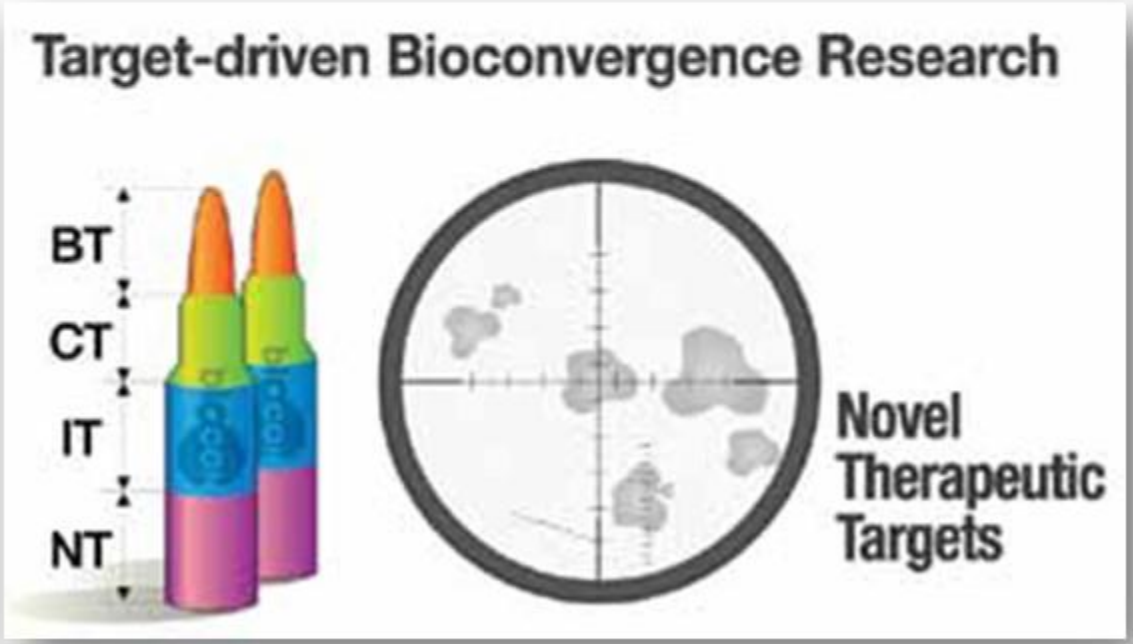
Linking Academic Discoveries to Biotech

Sunghoon Kim

Medicinal Bioconvergence Research Center (BIOCON)
Seoul National University

Mission

"To Provide Novel Target and Lead Package"

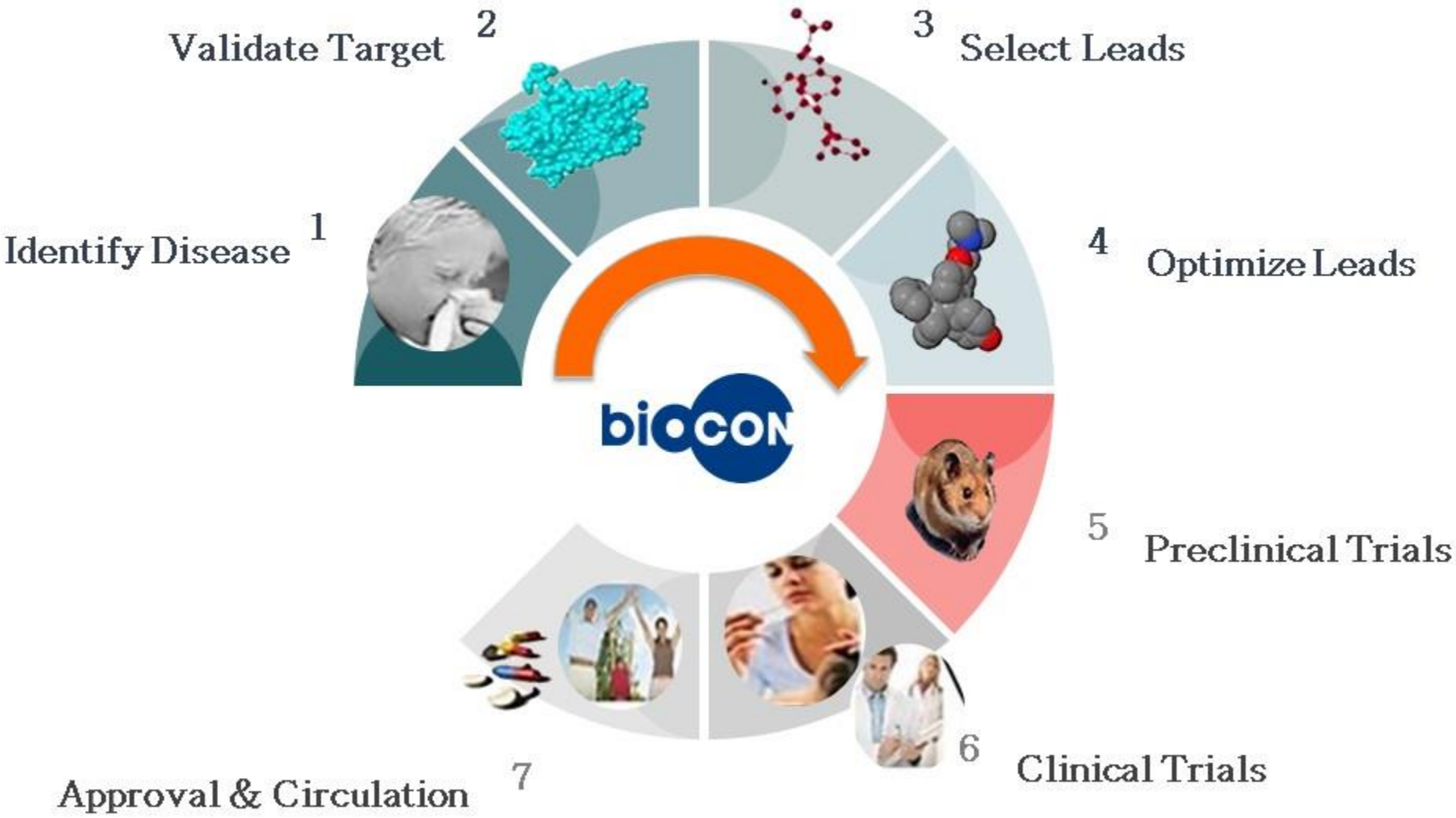


Two Birds One Stone

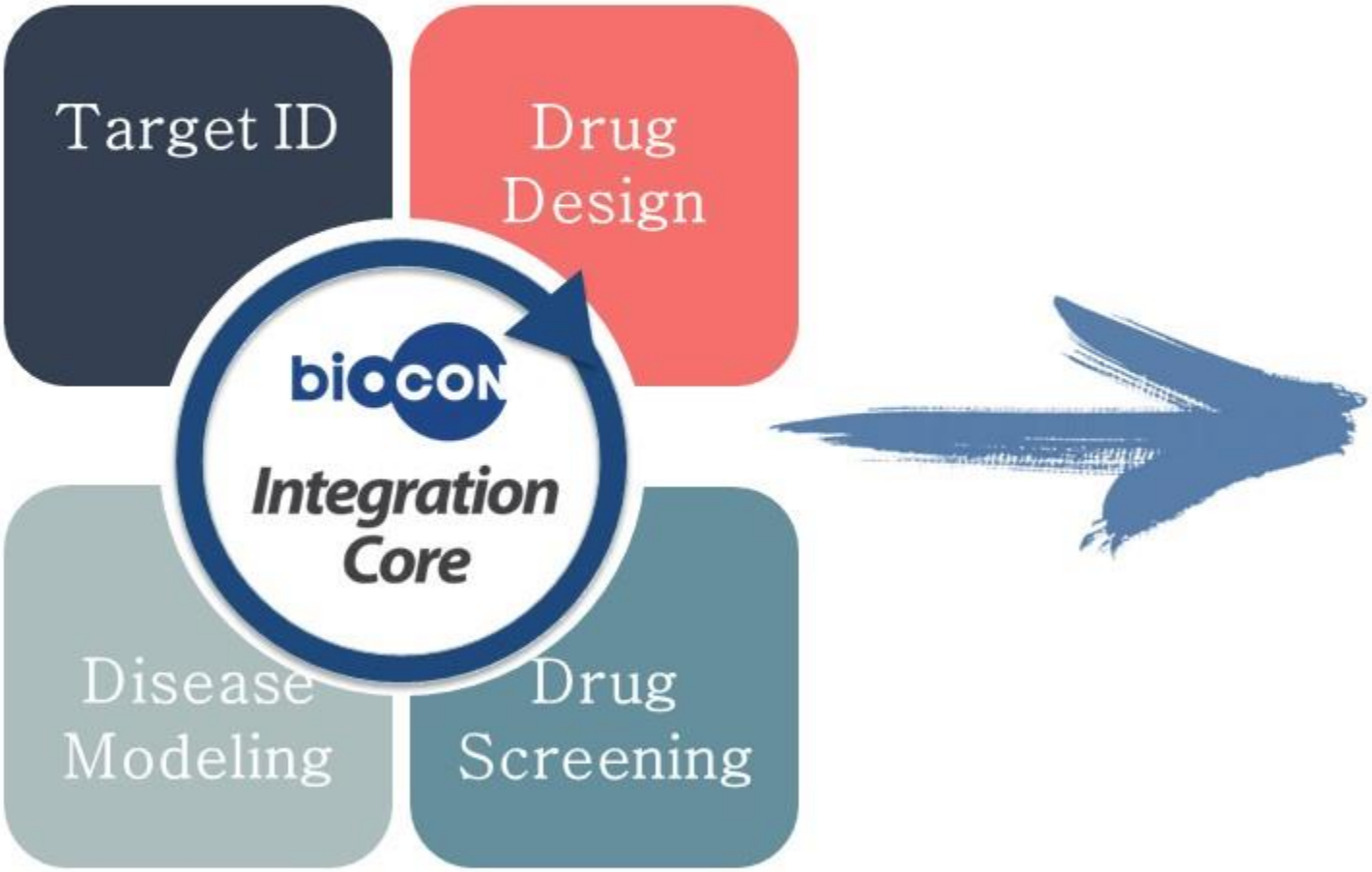
Excellency

Sustainability

Biocon Focuses to Early Discovery

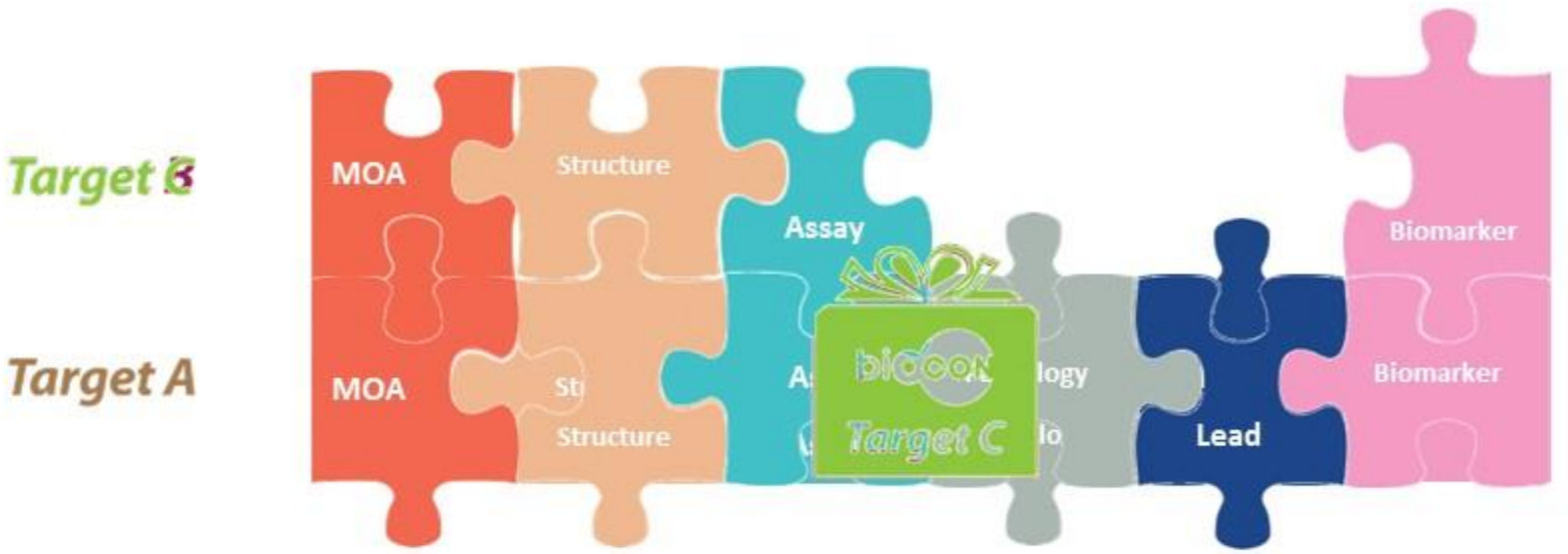


Team Structure (4+ 1)

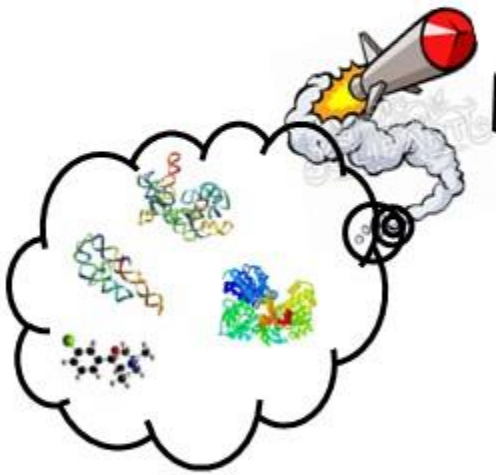


Integrated Research Platform

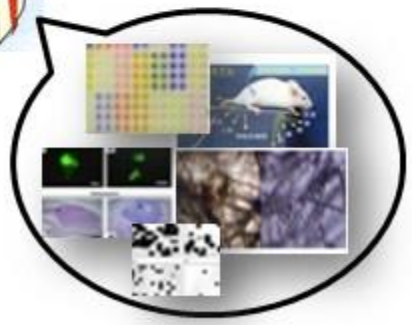
BIOCON: The Innovative Target Factory



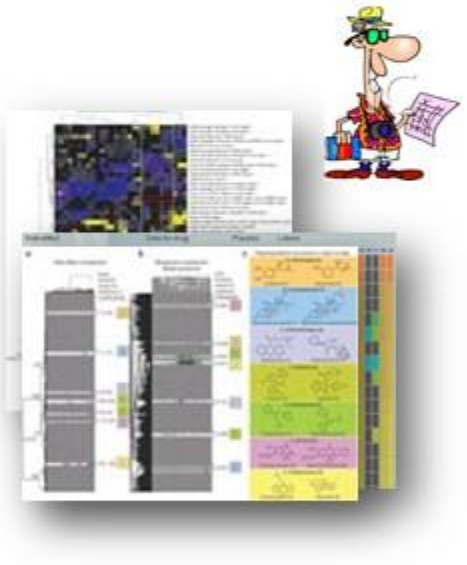
Biocon's Product Gallery



Target & lead

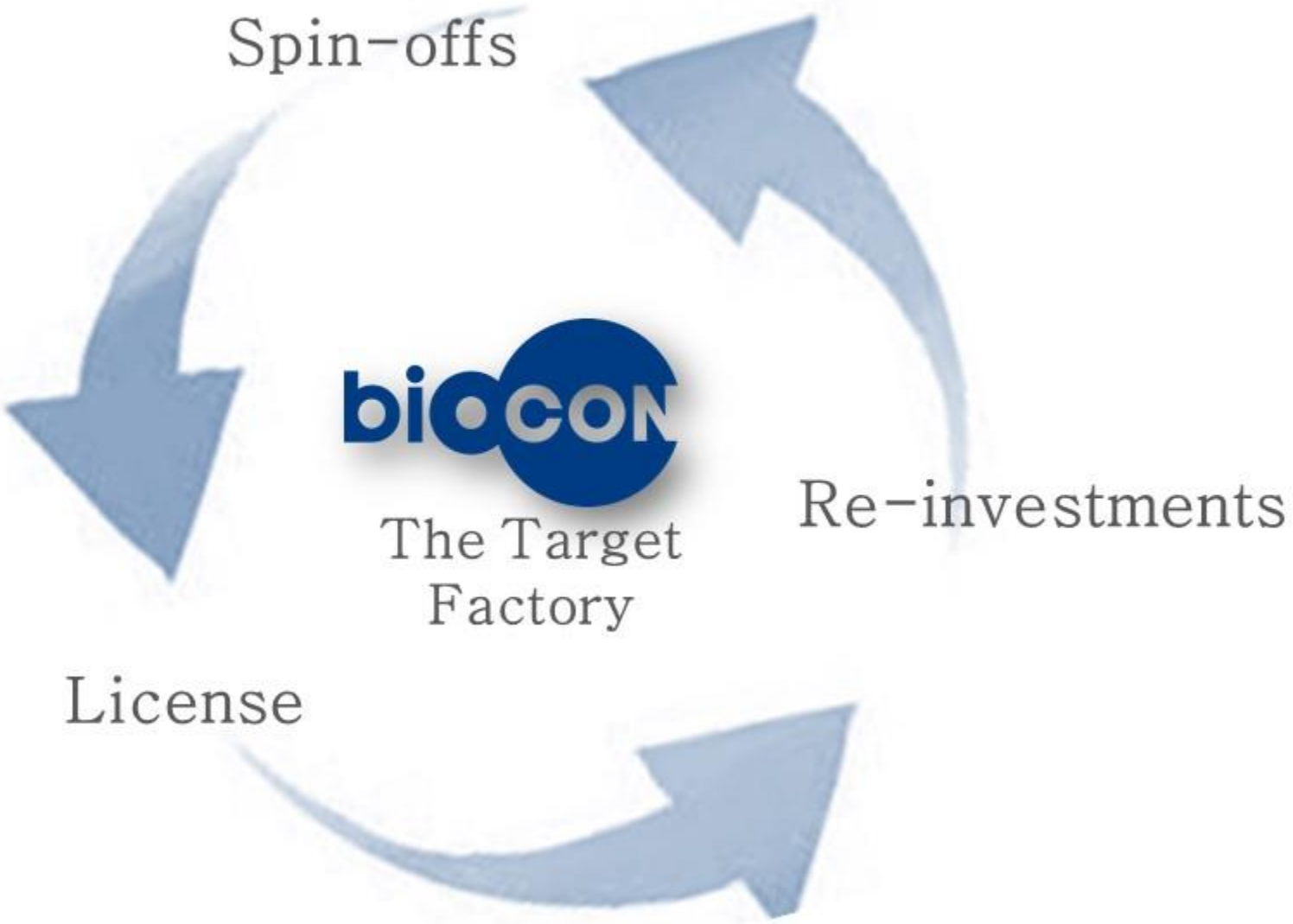


Innovative techs



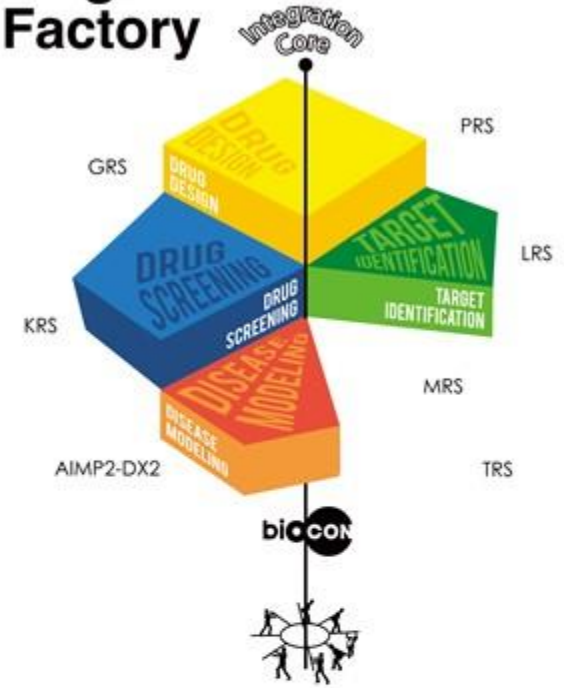
Infra-service

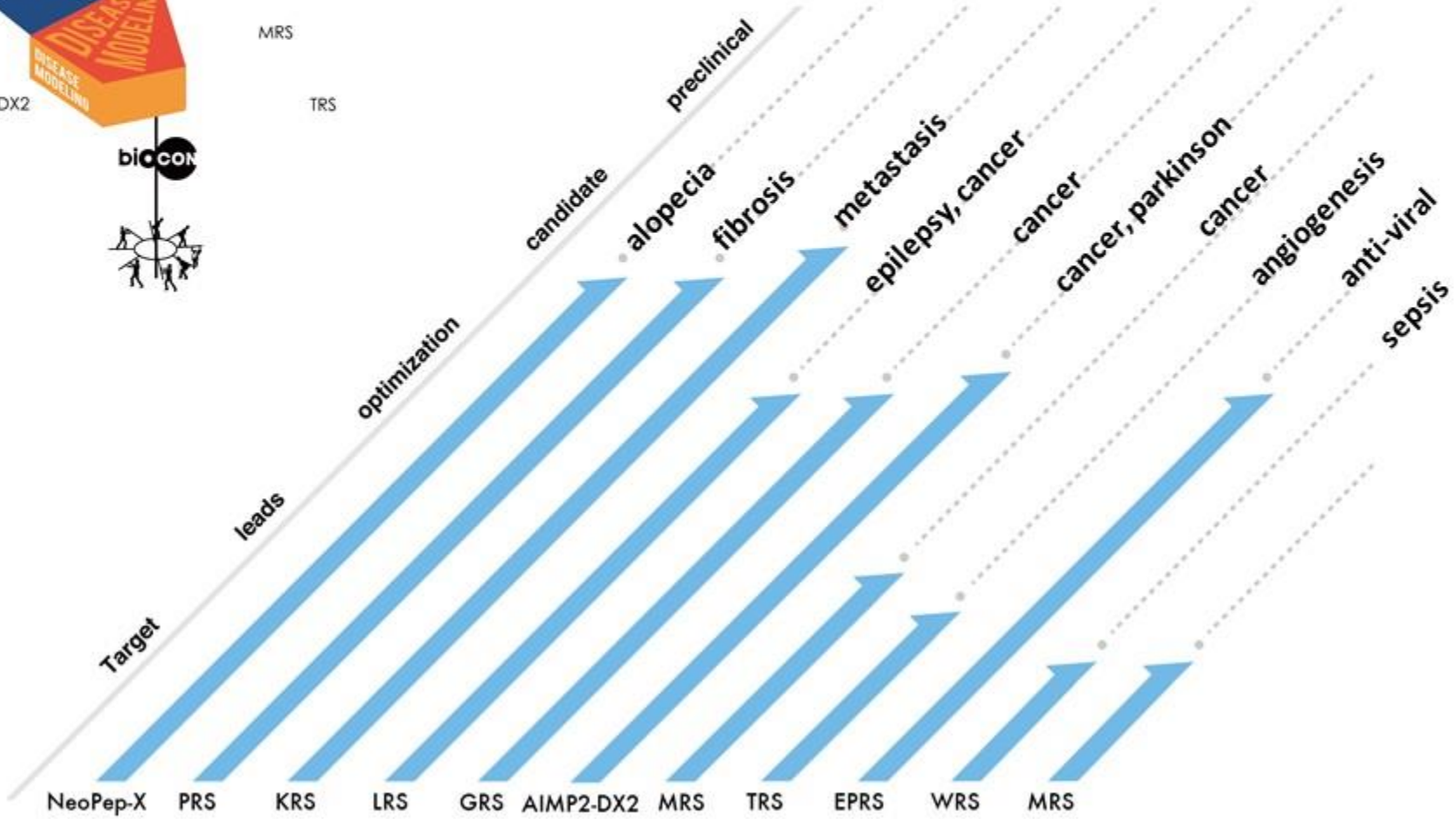
Biocon as Sustainable R&D Engine



Building Up Target Pipeline

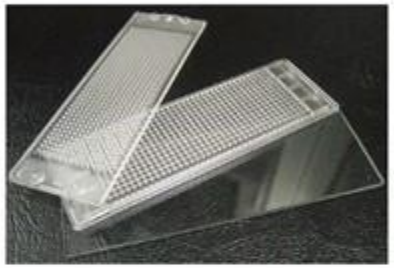
The Target Factory





Innovative Tech Products

Smart, Accurate, Fast, Economic (S.A.F.E.) technologies

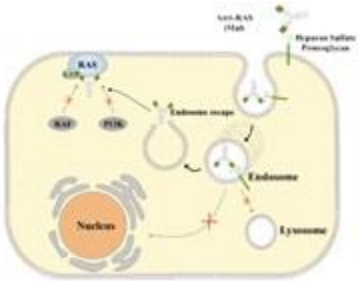


Micropillar/microwell chip platform

Microarray Spotter

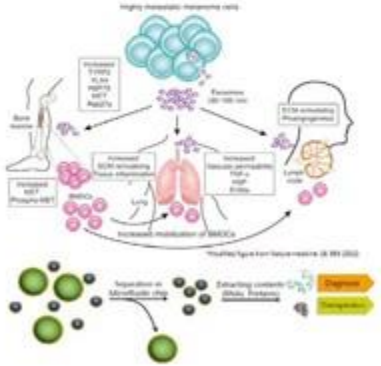
Scanner

IntraVital Microscopy (IVM)



Cell penetration/bi-specific/
Tissue penetration antibody platform

Exosome separation



Nanobio Platform for Ultrafine Separation

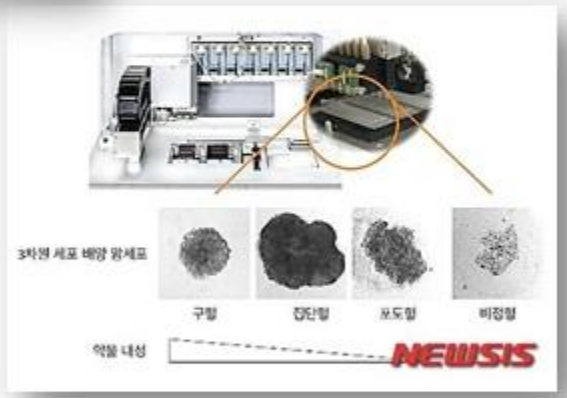
Following Diverse Routes to Market

Development of 3D Cell Culture & Drug Screening System

Global Trend:
From 2D to 3D
Cell-based Science

Cancer Research

Novel Morphologic and Genetic Analysis of Cancer Cells in a 3D Microenvironment Identifies STAT3 as a Regulator of Tumor Permeability Barrier Function



Development
of Prototype

Spin-off
Medican & Bio Device (MBD)

MBD
MEDICAL & BIO DEVICE

Alliance with Global Company for Sales

Discovery of a New Biomarker for Sepsis

Patent of the current marker PCT will be expired in 2017

→ A new marker hunting team

A company established

JW Bio Science

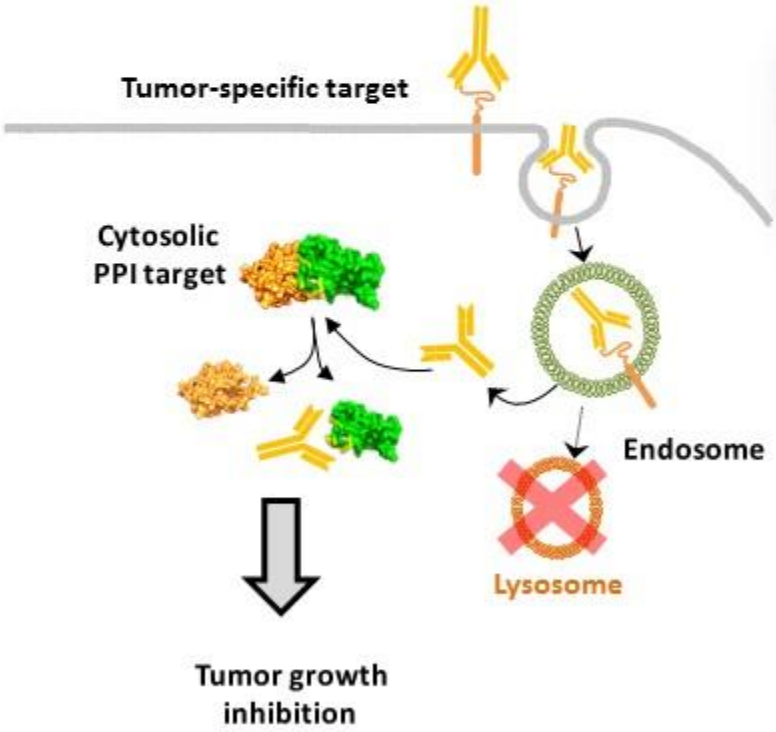
Development of Cell-penetrating Antibody

Challenge: Make antibody permeable to cell

↓

혁신형 항체팀 구성

ACT (Antibodies for Challenging Target)



A general strategy for generating intact, full-length IgG antibodies that penetrate into the cytosol of living cells

iMab platform technology Company Spin-off

Development of Innovative Anti-fibrosis Drug

Nature, 2012

ATP-directed capture of bioactive herbal-based medicine on human tRNA synthetase

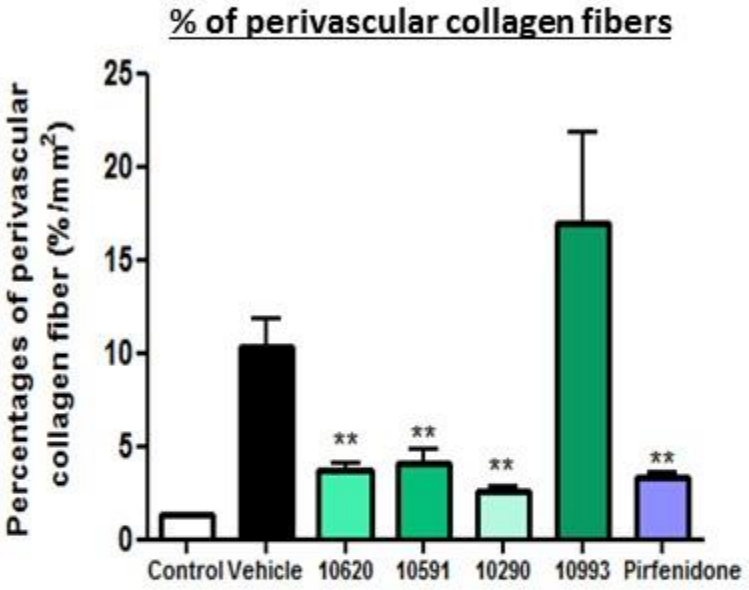
↓ Clinical unmet needs

Alliance with Pharma Team

↓

-Identified a candidate that shows 20x improved efficacy than Perfedinone

-Pre-clinical text on-going



BCPI = 10 mg/kg

Pirfenidone = 200 mg/kg

PO, once a day

First-in-Class Intravital Microscopy

Motivation: Set up an innovative system for phenotype and in vivo efficacy test.

↓

Eng/Clinic/Bio/Optics United Teamwork → Intravital imaging of intestinal lacteals unveils lipid drainage through contractility

Prototype

IntraVital Microscopy (IVM)

Company Spin-off → IR on-going

Development for Import Substitution

Collagen Detection System:
Depends on Imported Products

Identification
of Technical Problem

Development
of New Antibody

1st Generation
Product

Released
to Market

TRADE(TRAnslation and DEvelopment Group) for Global Outreach

Dr. Thomas Neenan (CTO)

Dr. Robert Burrier (CSO)

Robert Lafyatis, M.D.
Professor of Medicine
Thomas A. Medsger Endowed Professor of Scleroderma Research
University of Pittsburgh School of Medicine

Steven Ledbetter, PhD
formerly, Group Vice-President, Renal, Cardiovascular and Bone and Joint Diseases, Genzyme

Daniel Meruelo, PhD
Professor of Pathology and director of the Gene therapy Center, NYU

Robert Burrier, PhD
Chief Operating Officer and Vice-President Of Research and Development, Stemina Biomarker Discovery

Steven Burke, MD
Senior Vice President and Chief Medical Officer, Proteon Therapeutics, Inc.

Neil Kirby, PhD CEO, Edimer Pharmaceuticals,

John R. MacDonald, PhD, DABT,
formerly Senior VP R&D, MGI Pharma

Zihai Li, MD, PhD
Chairman and Professor, Department of Microbiology & Immunology Program Leader, Cancer Immunology Program Hollings Cancer Center Medical University of South Carolina (MUSC)

Biocon Salon 2016
Cambridge, USA
August 8-9, 2016

Biocon Recognized as "Tech Biz Star"

2015. 6. 25

Novel Cancer Therapeutics Derived from Aminoacyl-tRNA Synthetases

Sunghoon Kim, Ph.D. Professor and Director

Medicinal Bioconvergence Research Center (BIOCON), Dept. Molecular Medicine & Biopharmaceutical Sciences, College of Pharmacy, Graduate School of Convergence Science and Technology, Seoul National University, Korea

Sunghoon Kim is a professor at Seoul National University College of Pharmacy and Graduate School of Convergence Science and Technology, and also a director of "Medicinal Bioconvergence Research Center (Biocon, http://biocon.re.kr)" that is the biggest national project in Korea for novel target and lead discovery. In this project, he is building up the pipeline of druggable "target and lead" packages for industrial development.

2015. 3. 5.

Converged for One Vision

Making a Platform Linking Academia and Industry

The Target Factory

Integrated Research Platform
for Novel Target and Lead Discovery

since 2010

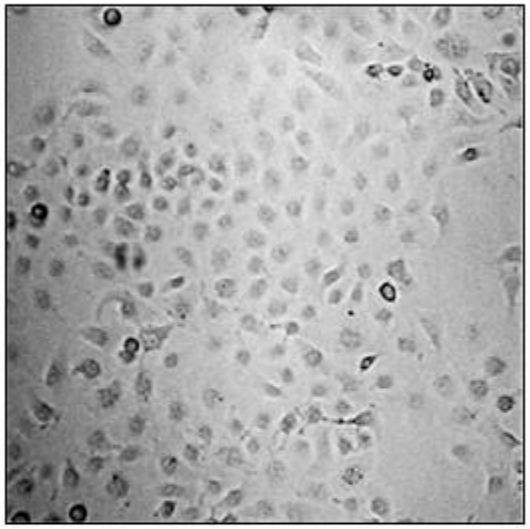
SUPPLEMENTS

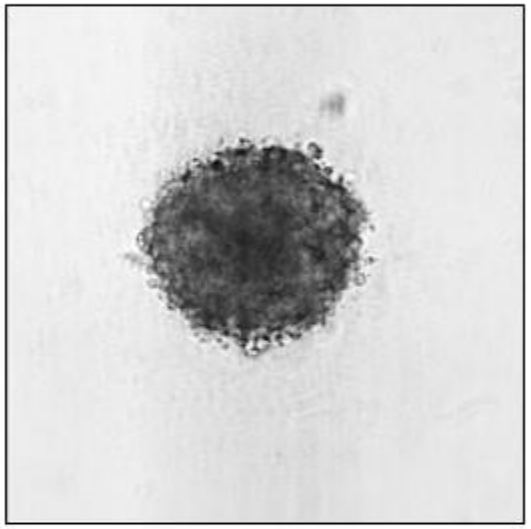
Biocon's 2 Target Packages: Calls from Global Pharmas for Information

Genentech
GSK
UCB
MSD
AbbVie
Ironwood Pharma
EA Pharma
A.Menarini IR
Maruho Co
F. Hoffman La Roche LTD
BMS
Merck Biopharma

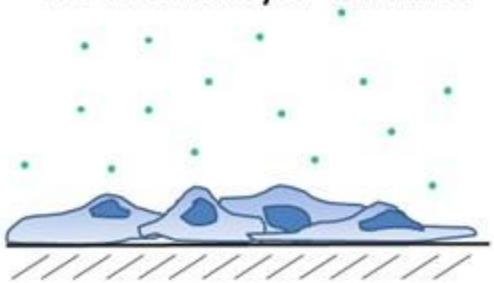
Fortress Biotech
Kissel Pharma
Servier
Daichi Sankyo
Onxeo
Inventiva
Chugai Pharma
JT Pharma
Mitsubishi Tanabe Pharma
Kyowa Hakko Kirin
Eli Lilly & Co
Pfizer

Background of 3D Cell Culture Platform

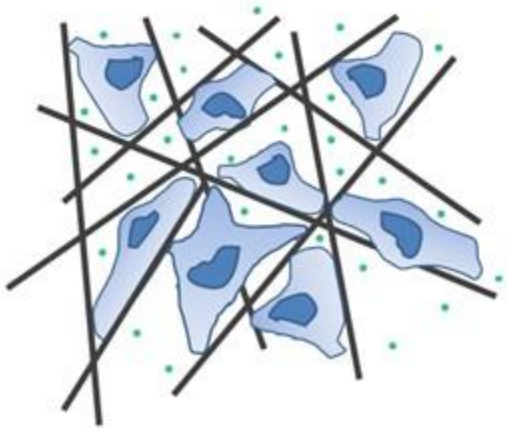




2D monolayer culture



3D culture



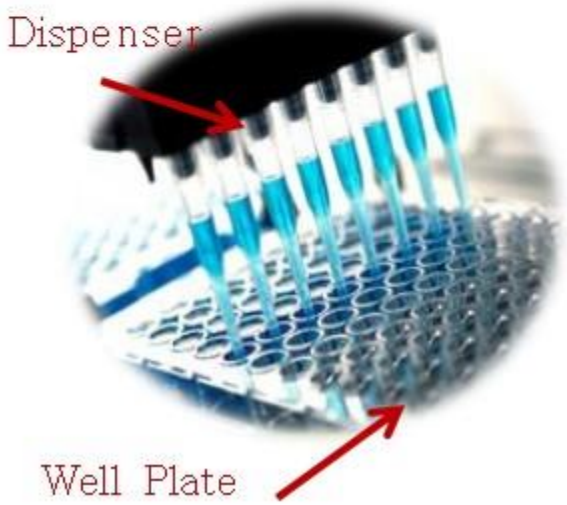
Background of 3D Cell Culture Platform

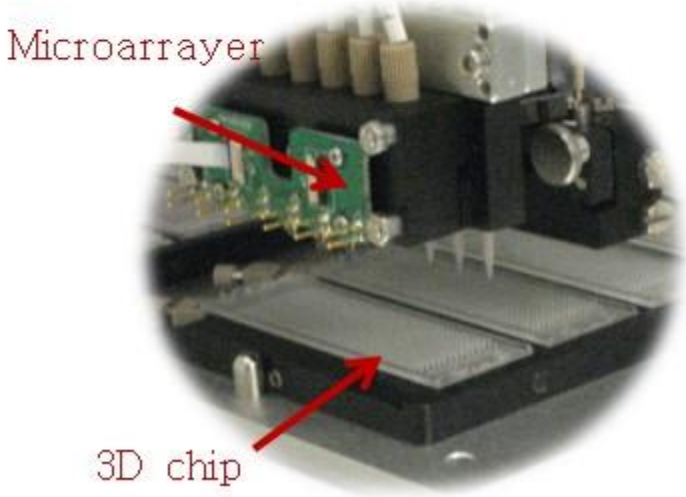
Drug development process: 11 – 15 yrs, $2 B per drug

High throughput Screening

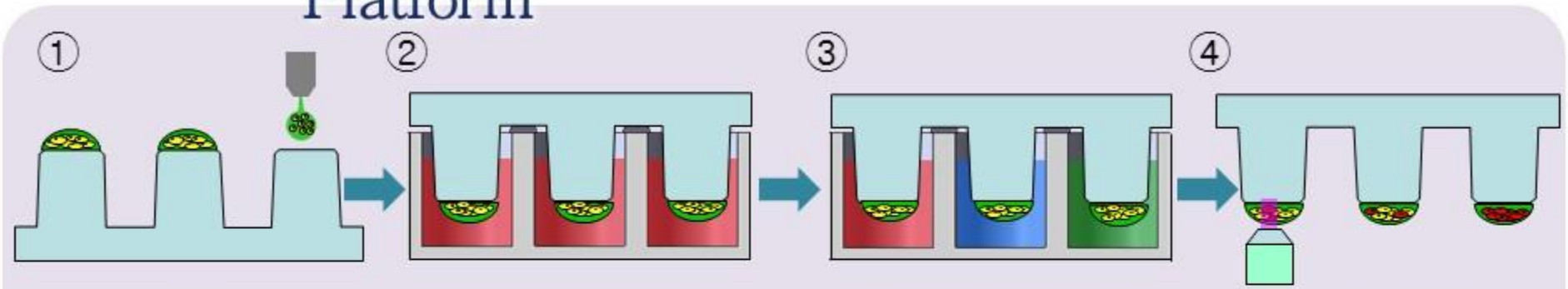
Macro System
(10~300ul, 2D culture

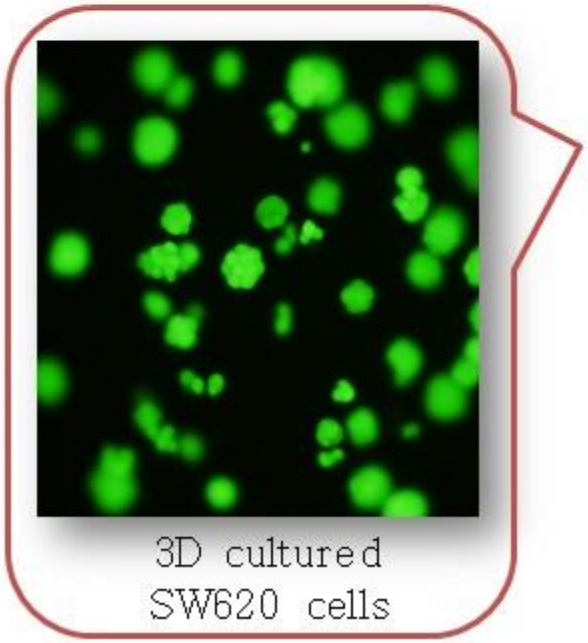
Micro System
(20~900nl, 3D culture

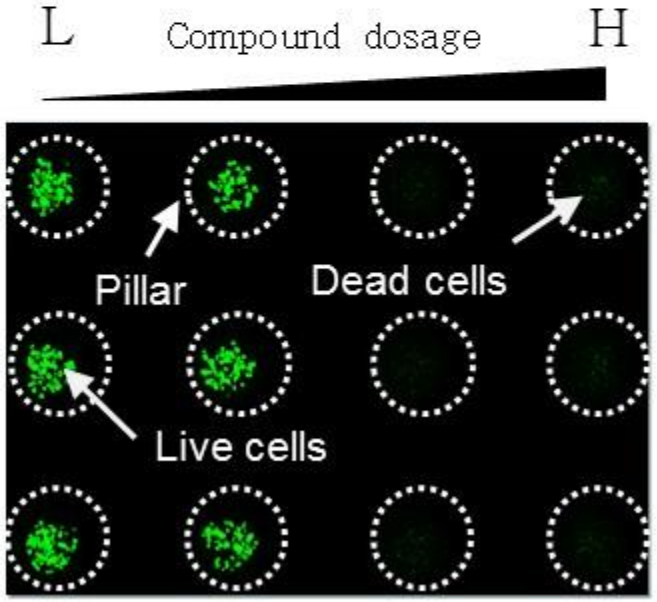


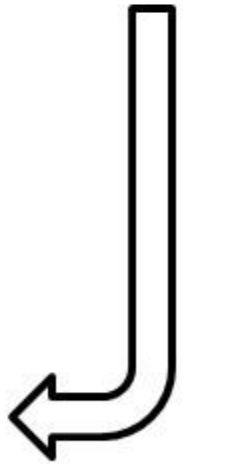


Procedure with 3D Cell Culture Platform





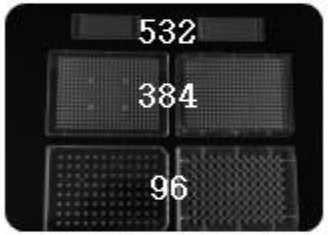




Co-work for 3D Cell Culture Platform

- Target Drug Screening and Proposition
- Compatibility Verification of the existing assay
- Development of novel assay
- Suggestion of the user-oriented VOC

- Development of 3D Cell Chip
- Development of HTS (Spotter, Scanner, S/W etc.)
- Securement of Reproducibility by QC



- Correlation Construction of Clinical Data
- Provision of Major Primary Cells
- Provision of VOC

History of 3D Cell Culture Platform

2009. 12. Project Start

2010. 02. Feasibility Test with Commercial Tools

2010. 05. Development of 1st Generation Cell Spotter

2011. 12. Development of 532 Chip

2012. 08. Pfizer Validation

2013. 01. Development of 2nd Generation Cell Spotter

2014. 03. Development of 3rd Generation Cell Spotter

2014. 06. Eli Lilly Validation and P/O

2015. 01. Establishment of MBD (Commercialization)

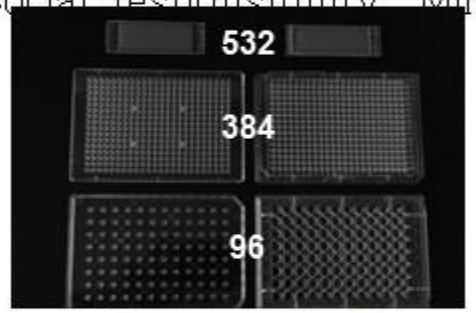
2015. 12. Development of 384, 96 Chip

2016. 08. Purchase Order from Ksilink (France)

2016. 10. Development of 4th Generation Cell Spotter

Summary of 3D Cell Culture Platform

- 3D Cell Culture Platform with Micropillar/microwell chip
  - ❖ High-throughput screening platform for 3D human cell cultures
  - ❖ Cost effectiveness: Minimal volume < 1 μl (beneficial for valuable human cells)
  - ❖ Higher predictability: Spanning a gap between gene sequencing and xenografted animal models
  - ❖ Social responsibility: Minimizing [illegible] animal testing for drug development



Chips


Microarrayer


Image Scanner

- Publications/Collaborations
  - ❖ SCI Journal Publish
    : JMEMS, Lab on a chip, Small, Nature Communication, Analytical Chemistry, Sensors&Actuator B, etc.
  - ❖ Global Pharmacy(Pfizer, Lilly, etc)
    : Validation of the chip platform is completed and save
  - ❖ Hospital (Samsung Medical Center, Seoul ST.Mary's Hospital etc)
    : Personalized cancer therapy with patient-derived primary cancer cells
  - ❖ University/Institute(Korea Institute of Toxicology, Seoul National Universtiy, etc)