast Cancer
Alteogen
PHASE I
18
Disorder
SK Biopharm
Gastroesophageal reflux disease
Daewoong pharmaceutical
Myocardial infarction
LG Chem
Growth Hormone Deficiency / PGHD
Genexine
Infectious Disease
Legochem biosciences
Infectious Disease
Crystal Genomics
Rheumatoid arthritis
Oscotec
Rheumatoid arthritis
CKD Pharmaceuticals
Autoimmune Disease
HANDOK
Stroke
Jeil Pharmaceutical
Alzheimer's Disease
Gemvax Kael
Infatitle spasms
Biopharm solutions
Recurrent Glioblastoma
PharmAbcine
PHASE II
16

ACCOMPLISHMENT

KDDF has been supporting new drug development throughout all value chains from discovery to clinical trials. As of April 2018, 27 pipeline entered into licensing agreement, of which deal value is totaled more than 4.5 billion USD.

Global Licensing out

Genexine, Cj Healthcare, Hanmi Pharm, LecoChem BIO, AbClon, hanAll-biopharma, Queient, PharmAbcine, GCPharma, Dong-A ST, Dinona

US-FDA ODD*

Qurient, LegoChem BIO, PharmAbcine, BioPharmSolutions, Enzychem Lifescience

* ODD: Orphan Drug Designation

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RESPIRATORY DISEASE

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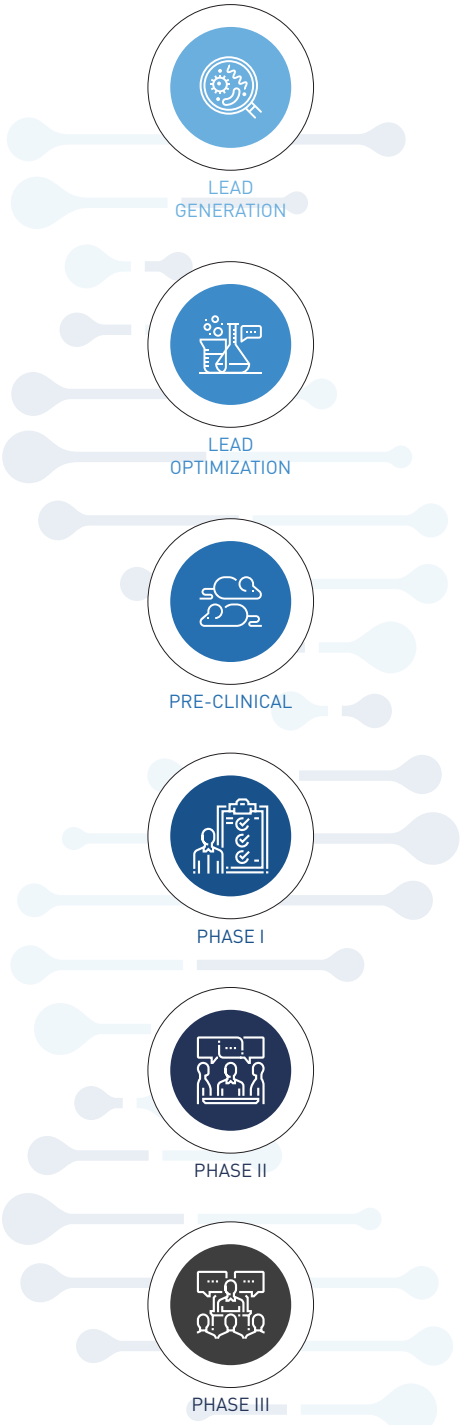
OTHERS

78 Olix

From Discovery to Clinical stage

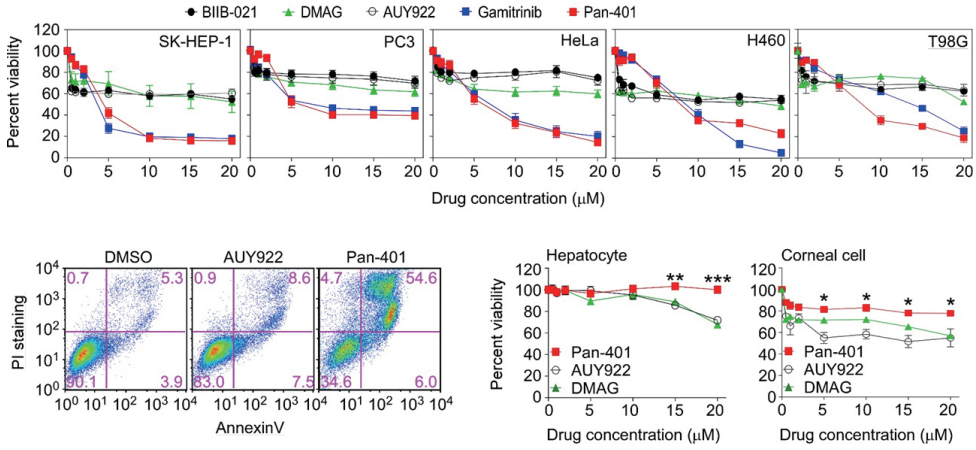
From Academia, research institutes, to Biotech and Pharmaceutical companies



Development of cancer therapeutics targeting mitochondrial TRAP1

Ulsan National Institute of Science and Technology

Product Type	Chemical Product
Indication	1st indication: Prostate cancer, Prostatic Neoplasms (MeSH term) 2nd indication: Brain tumor, Brain Neoplasms (MeSH term)
Target	TNF Receptor associated Protein 1 (TRAP1)
MoA (Mechanism of Action)	Mitochondria permeable TRAP1 inhibitor DN401 accumulates inside the mitochondria and inhibits tumor-supporting chaperone activities of TRAP1.
Differentiation Point	First In Class The subcellular distribution of the drug has been optimized to efficiently inhibit the mitochondrial target TRAP1.
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intravenous
Data	DN401: A purine derivative, intramitochondrial accumulation without the mitochondrial delivery moiety. More potent anticancer activity compared with conventional HSP90 inhibitors.



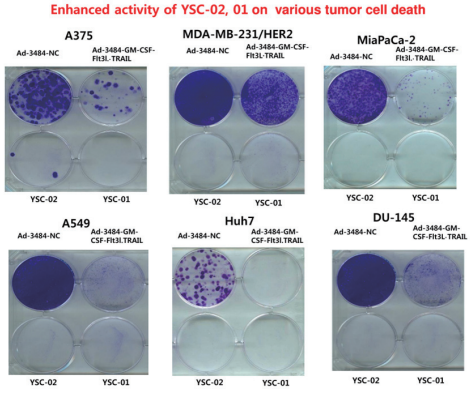
Patent Position	PCT/KR2017/007907

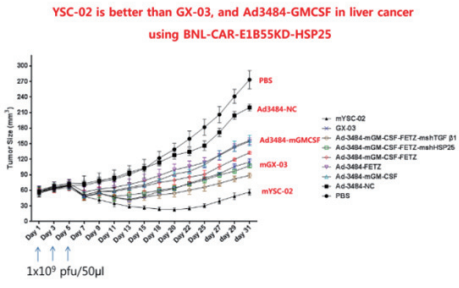
ByoungHeon Kang kangbh@unist.ac.kr (+82)52-217-2521

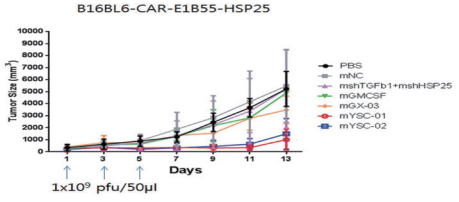
YSC-02: adenovirus-based anticancer drug with enhanced cancer cell killing and immune activation

Yonsei University

Product Type	shRNAs, cytokines
Indication	1st indication: HCC, Neoplasms (MeSH term) 2nd indication: TNBC, Neoplasms (MeSH term)
Target	TGF-beta, HSP27
MoA (Mechanism of Action)	tumor lysis by oncolytic virus, anti tumor immunity/apoptosis
Differentiation Point	Best In Class
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intravenous
Data	







Patent Position	10-2016-0166171/Korea, PCT/KR2016/014325 (10-2016-0166171) and PCT (PCT/KR2016/014325)

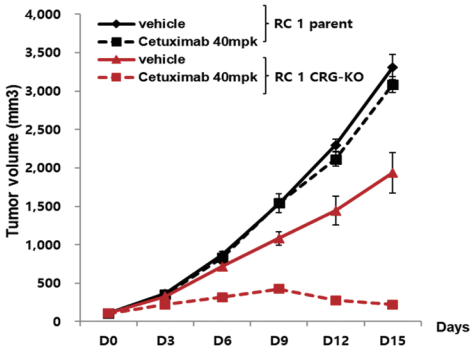
Song Jae Jin jjs109@yuhs.ac (+82)2-2228-8037

Development of a novel small molecule inhibitor for treatment of Erbitux resistant colon cancer

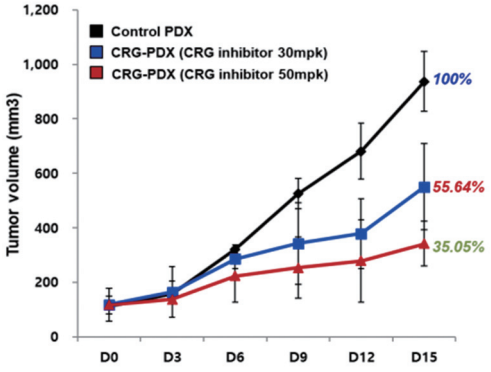
Wellmarkerbio Co., Ltd.

WMBIO

Product Type	Chemical Product
Indication	1st indication: Colon Cancer, Colonic Neoplasms (MeSH term) 2nd indication: Breast Cancer, Breast Neoplasms (MeSH term)
Target	Undisclosed
MoA (Mechanism of Action)	Binding to CRG (Cetuximab-Resistant Gene)
Differentiation Point	First In Class Predictive biomarker for treatment of colon cancer Overcoming resistance of Cetuximab in treatment of colon cancer
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Oral
Data	Target validation by CRG-Knock out animal model



CRG activated patients' derived colon cancer mouse model shows strong anti-cancer effect of WM-S1-001

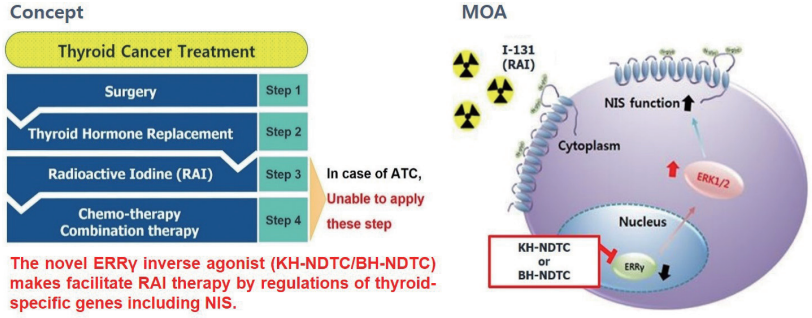
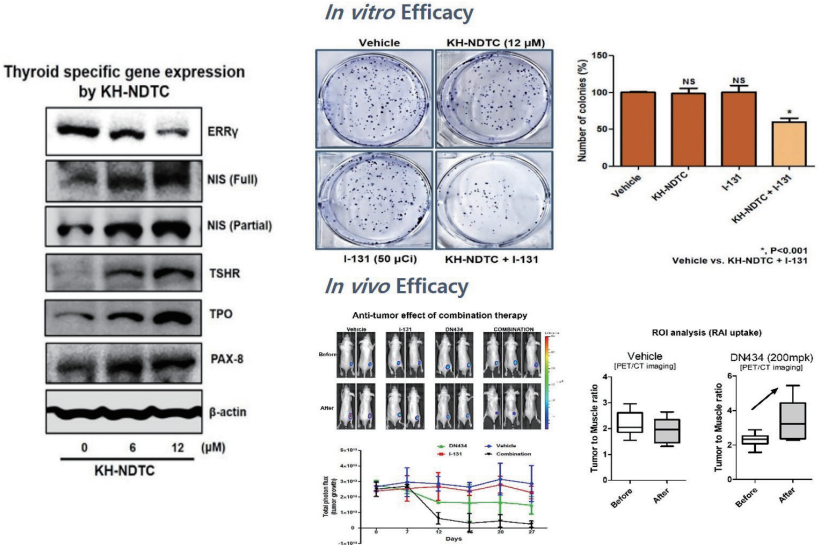


Ph. D DongHoon Jin inno183@amc.seoul.kr (+82)2-3010-2643

Verify candidate for pre-clinical study in Anaplastic Thyroid Cancer (ATC)

KEMIMEDI Co., Ltd.

KEMIMEDI

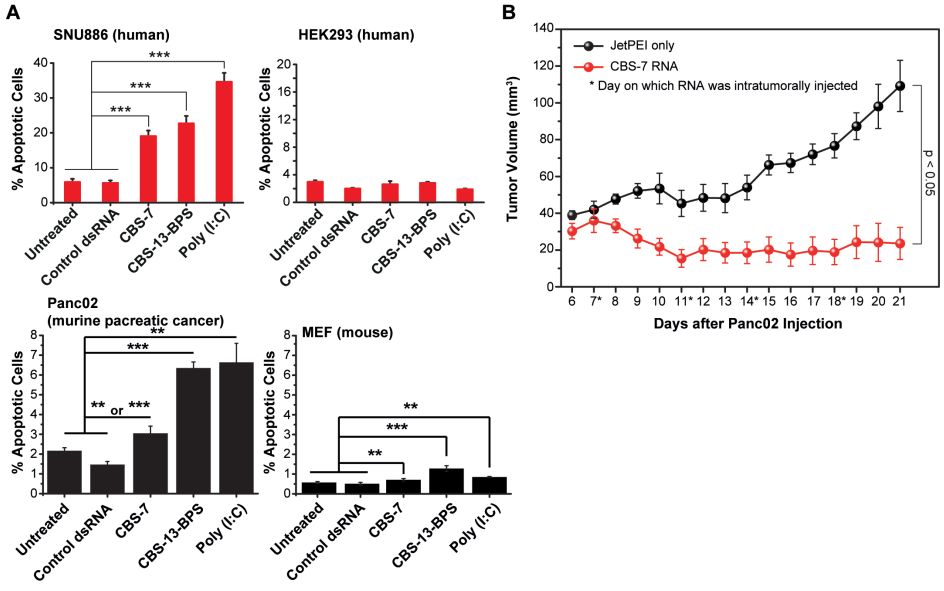
Product Type	Chemical Product
Indication	1st indication: Anaplastic Thyroid Cancer, Thyroid Carcinoma, Anaplastic (MeSH term)
Target	Estrogen-related receptor gamma (ERRγ)
MoA (Mechanism of Action)	
Differentiation Point	It will be possible to expand indications to other types of thyroid cancer and to decrease the side effects of radioiodine by reduction of its dose.
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Undecided
Data	
Patent Position	10-1819639 / Korea, 10-1835133 / Korea

SangWook Kim sangwook.kim@wellcan.co.kr (+82)2-3443-9252

A novel RNA oligonucleotide developed for cancer therapy

Korea Advanced Institute of Science and Technology (KAIST)

Product Type	Aptamer (RNA oligonucleotide)
Indication	1st indication: Cancer, Neoplasms (MeSH term)
Target	Retinoic acid-inducible gene I (RIG-I) (putative)
MoA (Mechanism of Action)	Developed a novel RNA oligonucleotide that specifically induces apoptosis of a tumor
Differentiation Point	First In Class A systematically designed RNA oligonucleotide that shows comparable anti-tumor efficacy to poly I:C
Current Development Stage	Lead Generation (Hit to Lead)
Route of Administration	Parenteral-Intratumoral
Data	- Developed RNA oligonucleotide (CBS RNA) is 5'-OH dsRNA. It shows selective ant-tumor efficacy in human liver cancer (SNU886) and mouse pancreatic cancer cells (panc02). (Fig. A) - CBS RNA showed anti-tumor activity against mouse pancreatic cancer (panc02) in vivo (Fig. B). RNA was administered via intratumoral injection.



Patent Position	PCT/KR2016/011571

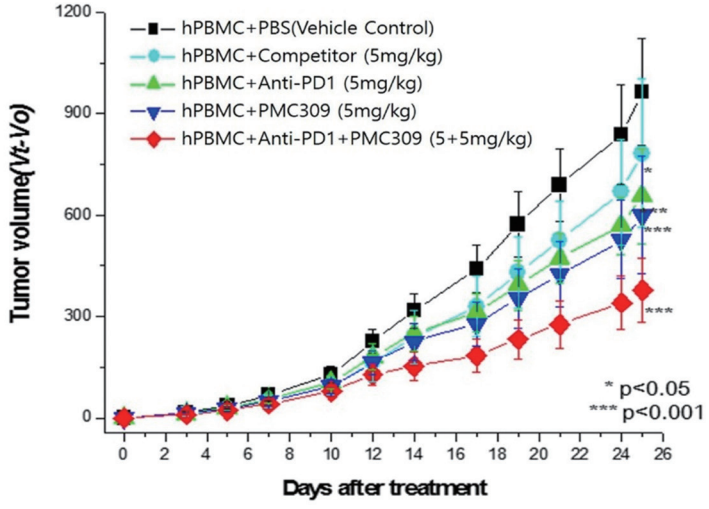
ByongSeok Choi bschoi@kaist.ac.kr (+82)42-350-2828

Development of immuno-onoclogy drug PMC-309 targeting VISTA known as a negative checkpoint regulator

PharmAbcine

PharmAbcine
Antibody Therapeutics for Life

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: NSCLC, carcinoma, non-small cell lung (MeSH term) 2nd indication: breast cancer, Breast Neoplasms (MeSH term)
Target	VISTA (v-domain Ig suppressor of T-cell activation)
MoA (Mechanism of Action)	Increase immunity against tumor by binding to VISTA
Differentiation Point	Best In Class fully human, best immune activation activity
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intravenous
Data	- stronger anti-tumor activity than competitor in humanized mouse model - synergic anti-tumor activity with anti-PD1 antibody



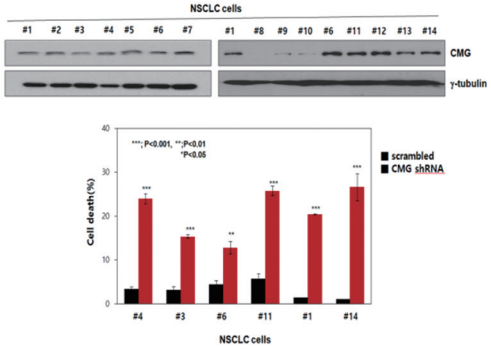
WeonSup Lee weonsup.lee@pharmabcine.com (+82)43-235-2017(ext 3001)

Development of new mechanism based therapeutic antibodies in non-small cell lung cancer patients

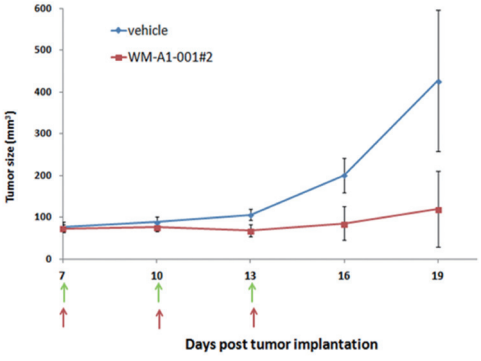
Wellmarkerbio Co., Ltd.

WMBIO

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: Lung cancer, Lung Neoplasms (MeSH term) 2nd indication: Liver cancer, Liver Neoplasms (MeSH term)
Target	Undisclosed
MoA (Mechanism of Action)	Binding to CMG (Cancer Immunotherapy-related gene)
Differentiation Point	First In Class
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intraperitoneal injection (IP)
Data	Target validation : knockdown of CMG



Syngeneic model:
in vivo efficacy for WM-A1-001#2



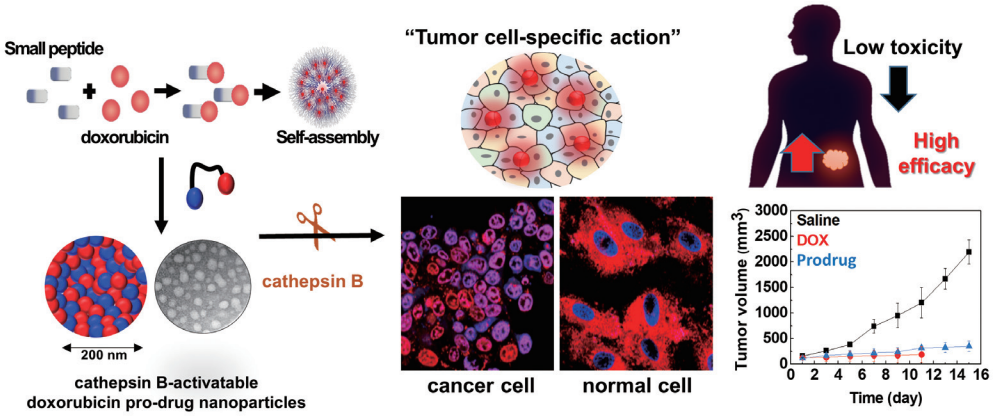
Dr. DongHoon Jin inno183@amc.seoul.kr (+82)2-3010-2643

Development of nano-sized anti-cancer prodrug capable of tumor enzyme (cathepsin B)-specific activation

Korea Institute of Science and Technology (KIST)

Korea Institute of Science and Technology

Product Type	Peptide Product (A self-assembly tumor specific drug conjugate)
Indication	1st indication: Colorectal cancer, Colorectal neoplasms (MeSH term) 2nd indication: Breast cancer, Breast neoplasms (MeSH term) 3rd Indication: Pancreatic cancer, Pancreatic neoplasms (MeSH term)
Target	DNA in tumor cells (doxorubicin based)
MoA (Mechanism of Action)	1. Self-assembly small peptide-based nanoparticles without any nanocarriers 2. Passive accumulation effect in the tumor site 3. Tumor cell specific activation by cathepsin B (biomarker) 4. Doxorubicin-based strong cytotoxic effect on cancer cells
Differentiation Point	First In Class This is the first low molecular weight drug cadidate based on self-assembly and cathepsin B-specific action among doxorubicin prodrugs
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intravenous
Data	1. Long term administration due to low toxicity by prodrug-type 2. Delivery to tumor tissue by the passive accumulation effect of nanoparticles 3. Simple synthesis and predicted efficacy with a clear biomarker 4. Having the advantages of cytotoxic and target anticancer agents



Patent Position	KR 10-2017-0121169

Jooho Park pkjhdn@kist.re.kr (+82)2-958-5918)

A novel anti-angiogenic human monoclonal antibody specifically targeting CLEC14a

Scripps Korea Antibody Institute

스크립스코리아항체연구원
Scripps Korea Antibody Institute

Product Type
Immunoglobulin Product (mAb)

Indication
1st indication: Cancer, Neoplasms (MeSH term)
2nd indication: Wet age-related macular degeneration, Macular Degeneration (MeSH term)

Target
CLEC14a (Tumor endothelial marker)

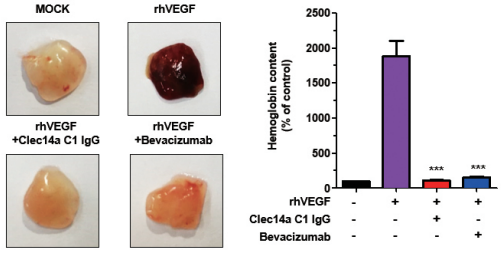
MoA (Mechanism of Action)
1) Internalization-dependent down-regulation of CLEC14a on the surface of endothelial cells
2) Inhibition of CLEC14a-CLEC14a protein interactions
→ Inhibition of endothelial cell-cell contacts
→ Inhibition of angiogenesis

Differentiation Point
First In Class
This mAb has lower toxicity and anti-angiogenic efficacy similar to Avastin

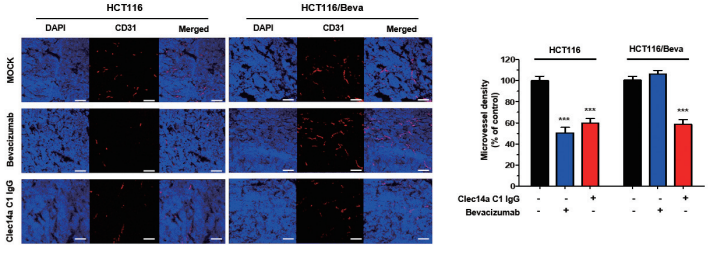
Current Development Stage
Pre-Clinical

Route of Administration
Parenteral-Intravenous

Data
1) Inhibition of VEGF-dependent and tumor angiogenesis



2) Inhibition of tumor angiogenesis induced by Avastin-resistant tumor



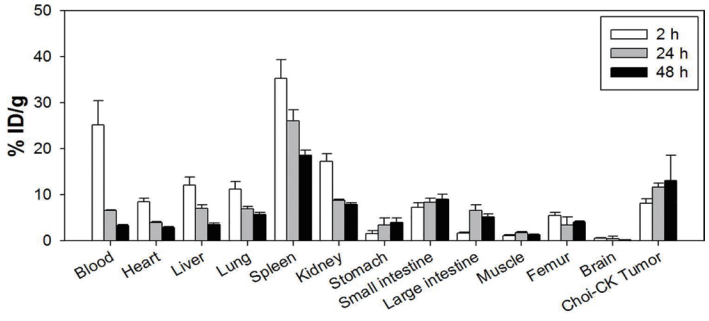
Patent Position
9,751,933/USA, 6129305/Japan, 10-1760465-0000/Korea, 201380043426.9/China, 10-2016-0115577/PCT

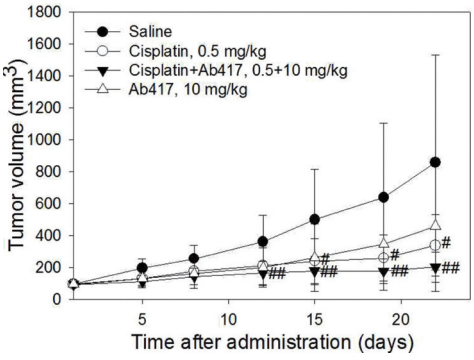
JiHye Jang jjh717@skai.or.kr (+82)33-250-8098

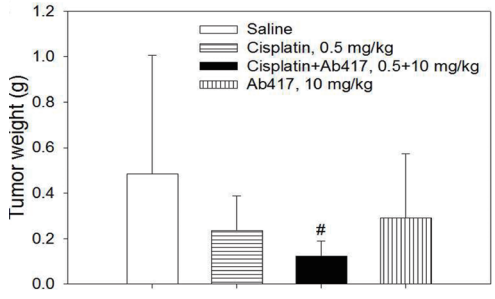
Preliminary non-clinical study of a therapeutic antibody candidate for the treatment of cholangiocarcinomas

Kangwon National University

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: Cancers, Neoplasms (MeSH term) 2nd indication: Cholangiocarcinomas, Cholangiocarcinomas (MeSH term)
Target	L1CAM
MoA (Mechanism of Action)	Inhbition of tumor growth by internalization of L1CAM in the cells and down-regulation of membrane L1CAM
Current Development Stage	Pre-Clinical
Route of Administration	Parenteral-Intravenous
Data	: No adverse effect in single-dose toxicity sudy in mice. Cross-reactivie with mouse L1CAM







Patent Position	10-2007-0084868/ Korea; 10-2013-0140237/Korea; 10-2018-0000381/Korea

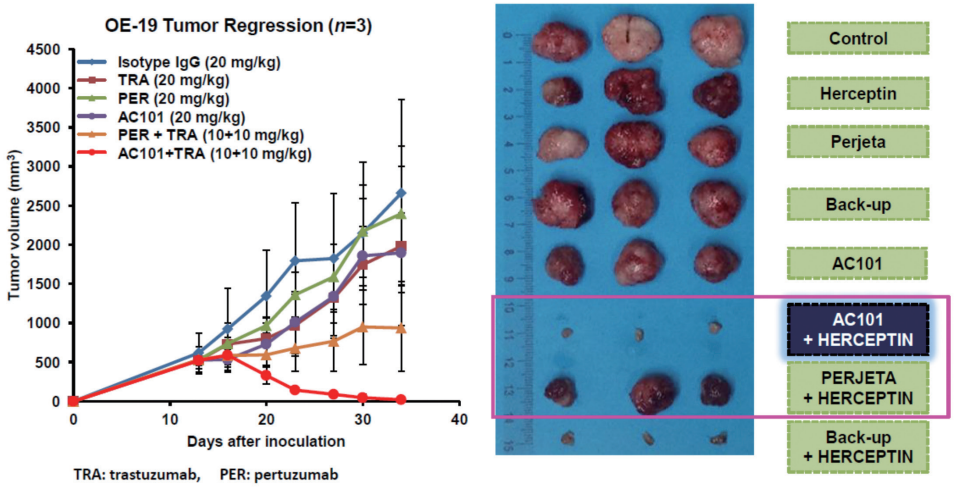
HyoJeong Hong hjhong@kangwon.ac.kr (+82)33-250-8086

A Novel Theraeputic Antibody targeting HER2

AbClon Inc.

Innovative Therapeutic Antibody AbClon

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: Gastric Cancer, Stomach Neoplasms (MeSH term) 2nd indication: Breast Cancer, Breast Neoplasms (MeSH term)
Target	Human epidermal growth factor receptor 2 (HER2)
MoA (Mechanism of Action)	The drug shows superior efficacy in combination with trastuzumab against HER2(+) cancers. Synergistic effect of the drug with trastuzumab due to increased apoptosis, increased cell cycle arrest, inhibition of both homo- & hetero- dimerization effect.
Differentiation Point	Best In Class The drug can overcome limitation of Herceptin mono-therapy. The anti-cancer activity of the drug is superior to the combination of Herceptin and Perjeta when the drug is combined with Herceptin.
Current Development Stage	Pre-Clinical
Route of Administration	Parenteral-Intravenous
Data	▪ **Combination treatment of AC101 with trastuzumab (Herceptin®, TRA) in HER2 positive gastric cancer cell (OE-19) xenografted mice shows superior tumor regression efficacy to the monotherapy of trastuzumab, pertuzumab (Perjeta®, PER) or the combination of the both (PER + TRA).**



Patent Position	PCT/KR2014/004317

KyuTae Kim ktkim@abclon.com (+82)2-2109-1366

Development of gene therapeutic-mediated combination therapy regimen targeting lung cancer

Hanyang University, Gene Therapy Lab.

Product Type

Oncolytic adenovirus

Indication

1st indication: Lung cancer

2nd indication: Breast cancer, Prostate cancer

Target

Hypoxia, VEGF, Immune surveillance

MoA (Mechanism of Action)

- Oncolytic adenovirus kill cancer cell specifically and multiply therapeutic transgene shVEGF and IL-12.
- Novel promoter enhances induces cancer-specific killing effect
- shVEGF inhibits angiogenesis, metastasis and proliferation of cancer cell.
- shVEGF reverses immunosuppressive tumor microenvironment.
- IL-12 decreases the tumor metastasis by regulating tumor microenvironment.
- IL-12 increases infiltration of CD4+ T, CD8+ T, natural killer, and dendritic cells in tmors tissues
- IL-12 upregulates IFN-γ to shift the T cell response toward the Th1 immunity, ultimately enhancing anti-tumor immune response.

Differentiation Point

- Targeting multiple carcinogenic pathway through novel strategy
- No observable cytotoxicity or side effect in normal cells while preferentially treating tumor cells
- Significantly lower production cost in comparison with competing product
- Synergistic antitumor efficacy in combination with standard therapies (chemotherapy, radiotherapy, antibody, immune cells)

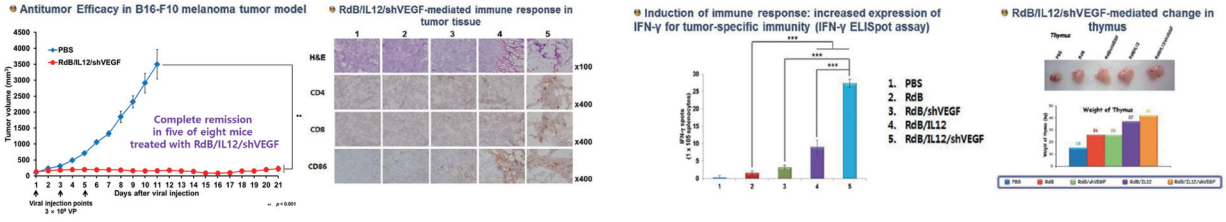
Current Development Stage

Pre-Clinical

Route of Administration

Parenteral-Intratumoral

Data



Patent Position

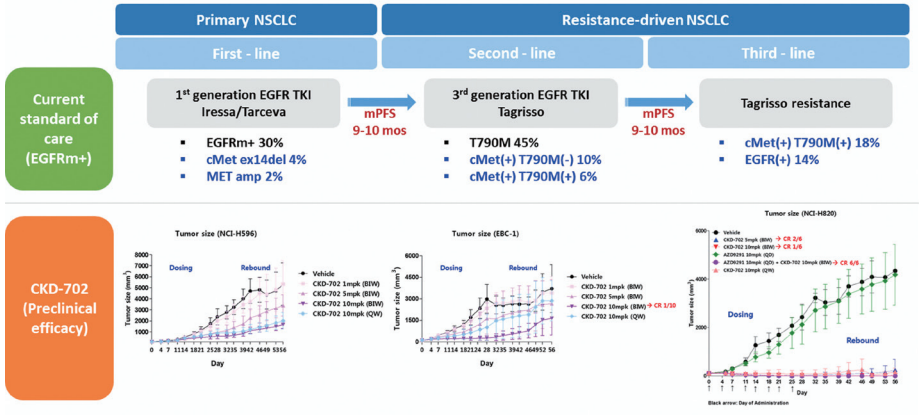
- PCT/KR2016/009717 (IL12/shVEGF)
- PCT/KR2004/000427 (mTERT)
- PCT/KR2011/004693 (E2F+TERT)

Chaeok Yun chaeok@hanyang.ac.kr (+82)10-9492-0334

Pre-Clinical studies of a novel anti-cancer bispecific antibody CKD-702

Chong Kun Dang Pharmaceutical Corporation

Product Type	Immunoglobulin Product (mAb), bispecific antibody
Indication	1st indication: Non-small cell lung cancer, Carcinoma, Non-Small-Cell Lung (MeSH term) 2nd indication: Gastric cancer, Glioblastoma, Stomach Neoplasms, Glioblastoma (MeSH term)
Target	Mesenchymal to Epithelial Transition factor receptor (cMET) or Hepatocyte growth factor receptor (HGFR) and Epidermal growth factor receptor (EGFR)
MoA (Mechanism of Action)	CKD-702 binds and internalizes both cMET and EGFR → Degrades the receptors and effectively blocks downstream signaling pathways → Superior antitumor activity
Differentiation Point	Best In Class Superior antitumor activity in multiple NSCLC, colon and gastric cell lines or NSCLC tumor xenograft models. Treatment of cynomolgus monkeys with CKD-702 resulted in a low toxicity profiles, including skin rash observed with other EGFR-directed agents.
Current Development Stage	Pre-Clinical
Route of Administration	Parenteral-Intravenous
Data	CKD-702 opportunities in NSCLC: - In first-line therapy, patients with EGFR wild type and cMET ex14 deletion - In second and third line treatment, patients with cMET amplification and acquired resistance to EGFR tyrosine kinase inhibitors



Patent Position	10-2017-0067106 (Korea)

EunJu Jeon ejjeon@ckdpharm.com (+82)31-340-1421

Development of CD19-targeting CAR-T therapeutics

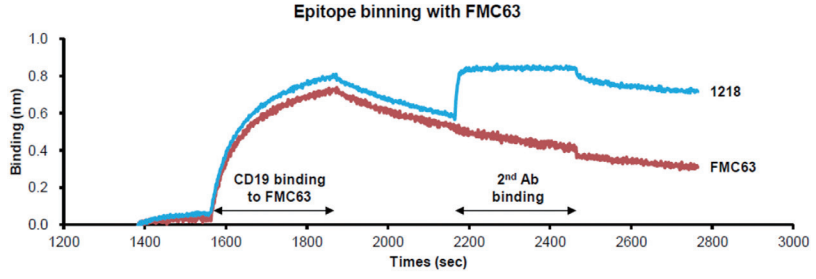
AbClon Inc.

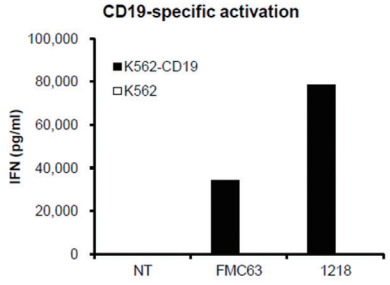
Innovative Therapeutic Antibody AbClon

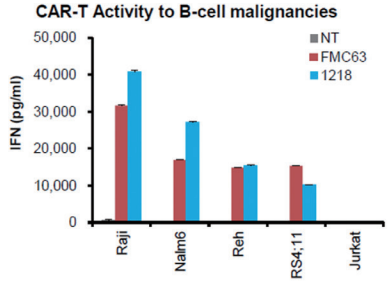
Product Type	Cell Therapy
Indication	1st indication: Acute Lymphoid Leukemia, Precursor Cell Lymphoblastic Leukemia-Lymphoma (MeSH Term) 2nd indication: B-cell lymphoma, Lymphoma, B-Cell (MeSH term)
Target	B-lymphocyte antigen CD19 (CD19)
MoA (Mechanism of Action)	Favorable formation of immune synapse of the CAR-T using new CD19 antibody with novel epitope can increase the efficacy whereas it can reduce adverse effects.
Differentiation Point	The drug can overcome limitations such as resistance and immunogenecity of marked CD19 targeting CAR-T on the basis of novel epitope.
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intravascular

Data

- **New CAR-T is constructed using novel CD19 scFv (1218).**
- **The drug has different epitope compared to marked CAR-T using chimeric scFv (FMC63).**
- **The drug has increased activity compared to FMC63 CAR-T.**







Patent Position	10-2017-0166969/KR

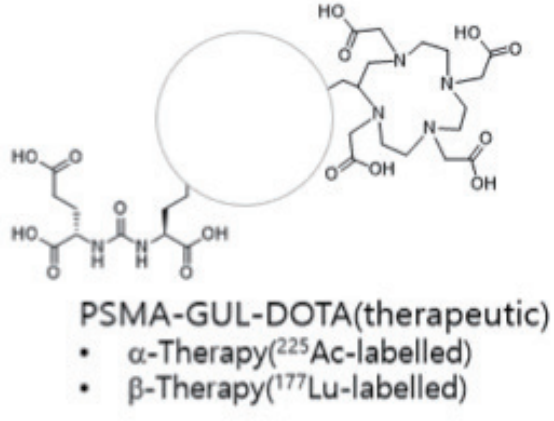
Kyu-Tae Kim ktkim@abclon.com (+82) 2 2109 1366

Development of a PSMA(Prostate Specific memebrane antigen)-targetting therapeutic radiopharmaceutical

Cellbion Co. ltd.

CellBion

Product Type	Peptide Product
Indication	1st indication: Prostate cancer, Prostatic Neoplasms (MeSH term) 2nd indication: Metastatic cancer, Prostatic Neoplasms, Castration-Resistant (MeSH term)
Target	Prostate Specific Membrane Antigen (PSMA)
MoA (Mechanism of Action)	Prostate-specific membrane antigen (PSMA), also known as folate hydrolase I (FOLH1) or glutamate carboxypeptidase II (GCPII), is a transmembrane, 750 amino acid, type II glycoprotein that is primarily expressed in normal human prostate epithelium but is overexpressed in prostate cancer, including metastatic disease. Lu-177 has a relatively long physical half-life of 6.73 days. It is these physical properties that allow for the delivery of high activities of Lu-177 PSMA to prostate cancer cells.
Differentiation Point	Best In Class This compound is composed of Glutamate-Urea-Lysine moiety known as a pharmacophore for PSMA inhibitors, and a chelating agent for a radioisotope connected by a linker. This linker is very distinctive to make this molecule stable and safe due to its simple chemical structure compared to those of other products. This reference-based data is being investigated by performing some experiments to confirm the advantage of our chemical.
Current Development Stage	Pre-Clinical
Route of Administration	Parenteral-Intravenous
Data	Structure of PSMA-GUL-DOTA
Patent Position	PCT/KR2016/012849



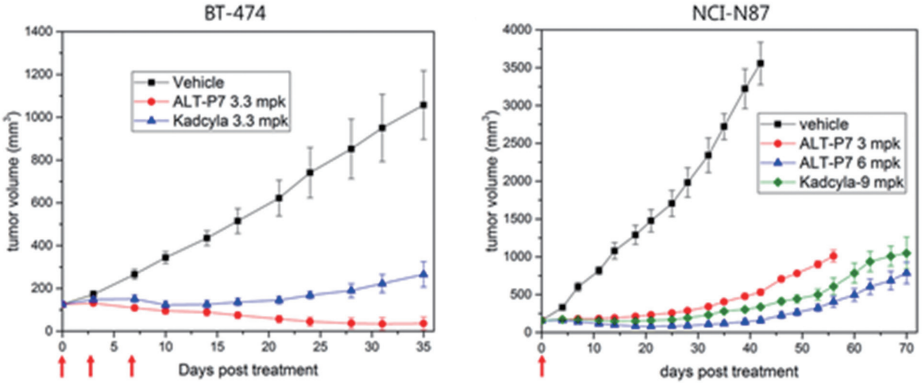
TaeRahk Kim trkim11@cellbion.co.kr (+82)2-743-3311

Phase I clinical study of HER2-positive breast cancer by an antibody-drug conjugate ALT-P7

Alteogen, Inc.

ALTEOGEN Inc.

Product Type	Immunoglobulin Product (mAb) Antibody-drug conjugate (ADC)
Indication	1st indication: Her2-positive breast cancer, Breast neoplasms (MeSH term) 2nd indication: Her2-positive gastric cancer, Stomach neoplasms (MeSH term)
Target	Human epidermal growth factor receptor 2 (Her2)
MoA (Mechanism of Action)	Antibody-based Her2-positive cancer cell targeting followed by a payload-dependent cancer cell death
Differentiation Point	Best In Class -Drug conjugation at a specific site of the antibody allows ALT-P7 a structural stability and low in vivo toxicity, compared to non-specifically conjugated ADC. -Cleavable linker permits ALT-P7 the bystander killing effect and shows superior efficacy to non-cleavable linker-adopted ADC in Herceptin-resistant in vivo models.
Current Development Stage	Phase I
Route of Administration	Parenteral-Intravenous
Data	1. Superior in vivo efficacy in mouse xenograft studies. - Higher in vivo efficacy and a complete regression of tumor in BT-474 breast carcinoma xenograft model. - Better in vivo efficacy even in lower dose in NCI-N87 gastric carcinoma xenograft model. 2. Phase I study is underway for the safety, tolerability, pharmacokinetics, and effective dose determination on a first-in-human setting.

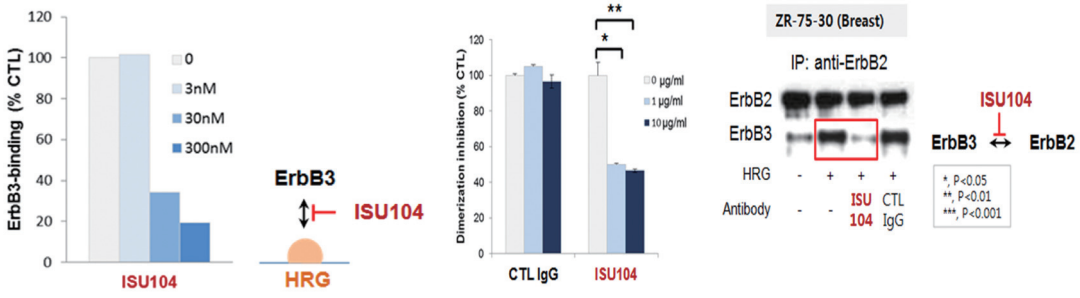


KyeongHoon Jeong khjeong@alteogen.com (+82)42-867-8782

ISU104, A fully human IgG1 monoclonal antibody blocking human ErbB3

ISU ABXIS Co., Ltd

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: Head and Neck Cancer, Head and Neck Neoplasms (MeSH term) 2nd indication: Breast Cancer, Breast Neoplasms (MeSH term)
Target	Human epidermal growth factor receptor 3 (ErbB3)
MoA (Mechanism of Action)	Anti-cancer mAb via blocking ErbB3 signaling
Differentiation Point	Best In Class - Dual blocker (ligand binding & receptor dimerization) - Tumor growth regression (TGR) in HNSCC, →50% tumor growth inhibition (TGI) (→10 sc/orthotopic xenograft & syngeneic models). - Confirmed ErbB3 upregulation by Erbitux-resistance (Bypass MOA for SOC resistance) - TGR (Erbitux-resistant xenograft model) & stronger TGI by various combination w/ SOC (HNSCC)
Current Development Stage	Phase I
Route of Administration	Parenteral-Intravenous
Patent Position	WO2017-099362 A1 / PCT, KR 10-2017-0067637 / Korea, KR 10-2017-0067638 / Korea
Data	ISU104 is a specific dual blocker for ligand binding and ErbB3 dimerization • Ligand Blocker • Dimerization Blocker

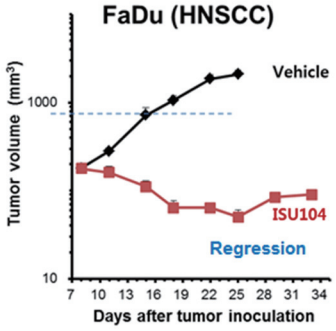


Minho Ihm ihmhjoy@isu.co.kr (+82)31-696-4753

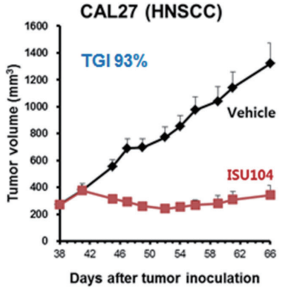
Data

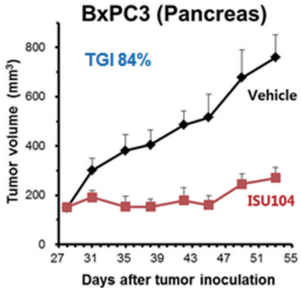
Efficacy in vivo : Tumor growth in mice

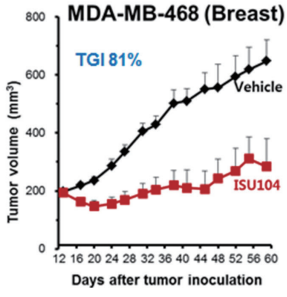
- Tumor growth regression (TGR) in HNSCC

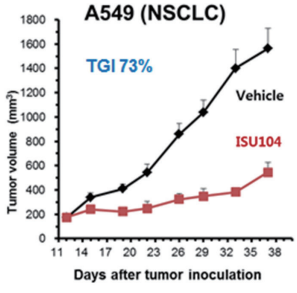


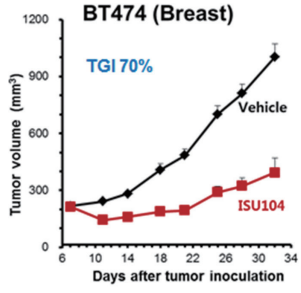
- Tumor growth inhibitions (TGI) in various xenografts & syngeneic models





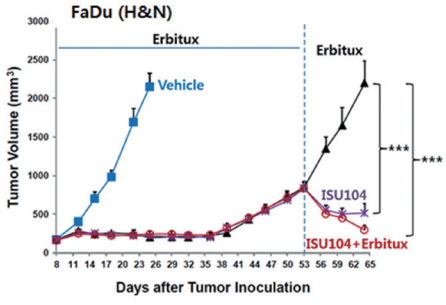


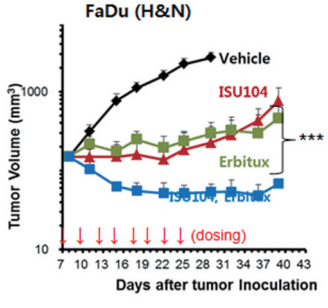




Resistance Overcome: Tumver growth & Cell proliferation

- TGR in Erbitux-resistant H&N cancer model
- TGR by combination of ISU104 w/ Erbitux

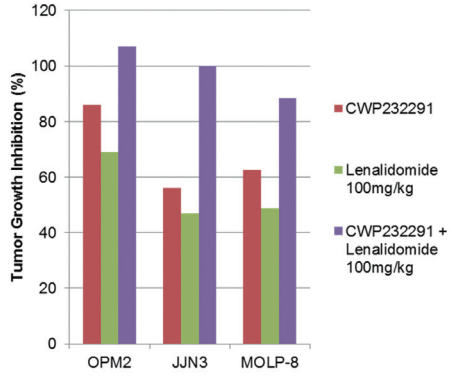




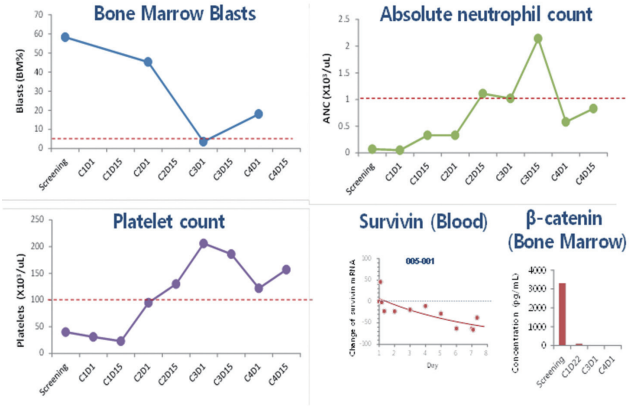
CWP232291
First-in-class Wnt signaling pathway inhibitor

JW Pharmaceutical

Product Type	Chemical Product
Indication	1st indication: Relapsed/Refractory Multiple Myeloma, Multiple Myeloma (Mesh term) 2nd indication: Relapsed/Refractory Acute Myeloid Leukemia, Leukemia, Myeloid, Acute (MeSH term)
Target	Wnt signaling pathway
MoA (Mechanism of Action)	Inhibit Wnt signaling pathway by disrupting the unfolded protein response and endoplasmic reticulum stress, resulting in tumor-selective apoptosis
Differentiation Point	CWP232291 showed single agent efficacy and good candidate for combo. with SOC
Current Development Stage	Phase I b
Route of Administration	Parenteral-Intravenous
Data	Synergistic effect with SOC in Multiple Myeloma xenograft model



Single-agent efficacy in RR-AML patients with excellent tolerability

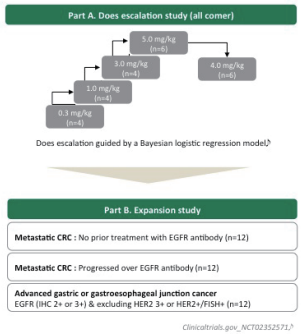


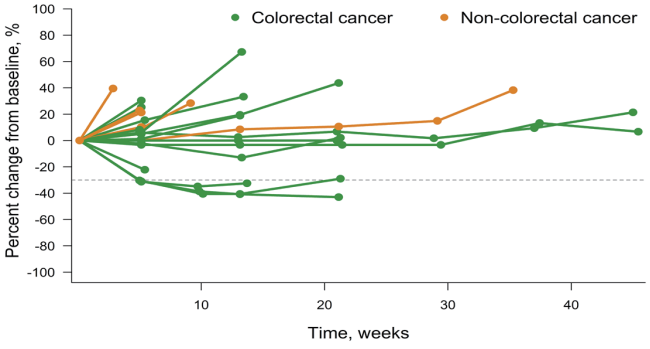
ZiHo Yeom zhyeom@jw-pharma.co.kr (+82)2-840-6885

Development of a novel EGFR-targeted antibody

GCPharma

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: Colorectal cancer, Colorectal Neoplasms (MeSH term) 2nd indication: Gastric cancer, Stomac Neoplasms (MeSH term)
Target	Epidermal Growth Factor Receptor
MoA (Mechanism of Action)	Binds to EGFR and interrupts the binding of EGFR ligands to EGFR
Differentiation Point	Best In Class Different binding epitope/More efficient inhibition of EGFR ligand binding to EGFR esp. high-affinity ligands
Current Development Stage	Phase I b
Route of Administration	Parenteral-Intravenous
Data	Phase 1 dose escalation study indicated that weekly infusion of GC1118 is tolerable and safety Partial response was observed from dose level of 4 and 5 mg/kg and best disese control rate was 67% In Expansion study 58.3% of DCR was observed in CRC patients with no prior EGFR therapeutics and 1 out of 12 gastric cancer patients showed PR Phase 1b/2a is open to evaluate the safety and efficacy of GC1118 in combination with FOLFIRI or irinotecan





Patent Position	WO2011/040668, WO2013/147509

Jiyoung Kim kimjy119@greencross.com (+82)31-260-0845

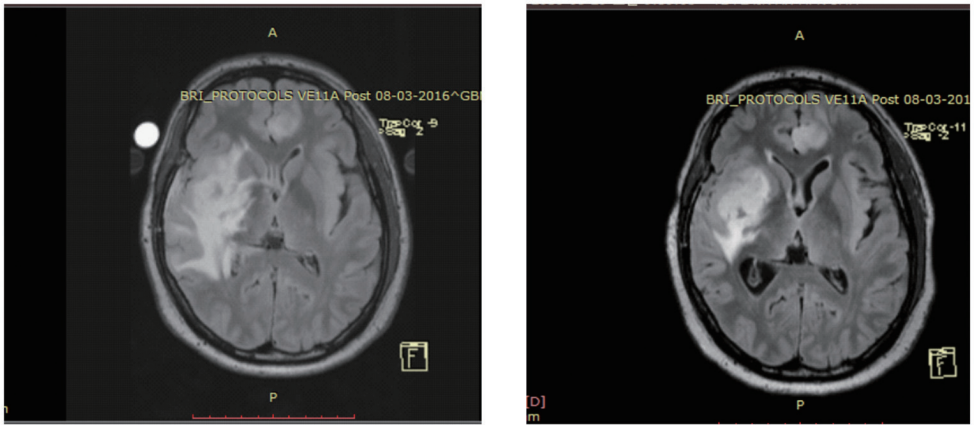
Clinical Phase IIa Trial with Tanibirumab, a Novel Anti-Cancer Antibody Therapeutics, in Recurrent Glioblastoma Patients

PharmAbcine

PharmAbcine
Antibody Therapeutics for Life

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: recurrent glioblastoma, glioblastoma (MeSH term) 2nd indication: breast cancer, breast neoplasms (MeSH term)
Target	VEGFR-2
MoA (Mechanism of Action)	Inhibit tumor angiogenesis by blocking VEGFs binding to VEGFR-2
Differentiation Point	Best In Class Fully human, good safety and activity
Current Development Stage	Phase II a
Route of Administration	Parenteral-Intravenous
Data	25 % diseae control rate (upto 16 cycles (1.5 years)) in rGBM phase IIa 42 % patients showed relief of edema in rGBM phase Iia (figure) 16.7 % patients showed steroid use reduction in rGBM phase Iia

Before **After**



Patent Position	WO2008153237

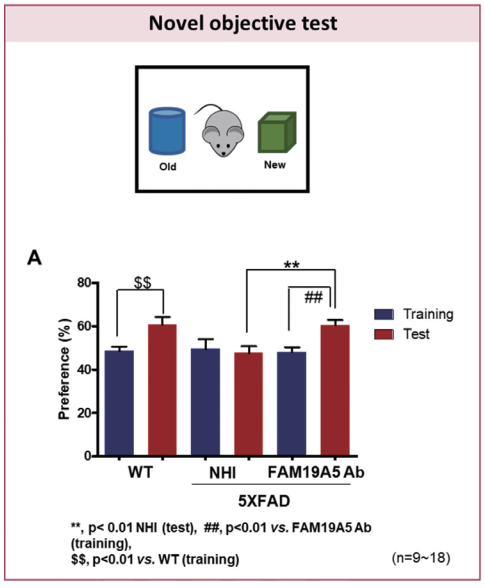
WeonSup Lee weonsup.lee@pharmabcine.com (+82)43-235-2017(ext 3001)

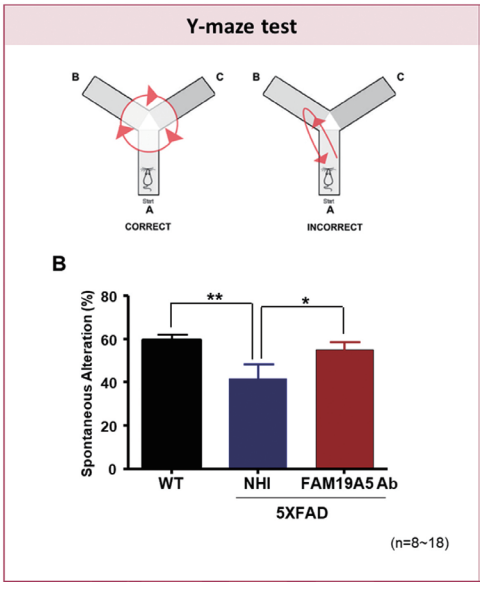
Development of therapeutic antibody for Alzheimer's disease by targeting glial scar formation

Neuracle Science Co., Ltd.

NEURACLE SCIENCE

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: Alzheimer`s disease, Alzheimer Disease (MeSH term)
Target	Family with similarity 19, member A5 (FAM19A5)
MoA (Mechanism of Action)	Glial scar remodeling and vessel normalization through increased immune activity
Differentiation Point	First In Class
Current Development Stage	Lead Generation (Hit to Lead)
Route of Administration	Parenteral-Intravenous
Data	FAM19A5 antibody efficacy test with Alzheimer`s disease animal model





Patent Position	US9579398B2

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Novel Anti-depressant by triple reuptake inhibition

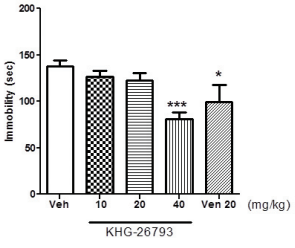
Korea Insititute of Science and Technology

Korea Institute of Science and Technology

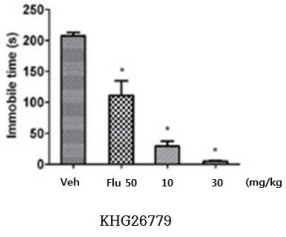
Product Type	Chemical Product
Indication	1st indication: anti-depressant, Nervous System Diseases (MeSH term)
Target	Reuptake inhibition of neurotransmitters
MoA (Mechanism of Action)	Reuptake inhibition of neurotransmitters
Differentiation Point	Reuptake inhibition of three neurotransmitters (dopamine, serotonin, norepinephrine) simultaneously
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Oral
Data	- Excellent reuptake inhibitory activities against three neurotransmitters - hERG, CYP, Microsomal stability, BBB, PK

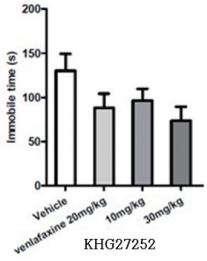
In vivo

Forced Swimming Test (FST)

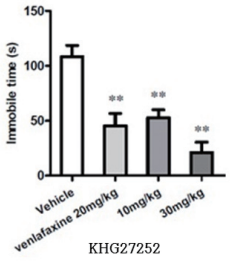


*p<0.05, ***p<0.001 compared with the Veh group.

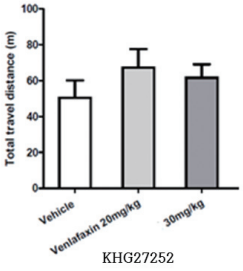




Tail suspension test (TST)



Locomotion test



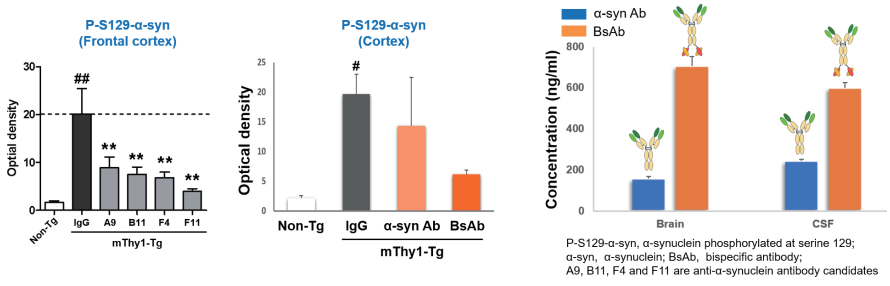
Patent Position	PCT/KR2012/007076, KR10-1561992, KR10-1651994

HohGyu Hahn hghahn@kist.re.kr (+82)2-958-5139

Bispecific Antibody Targeting Pathological α-synuclein with Improved Blood-brain Barrier Penetration

ABL Bio

Product Type	Immunoglobulin Product (mAb), Bispecific antibody
Indication	1st indication: Parkinson's Disease, Parkinson Disease (MeSH term) 2nd indication: Multiple Systems Atrophy, Multiple Systems Atrophy (MeSH term)
Target	- Aggregated forms of α-synuclein - A receptor on surface of brain endothelial cells
MoA (Mechanism of Action)	1. Increase α-synuclein clerance, inhibit cell-to-cell transmission of α-synuclein 2. BBB penetration: receptor-mediated transcytosis
Differentiation Point	First In Class The drug is bispecific antibody targeting α-synuclein aggregate with improved BBB penetration
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intravenous
Data	• Anti-α-synuclein antibody binds selectively to α-synuclein aggregates in vitro. • Bispecific antibody composed of the anti-α-synuclein antibody above and BBB shuttle enters into rat CSF and brains better than anti-α-synuclein antibody. • Bispecific antibody shows better therapeutic efficacy in animal model of Parkinson's disease by clearing aggregated α-synuclein more than anti-α-synuclein antibody and control IgG.



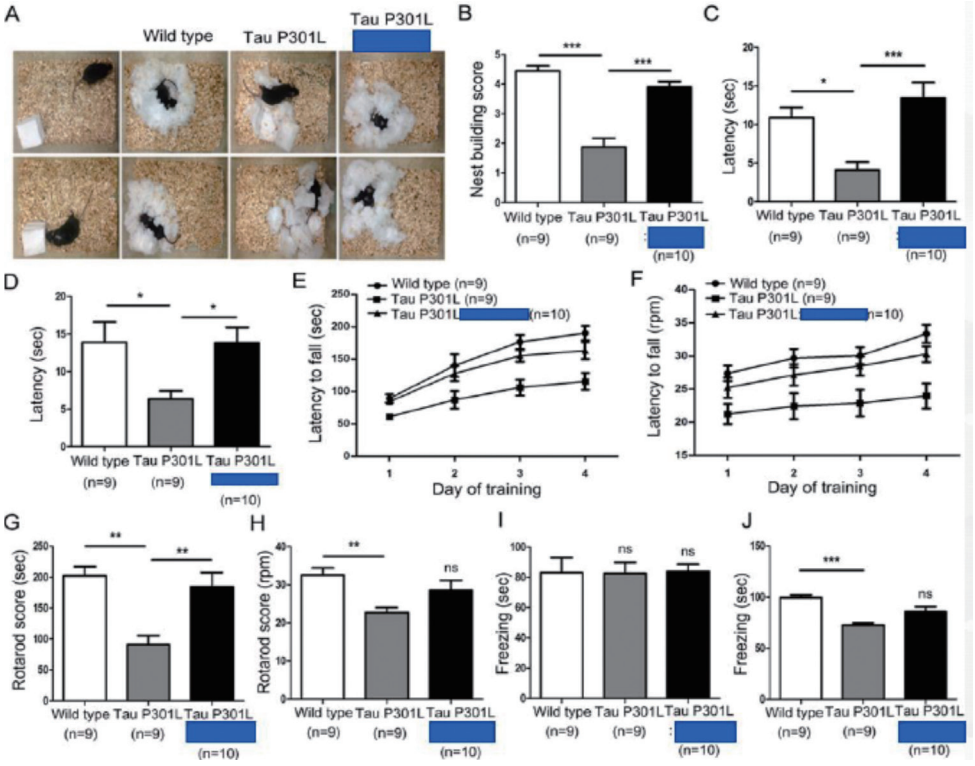
P-S129-α-syn, α-synuclein phosphorylated at serine 129; α-syn, α-synuclein; BsAb, bispecific antibody; A9, B11, F4 and F11 are anti-α-synuclein antibody candidates

Sungwon An sungwon.an@ablbio.com (+82)10-6555-4137

Tau Antibody development for Alzheimer's Disease

ADEL, Inc.

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: Alzheimer's disease, Alzheimer Disease (MeSH term) 2nd indication: Tauopathy, Tauopathies (MeSH term)
Target	Tau(specific epitope with post-translational modification)
MoA (Mechanism of Action)	anti-aggregation & anti-propagation of pathologic Tau protein, etc.
Differentiation Point	First therapeutic antibody targeting the specific epitope of Tau
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intravenous
Data	in vivo efficacy of Tau antibody



Patent Position	PCT/KR2017/015137

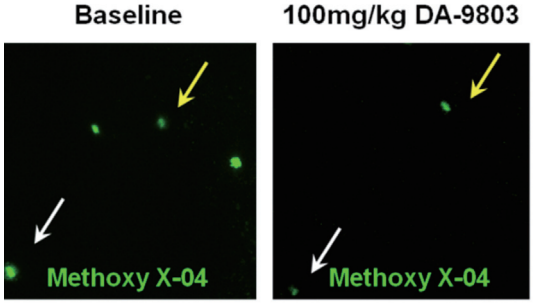
SeungYong Yoon ysy@amc.seoul.kr (+82)2-3010-4241

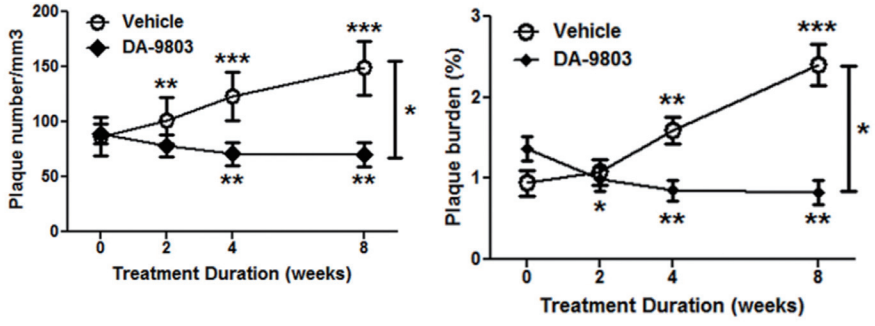
Novel Botanical Drug Development for Alzheimer`s disease in the US

Dong-A ST

DONG-A ST

Product Type	Botanical drug
Indication	1st indication: Alzheimer disease, Nervous System Diseases (MeSH term)
Target	Multi-Target (Aβ, Tau, AChE)
MoA (Mechanism of Action)	1) Disease-treating via removal of disease-causing source Aβ, ptau 2) Improving cognitive ability via AChE inhibition 3) Neuroprotection via NGF
Differentiation Point	Multi-function (Disease modifying and symptomatic effects)
Current Development Stage	Pre-Clinical
Route of Administration	Undecided
Data	Amyloid beta research (Brain of APP/PS1 mouse) (Alzheimers Res Ther. 2018 Jan 29;10(1):11)





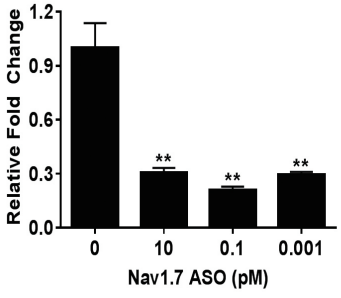
Patent Position	PCT/KR-2015-013134 , PCT/KR2015/013136

Hyeyeon Soh gpdus67@donga.co.kr (+82)31-280-1374

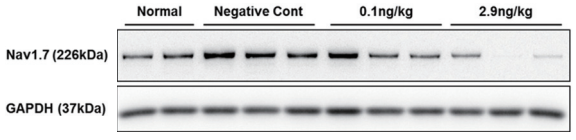
Novel Pain Killer SCN9A Antisense Oligonucleotide

OliPass Corporation

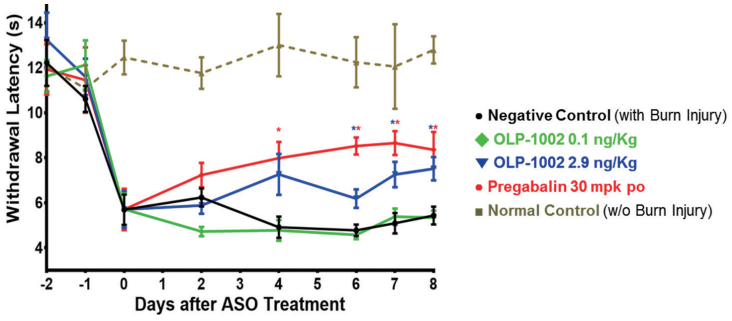
Product Type	RNAi, Antisense oligonucleotide
Indication	1st indication: Suffering, Physical, Pain (MeSH term)
Target	Sodium Voltage-Gated Channel Alpha Subunit 9 / SCN9A
MoA (Mechanism of Action)	OliPass PNA tightly binds to a specific region in pre-mRNA and potently induces exon skipping
Differentiation Point	Improvements in cell permeability will lead to lower doses and bettertherapeutic ratios
Current Development Stage	Phase I
Route of Administration	Parenteral-Subcutaneous
Data	SCN9A mRNA Level



Nav 1.7 expression in DRG (ex Vivo)



In vivo- Burn Model Pain Behivior



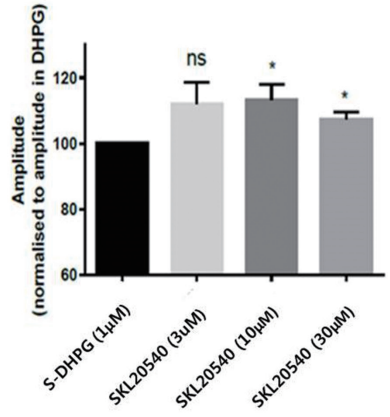
Patent Position	PCT/KR2009/001256, PCT/WO02009/113828

Hanyong Lee hylee@olipass.com (+82)10-3012-5644

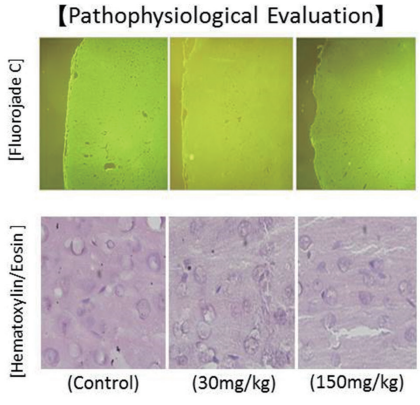
A New Generation of Anti-Psychotics Specialized in Schizophrenia with the improvement of Negative Symptom

SK biopharmaceuticals

Product Type	Chemical Product
Indication	1st indication: Schizophrenia, Schizophrenia (MeSH term)
Target	Metabotropic glutamate receptor subtype 5 (mGluR5)
MoA (Mechanism of Action)	Positive modulator of mGluR5 by binding the allosteric site thereof without the agonistic character to activate NMDA receptor
Differentiation Point	First In Class The compound is a non dopamined-based drug having the therapeutic effect on the netive symptom as well as the positive symptom and mitigating metabolic side effects caused by the currently marketed drugs
Current Development Stage	Phase I
Route of Administration	Oral
Data	- Confirmed that NMDAR-mediated fEPSP at CA region of hippocampus was enhaced - Confirmed that there was no significant toxicities which are related to the target receptor



A paired, one-tailed t-test (S-DHPG(N=3), 3μM(N=5), 10μM(N=7), 30μM(N=3))



Myoungki Baek myoungki.baek@sk.com (+82)31-8093-0110

Phase 2A Clinical Study of JPI-289 for the Treatment of Stroke

JEIL Pharmaceutical Co., Ltd.

JEIL PHARMACEUTICAL CO.,LTD.

Product Type

Chemical product

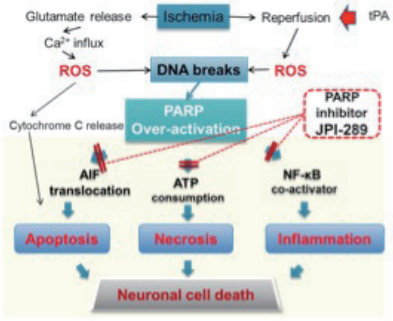
Indication

1st indication: Stroke, Stroke (MeSH term)

Target

Poly(ADP-ribose) polymerase-1 (PARP-1)

MoA (Mechanism of Action)



Differentiation Point

1. Inhibition of PARP-1 is a significantly distinct mechanism of action and is expected to show high efficacy in clinical trials with ischemic stroke patients through the neuroprotective effects.
2. In a monkey tMCAO stroke model, JPI-289 showed 49% decrease in infarction volume, which is the best result in the world when compared with that of 21% decrease in infarction volume by MP-124. Therefore, JPI-289 among PARP inhibitors is considered as one of the most promising agents for the treatment of stroke.
3. Safety of JPI-289 has been confirmed in healthy volunteers and stroke patients because there were no serious adverse events (SAEs) during phase 1 and phase 2A cohort 1 studies.

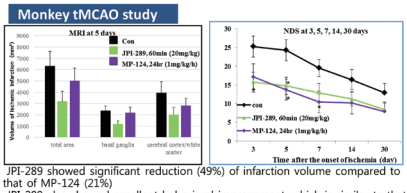
Current Development Stage

Phase II a

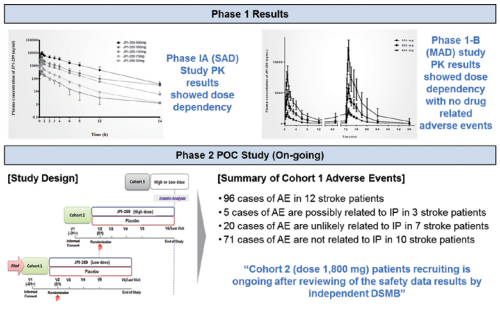
Route of Administration

Parenteral-Intravenous

Data



- JPI-289 showed significant reduction (49%) of infarction volume compared to that of MP-124 (21%)
- JPI-289 also showed excellent behavioral improvement, which is similar to that of MP-124



Patent Position

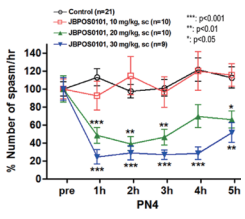
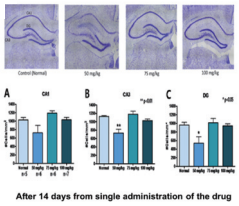
WO2010056038, WO2013115535

JeongMin Kim jminkim@jeilpharm.co.kr (+82)31-332-4457(Ext. 772)

Pre-Clinical study of new chemical entity for orphan disease: infantile spasms

Bio-Pharm Solutions

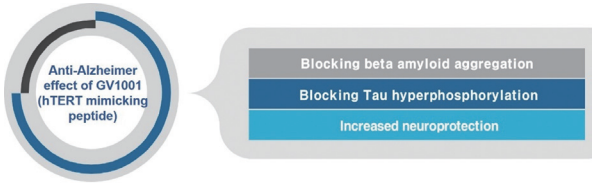
B-PS Bio-Pharm Solutions Co., Ltd.

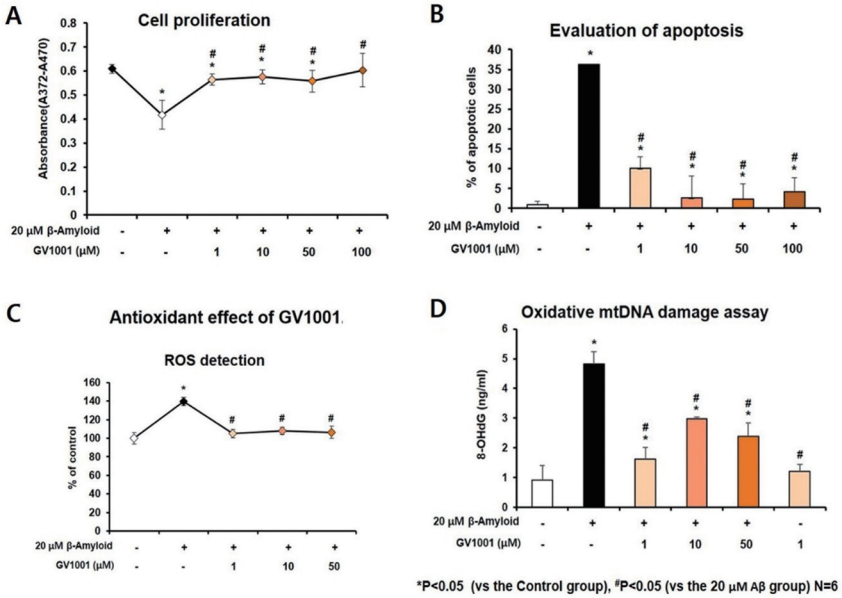
Product Type	Chemical Product
Indication	1st indication: Infantile Spasms (West Syndrome), Spasms, Infantile (MeSH term) 2nd indication: Status Epilepticus, Status Epilepticus (MeSH term)
Target	Metabotropic glutamate receptor family 1 & 3, glycolysis pathway
MoA (Mechanism of Action)	**In vitro** - Work as agonist of mGluR 4 & 5 and antagonist of mGluR 1, 5, and 7 - Protects pericytes against tPA-induced cytotoxicity and cell death - Interacts with phosphoglycerate kinase 1 and pyruvate dehydrogenase E1 alpha in the glycolysis pathway (on-going) **Ex vivo** - Using hippocampal slice on multielectrode array system, JBPOS0101 reduced significantly pilocarpine-induce spontaneous activity and reconfirmed JBPOS0101's agonist for mGluR 4 and antagonist for mGluR 1, and 7 **In vivo** - Protects BBB against Li-pilocarpine-induced SE and collagenase-induced intracerebral hemorrhage - Blocks hippocampal cell death in Li-pilocarpine-induced SE - JBPOS0101 shows broad spectrum of efficacy in the various conventional nonclinical epilepsy screening results in B-PS & ASP's studies **Bio-Marker** - EEG as a functional Bio-marker to show epilepsy state and efficacy of the stes drug
Differentiation Point	Best In Class The drug is expecting the best efficacy in the pediatric epilepsy.
Current Development Stage	Phase II
Route of Administration	Oral
Data	A) The drug shows good suppression of behiavoral spasms.  B) The drug protects hippocampal cell death against to Status Epilepticus.  After 14 days from single administration of the drug
Patent Position	13/175,025 / US, 10-2012-7033745 / KR, 15/190,123 / US

Yongho Kwak yhkwak@b-psol.com (+82)31-888-9636

Development of telomerase derived peptide, GV1001 in Alzheimer's disease

GemVax & KAEL Co., Ltd.

Product Type	Peptide product
Indication	1st indication: Alzheimer's disease, Alzheimer Disease (MeSH term)
Target	Unknown
MoA (Mechanism of Action)	
Differentiation Point	First In Class GV1001 is the first telomerase-derived peptide drug for the treatment of Alzheimer's disease.
Current Development Stage	Phase II
Route of Administration	Parenteral-Subcutaneous
Data	GV1001 effectively blocks β-amyloid toxicity by mimicking the extra-telomeric functions of human telomerase reverse transcriptase, including the induction of cellular proliferation, anti-apoptotic effects, mitochondrial stabilization, and anti-aging and anti-oxidant effects.



Patent Position	Patent No. 10-1685551 / KR, Patent No. 9540419 / US, Patent No. 201380036639.9 / CN

Eujin Hyun eujinhyun@kaelgemvax.com (+82)70-8670-0943

A Potential Game Changer for partial onset seizures (Cenobamate)

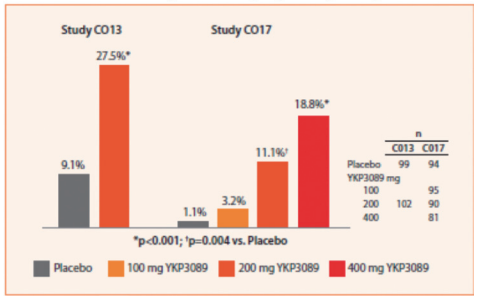
SK biopharmaceuticals

Product Type	Chemical Product
Indication	1st indication: Epilepsy, epilepsy (MeSH term)
Target	Voltage-gated Sodium channel inhibition and GABAergic modulation
MoA (Mechanism of Action)	Dual mechanism having sodium channel blocking and enhancing GABAergic inhibition
Differentiation Point	Best in class - Superior efficacy compared to other commercialized anti-epileptic drugs - Signals of 100% reduction in seizures - unique profile having both neurological and psychological profile
Current Development Stage	Phase III
Route of Administration	Oral
Data	- Cenobamate across all doses (100~400 mg) was highly effective vs. placebo in reducing the frequency of partial-onset seizures with traditional efficacy endpoints (median %seizure reduction; responder rate) - Cenobamate at 200 and 400 mg was highly effective vs. placebo in achieving seizure freedom - Most common AEs were dose-related and included somnolence, dizziness, fatigue, diplopia, and gait disturbances

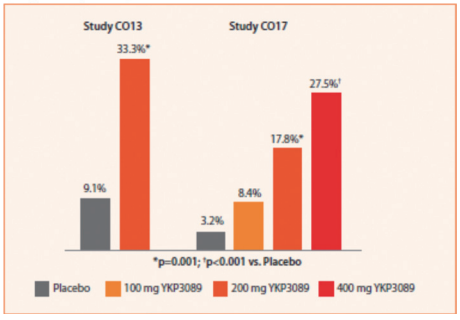
Traditional Efficacy Endpoints: Median % Reduction from Baseline 28-Day Seizure Frequency and Responder Rate (ITT Population)

	C013		C017			
		YKP3089		YKP3089		
	Placebo	200	Placebo	100	200	400
Median % reduction	21.5	55.6	24.0	35.5	55.0	55.0
P value		<0.001		0.007	<0.001	<0.001
Responder rate, %	22.2	50.4	21.7	40.7	56.9	60.4
P value		<0.001		0.003	<0.001	<0.001

% Patients Seizure-Free During Maintenance (Completer Population)



% Patients with ≥90% Reduction from Baseline Seizure Frequency (Completer Population)



Patent Position	US Patent No. US7598279B2

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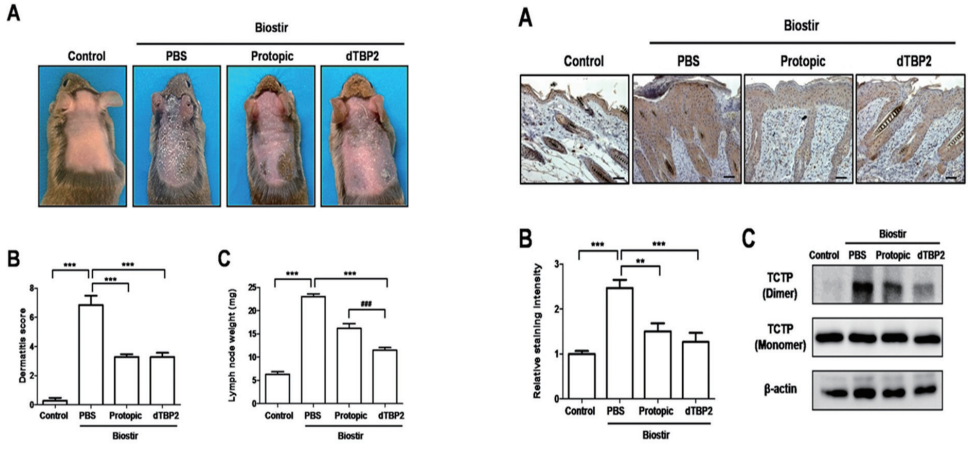
Development of a new lead compound targeting Histamine-releasing factor to treat atopic dermatitis

Ewha Womans University

Product Type	Peptide Product (7 mer)
Indication	1st indication: atopic dermatitis, Dermatitis, Atopic (MeSH term)
Target	Histamine releasing factor
MoA (Mechanism of Action)	HRF inhibiting peptide(dTBP2)→HRF inhibition→Targeted therapy for AD
Differentiation Point	First In Class Novel target
Current Development Stage	Lead Generation (Hit to Lead)
Route of Administration	Parenteral-Subcutaneous
Data	Dimerized translationally controlled tumor protein-binding peptide 2 (dTBP2) ameliorates house dust mite-induced atopic dermatitis. dTBP2 suppresses level of dTCTP (target) in AD-like skin lesions.



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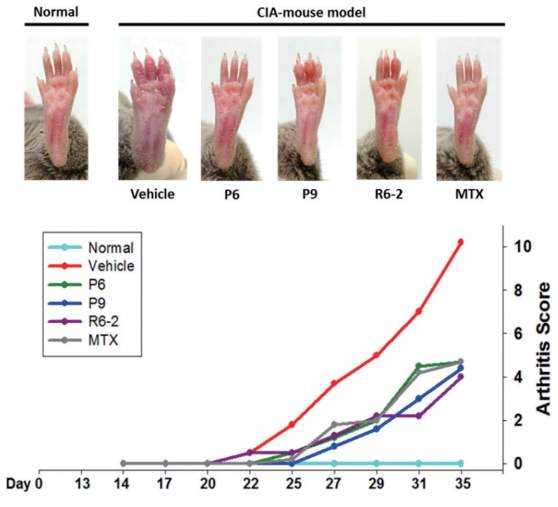
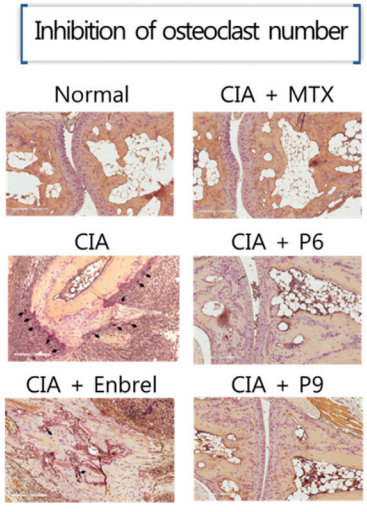
Development of drug candidates for treatment of rheumatoid arthritis by optimization of Erdr1-derived peptides

Sookmyung Women's University

SOOKMYUNG WOMEN'S UNIVERSITY

Product Type	Peptide product
Indication	1st indication: Rheumatoid arthritis, Arthritis, Rheumatoid (MeSH term)
Target	Regulatory T-cells (T-reg)
MoA (Mechanism of Action)	Increased Treg cell number and activity → Suppression of rheumatoid arthritis pathogenesis
Differentiation Point	First In Class Novel small peptide from Erdr1 protein Specific target identification for each peptides
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intravenous or Subcutaneous
Data	



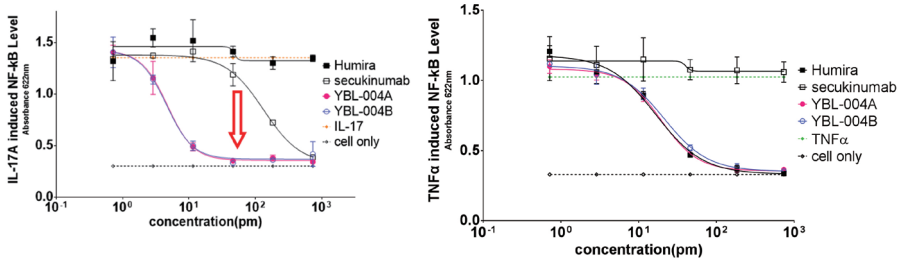


Daeho Cho cdhkor@sookmyung.ac.kr (+82)2-710-9416

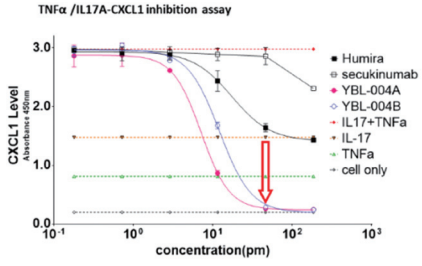
YBL-004
Bi-specific Antibody that inhibit dual inflammatory axis

Y-biologics Inc.

Product Type	Immunoglobulin Product (mAb), Bispecific Antibody
Indication	1st indication: Ankylosing Spondylitis, Spondylitis, Ankylosing (MeSH term) 2nd indication: Psoriatic Arthritis, Arthritis, Psoriatic (MeSH term)
Target	Tumor necrosis factor alpha (TNFα) and Interleukin 17A (IL-17A)
MoA (Mechanism of Action)	YBL-004 neutralize TNFα and IL-17A simultaneously.--→ Completly Inhibits the expression of pro-inflammatory cytokines than other single antibody.
Differentiation Point	• One shot Two kill: response rate & Disease modifying compared to TNF- α, IL-17A blockade • Could be applied to Non-responders to TNF- α blockade as an alternative strategy. • Easy to treatment & low cost compare to combination therapy • May be a choice for TNF- α blockade discontinuation
Current Development Stage	Pre-Clinical
Route of Administration	Parenteral-Subcutaneous
Data	YBL-004 : Synergy in inhibition of inflammatory cytokine production productionYBL-004 shows better efficacy to inhibit IL-17 activity compared to Secukinumab & similar efficacy to inhibit TNFα activity comparedto Humira.



YBL-004 shows synergy effect to inhibit the production of inflammatory cytokine.



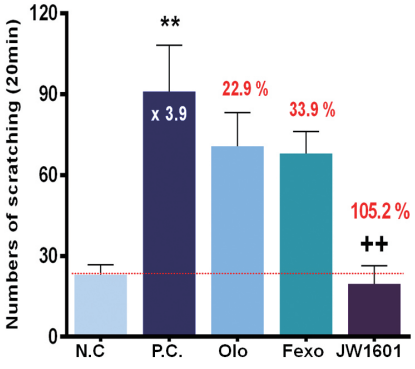
Patent Position	10-2017-0149362 / Korea

Younggyu Cho younggyucho@ybiologics.com (+82)42-716-4979

A H4R antagonist with anti-pruritic & anti-inflammatory dual effect as a treatment for atopic dermatitis

JW Pharmaceutical

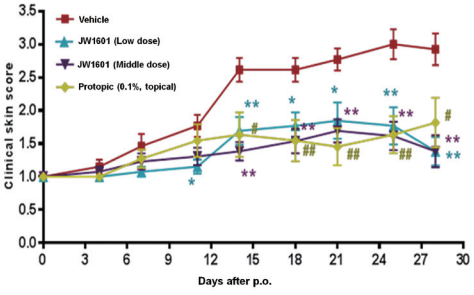
Product Type	Chemical Product
Indication	1st indication: Atopic Dermatitis, Dermatitis, Atopic (MeSH term) 2nd indication: Pruritus, Pruritus (MeSH term)
Target	Histamine H4 Receptor (H4R)
MoA (Mechanism of Action)	① Inhibition of pruritic signal transduction mediated by H4R →Blockade of pruritogen release → anti-pruritic effect ② Inhibition of immune cell migration →inhibition of Th2 cytokine production → anti-inflammatory effect
Differentiation Point	First In Class Novel target (FIC), Dual function, Broad safety margin
Current Development Stage	Pre-Clinical
Route of Administration	Oral (QI)
Data	• Histamine-induced itch model One-way ANOVA Dunnett's test ** p<0.01 vs N.C. and ++ p<0.01 vs P.C. Olo: Olopatadine (H1R antagonist) Fexo: Fexofenadine (H1R antagonist)



• Spontaneous NC/Nga AD mice model

JW1601: Steel test, * p<0.05, ** p<0.01 vs Vehicle

Protopic: Wilcoxon's test, # p<0.05, # # p<0.01 vs. Vehicle



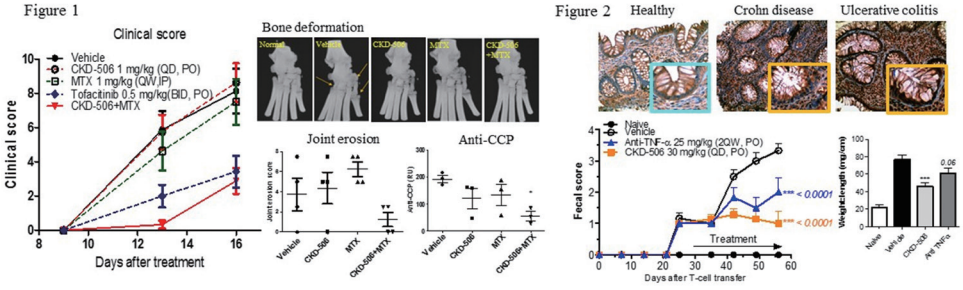
Patent Position	WO2013048214

PilSu Ho psho@jw-pharma.co.kr (+82)2-840-6054

CKD-506, a selective HDAC6 Inhibitor for the Treatment of Autoimmune Disease

Chong Kun Dang Pharmaceutical Corporation

Product Type	Chemical product
Indication	1st indication: Rheumatoid Arthritis, Arthritis, Rheumatoid (MeSH term) 2nd indication: Inflammatory Bowel Disease, Inflammatory Bowel Disease (MeSH term)
Target	Histone Deacetylase 6 (HDAC6)
MoA (Mechanism of Action)	TNF alpha Inhibition and Regulatory T cell Activiation
Differentiation Point	First In Class CKD-506 has strong synergistic efficacy with Methotrexate in adjuvant-induced arthritis (AIA) and better efficacy than anti-TNF therapy in animal models of autoimmune disease rheumatoid arthritis and inflammatory bowel disease
Current Development Stage	Phase II a
Route of Administration	Oral
Data	Figure 1. Synergistic efficacy of CKD-506 with Methotrexate in AIA model Figure 2. Better efficacy of CKD-506 than anti-TNF therapy in T cell transferred inflammatory bowel disease animal model



Patent Position	10-2014-0051151/Korea, 14792173.8/Europe, 14/785812/US

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Development of SYK inhibitor for Rheumatoid Arthritis

Oscotec

Oscotec Inc.

Product Type	Chemical Product
Indication	1st indication: Rheumatoid Arthritis, Arthritis, Rheumatoid (MeSH term) 2nd indication: Autoimmune Thrombocytopenia, Purpura, Thrombocytopenic, Idiopathic (MeSH term)
Target	Spleen tyrosine kinase (SYK)
MoA (Mechanism of Action)	ATP competitiive SYK inhibitors
Differentiation Point	Best In Class SKI-O-793 has better efficacy and safety characteristics in animal and human study when compared to existing SYK inhibitors (R788, P505-15).
Current Development Stage	Phase II a
Route of Administration	Oral
Data	1. Phase I clinical study 1) Single ascending dose (SAD) study : completed - Clinical safety (50 to 800 mg oral qd dosing) : no outstanding issue found at any test dose and no other significant findings, including vital signs, ECG and laboratory tests (hematology, serum chemistry, urinalysis) - Strong PD effect in activated basophil followed by anti-IgE stimulation Estimated EC50 of SKI-O-703, ~350 nM in the % activated basophil 2) Multiple ascending dose (MAD) study : completed - 200 mg (qd & bid) and 400 mg (qd): completed at Q2, 2017 - Clinical safety : no outstanding issue found at any test dose - Reproducible PD effect in activated basophil followed by anti-IgE stimulation 2. Phase II clinical study 1) Rheumatoid arthritis : US FDA IND in 2017 Q4 2) Immune thrombocytopenic purpura : US FDA IND in 2018 Q2

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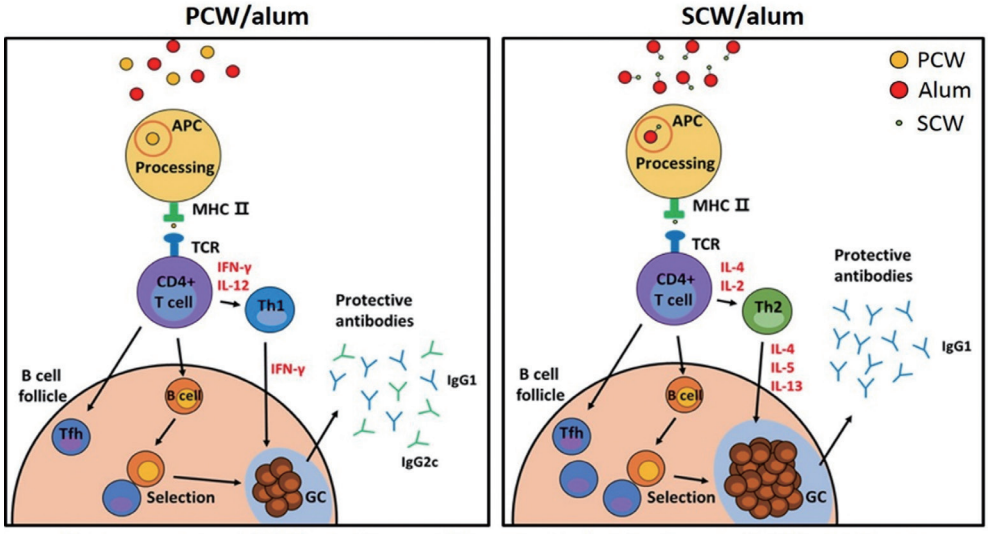
Novel vaccine lead (△SpA-ICW) for methicillin-resistant Staphylococcus aureus (MRSA) infection

Pusan National University

PUSAN NATIONAL UNIVERSITY

Product Type	Vaccine (Subunit Vaccine)
Indication	1st indication: MRSA, Methicillin-Resistant Staphylococcus aureus (MeSH term) 2nd indication: cell wall, cell wall (MeSH term)
Target	Methicillin-Resistant Staphylococcus aureus
MoA (Mechanism of Action)	Vaccination of cell walls → Engulfment by host phagocytes → Phagocytosis → Presentation to T cells & B cells → Memory B cells → MRSA infection → Long-lived Plasma cells → Humoral-immunity mediated clearance
Differentiation Point	First In Class Immunization of purified particulate and soluble staphylococcal cell wall derivatives induce host innate and acquired immune responses, subsequently inducing early stage MRSA clearance, and protecting the host using a memory immune response to a secondary MRSA challenge.
Current Development Stage	Lead Generation (Hit to Lead)
Route of Administration	Undecided
Data	

APC, antigen presenting cell; MHC Ⅱ, major histocompatibility complex class Ⅱ; TCE, T cell receptor; Tfh, T follicular helper cell; GC, germinal center
* PCW : Particulate Cell Wall
* SCW : Soluble Cell Wall

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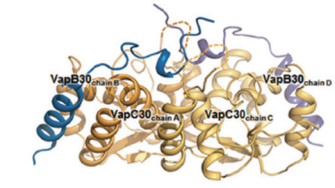
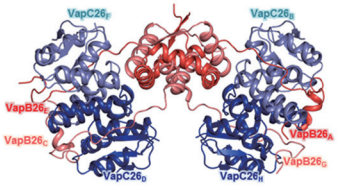
Novel antibiotic peptide based on toxin-antitoxin system

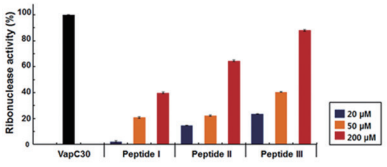
Seoul National University

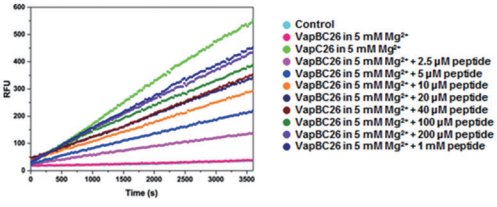
서 울 대 학 교
SEOUL NATIONAL UNIVERSITY

Product Type	Peptide Product (Antimicrobial peptide)
Indication	1st indication: Tuberculosis, Tuberculosis (MeSH term)
Target	Toxin-Antitoxin system
MoA (Mechanism of Action)	Antimicrobial peptides dirupt the Toxin-Antitoxin complex → Free toxin release and cell death
Differentiation Point	First In Class Inhibitory peptides target new mechanism of bacterial physiology
Current Development Stage	Lead Generation (Hit to Lead)
Route of Administration	Parenteral-Intravenous
Data	• The toxicity is not detected in The toxin-antitoxin complex where The toxin toxicity is neutralized by The antitoxin. • When the complex is collapsed due to the designed drug, the toxin is liberated and toxicity is detected.









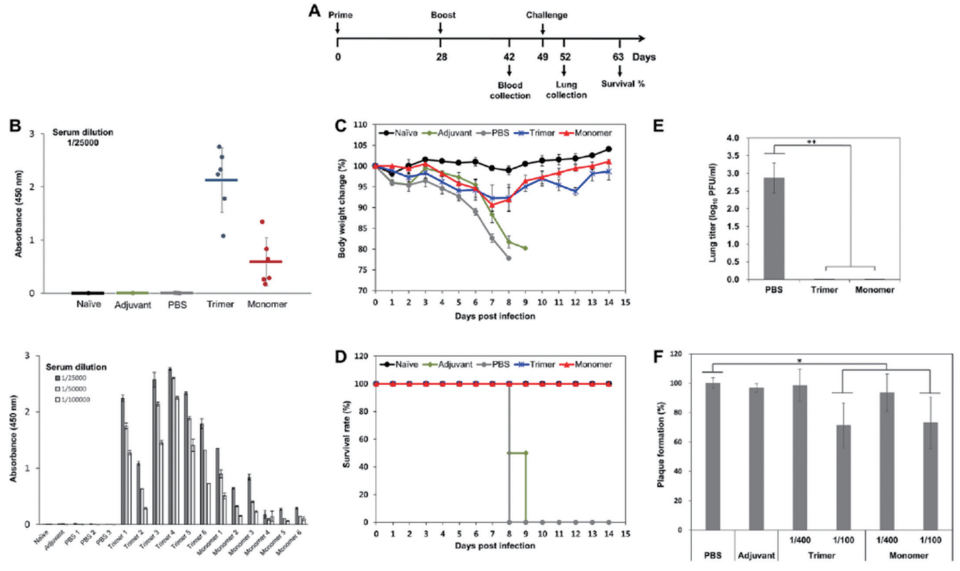
Patent Position	10-1746160 / Korea

SungMin Kang men0528@snu.ac.kr (+82)10-6660-1697

Recombinant monomeric and scaffold-based viral antigens

Korea University Research and Business Foundation Sejong

Product Type	Vaccin (recombinant protein antigens / scaffold-based multiantigens)
Indication	1st indication: influenza vaccines, Influenza Vaccines (MeSH term)
Target	Generation of influenza virus hemagglutinin-specific antibodies
MoA (Mechanism of Action)	Virus attachment, fusion, maturation, and budding
Differentiation Point	First In Class Efficacy comparable to the trivalent vaccine marketed by SK Chemicals, first monomeric antigens and scaffold-based multiantigen
Current Development Stage	Lead Generation (Hit to Lead)
Route of Administration	Intramuscular/Intranasal
Data	Protection of mice against virus infection by preliminary recombinant hemagglutinin monomers. A) Schedule of mouse immunization, B) IgG antibody titration, C) Body weight changes and D) survival rate of PR8-challenged groups, and F) Plaque reduction neutralization assay.



Patent Position	10-2016-0151609/Korea

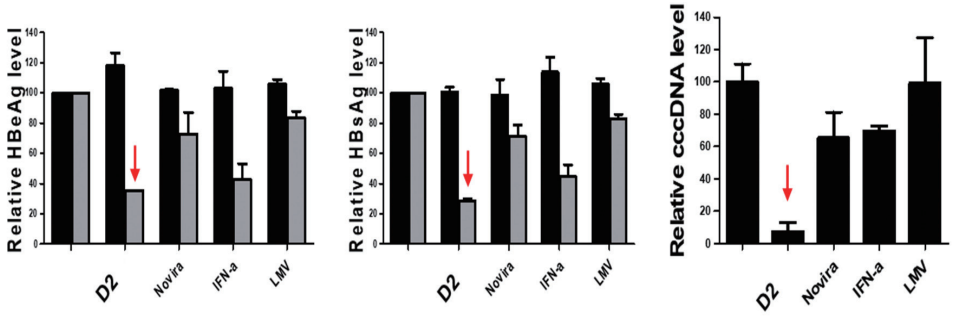
Ji-Hye Lee jihyelee@korea.ac.kr (+82)2-3290-3945

A novel agent targeting covalently closed circular DNA of HBV

Konkuk University

KONKUK UNIVERSITY

Product Type	Oligonucleotide
Indication	1st indication: Hepatitis B, Hepatitis B (MeSH term)
Target	Covalently closed circular DNA
MoA (Mechanism of Action)	Directly targets HBV covalently closed circular DNA
Differentiation Point	First In Class The drug works on all genotypes of hepatitis B virus and drug-resistant mutant viruses.
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Undecided Subcutaneous / Intravenous
Data	Inhibition of viral replication, antigen expression, and level of covalently closed circular DNA in primary human hepatocytes (PHHs).



Patent Position	PCT/KR2017/014662

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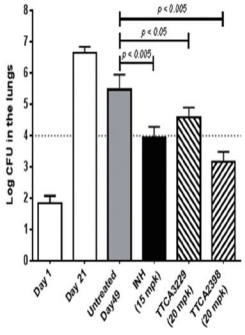
Discovery of novel anti-tubercular agent for the treatment of MDR/XDR TB

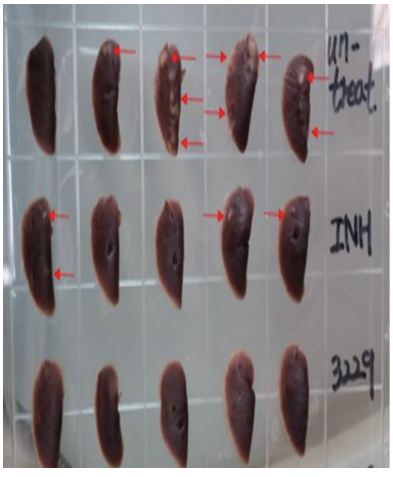
Institut Pasteur Korea

한국파스퇴르연구소 Institut Pasteur Korea

Product Type	Chemical Product
Indication	1st indication: Tuberculosis, Pulmonary, Bacterial Infections and Mycoses (MeSH term)
Target	MDR/XDR TB patients including drug sensitive TB patients
MoA (Mechanism of Action)	Novel (Not identified yet)
Differentiation Point	First In Class Active against latent TB and MDR TB strains / Much more active against TB within macrophage than in liquid broth culture medium / Potent bactericidal effect in vivo / Expected novel MOA related to host or mycobacterial factor within macrophage
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Oral
Data	- Significantly reduced bacterial load (more potent than INH) - Lower number of granulomatous foci in the lung than untreated and INH treated group



Groups	Lung		
	Log_{10}	SD	n
D_1 Pre-treatment control	**1.85**	0.24	5
D_21 Pre-treatment control	**6.64**	0.20	5
After 49 days administration			
Vehicle Un-treat	**5.47**	0.47	5
INH (positive control)	**3.93**	0.36	4
TTCA3229_20mg/kg, QD	**4.59**	0.32	4
TTCA2398_20mg/kg, QD	**3.12**	0.32	2



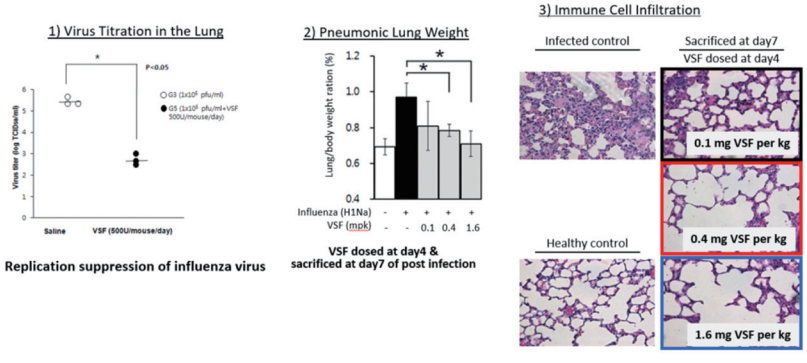
Patent Position	PCT/EP2015/063982

Kaapjoo Park kaapjoo.park@ip-korea.org (+82)31-8018-8009

A novel anti-viral therapeutic antibody selectively targeting virus-infected cells

ImmuneMed, Inc.

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: Virus diseases, Virus disease (Mesh term) 2nd indication: Inflammatory skin disease induced by viral infection, Dermatitis (Mesh term)
Target	Virus suppressing factor Receoptor (VR): viral infection induced, conformationally changed vimentin expressed on the cell surface
MoA (Mechanism of Action)	Proprietary immunoglobulinG4(IgG4) named as Virus Suppressing Factor (VSF) shows anti-viral, anti-inflammatory activity via association of its receptor (VR) which specifically expressed on the surface of virus-infected cells. The receptor protein is vimentin isoform, 60 kilo-Dalton in size and is conformationally changed form of natural vimentin in the cytoplasm. Anti-viral, anti-inflammatory activity of VSF was shown at association of VSF and its receptor VR followed by internalization of the complex into the lysosome and degradation in it.
Differentiation Point	First in Class
Current Development Stage	Pase I
Route of Administration	Parenteral-Intravenous/Parenteral-Intramuscular/Topical administration
Data	• Anti-viral and anti-inflammatory efficacy of VSF in the mice infected with influenza virus: 1) Virus titer was reduced by 1,000 folds, 2) Pneumonic lung was recovered or lung weight was decreased in dose-dependent manner and 3) Infiltration of immune cells was suppressed. • Pre-Clinical tests (in vitro, in vivo) have been done for influenza A, influenza B, Hepatitis B and Hepatitis C. VSF was effective in all the test per formed without cytotoxicity or any side effect.
Patent Position	10-2016-0072697/KR, PCT/KR2016/006215 10-2017-0110924/KR, PCT/KR2017/013706



Replication suppression of influenza virus

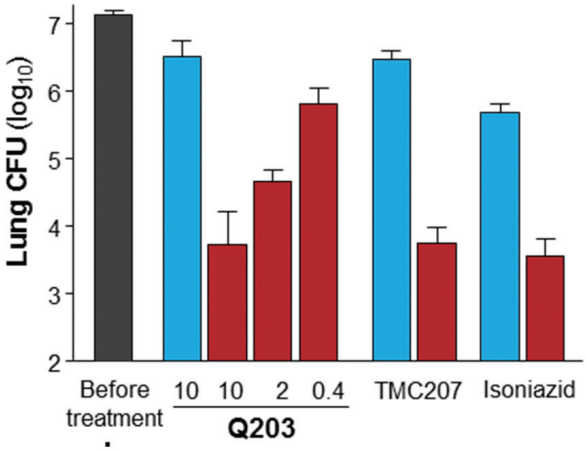
VSF dosed at day4 & sacrificed at day7 of post infection

Jinhee(Jennifer) Bae jhbae@immunemed.co.kr (+82)33-258-6558

Q203, Anti-tuberculosis drug candidate

Qurient Co. Ltd.,

Product Type	Chemical Product
Indication	1st indication: Tuberculosis, Tuberculosis, Pulmonary (MeSH term)
Target	First-in-class compound targeting cytochrome bc1 complex (Complex III) QcrB subunit in TB
MoA (Mechanism of Action)	Blocking of ATP synthase (both aerobic and hypoxic) and decrease in oxygen consumption rate
Differentiation Point	First In Clss Novel mode of action (First-in-Class) Potent in vitro/in vivo, activity against drug resistant. Reduce treatment period (latency) QD or less frequent dosing schedule (increase adherence)
Current Development Stage	Phase I b
Route of Administration	Oral
Data	Strong efficacy in an established mouse TB model Strong efficacy against 13 MDR & 15 XDR clinical isolates



Patent Position	PCT/EP2011/001345

June Kim jkim@qurient.com (+82)31-8060-1610

Clinical study of new oxazolidinone antimicrobial LCB01-0371

LegoChemBio Sciences

Product Type	Chemical Product (Oxazolidinone Antibiotic)
Indication	1st indication: MDR-TB, Tuberculosis, Multidrug-Resistant(MeSH term) 2nd indication: MRSA, Methicillin-Resistant Staphylococcus aureus(MeSH term)
Target	Gram+ (MRSA, VRE, S. pneumoniae), MDR-TB
MoA (Mechanism of Action)	Inhibition of Mitochondrial Protein Synthesis
Differentiation Point	Best in class Safe and Potent Second Generation Oxazolidinone Antibiotics
Current Development Stage	Phase II a
Route of Administration	Oral / Parenteral-Intravenous
Data	- Superior In-Vitro & In-Vivo activity compared with Linezolid - No cross-resistance and Low resistant rate - Excellent efficacy in TB and NTM (M. abscessus) mouse model

✓ **Activity summary of LCB01-0371 and comparator antimicrobial agents**

Organism	Number	Antimicrobial agent	MIC_{50}	MIC_{90}	Range	CLSI %S / %R	EUCAST %S / %R
Staphylococcus aureus	100	LCB-0371	1	4	0.5 – 16	- / -	- / -
		Linezolid	1	8	0.5 – 32	82.0 / 18.0	82.0 / 18.0
		Vancomycin	1	1	0.5 – 2	100.0 / 0.0	100.0 / 0.0
Staphylococcus aureus (Linezolid-resistant)	21	LCB-0371	4	16	1 – 16	- / -	- / -
		Linezolid	8	32	4 – 32	14.3 / 85.7	14.3 / 85.7
		Vancomycin	1	2	0.5 – 2	100.0 / 0.0	100.0 / 0.0
Coagulase-Negative Staphylococci	99	LCB-0371	1	16	0.5 – 32	- / -	- / -
		Linezolid	1	64	0.25 – >64	60.6 / 39.4	60.6 / 39.4
		Vancomycin	2	2	0.5 – 4	100.0 / 0.0	99.0 / 1.0
Enterococcus faecalis	80	LCB-0371	1	1	0.5 – 2	- / -	- / -
		Linezolid	1	1	0.25 – 2	100.0 / 0.0	100.0 / 0.0
		Vancomycin	1	2	1 – 4	100.0 / 0.0	100.0 / 0.0
Enterococcus faecium	99	LCB-0371	1	8	0.5 – 16	- / -	- / -
		Linezolid	1	16	0.5 – 32	68.7 / 23.2	76.8 / 23.2
		Vancomycin	>16	>16	0.5 – >16	24.2 / 75.8	24.2 / 75.8
Enterococcus faecium (Linezolid-resistant)	30	LCB-0371	4	8	2 – 16	- / -	- / -
		Linezolid	8	16	4 – 32	0.0 / 76.7	23.3 / 76.7
		Vancomycin	>16	>16	1 – >16	13.3 / 86.7	13.3 / 86.7
Haemophilus influenzae	51	LCB-0371	4	4	2 – 8	- / -	- / -
		Linezolid	16	16	8 – 32	- / -	- / -

Patent Position	PCT/KR2009/005376, PCT/KR2009/0020525

Young Lag Cho young@legochembio.com (+82)42-861-0688

Development of New Antibiotics against Gram Negative Pathogens

LegoChemBio Sciences

Product Type Chemical Product (Siderophore-cephalosporin conjugate)

Indication 1st indication: Pseudomonas aeruginosa, Pseudomonas aeruginosa (MeSH term)
2nd indication: Acinetobacter baumannii, Acinetobacter baumannii (MeSH term)

Target Penicillin-binding protein

MoA (Mechanism of Action) Disrupts cell wall synthesis

Differentiation Point Increased transportation into bacterial cells

Current Development Stage Pre-Clinical

Route of Administration Oral

Data

- Excellent anti-pseudomonas activity
- Safe and Potent anti-Pseudomonal Antibiotic Compound

	K. pneumoniae (n=198)			P. Aeruginosa (n=209)			A. baumannii (n=200)		
	MIC50	MIC90	Range	MIC50	MIC90	Range	MIC50	MIC90	Range
LCB10-200	0.125	8	0.125 - 64	0.25	1	0.125 - 16	1	16	0.125 - 64
LCB10-200 + BLI	≤0.0625	≤0.0625	≤0.063 - 1	0.25	0.5	≤0.063 - 16	1	4	≤0.063 - 64
Meropenem	0.0625	0.0625	0.063 - 64	0.5	16	0.063 - 128	16	128	0.063 - 128
Aztreonam	0.0625	32	0.063 - 128	8	64	0.25 - 128	64	128	4 - 128
Aztreonam + AVI	0.0625	0.125	0.063 - 1	8	32	0.25 - 128	32	128	4 - 128
Ceftazidime	0.25	128	0.063 - 128	4	128	1 - 128	32	128	1 - 128
CAZ + AVI	0.125	1	0.063 - 128	2	8	1 - 128	16	128	1 - 128
Colistin	0.5	1	0.063 - 128	2	4	0.063 - 64	0.5	1	0.25 - 128

Patent Position PCT/KR2012/002302

Young Lag Cho young@legochembio.com (+82)42-861-0688

A First-in-class Anti-MRSA Agent

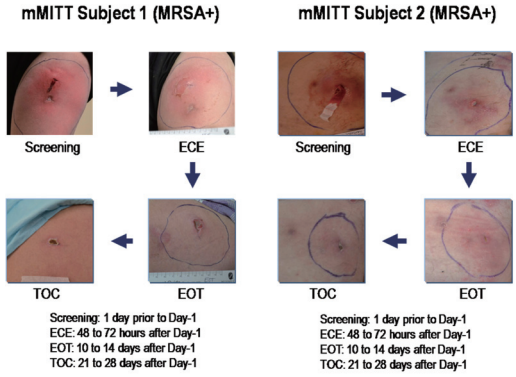
CrystalGenomics

CrystalGenomics

Product Type	Chemical Product
Indication	1st indication: Methicillin-resistant Staphylococcus aureus infections, Bacterial Infections and Mycoses (MeSH term)
Target	Enoyl-acyl carrier protein reductase (FabI)
MoA (Mechanism of Action)	A novel mechanism of blocking synthesis of fatty acid, a key component of bacterial cell membrane formation process.
Differentiation Point	First In Class
Current Development Stage	Phase II
Route of Administration	Oral / Intravenous infusion
Data	① CG400549 demonstrated the lowest MIC values against MRSA and VRSA ② Drastic reduction of redness & edema by ECE and clinical cure by EOT (Phase IIa study in US)

Drug	Methicillin-Susceptible (μg/ml)			Methicillin-Resistant (μg/ml)		
	Range	MIC_{50}	MIC_{90}	Range	MIC_{50}	MIC_{90}
CG400549*	0.06-1.0	0.25	0.25	0.06-1.0	0.25	0.25
Vancomycin*	1.0-2.0	1.0	2.0	1.0->64.0	1.0	2.0
Linezolid*	0.25-2.0	1.0	2.0	0.25-2.0	1.0	2.0
Quinupristin-dalfopristin*	0.25-2.0	1.0	2.0	0.25-2.0	1.0	2.0
Daptomycin*	0.25-2.0	1.0	1.0	0.25-4.0	0.5	0.5
Clindamycin**	0.25-2.0	0.25	0.25	<0.25->2.0	<0.25	>2.0
Tetracyclines**	<2.0->8.0	<2.0	<2.0	<2.0->8.0	<2.0	<2.0
Tigecycline**	<0.03-1.0	0.12	0.25	<0.03-1.0	0.12	0.25
TMP-SMX**	<0.5->2.0	<0.5	<0.5	<0.5->2.0	<0.5	<0.5
Ceftaroline**	<0.008-1	0.25	0.25	0.12-2.0	1.0	1.0

* Measured in Hershey Hospital, PA, USA
**Clinical Infectious Diseases 2012, s206.



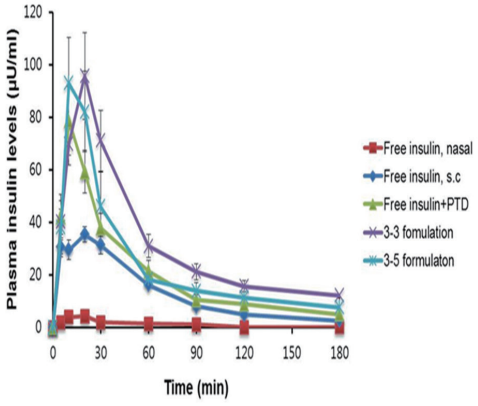
Patent Position	US7973060B2

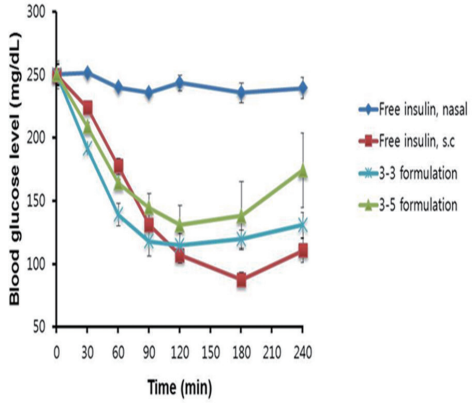
GwangSu Kim gskim@cgxinc.com (+82)31-628-2718

Development of intranasal insulin using TCTP-PTD

Ewha Womans University

Product Type	Cell penetrating peptide
Indication	1st indication: diabetes, diabetes mellitus (MeSH term)
Target	Insulin resistance
MoA (Mechanism of Action)	Insulin/TCTP-PTD formulation→Nasal delivery of insulin→Change in blood glucose levels
Differentiation Point	First In Class Nasal delivery of insulin using TCTP-PTD may serve the user-friendly medications that are safe and effective for the treatment of diabetes.
Current Development Stage	Lead Generation (Hit to Lead)
Route of Administration	Parenteral-Others (Nasal administration)
Data	Completed studies testing pharmacokinetics of insulin/TCTP-PTD. Changes in blood glucose levels in dianetic rats following nasal administration of insulin/TCTP-PTD





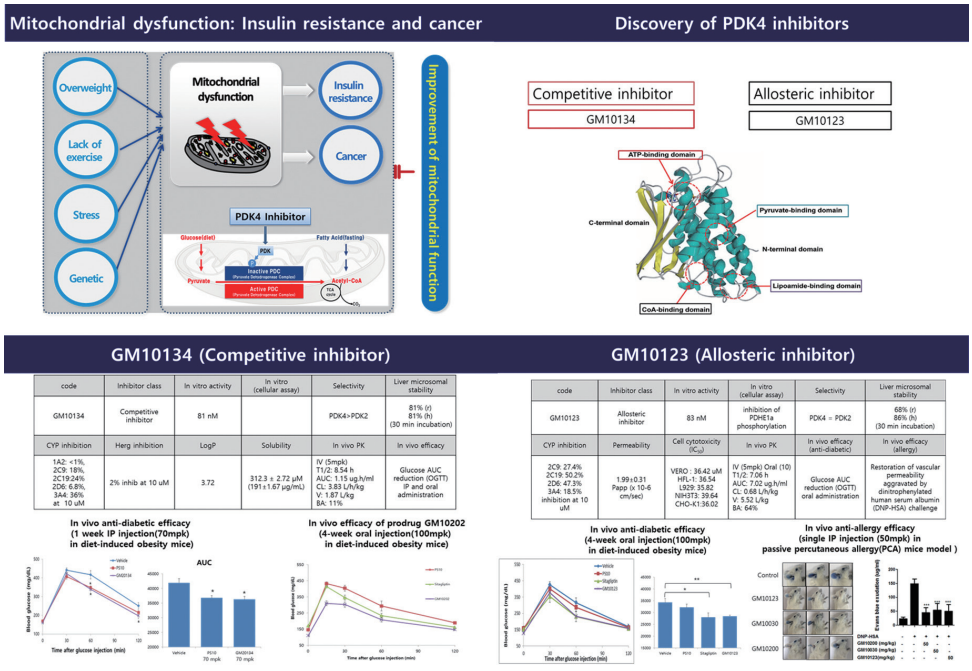
Kyunglim Lee klyoon@ewha.ac.kr (+82)2-3277-3024

Discovery of PDK4 inhibitor for meatabolic disease and cancer

Gwangju Institute of Science and Technology

Product Type	Chemical Product
Indication	1st Indication: Diabetes, Diabetes Mellitus (MeSH) 2nd Indication: Breast Cancer, Breast Neoplasms (MeSH)
Target	Pyruvate dehydrogenase kinase (PDK) 4
MoA (Mechanism of Action)	PDK inhibition ---→ Control PDC (Pyruvate dehydrogenase complex) activity --->Control Glucose metabolism
Differentiation Point	First In class Novel Mitochondrial Targeting Compound
Current Development Stage	Lead Generation (Hit to Lead)
Route of Administration	Oral / Intravenous

Data

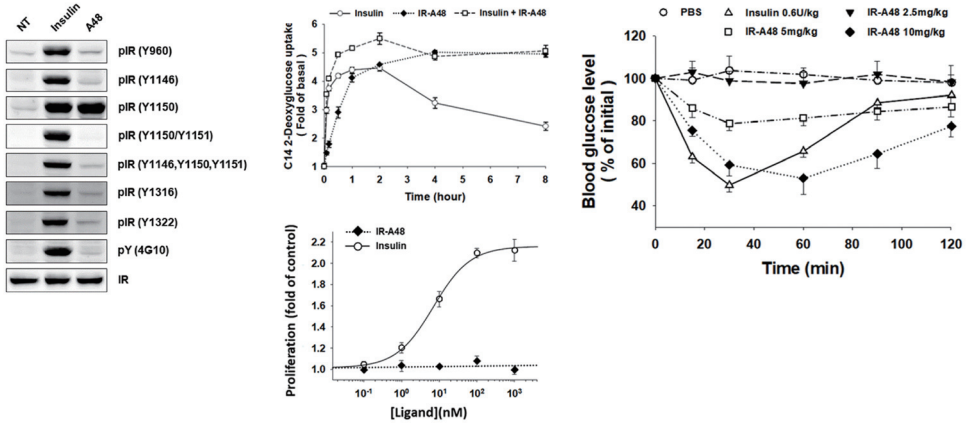


Jin Hee Ahn jhahn@gist.ac.kr (+82)62-715-4621

Lead optimization of Selective Insulin Receptor Agonist aptamer

Aptamer Sciences Inc.

Product Type	Aptamer
Indication	1st indication: Type 2 Diabetes, Diabetes Mellitus, Type 2 (MeSH term) 2nd indication: Type 1 Diabetes, Diabetes Mellitus, Type 1 (MeSH term)
Target	Insulin Receptor
MoA (Mechanism of Action)	Selective Insulin Receptor Agonist Aptamer binds to Insulin receptor, and induces monophosphorylation at the 1150th tyrosine residue on the kinase domain. → it causes biased activity to glucose uptakewithout mitogenic activity
Differentiation Point	First In Class
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Subcutaneous
Data	- Induces monophosphorylation at Tyr1150 on insulin receptor - Biased signaling activates glucose uptake without mitogenic activity - Dose dependent target activity following systemic injection



Patent Position	PCT/KR2016/004665

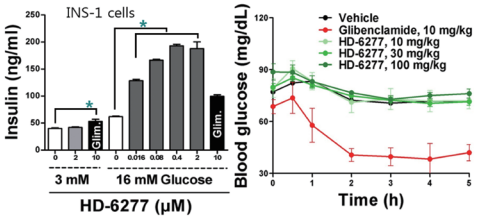
Youndong Kim youndong@aptsci.com (+82)31-786-0082

a Novel GPR40 Agonist, HD-6277, on Glycemic Control and Insulin Sensitivity in Type 2 Diabetes

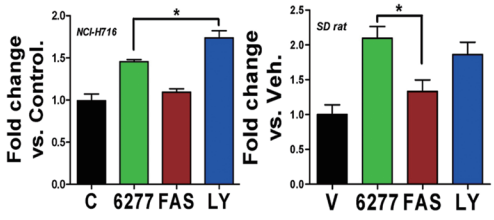
Hyundai Pharmaceuticals

HYUNDAI PHARM

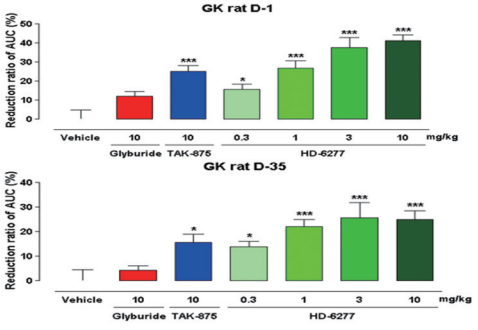
Product Type	Chemical Product
Indication	1st indication: Type 2 Diabetes, Diabetes Mellitus, Type 2 (MeSH term)
Target	G-protein-Coupled Receptor 40
MoA (Mechanism of Action)	Insulin secretagogue, Glucose dependent beta cell function regulation
Differentiation Point	First In Class
Current Development Stage	Phase I a
Route of Administration	Oral
Data	(A.) Dose dependent insulin secretion study in in vitro. No hypoglycemic risk in in vivo.



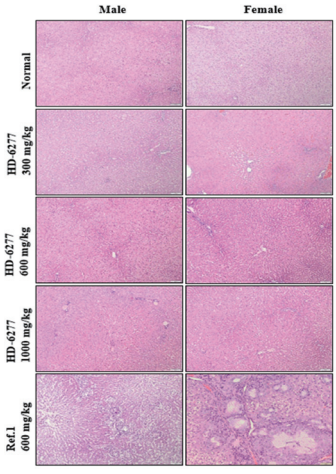
(B.) GLP-1 secretion assay in in vitro and in vivo.



(C.) Dose dependent glucose lowering effects.



(D.) Comparison of liver toxicity vs. Fasiglifam(TAK-875) with 2 weeks DRF study in Beagle dogs.



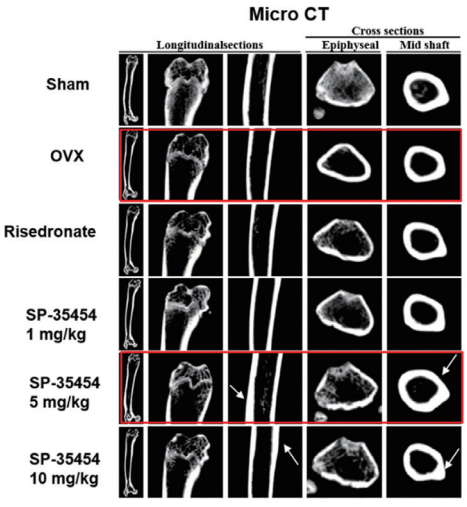
KiHwan Kim kimkihw@hdpharm.co.kr (+82)10-4759-6180

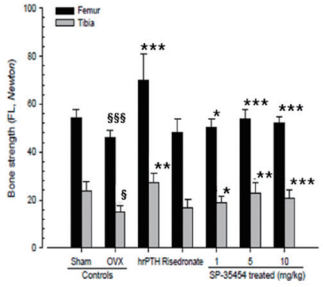
New drug development study for osteoporosis with novel mechanism to improve the clinial unmet needs

Shin Poong Pharm. Co., LTD.

SHIN POONG PHARM. CO., LTD.

Product Type	Chemical Product
Indication	1st indication: Osteoporosis, Osteoporosis (MeSH term)
Target	Undisclosed
MoA (Mechanism of Action)	Undisclosed
Differentiation Point	Dual action: increase of bone formation and decrease of bone resorption. Oral application with much less side effects.
Current Development Stage	Phase I
Route of Administration	Oral
Data	Increase of the mid-shaft BMD/Bone thickness/Bone strength/ Non-clinical toxicity studies/Clinical Phase I study





GLP	Study	Species/ Model	Major findings
Safety Pharmacology	CNS safety	Rat	NOAEL = 1000 mg/kg
	Respiratory safety	Rat	NOAEL = 1000 mg/kg
	hERG assay	*In vitro*	45,9% inhibition at top conc.
	Cardiovascular safety	Dog	NOEL 1000 mg/kg
Genotoxicity	Bacterial mutation	In vitro	None
	Chromosome aberration	In vitro	None
	In vivo micronucleus	Mouse	None
	In vivo micronucleus	Rat	None
General toxicity	4 weeks rat toxicity study	Rat	NOAEL = 1000 mg/kg/day
	4 weeks dog toxicity study	Dog	NOAEL = 1000 mg/kg/day
	26 weeks rat toxicity study	Rat	Male: NOAEL= 600 mg/kg Female: NOAEL= 200 mg/kg
	39 weeks dog toxicity study	Dog	Male: NOAEL= 600 mg/kg Female: NOAEL= 70 mg/kg

- **Results: Clinical Phase I study was completed on March 2017 in Europe**
  - Volunteers: healthy postmenopausal women
  - **No SAE** (AE: fatigue, diarrhea, back pain, myalgia(muscle pain), headache)
  - **No issues**: ECGs, vital signs, physical examination
  - Pharmacokinetics (Food effects): delayed T_{max} and **dose-proportional increased AUC**
  - Pharmacodynamics : Bone biomarker (MAD)

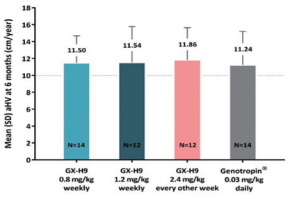
Patent Position	PCT/KR2009/006085

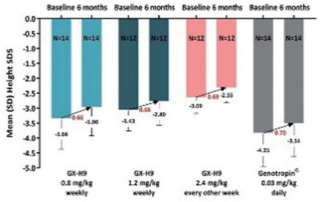
GuemSil Cho anagscho@shinpoong.co.kr (+82)10-5378-8312

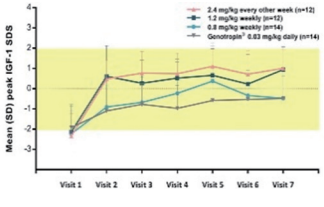
Long-acting Growth Hormone GX-H9 (hGH-hyFc)

Genexine, Inc.

Product Type	Fusion Protein, Hybrid Fc (hyFc), Long-Acting
Indication	1st indication: Pediatric Growth Hormone Deficieny, Pediatric Growth Hormone Deficieny (MeSH term) 2nd indication: Adult Growth Hormone Deficieny, Adult Growth Hormone Deficieny (MeSH term)
Target	Growth Hormone (GH), Insulin-like Growth Factor-1 (IGF-1)
MoA (Mechanism of Action)	Growth hormone stimulates the production of IGF-1 in liver. IGF-1 has growth-stimulating effects on a wide variety of tissues and also has stimulatory effects on osteoblast and chondrocyte activity to promote bone growth. Growth hormone itself also directly stimulates division and multiplication of chondrocytes of cartilage.
Differentiation Point	Best In Clasee To develop more convenient product versus current daily treatment by reducing dose frequency To address the adherence and treatment outcome issues
Current Development Stage	Phase II
Route of Administration	Parenteral-Subcutaneous
Data	- GX-H9 treatment for 6 months was found to be safe and well tolerated in pre-pubertal GH naïve patients with GHD - Annulized height velocity and improvement of height SDS were comparable across GX-H9 treatment groups and with currently available daily rhGH product, Genotropin® - Average peak IGF-1 SDS values were less then +2SDS regardless of GX-H9 dosage regimens







Patent Position	US 8529899 B2, WO2017/142331

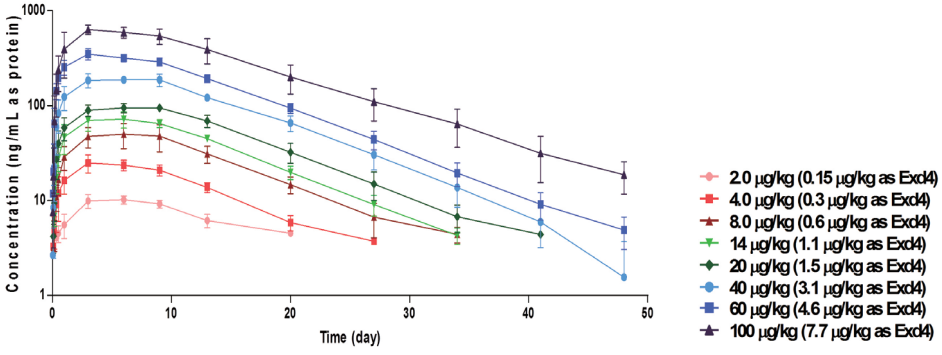
GaYoung Lee gayoung.lee@genexine.com (+82)31-628-3215

Study of Global Clinical Trial and Production for next-generation diabetes drug, HM11260C

Hanmi Pharm. Co., Ltd.

Hanmi Pharm.

Product Type	Aglycosylated human Fc fragment conjugate
Indication	1st indication: T2DM, Diabetes Mellitus, Type 2(MeSH term) 2nd indication: Obesity, Obesity(Mesh Term)
Target	Glucagon like peptide 1 (GLP-1) receptor
MoA (Mechanism of Action)	GLP-1 receptor agonist
Differentiation Point	Best in Class Epfeglenatide activates GLP-1 receptor with superagonistics character and showes superior blood glucose lowering and body weight loss efficacy
Current Development Stage	Pase III
Route of Administration	Parenteral-Subcutaneous
Data	Completed Phase II study showed potent glucose lowering and body weight loss efficacy with once a week regimen and showed no significant adverse effects related to treatment



Patent Position	WO2008082274

SungYoub Jung jsykmj@hanmi.co.kr (+82)31-371-5114

Development of Novel Acute Heart Failure Medicine Targeting Actin-Myosin Cycle

Shin Poong Pharm. Co., LTD.

Product Type
Chemical Product

Indication
1st indication: Heart failure, Heart Failure (Mesh term)
2nd indication: Myocardial Failure , Heart Failure (Mesh term)

Target
Cardiac myosin ATPase

MoA (Mechanism of Action)
Cardiac myosin activator binds S1 sub-domain of myosine, increasing the duration and amount of myocyte contraction.

Differentiation Point
First In Class
Establishment of strategic position for world wide market of ionotrope through the discovery of novel Ca2+ non-dependent inotrope abolishing the serious side effects of current ionotropes.

Current Development Stage
Lead Optimization (Lead to Candidate)

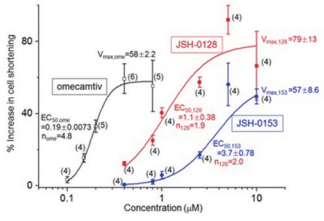
Route of Administration
Parenteral-Intravenous

Data

- In vitro Cardiac myosin ATPase activity and selectivity study

Compound	% ATPase Activity					
	Cardiac		Smooth		Skeletal	
	1 μM	10 μM	10 μM	100 μM	10 μM	100 μM
JSH-0128	ND	48.5	1.4	5.2	0	-4.8
JSH-0153	15.0	47.6	1.4	3.9	11.1	-20.2
Omecamtiv		~ 68.0	0	4.0	-5.5	2.8

- In vitro cardiac ventricular cell contractility study



- Omecamtiv mecabil VS. JSH

	OMM	JSH-0128	JSH-0153
Cardiac ventricular cell contractility, Vmax [in vitro]	58±2.2	79±13	57±8.6
FS% increase [in vivo, normal rat, 16㎍/kg/min for 3min]	20.60	31.85	24.07
NOAEL [mg/kg, 7 days repeated toxicity]	1.5	9.0	4.0

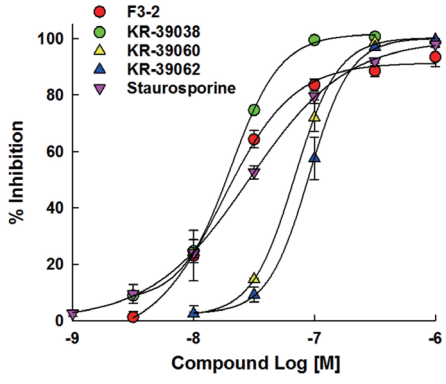
JeongSik Lee grayfox80@shinpoong.co.kr (+82)10-6300-3294

G-protein coupled receptor kinase 5 inhibitor to treat heart failure

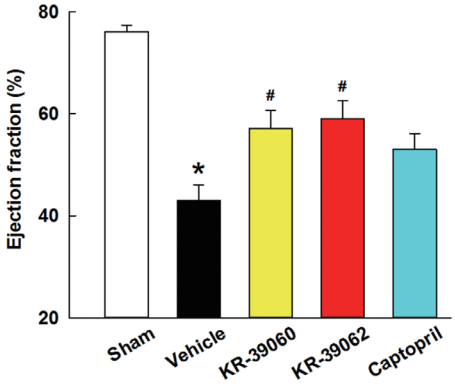
Korea Research Institute of Chemical Technology

Product Type	Chemical Product
Indication	1st indication: Heart failure, Heart failure (MeSH term)
Target	G-protein coupled receptor kinase 5 (GRK5)
MoA (Mechanism of Action)	- GRK5 inhibitor suppresses the phosphorylation of c-terminal intracelluar region of GPCR. - GRK5 inhibitor suppresses the functions as a specific HDAC5 kinase.
Differentiation Point	First In Class The drug is devoid of unwanted side effect- hypotensive effect in rats.
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Oral
Data	- Candidate compounds: KR-39038, 39060, 39062 - ATP non-competitive, substrate competitive - Effective both in pressure overload- and ischemia-induced heart failure models - No blood pressure lowering effect

GRK5 inhibitory activity



Heart failure model (myocardial ischemia, rat)

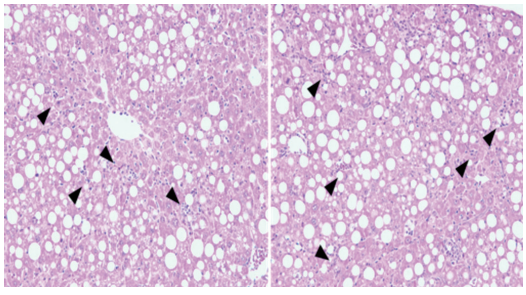


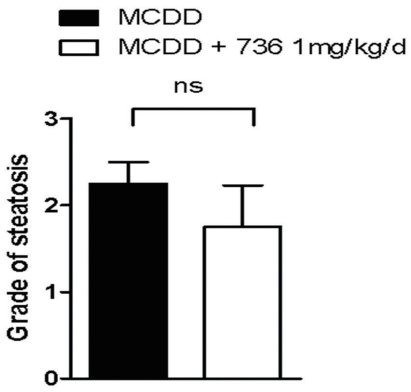
ByungHo Lee bhlee@krict.re.kr (+82)42-860-7415

Development of a new drug for non-alcholic steatohepatitis and liver cirrhosis using myriocin analogues

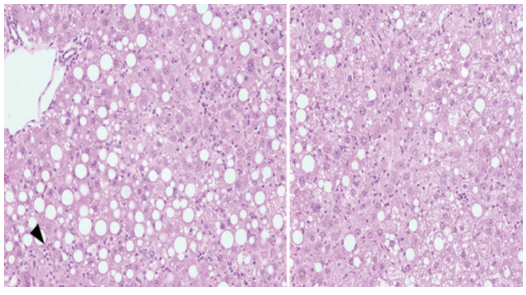
Asan Medical Center

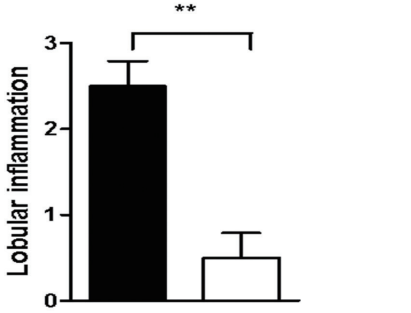
Product Type	Chemical Product
Indication	1st indication: Non-alcholic steatohepatitis, Non-alcoholic Fatty Liver Disease (Mesh term)
Target	S1PR4
MoA (Mechanism of Action)	Inhibition of inflamamsome activity
Differentiation Point	First In Class Treatment of non-alcholic steatohepatitis, but not simple hepatic steatosis
Current Development Stage	Lead Generation (Hit to Lead)
Route of Administration	Oral
Data	Non-alcholic steatohepatitis





SLB 736





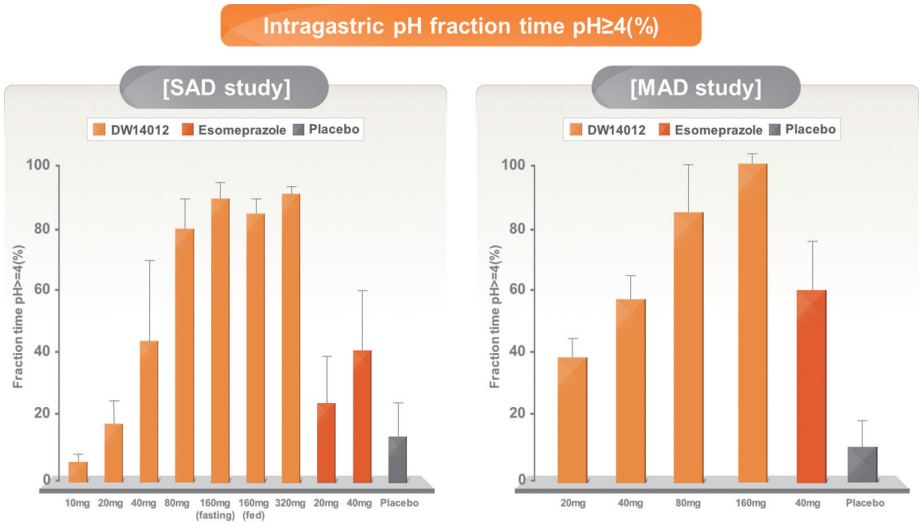
Patent Position	PCT-KR-10-2017-0040139

EunHee Koh ehk@amc.seoul.kr (+82)2-3010-3248

Development of Acid Pump Antagonist for Gastric acid related Disease, DWP14012

Daewoong Pharmaceutical Co., Ltd.

Product Type	Chemical Product
Indication	1st indication: Gastroesophageal Reflux Disease (GERD), Gastroesophageal Reflux (MeSH term) 2nd indication: Peptic Ulcer, Peptic Ulcer (MeSH term)
Target	Acid Pump Antagonist
MoA (Mechanism of Action)	Reversible and Potassium-Competitive Inhibition of Acid Secretion
Differentiation Point	Best In Class DWP14012 inhibits acid secretion in a reversible and potassium-competitive manner with fast onset of action. Phase I clinical trial shows that DWP14012 exhibited dose-dependent acid suppression in human, rapid onset time, excellent safety & tolerability, and favorable pharmacokinetic profiles with a once a day regimen.
Current Development Stage	Phase II
Route of Administration	Oral
Data	Phase I Clinical Study: Pharmacodynamics : DWP14012 showed dose-dependent acid suppression and clear exposure-response relationship. Compared to esomeprazole, DWP14012 demonstrated more favorable or higher extent of 24-hour pH(↗4) holding time.



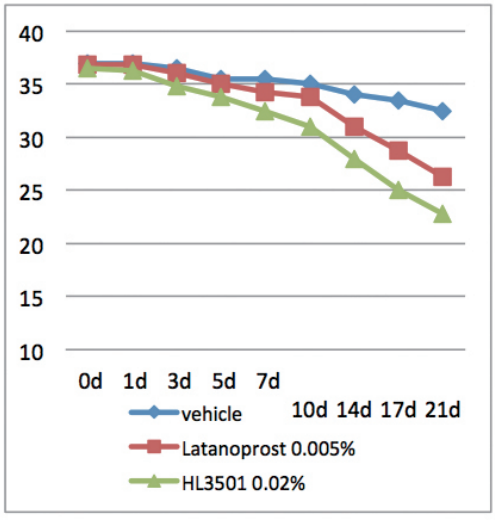
Patent Position	PCT/KR2016/004411

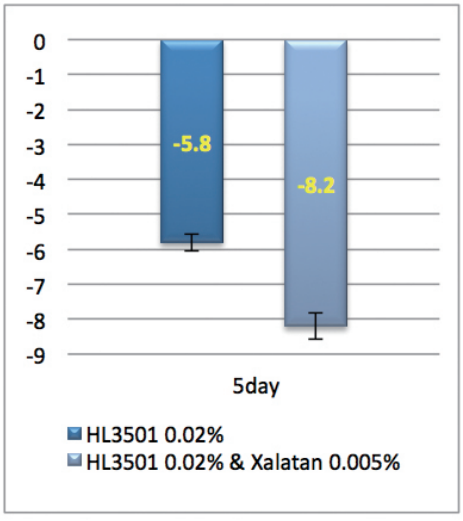
TaeYeon Kim tykim@daewoong.co.kr (+82)2-550-8026

Development of Anti-Glaucoma Drug with a Novel Mechanism of Action

Handok Inc.

Product Type	Chemical Product
Indication	1st indication: Primary open angle glaucoma, Glaucoma, Open-Angle (MeSH term) 2nd indication: Ocular hypertension, Ocular Hypertension (MeSH term)
Target	A3 adenosine receptor
MoA (Mechanism of Action)	A3 adenosine receptor antagonism effect induced lowering intraocular pressure.
Differentiation Point	Favorable safety profile from single tox(topical ocular treatment)
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Eye Drop
Data	• HL3501 was superior to Latanoprost in laser model blocked main TM outflow of AH. • The treatment of combination elicited faster IOP lowering effect than mono in HL3501 by 5day





Patent Position	15/406,556(US), PCT/KR2017/000492

Seungyong Kim seungyong.kim@handok.com (+82)2-527-0549

Development of the dry AMD treatment

Chungnam National University

***KUKJE Pharm licensed KDDF-201202-10 and is developing this project.**

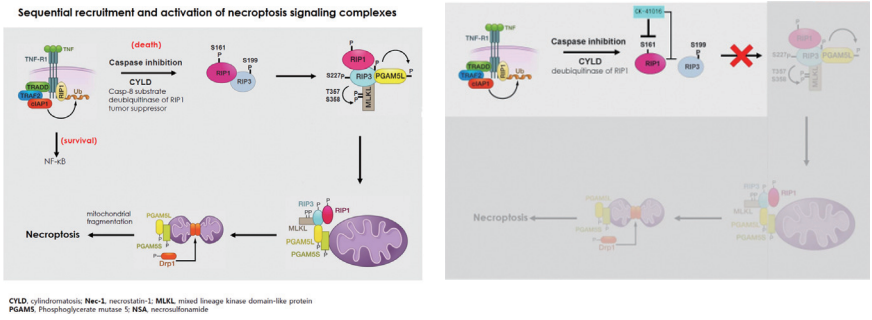
충남대학교 CHUNGNAM NATIONAL UNIVERSITY

Product Type
Chemical Product

Indication
1st indication: Blindness, Eye diseases (MeSH term)
2nd indication: Macular degeneration, Retina (MeSH term)

Target
Age-Related Macular Degeneration

MoA (Mechanism of Action)
RIP-dependent necroptosis signal pathway



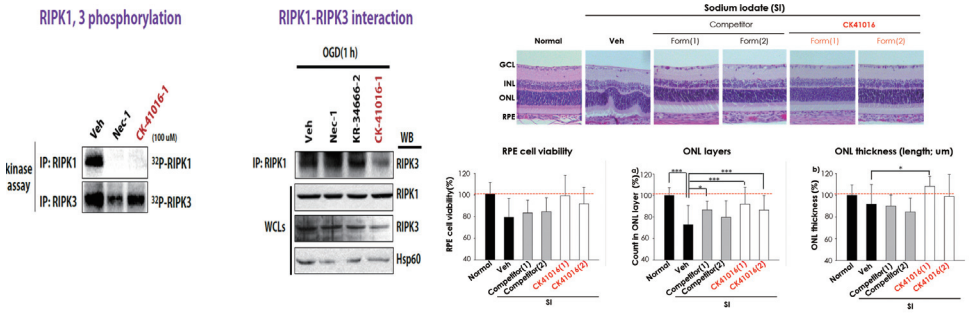
CYLD, cylindromatosis; Nec-1, necrostatin-1; MLKL, mixed lineage kinase domain-like protein PGAM5, Phosphoglycerate mutase 5; NSA, necrosulfonamide

Differentiation Point
First it Class
- New molecular entity(NME) with a new structure
- There are currently no available treatments in market

Current Development Stage
Pre-Clinical

Route of Administration
Eye drop

Data
- Inhibition of RIPK1 phosphorylation/RIPK1-RIPK3 interaction of CK41016
- Following eye drops administration in animals model of dry AMD, in vivo protective effects of CK41016 were superior to those of competitors



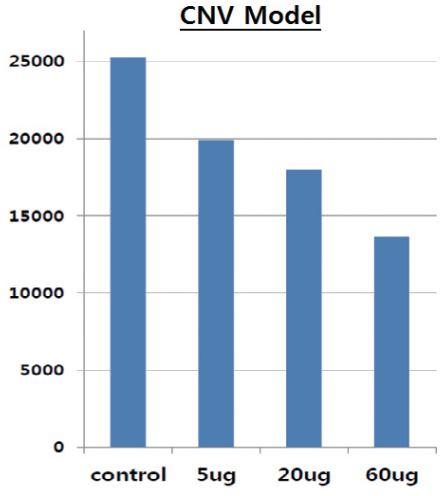
Patent Position
KR10-1551313/KR10-1515985, PCT/KR2015/007562

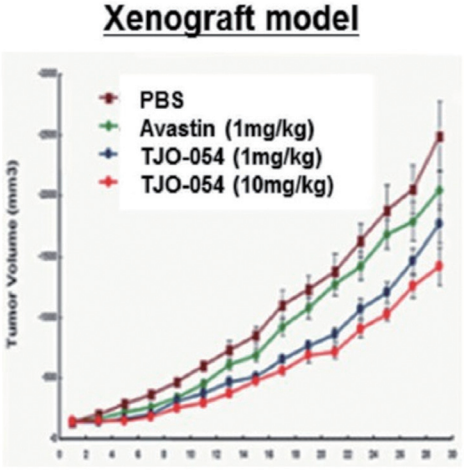
YoungKwan Kim ykkim@kukjepharm.co.kr (+82)31-781-7204

Nonclinical studies of novel antibody TJO-054 for treatment of wet AMD

Taejoon Pharmaceutical Co., Ltd.

Product Type	Immunoglobulin Product (mAb)
Indication	1st indication: wet AMD, Eye Diseases(MeSH term)
Target	VEGFR2
MoA (Mechanism of Action)	VEGFR2-specific binding →blocking not only VEGF-A, but as well as VEGF-C and VEGF-D
Differentiation Point	First In Class TJO-054 is a fully human monoclonal antibody to bind VEGFR-2/KDR on abnormal vasculature related to new angiogenesis diseases including wet AMD.
Current Development Stage	Pre-Clinical
Route of Administration	Intravitreal injection
Data	Pre-Clinical Pharmacology





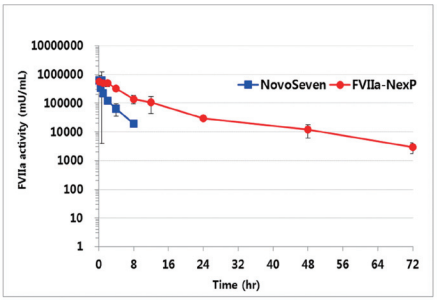
DongHyeon Kim kimdh@taejoon.co.kr (+82)2-799-0160

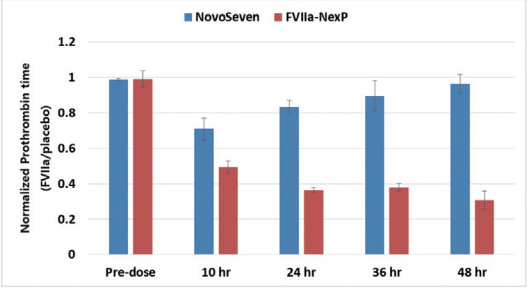
A Long-acting coagulation factor VIIa

Alteogen, Inc.

ALTEOGEN Inc.

Product Type	Protein Product
Indication	1st indication: Hemophilia, Hemophilia A (MeSH term)
Target	Coagulation factor VIIa (FVIIa)
MoA (Mechanism of Action)	Recombinant FVIIa + NexPTM fusion → Long-acting factor VIIa (FVIIa-NexPTM)
Differentiation Point	Best In Class Prolonged half-life of factor VIIa activity among those of competitors (best-in-class potential)
Current Development Stage	Lead Optimization (Lead to Candidate)
Route of Administration	Parenteral-Intravenous - The possibility of subcutaneous admininstration is also being explored.
Data	- Significantly enhanced pharmacokinetics of factor VIIa as a NexPTM fusion in hemophilia mice - Prolonged coagulation activity of factor VIIa compared to NovoSeven in rats





Patent Position	PCT/KR2010/002520, PCT/KR2012/006441

Jaehyeong Ko jhko@alteogen.com (+82)42-867-8785

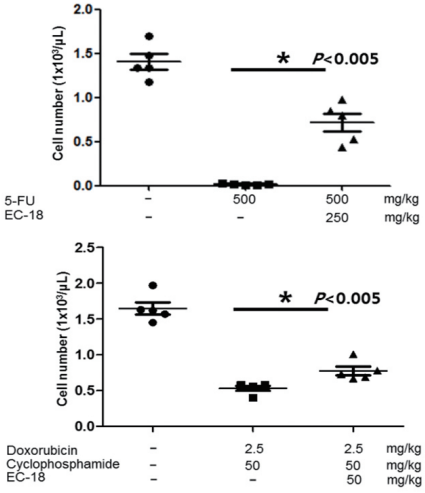
Management of Chemotherapy-induced Neutropenia in Advanced Breast Caner Patients

Enzychem Lifesciences Corporation

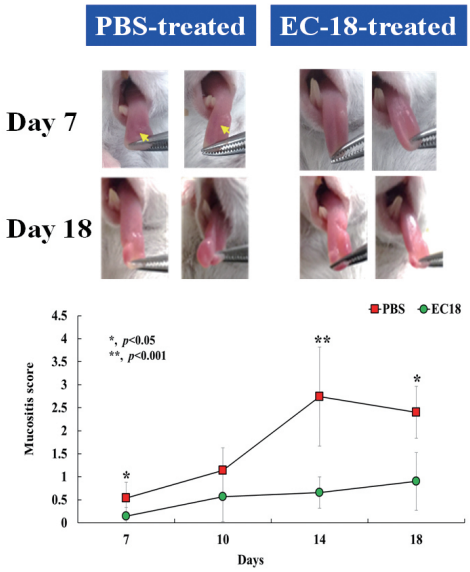
ENZYCHEM LIFESCIENCES

Product Type	Chemical Product (Diacylglycerol)
Indication	1st indication: Chemotherapy-induced Neutropenia (CIN), Neutropenia (MeSH term) 2nd indication: ChemoRadiation-induced Oral mucositis (CRIOM), Stomatitis (MeSH term)
Target	Undisclosed
MoA (Mechanism of Action)	Suppression of STAT3 → Down-regulation of chemokines/Decrease of DAMP → regulation of neutrophil migration/induction of bacterial clearance
Differentiation Point	Fisrt in Class-The drug can maintain blood levels of neutrophils with no direct impact on bone marrow functions, especially in the condition that homeostasis imbalance happens
Current Development Stage	Phase II
Route of Administration	Oral (Softgel Capsule)
Data	

EC-18 inhibits blood neutrophils extravasation in CIN mouse model



EC-18 ameliorates oral mucositis in CRIOM-induced Model



Patent Position	10-2016-7035244/Korea, PA17-67/Japan

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Pre-Clinical Toxicology Study & Clinical IND approval for the development of idopathic pulmonary fibrosis using SAMiRNA

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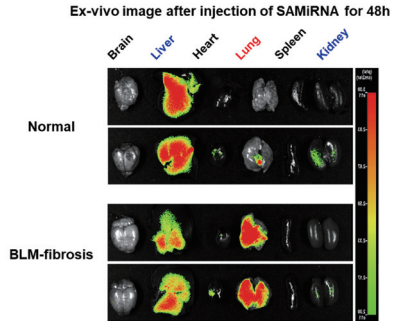
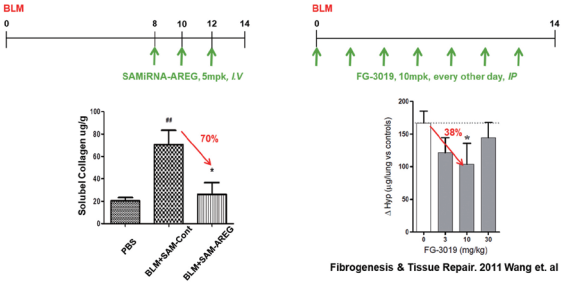
Product Type	RNAi Nanoparticles
Indication	1st indication: Idiopathic Pulmonary Fibrosis, Respiratory Tract Diseases (MeSH term)
Target	Amphiregulin
MoA (Mechanism of Action)	Amphiregulin: highly expressed downstream genes by TGF-β signaling in lung Fibroblast cells SAMiRNA-AREG: inhibit the expression of AREG → block the differention of fibroblast to myofibroblast → inhibit proloferation, secretion of ECM in the lung tissues
Differentiation Point	Esbriet® (Pirfenidone) and Ofev® (Nintedanib), which are approved by FDA in 2014, is expensive and exhibits limited efficacy. Urgent need for the development of new effective drug which can actively reverse the process of fibrosis. in vivo efficacy test: The efficacy of the SAMiRNA-IPF drug has been evaluated with TGF-ß transgenic & Bleomycin induced mouse models of pulmonary fibrosis. Based on these comprehensive evaluations, the candidates show the more significant therapeutic potential for IPF treatment than Pirfenidone of InterMune, Inc and FG-3019 (CTGF mAb) of Fibrogen, Inc.
Current Development Stage	Pre-Clinical
Route of Administration	Parenteral-Intravenous
Data	In vivo biodistrubution of SAMiRNA by I.V inj. in BLM-induced IPF models



SAMiRNA by I.V injection shows collagen clearance efficacy compare to FG-3019 targeting proteins with much less doses and frequency



Patent Position	PCT/KR2010/003039, PCT/KR2014/006031, PCT/KR2014/006033

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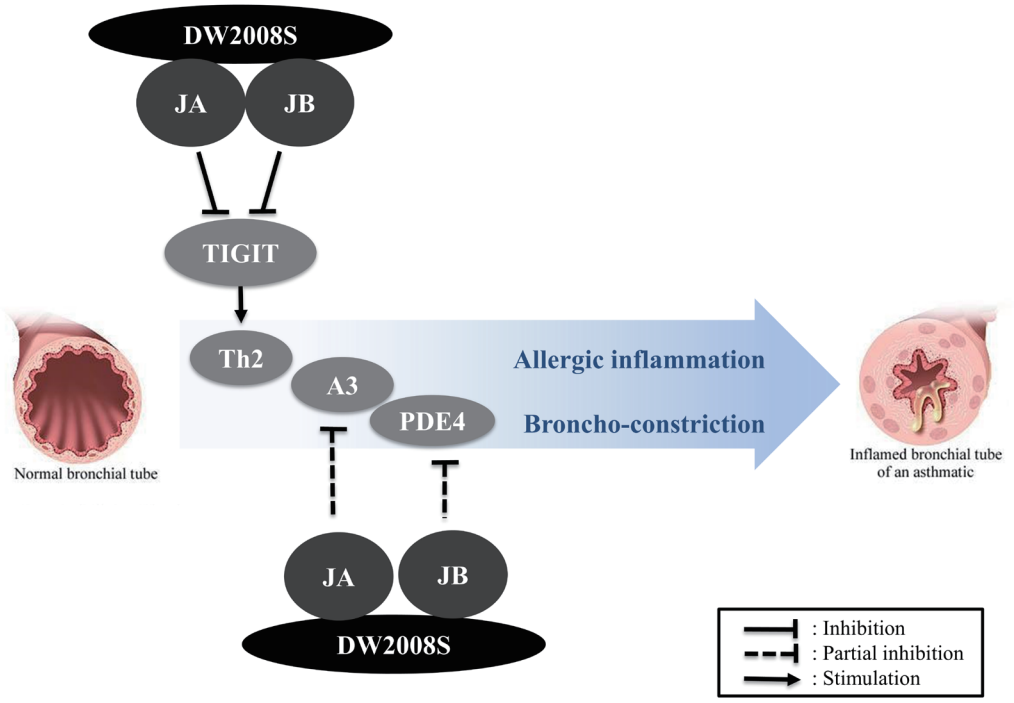
Development of Anti-Allergic asthma agents

Dong-Wha Pharmaceutical

DONGWHA PHARM SINCE1897

Product Type	Botanical drug
Indication	1st indication: Asthma, Respiratory Tract Diseases (MeSH term)
Target	TIGIT, PDE4 (partial), Adenosine Receptor 3 (A3AR, partial)
MoA (Mechanism of Action)	Th2 selective inhibition & Bronchodilation
Differentiation Point	First In Class
Current Development Stage	Phase I
Route of Administration	Oral
Data	1. Safety: NOAEL - SD Rat: 2,000 mg/kg, Beagle: 250 mg/kg → Safety Margin (H.E.D) : approximately 80 fold 2. Efficacy (Animal) : Superior to Montelukast



Patent Position	10-1747139/Korea

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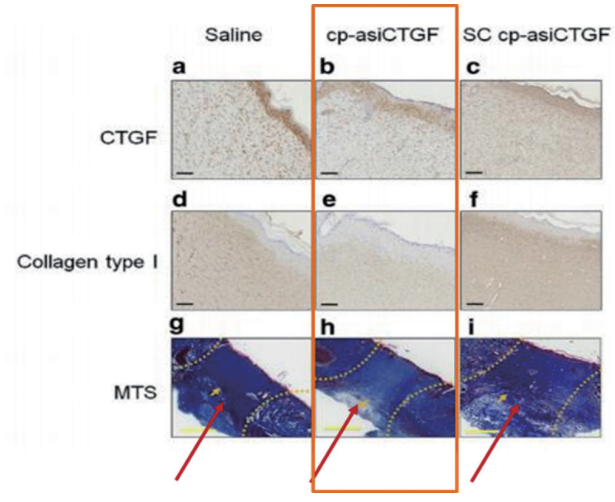
Development of anti-scarring therapeutics OLX101 (previously BMT101), self-delivering RNAi molecule

OliX Pharamceuticals, Inc.

Product Type	Cell-penetrating asymmetric siRNA
Indication	1st indication: Hypertrophic Scar, Cicatrix, Hypertrophic (MeSH term)
Target	Connective tissue growth factor (CTGF)
MoA (Mechanism of Action)	RNAi mediated repression of target gene CTGF which is a key factor in pathogenesis of fibrotic diseases including hypertrophic scra
Differentiation Point	First In Class
Current Development Stage	Phase I
Route of Administration	Local (Intradermal injection)
Data	Therapeutic Efficacy in rat skin excision wound model - Reduced expression of both target gene (CTGF) and collagen by cp-asiCTGF (OLX10010) treatment. - Masson's trichrome staining (MTS) data also revealed fibrosis repressing effect by cp-asiCTGF treatment.



Major outcomes in Phase I study
- Completion of dosing and follow-up (N=24/8; OLX10010/placebo)
- No SAE (serious adverse event) until 10X of expected therapeutic dose
- Very limited systemic exposure up to cohort 2 (←LLOQ (2 ng/ml), waiting for results in cohorts 3 and 4)
- Mild local erythema in OLX10010 treated subjects

Patent Position	PCT/KR2008/007530, PCT/KR2011/006632, PCT/KR2013/004463

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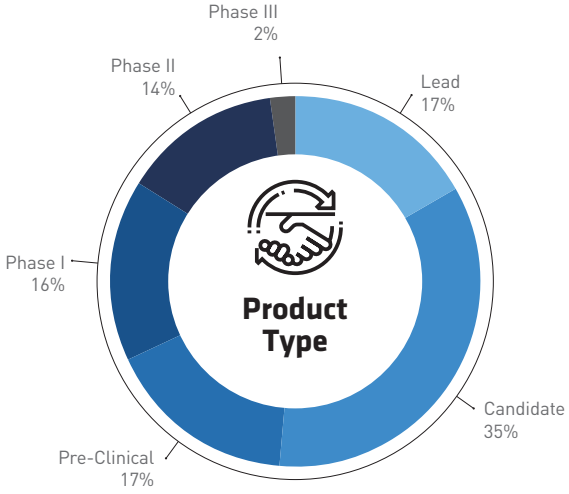
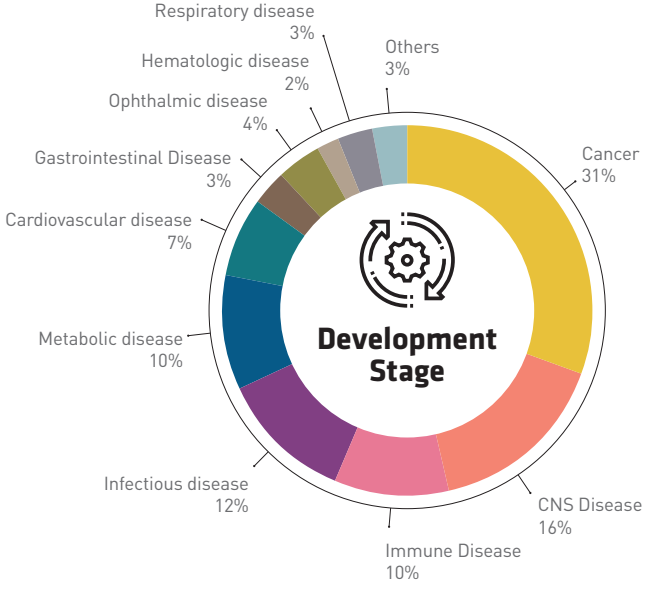
R&D PIPELINE OVERVIEW

KDDF covers broad range of drug development fields.





KDDF
Korea Drug Development Fund

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