Sumitomo Dainippon Pharma

Innovation today, healthier tomorrows

R&D meeting

March 3, 2020

Sumitomo Dainippon Pharma Co., Ltd.

Disclaimer Regarding Forward-looking Statements

This material contains forecasts, projections, targets, plans, and other forward-looking statements regarding the Group's financial results and other data. Such forward-looking statements are based on the Company's assumptions, estimates, outlook, and other judgments made in light of information available at the time of preparation of such statements and involve both known and unknown risks and uncertainties.
Accordingly, plans, goals, and other statements may not be realized as described, and actual financial results, success/failure or progress of development, and other projections may differ materially from those presented herein.
Information concerning pharmaceuticals (including compounds under development) contained herein is not intended as advertising or as medical advice.

Today's Agenda

1	**Introduction**	Representative Director President and CEO	**Hiroshi Nomura**	**P.3-14**
2	**Psychiatry & Neurology**	Member, Board of Directors Senior Executive Officer	**Toru Kimura, Ph.D.**	**P.15-29**
3	**Regenerative Medicine/ Cell Therapy**	Member, Board of Directors Senior Executive Officer	**Toru Kimura, Ph.D.**	**P.30-47**
4	**Oncology**	Senior Executive Officer Global Head of Oncology	**Kazuo Koshiya, Ph.D.**	**P.48-61**
5	**Development pipeline : SEP-363856**	Sunovion Pharmaceuticals Inc. Chief Scientific Officer	**Kenneth S. Koblan, Ph.D.**	**P.62-75**
6	**Q&As**			

To deliver innovation to patients with CHANTO

Hiroshi Nomura
Representative Director, President and CEO

CHANTO

Capability to continuously foster and deliver innovation to patients and other customers, while transforming our organization in flexible ways to adapt to changes in the world

Corporate Mission

To broadly contribute to society through value creation based on innovative research and development activities for the betterment of healthcare and fuller lives of people worldwide

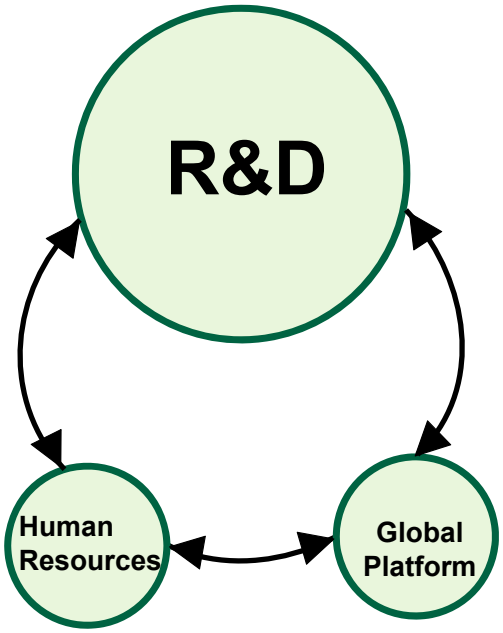
Value Creation Process (Research & Development)

Sumitomo Dainippon Pharma

Sources of value creation —— six types of capital | **Business Activities** | **Value provided to society**

Six types of capital

Our Strengths



Value Chain

Innovative Drug Discovery

- **Psychiatry & Neurology Area**
  New compounds under development: 11
- **Oncology Area**
  New compounds under development: 11
- **Regenerative Medicine/Cell Therapy Field**
  Projects under development: 6
- **Infectious Diseases Area**
  Joint research with academia, etc.

Drug Development, Production, Sale, and Information Provision

CSR-based Management /Corporate Governance

Creating innovative pharmaceutical products and healthcare solutions in areas with high unmet medical needs

Contributing to the development of science

Contributing to improving quality of life (QOL) for patients and their families

Improving sustained corporate value

- **Returns to shareholders (stable dividends, increases in dividends linked to improvements in performance)**
- **Strategic investment aimed at sustained growth (includes research and development investment)**

Also contributing to achieving the Sustainable Development Goals (SDGs)

R&D: Research & Development

Sustained Growth

Mid-to-Long Term Corporate Vision

Sumitomo Dainippon Pharma

We aspire to establish ourselves as a "Global Specialized Player" by 2033 with the ability to meet increasingly diversified healthcare needs

Goal and Vision 2033

Vision

For Longer and Healthier Lives:
We unlock the future with cutting-edge technology and ideas

Position we aspire to establish in 2033

Global Specialized Player

Pharmaceuticals+Solutions

Medicine / Cell Therapy + Healthcare Solution (Frontier business)

Global leader in 3 areas

Focus Research Areas

Psychiatry & Neurology | Oncology | Regenerative / Cell

Best in class focused on value

Mid-term Business Plan 2022 Basic Strategies: Re-build Business Foundation

Sumitomo Dainippon Pharma

Reshape business foundation through the "establishment of growth engine" and the "building of flexible and efficient organization", preparing for the "Time for Change" and post-LATUDA® revenue replacement

I. Establishment of growth engine

1. **Enhance innovation base with new approaches to drug discovery**
2. **Deliver highest performance of clinical development**
3. **Pipeline expansion through strategic investment**
4. **Regional strategy centering in Japan, North America and China**
5. **Launch frontier business**

Today's presentation shows the progress in each area starting on page 15

II. Building of flexible and efficient organization

"CHANTO"

- Flexible and efficient operations
- Digital innovation
- Corporate culture and talent to drive innovation

Main Progress of Development Pipeline in FY2019

One approval obtained (LONASEN® Tape)
Three NDAs submitted (dasotraline < BED in U.S. >, apomorphine <in U.S.>, lurasidone <in Japan>)
New Phase 1 study: DSP-1181 (proposed indication: obsessive compulsive disorder)

Products	Status	Countries	Launch target
Lurasidone	NDA submitted for schizophrenia and bipolar depression in July 2019	Japan	FY2020
Dasotraline	NDA submitted for binge eating disorder (BED) (PDUFA date: May 14, 2020)	U.S.	FY2020
Apomorphine	NDA submitted for OFF episodes associated with Parkinson's disease (PDUFA date: May 21, 2020)	U.S.	FY2020
SEP-363856	Started Phase 3 studies for schizophrenia	U.S.	FY2023
Napabucasin	Colorectal cancer (combination therapy): Global clinical phase 3 study ongoing Pancreatic cancer (combination therapy): Global clinical phase 3 study discontinued	U.S. Japan	FY2021 (Colorectal cancer: U.S.) FY2022 (Colorectal cancer: Japan)
Imeglimin	Completed Phase 3 studies for Type 2 diabetes, preparing to submit NDA	Japan	FY2021

Obtained 10 products due to the strategic alliance with Roivant Sciences
(Pipeline includes the following: RVT-801, RVT-802, rodatristat ethyl, MVT-602, URO-902, SPIRO-2101, SPIRO-2102, ALTA-2530)

Products	Status	Countries	Submit target
Vibegron	NDA submitted for overactive bladder Ongoing Phase 3 study for overactive bladder in men with BPH Ongoing Phase 2a study for IBS-associated pain	U.S.	Overactive bladder: NDA submitted in December 2019
Relugolix	Completed Phase 3 studies for uterine fibroids, preparing to submit NDA Completed Phase 3 studies for prostate cancer, preparing to submit NDA Ongoing Phase 3 study for endometriosis	U.S.	Uterine fibroids: April 2020 Prostate cancer: Q1 FY2020

Introduction

Development Pipeline (as of March 3, 2020)

Sumitomo Dainippon Pharma

: Psychiatry & Neurology : Oncology : Regenerative medicine / cell therapy : Others

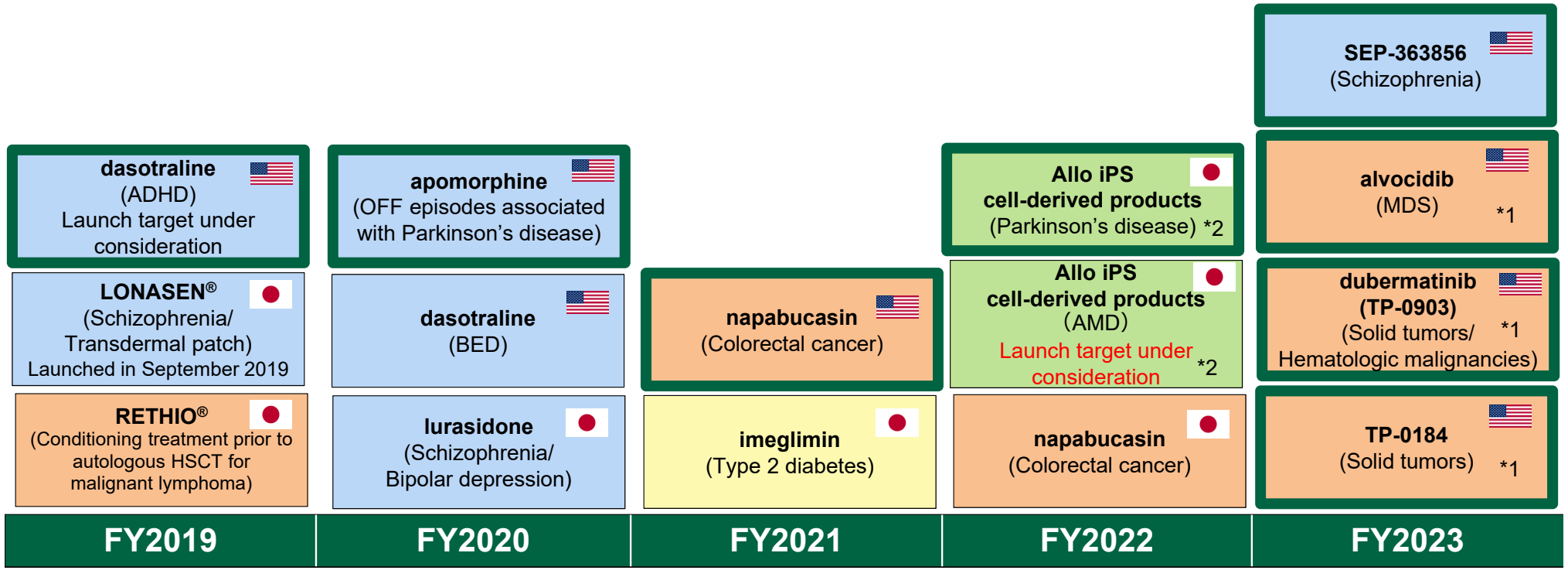
Revisions since the announcement of January 2020 are shown in red

Area	Phase 1		Phase 2	Phase 3	NDA/BLA submitted
Japan	**dasotraline** (ADHD) **SEP-363856** (Schizophrenia) **EPI-589** (ALS) **DSP-1181** (Obsessive compulsive disorder)	**alvocidib** (Hematologic malignancies) **dubermatinib (TP-0903)** (Solid tumors)	**SEP-4199** (Bipolar I depression) **DSP-7888** (Solid tumors/ Hematologic malignancies) **Allo iPS cell-derived products** (Parkinson's disease) Investigator-initiated clinical study	**EPI-743** (Leigh syndrome) **napabucasin** (Colorectal cancer) **imeglimin** (Type 2 diabetes)	**lurasidone** (Schizophrenia/ Bipolar depression) **RETHIO®** (Conditioning treatment prior to autologous HSCT for malignant lymphoma)
U.S.	**DSP-6745** (Parkinson's disease psychosis) **SEP-378608** (Bipolar disorder) **DSP-3905** (Neuropathic pain) **SEP-378614** (Treatment resistant depression) **SEP-380135** (Agitation in Alzheimer's disease)	**alvocidib** (MDS) **dubermatinib (TP-0903)** (Solid tumors/ Hematologic malignancies) **DSP-0509** (Solid tumors) **TP-0184** (Solid tumors / Hematologic malignancies) **DSP-0337** (Solid tumors) **TP-1287** (Solid tumors) **TP-3654** (Solid tumors/ Hematologic malignancies)	**EPI-589** (Parkinson's disease/ALS) **SEP-363856** (Parkinson's disease psychosis) **SEP-4199** (Bipolar I depression) **alvocidib** (AML) **DSP-7888** (Solid tumors) **vibegron** (IBS-associated pain) **rodatristat ethyl** (Pulmonary arterial hypertension) **URO-902** (Overactive bladder)	**SEP-363856** (Schizophrenia) **napabucasin** (Colorectal cancer) **relugolix** (Prostate cancer) **relugolix** (Uterine fibroids/Endometriosis) **vibegron** (OAB in men with BPH)	**dasotraline** (BED) **dasotraline** (ADHD) Development strategy under consideration **apomorphine** (OFF episodes associated with Parkinson's disease) NDA resubmitted in November 2019 **RVT-802** (Pediatric congenital athymia) Received Complete Response Letter **vibegron** (OAB)

Introduction

Product Launch Target (as of March 3, 2020)

Revisions since the announcement of January 2020 are shown in red



: Psychiatry & Neurology : Oncology

: Regenerative medicine / cell therapy : Others

Expect peak annual sales to be 50 billion yen or more (described in the first launch)

*1 Premise to utilize an application of accelerated approval program (Plan to consult with the FDA)

*2 Launch schedule is based on our goal pending agreement with partners

*** Plan to launch RVT-802, vibegron and relugolix from FY2019 to FY2023 (launch targets are not disclosed)**

• RVT-802 (Pediatric congenital athymia)	Submitted in April 2019 , Received Complete Response Letter in December 2019
• Vibegron (OAB)	Submitted in December 2019
• Relugolix (Uterine fibroids)	Plan to submit NDA in April 2020
(Prostate cancer)	Plan to submit NDA in Q1 FY2020

Research & Development Strategy in Each Areas

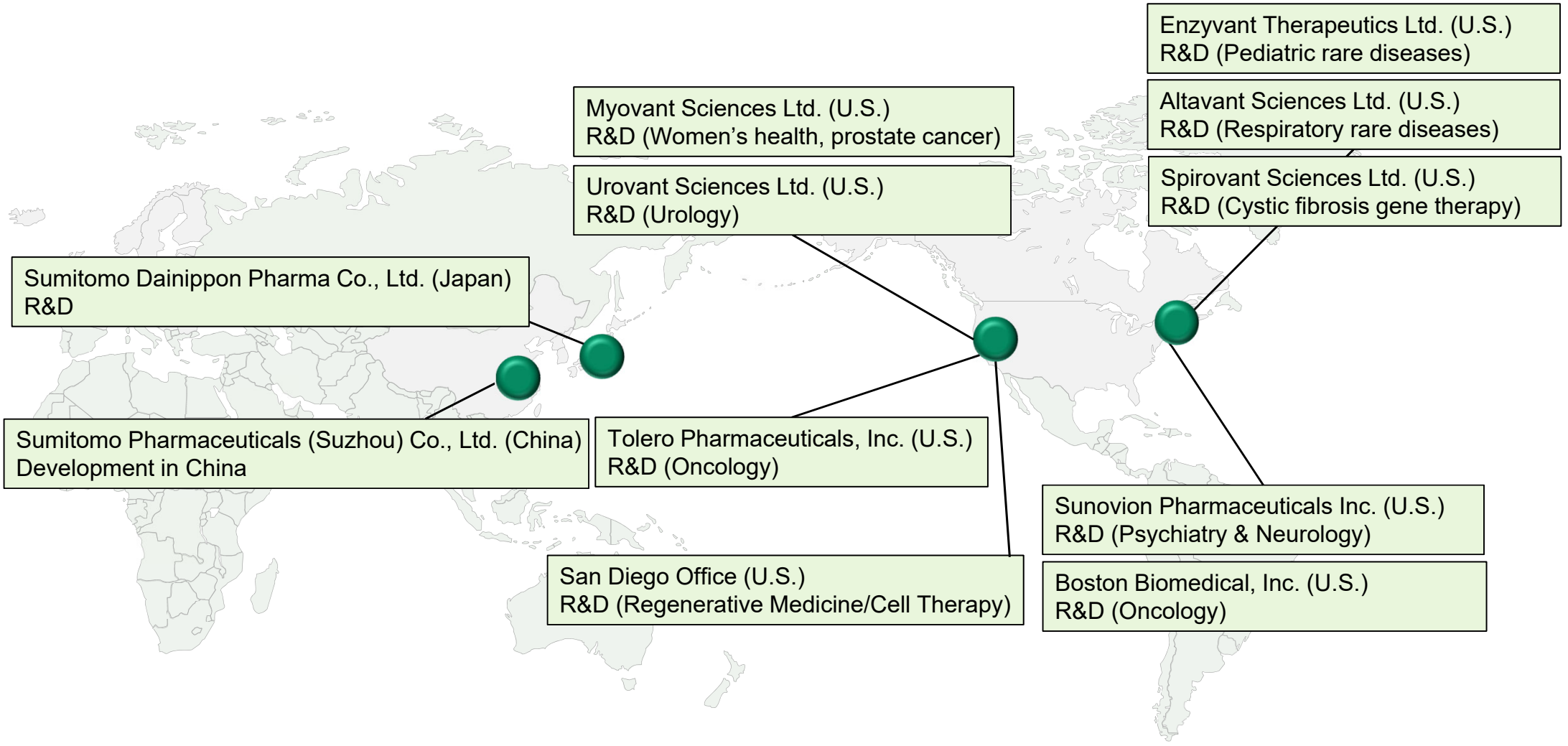
Sumitomo Dainippon Pharma

Basic policy: Concentrated investment in three focus research areas, bringing in open innovation, and allocation of R&D investment by priority

Focus Research Areas	Psychiatry & Neurology	Oncology	Regenerative Medicine/ Cell Therapy
Approach	Target psychiatric disorders with poor treatment satisfaction; also aim at discovery of disease-modifying drugs in addition to drugs for treating peripheral symptoms of neurodegenerative diseases	Build diversified and innovative development pipeline through discovery research focused on tumor microenvironment (intercellular interaction) and other key cancer pathways	Pursue advanced manufacturing expertise and cutting-edge science to become a global leader

	Infectious Diseases	Frontier Business	Best in class focused on value
Approach	Promote R&D in collaboration with academia aiming at contributing to global health	Build a unique technology platform centering around our pharmaceutical business	Promote R&D by each “Vant” by leveraging their strengths

Research & Development Base



Research & Development System (scheduled for April 1, 2020)

Appointment of Chief Scientific Officer

- Supervision of R&D activities in all areas
- Central management of R&D expense allocation and achievement of optimal R&D portfolio management

President and Chief Executive Officer

Chief Scientific Officer
Toru Kimura

R&D resource allocation policy will be discussed in the Management Committee

Psychiatry & Neurology / Others

Drug Research (Division)
Drug Development (Division)
Sunovion Pharmaceuticals Inc.
etc.

Oncology

DSP Cancer Institute
Boston Biomedical, Inc.
Tolero Pharmaceuticals, Inc.
etc.

Regenerative Medicine/ Cell Therapy

Regenerative & Cellular Medicine Office
Regenerative & Cellular Medicine Kobe Center
Regenerative & Cellular Medicine Manufacturing Plant
etc.

Sumitovant Biopharma Group

Myovant Sciences Ltd.
Urovant Sciences Ltd.
Enzyvant Therapeutics Ltd.
Altavant Sciences Ltd.
Spirovant Sciences Ltd.

For Sustainable Growth

Sumitomo Dainippon Pharma

Continuously foster and deliver innovation to patients and other customers

Transform our organization to adapt to changes in the world and to continue a sustained growth

Psychiatry & Neurology

Toru Kimura, Ph.D.
Member, Board of Directors
Senior Executive Officer

R&D Strategy

- **Achieve precision medicine through pathophysiology-based drug discovery**
- **Provide total health care solutions through combining pharmaceuticals with digital technologies**
- **Overcome neurodegenerative diseases and move toward preventive medicine**

Direction

- Psychiatry: Drive “genetics and neural circuit anomalies”-based drug discovery for the treatment of schizophrenia, depression, psychiatric symptoms in neurological disorders, and developmental disorders
- Neurology: Identify disease modifying drugs for dementia, Parkinson’s disease, and rare diseases, maximizing the opportunities of advance in science

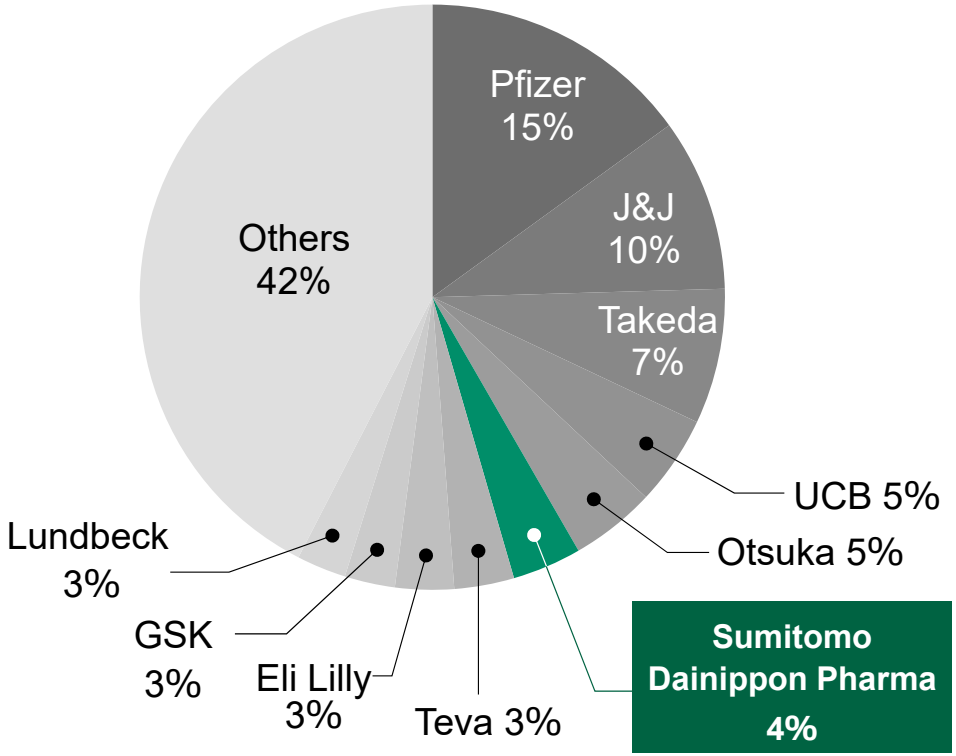
Measures

- Maximize our strengths in monoamine drug discovery
- Take advantage of our original technologies; in silico-, iPS-, and ion channel-based drug discoveries
- Deepen genetics- and neural circuit-based research to achieve precision medicine
- Utilize big data and explore surrogate biomarkers in collaboration with industries, governments, and academia.
- Advance use of digital devices for patient support, diagnosis, and treatment
- Strengthen open innovation

Pursuing a Leading Position in Psychiatry and Neurology Area

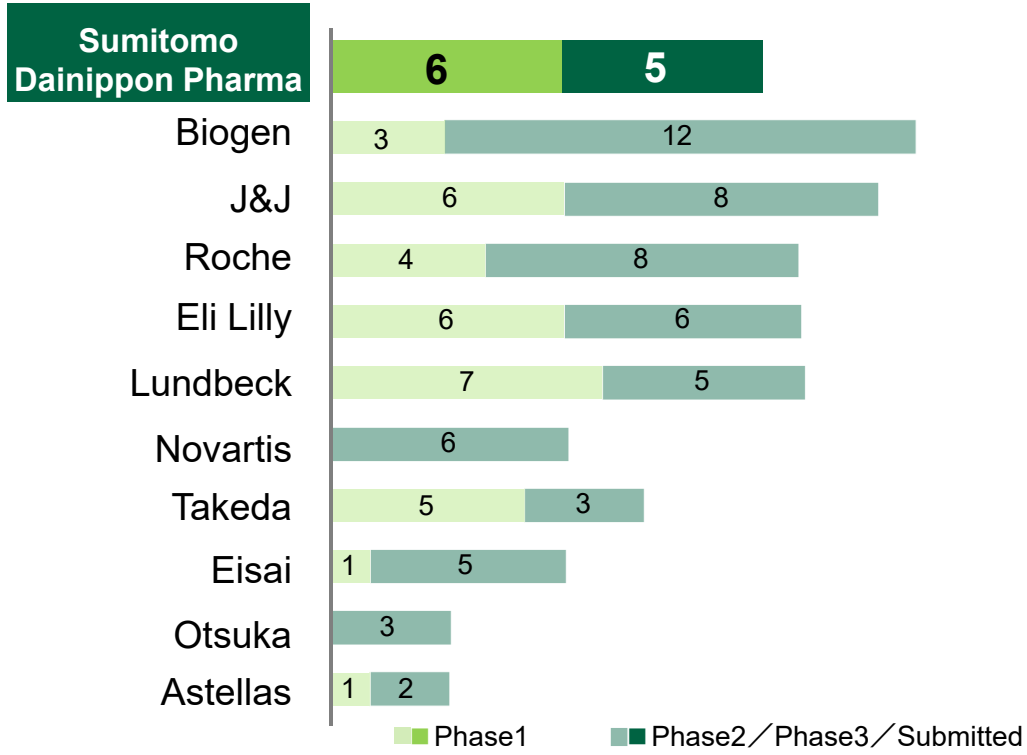
Established a top-class position in global market and building unique R&D pipeline

● **Market share of pharma companies (2018)**
Global market size: 55.6 B$



EvaluatePharma® 14 February 2020, © Evaluate Ltd
Excluding multiple sclerosis drug (autoimmune disease)

● **Numbers of new active ingredients in neuroscience clinical pipeline (as of Jan. 2020)**



Cortellis Competitive Intelligence, 12 Feb 2020, © Clarivate Analytics
Excluding multiple sclerosis drug (autoimmune disease)

High Unmet Needs in Psychiatric and Neurological Disorders

■ Psychiatric and neurological disorders cause enormous loss for society

- ➢ Highest disease burden in disability-adjusted life year (DALY)
- ➢ Increasing economic loss worldwide
  USD 2,493 B (2010) to USD 6,046 B (2030)
  （Source：The Global Economic Burden of Non-communicable Diseases 2011.9）

□ Patients with schizophrenia or depression are often resistant to current therapy and facing difficulty in social reintegration

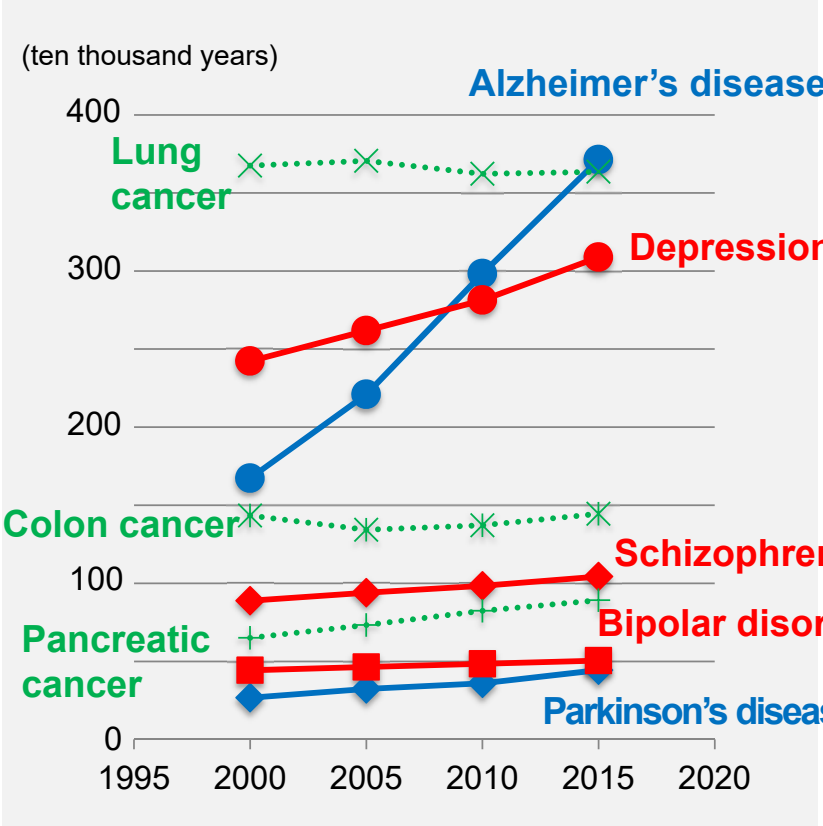
- ✓ Approx. 30% of patients are treatment resistant
- ✓ No approved drugs for negative symptoms/cognitive impairment of schizophrenia
- ✓ >150K schizophrenia patients hospitalized in Japan
  （Source: Ministry of Health, Labor and Welfare 2017 patient survey）

□ Burden of care for patients with behavioral and psychiatric symptoms in dementia (BPSD) is increasing

- ✓ Number of patients increasing rapidly in Japan, likely to exceed 7 million by 2025 （Source: 78th Social Security Council Nursing Care Insurance Subcommittee Reference Material 2-1）
- ✓ Importance of prevention and handling of BPSD is emphasized in the Framework for Promoting Dementia Care
  (psychiatric symptoms include anxiety, depression, apathy, agitation, delusion, hallucination, sleep disorders, etc)

Disability-adjusted life years (DALY) in the U.S.

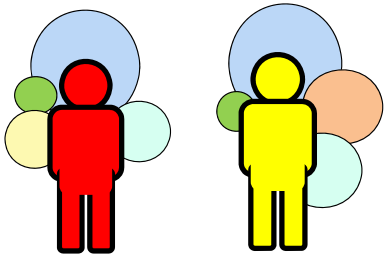
(Time of healthy life lost per year)



Heterogeneity in Psychiatric and Neurological Disorders

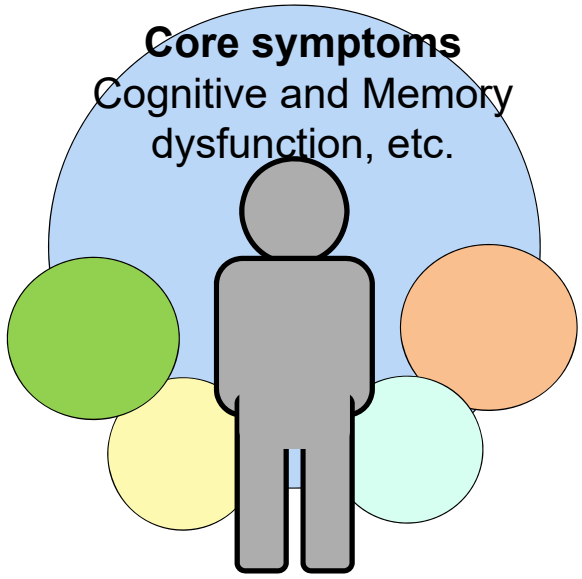
Psychiatric Disorder

Drug responsive patients



Drug-resistant patient/ patient with residual symptoms

Neurological Disorder



Psychiatric symptoms
Anxiety, depression, apathy, agitation, delusions, hallucinations, sleep disorders, etc.

High Unmet Medical Needs

Initiatives Leveraging Strengths in Science & Technology

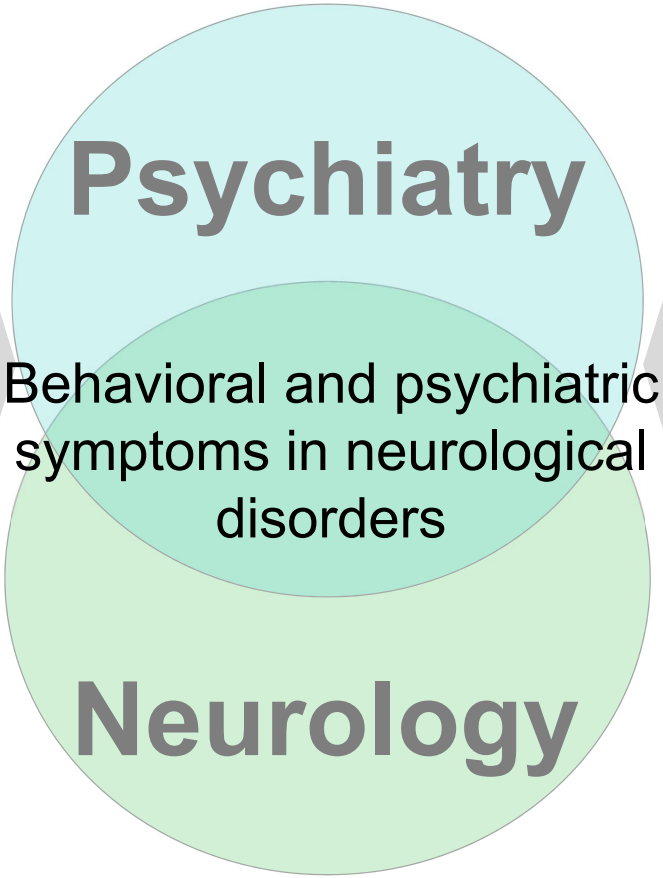
Sumitomo Dainippon Pharma

Biology

Novel disease models
- Genetic modification
- Abnormal neural circuit model

Patient-derived iPSCs
- Human disease model

Other advanced technologies
- AI-driven behavior analysis
- Neuroimaging
- EEG
- GWAS



Chemistry
Computational science

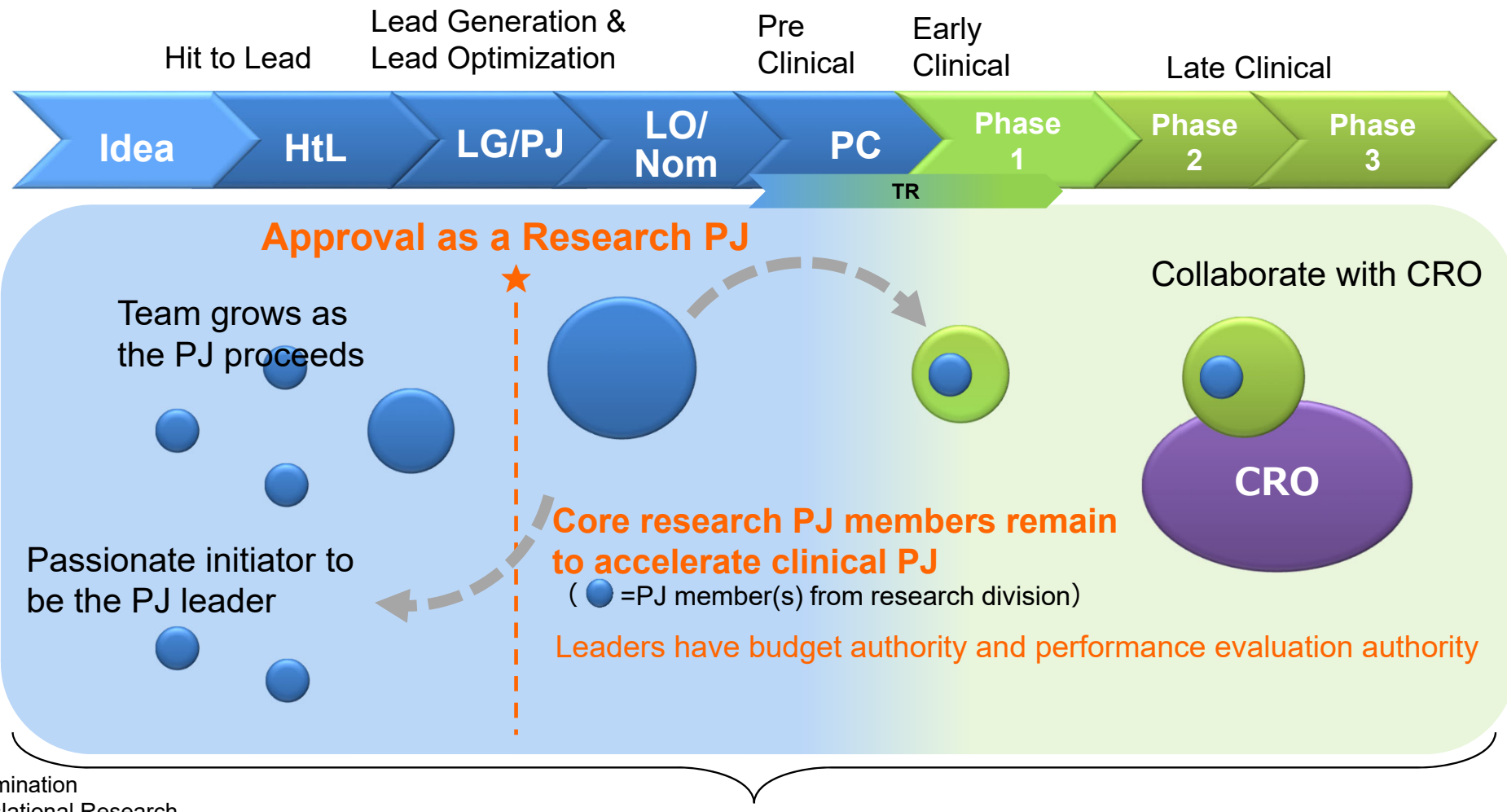
Med-Chem in CNS
- Know-how
- Accumulated data

In silico prediction
- Chemical structure
- Physicochemical property
- ADMET

Clinical Science

- Abundant clinical experiences and rich clinical data

Organizational Activation: Research Project (PJ) System (from October 2017)



Nom: Nomination
TR: Translational Research

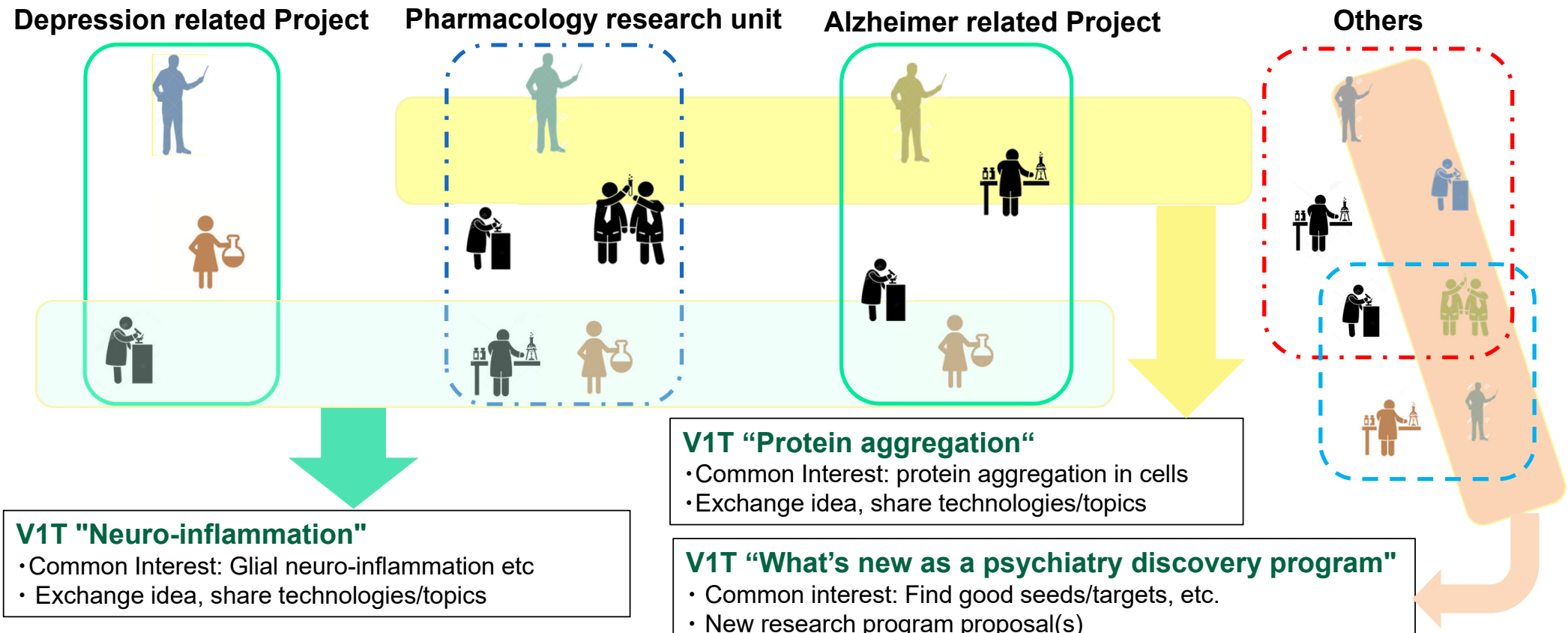
All other functions in the company support PJs

Psychiatry & Neurology

Organizational Activation: Virtual One Team (V1T) Initiatives

Sumitomo Dainippon Pharma

Researchers from different PJs/departments with common interest gather, discuss and share ideas/knowledge/technologies ~ key for open, creative culture



V1T "Neuro-inflammation"
- Common Interest: Glial neuro-inflammation etc
- Exchange idea, share technologies/topics

V1T "Protein aggregation"
- Common Interest: protein aggregation in cells
- Exchange idea, share technologies/topics

V1T "What's new as a psychiatry discovery program"
- Common interest: Find good seeds/targets, etc.
- New research program proposal(s)

This initiative leads to organizational activation, resulting in new program proposals

Psychiatry & Neurology: Utilization of Advanced Technologies

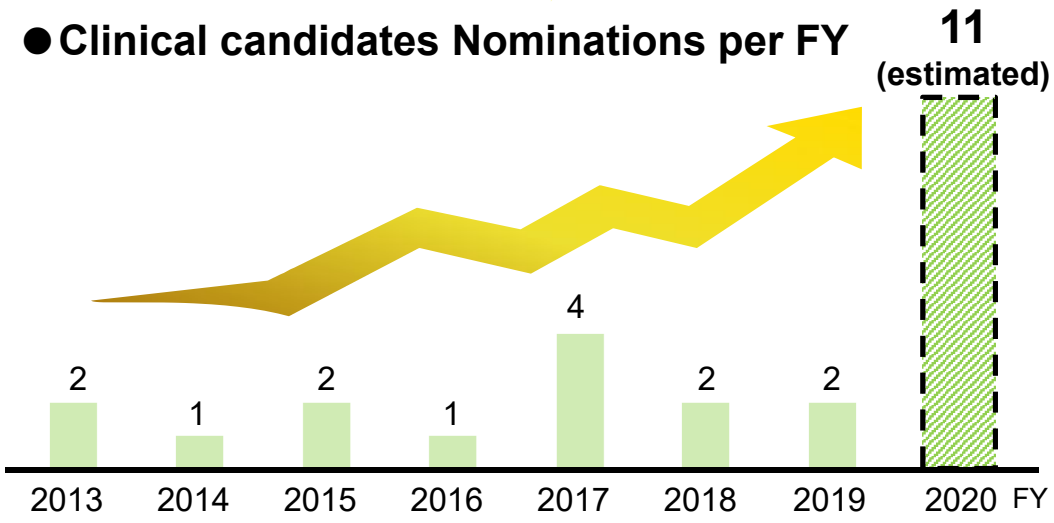
Aggressive Utilization of Advanced Technologies Makes Difference

Sumitomo Dainippon Pharma

In-house advanced technologies platform

- Patients-derived iPSC
- In silico drug discovery
- New modalities
- Neural circuits
- Higher brain function
- Ion channels
- Optogenetics
- Monoamines
- Genetic modifications

● Clinical candidates Nominations per FY



Advanced technologies platform built through internal effort and external alliances aggressively utilized in drug discovery research process

Key success factor to proceed research PJs

Psychiatry & Neurology: Utilization of Advanced Technologies

DSP-1181, a 5-HT$_{1A}$ Receptor Full Agonist, As an OCD Drug Candidate

Sumitomo Dainippon Pharma

BBC Sign in | News | Sport | Reel | Worklife | Travel | Future | More | Search

NEWS

Home | Video | World | Asia | UK | Business | Tech | Science | Stories | Entertainment & Arts | Health | World News TV | More

ADVERTISEMENT

Ad closed by Google

Stop seeing this ad | Why this ad?

Technology

Artificial intelligence-created medicine to be used on humans for first time

By Jane Wakefield
Technology reporter

30 January 2020 | Share

AAAS Become a Member | Log In | ScienceMag.org | Search

Science Translational Medicine | Contents | News | Careers | Journals

SHARE

94

IN THE PIPELINE

Derek Lowe's commentary on drug discovery and the pharma industry. An editorially independent blog from the publishers of *Science Translational Medicine*. All content is Derek's own, and he does not in any way speak for his employer.

By Derek Lowe

MORE FROM *SCIENCE TRANSLATIONAL MEDICINE*

- Archive
- Current Table of Contents
- In the Pipeline
- About Science Translational Medicine

RECENT COMMENTS

- Henry Spencer on Harvard's Chemistry Dept. Chairman in FBI Custody
- loupgarous on Unscrambled Eggs
- Young Process on The Good Ol' Grignard
- PUI Prof on Unscrambled Eggs
- Baltic on The Good Ol' Grignard

DRUG DEVELOPMENT

Another AI-Generated Drug?

By Derek Lowe | 31 January, 2020

I see that there's press coverage today of "the first AI-generated drug" to go into human trials. Some will recall this similar claims have been made before, so what exactly are we looking at?

The compound is DSP-1181, from a collaboration between Sumitomo and the startup Exscientia (out of Dundee). It's a long-acting 5-HT1a agonist, from what I can see (page 15 of that document). The coverage says that it "was created by using algorithms that sifted through

Advertisement

Ad closed by Google

Stop seeing this ad

Why this ad?

125%

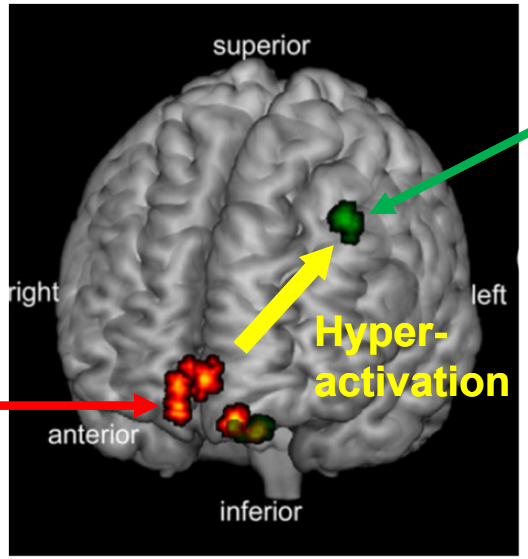
Reported in BBC news and Science Translational Medicine

OCD; Neural Circuits and Pathophysiology

Sumitomo Dainippon Pharma

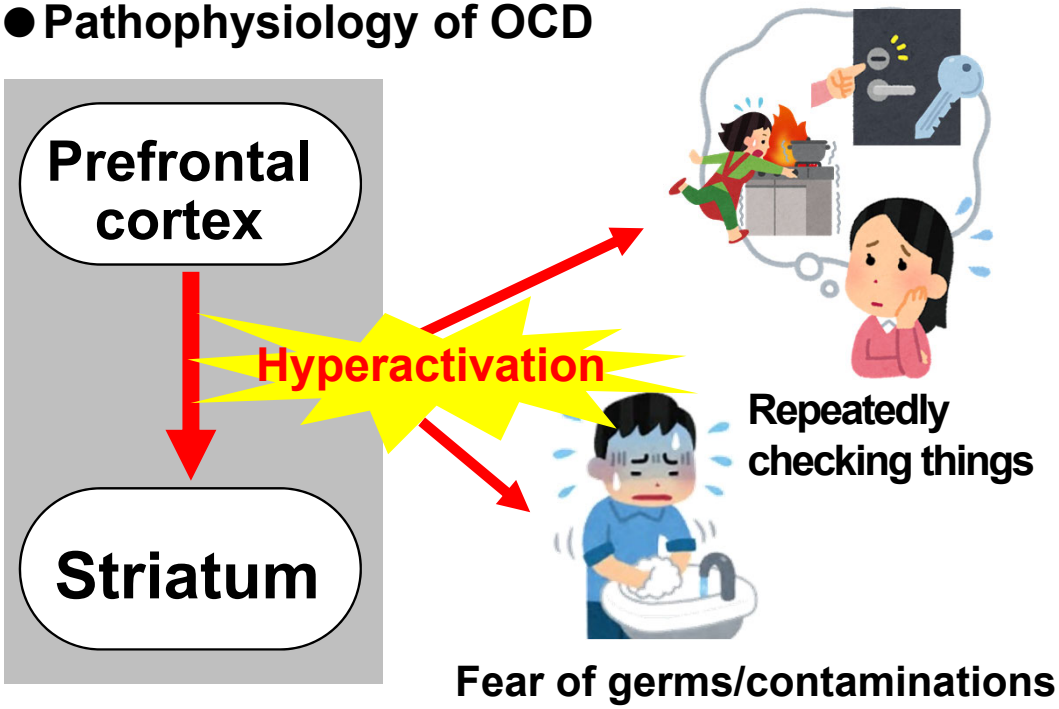
Positive cortico-striatal connectivity in OCD patients

- Increased cortico-striatal connectivity



Eur Psychiatry. 2011 Oct;26(7):463-9.

- Pathophysiology of OCD



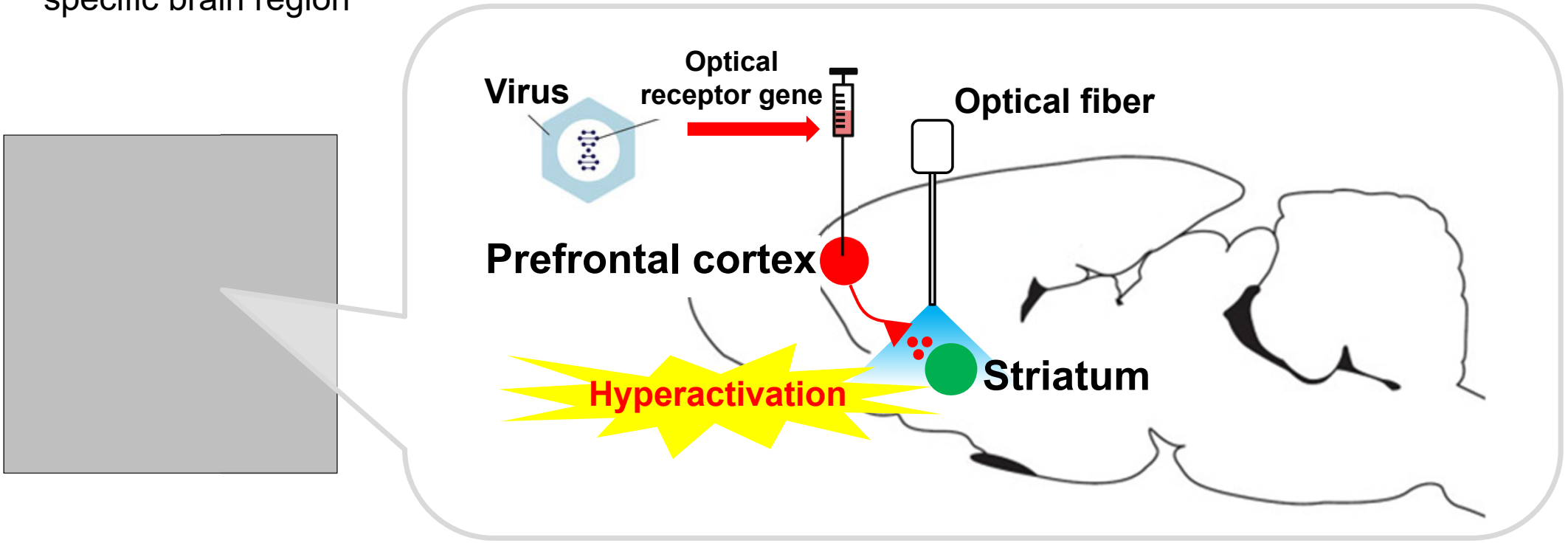
Challenges in Drug discovery:
Lack of reliable disease models in Psychiatry area

Optogenetics technology to produce pathophysiology-related models

Utilizing Optogenetics to Produce an OCD Model

Sumitomo Dainippon Pharma

Optogenetics, a technology to control specific neuronal activities using opto-stimulation in specific brain region



The efficacy of DSP-1181 was evaluated in the animal model with human OCD pathophysiology

Efficacy of DSP-1181 in OCD Model

Sumitomo Dainippon Pharma

No optical stimulation

Movie

Optical stimulation ＋ DSP-1181

Movie

Grooming (OCD-like behavior) suppressed in DSP-1181-treated mice

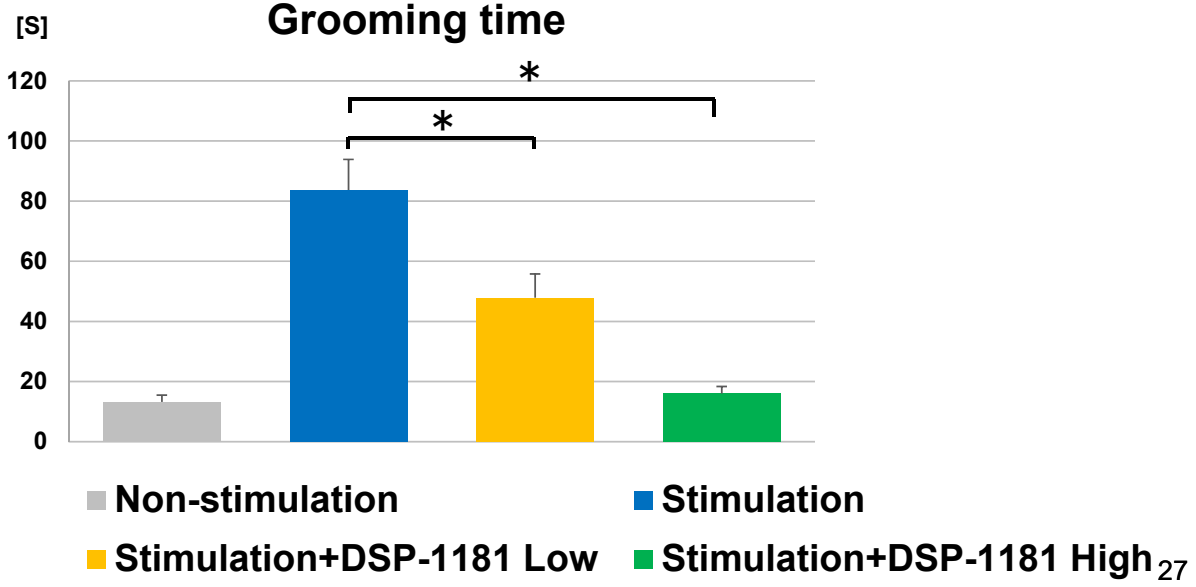
Normal exploration behavior

Optical stimulation only

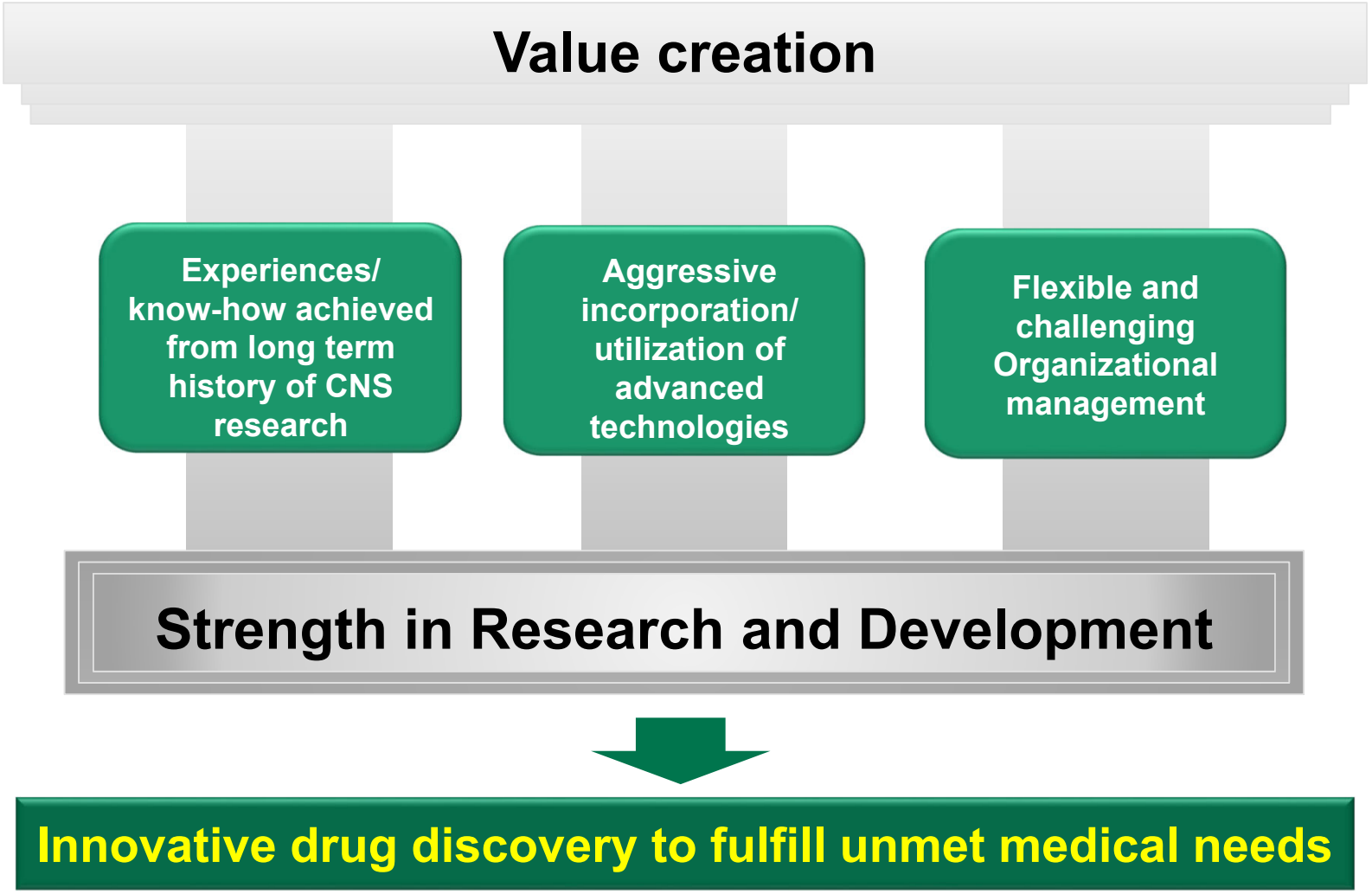
Movie

OCD-like behavior
Repeated grooming

n=7-9 Mean±SEM
*p<0.01 (Parametric Dunnett's test)



Aiming for Global Leading Company in Psychiatry & Neurology Area



Tackling Infectious Diseases; Also Considering the Contribution to Society

Sumitomo Dainippon Pharma

"Contribution to Global Health"

- Accelerate drug research through collaboration between Sumitomo Dainippon Pharma and academia
- Aim for commercialization during or after the next MTBP period

Sumitomo Dainippon Pharma

- Accumulated R&D experience (MEROPEN®, TLR7 agonist, etc.)

Academia, etc.

- Scientific expertise and insights in respective specialty fields
- Global network

Drug discovery to treat Antimicrobial resistance (AMR*1)

Joint project with the Kitasato Institute, supported by AMED*2' CiCLE*3

学校法人 北里研究所 THE KITASATO INSTITUTE

Adjuvanted vaccines R&D

Combination of our TLR7 agonist (adjuvant) and promising external antigen

- Universal influenza vaccine supported by AMED CiCLE)
- Blood-stage malaria vaccine supported by GHIT fund*4

NIID NATIONAL INSTITUTE OF INFECTIOUS DISEASES 国立感染症研究所 / NIBIOHN 国立研究開発法人 医薬基盤・健康・栄養研究所 National Institutes of Biomedical Innovation, Health and Nutrition / 愛媛大学 EHIME UNIVERSITY / PATH / Vaccine Formulation Institute

(Collaboration supported by AMED*2)

*1 AMR：Antimicrobial resistance

*2 AMED：Japan Agency for Medical Research and Development

*3 CiCLE：Cyclic Innovation for Clinical Empowerment

*4 GHIT Fund: Global Health Innovative Technology Fund

Regenerative Medicine/Cell Therapy

Toru Kimura, Ph.D.
Member, Board of Directors
Senior Executive Officer

Basic Strategy

Sumitomo Dainippon Pharma

Area

From the central nervous system (including ophthalmology) to peripheral tissues

Modality

From single cell to tissues and organs

iPS cell, mesenchymal stem cell (MSC)

Region

From Japan to the U.S.

Open innovation

Academia, biotech companies, companies of other industries, governmental institutions

Regenerative Medicine/Cell Therapy

Business Plan (as of March 3, 2020)

Proposed indication, etc.	Partnering	Region (planned)	Cell type	status
Pediatric congenital athymia (RVT-802)	Duke University	Global	Cultured thymus tissue	**BLA submitted in the U.S. in April 2019 Under consideration to resubmit BLA**
AMD (age-related macular degeneration)	Healios RIKEN	Global	Allo iPS cell-derived retinal pigment epithelium	**In progress: clinical research Preparing to start clinical study (Japan)**
Parkinson's disease (Designated as a "SAKIGAKE")	Kyoto University CiRA	Global	Allo iPS cell-derived dopamine neural progenitor	**In progress: investigator-initiated clinical study (Phase 1 / 2 study) (Japan)**
Retinitis pigmentosa	RIKEN	Global	Allo iPS cell-derived photoreceptor (3D)	**Preparing to start clinical research**
Spinal cord injury	Keio University Osaka National Hospital	Global	Allo iPS cell-derived neural progenitor	**In progress: clinical research**
Kidney failure	Jikei University Bios PorMedTec	Japan, North America	Auto/ Allo iPS cell-based induced nephron progenitor cells (organ)	**In progress: pre-clinical study**

Aim to start clinical study in FY2020 (Launch target under consideration)

Aim to launch in FY2022 *

* Launch schedule is based on our goal pending agreement with partners

Expand the Business through Strategic Alliance with Roivant

Sumitomo Dainippon Pharma

Regenerative Therapy
Enzyme Replacement Therapy

Enzyvant Therapeutics

US Headquarters: Cambridge, Massachusetts
Number of employees: 26 (as of December 31, 2019)
Representative: Rachelle Jacques, CEO
Focus Area: Pediatric Rare Diseases
Pipeline: RVT-802, RVT-801
Wholly owned

Gene therapy

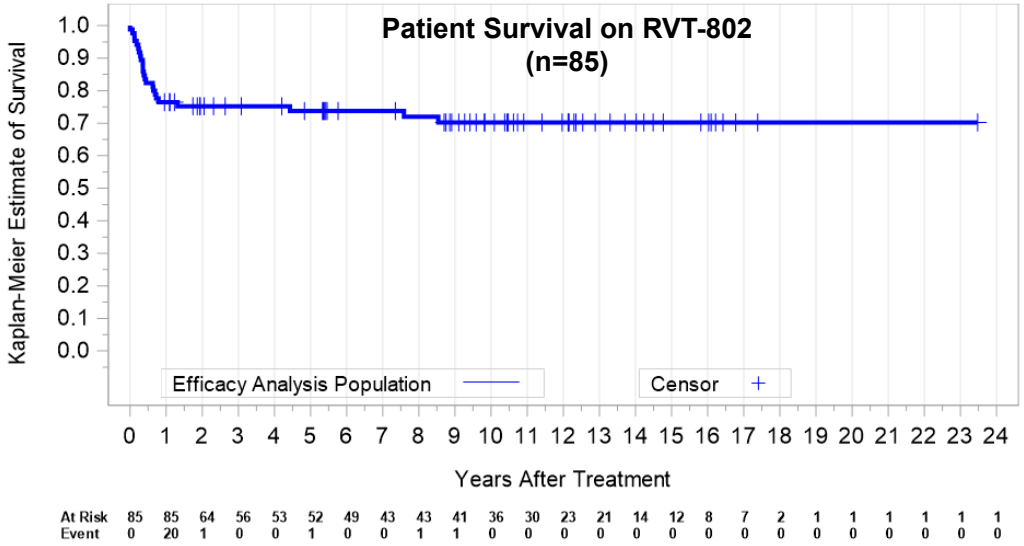
Spirovant Sciences

US Headquarters: Philadelphia, Pennsylvania
Number of employees: 11 (as of December 31, 2019)
Representative: Joan Lau, CEO
Focus Area: Cystic Fibrosis Gene Therapy
Pipeline: SPIRO-2101, SPIRO-2102, SPIRO-2110
Wholly owned

Early entry in the U.S. market
Expand into gene therapy business

Profile of RVT-802

- **Originator:** Duke University
- **Phase:** BLA submitted in the U.S. in April 2019, Complete Response Letter received in December 2019
- **Characteristics:**
  - One-time regenerative tissue-based therapy indicated for immune reconstitution when implanted in pediatric patients with congenital athymia, a condition that is fatal when untreated, usually by the age of 2
  - Produced from human thymus tissue that has been removed during unrelated pediatric cardiac surgeries
  - Granted Breakthrough Therapy, Regenerative Medicine Advanced Therapy, Orphan Drug and Rare Pediatric Disease designations by the FDA



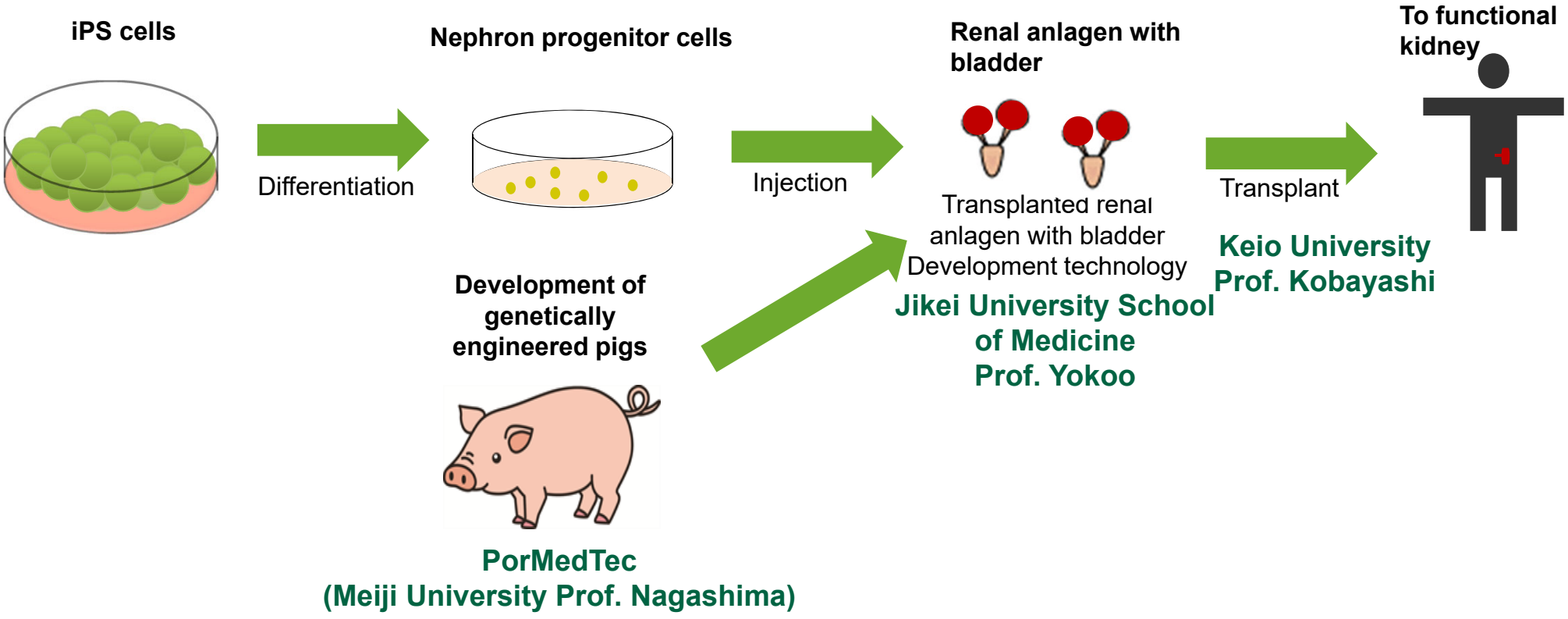
- In 85 RVT-802 treated patients with congenital athymia, Kaplan-Meier estimated survival rates at Year 1 and Year 2 were 76% and 75%, respectively
- For patients surviving 12 months post-treatment, there was a 93% probability of surviving 10 years post-treatment

Sources: Data on File

Started Renal Regeneration Project Using iPS Cells

Sumitomo Dainippon Pharma

Started collaborative efforts including joint research and development with the goal of developing renal regenerative medicine



Aim to launch before FY2027 in Japan

Cell Transplantation Therapy for Parkinson's disease Using iPS Cells

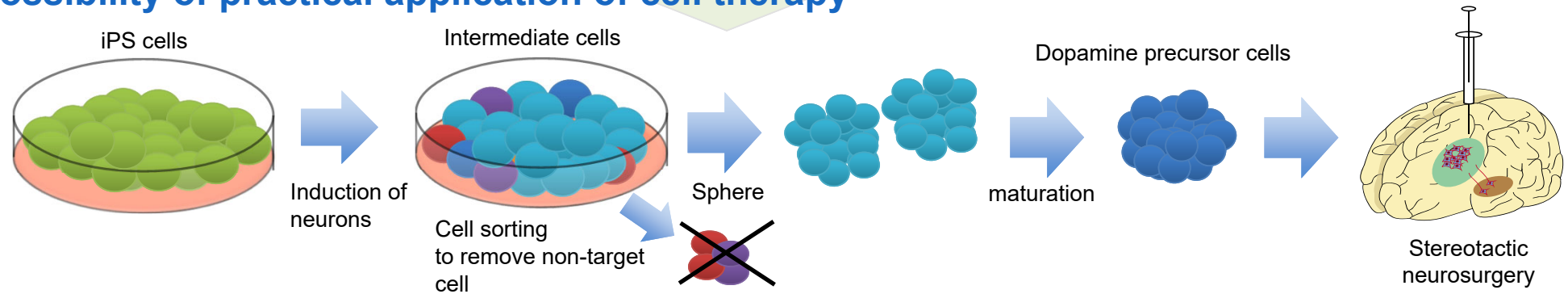
Sumitomo Dainippon Pharma

Collaboration partner: CiRA, Kyoto University (Prof. Jun Takahashi)

- Most common neurodegenerative disease, which causes motor symptoms
- Number of patients: 1.5 million in the USA, 163,000 in Japan; 7.3% of patients at level 5 of nursing care needed (ranks 5th)
- Cardinal symptoms are motor symptoms associated with **degeneration of substantia nigro/striatal doperminergic neurons**
- **Efficacy of implanted embryonic doperminergic neurons has been confirmed**

Safety and ethical issues

Establishment of protocol for creating dopamine precursor cells from iPS cells has opened up the possibility of practical application of cell therapy



- **Investigator-initiated clinical trial in Kyoto University is ongoing.**
  * Transplantation of iPS cells completed in 3 of 7 patients in 2019. The remaining 4 patients to receive transplantations in FY2020.
- **We plan to proceed with commercialization based on the results of the investigator-initiated clinical study.**
  * Product designated for Sakigake

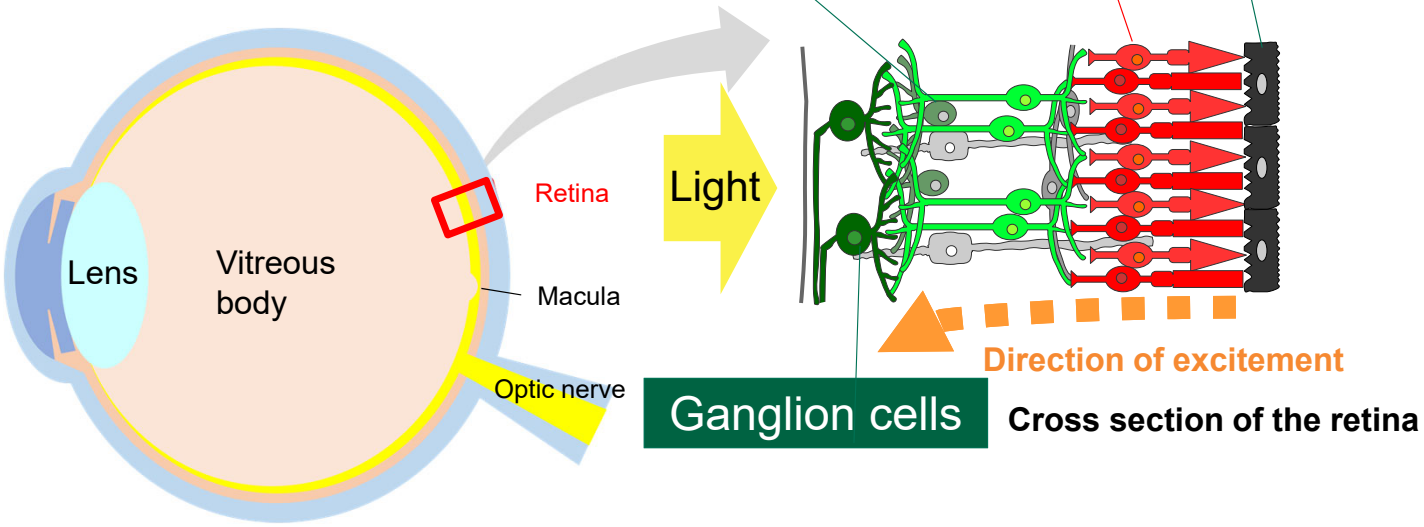
Retinal Structure and Disease

Sumitomo Dainippon Pharma

Retinal pigment epithelium（RPE） → **Age-related macular degeneration**

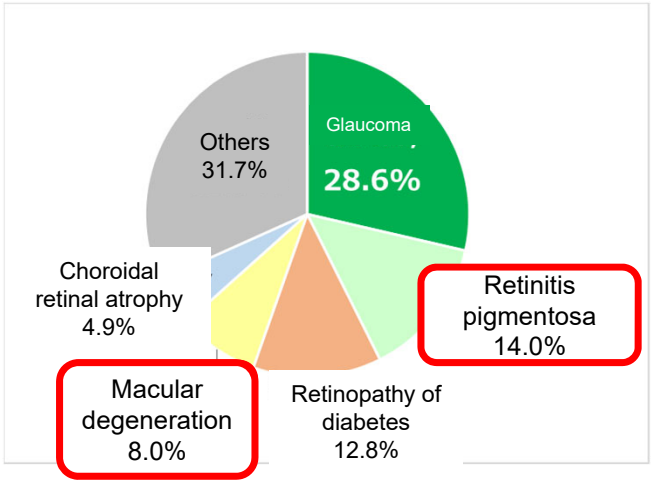
Photoreceptor cells → **Retinitis pigmentosa**

Intermediate neurons



Cross section of the retina

■ Causes of visual impairment in Japanese

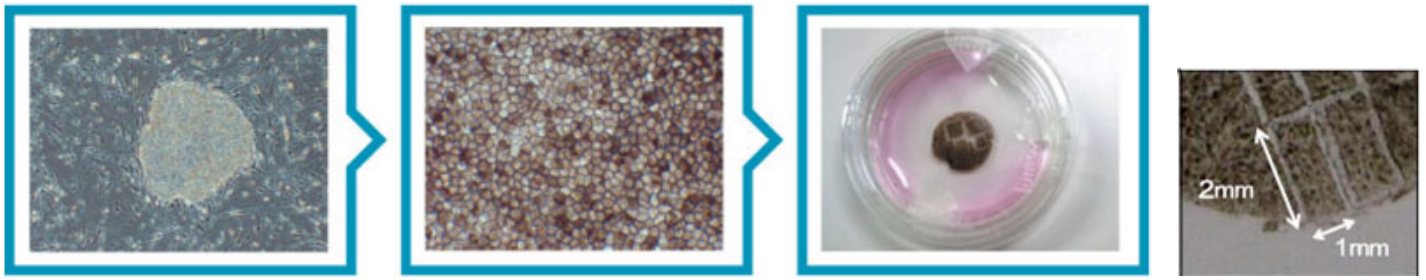


Created by Sumitomo Dainippon Pharma based on Morizane Y et al. *Jpn J Ophthalmol*. 2019; **63**: 26-33.

Cell Transplantation Therapy for AMD Using iPS Cells

Sumitomo Dainippon Pharma

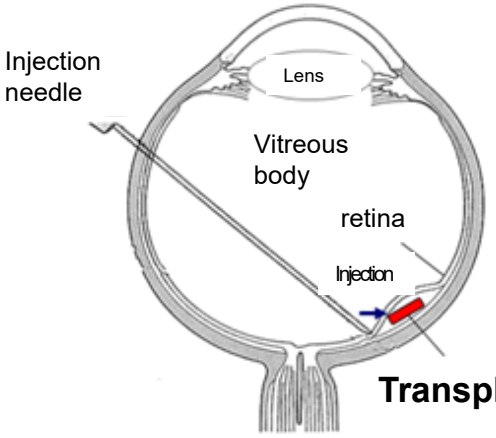
Collaboration partner: RIKEN/ Healios K.K.



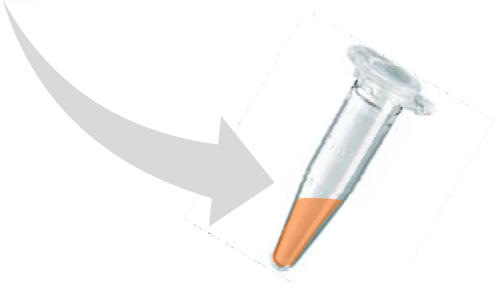
iPS cells

Retinal Pigment Epithelium (RPE) cells derived from human iPS cells

RPE cell sheet



Transplanted cells



RPE cell suspension

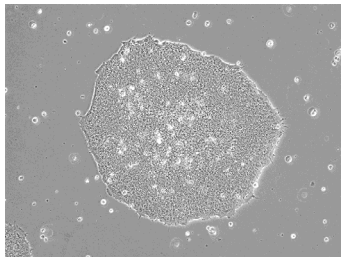
- **Clinical research conducted by RIKEN (Prof. Masayo Takahashi)**
  - **Auto RPE sheet (1 patient) → world's first**
  - **Allogeneic cell suspension (5 patients)**

Cell Transplantation Therapy for Retinitis Pigmentosa Using iPS Cells

Sumitomo Dainippon Pharma

Partnering: RIKEN (Dr. Mandai)

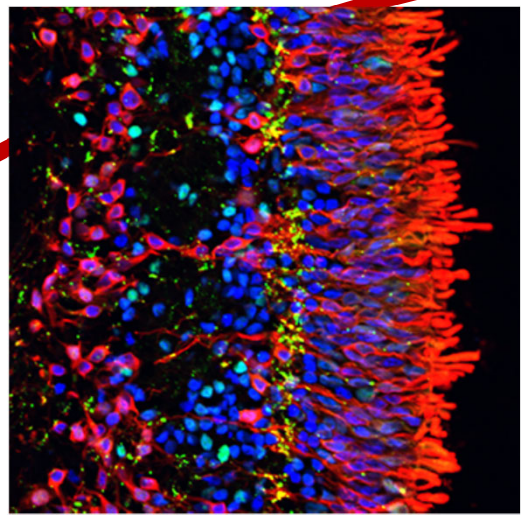
Sumitomo Dainippon Pharma



Allo human iPS cell

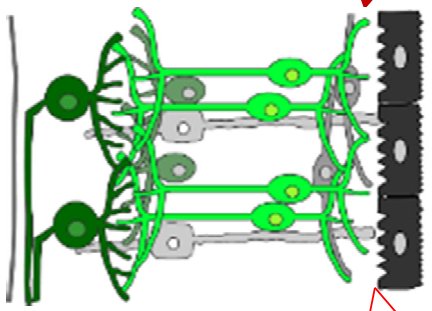
Self-organizing culture

3D retina (including neural photoreceptors)



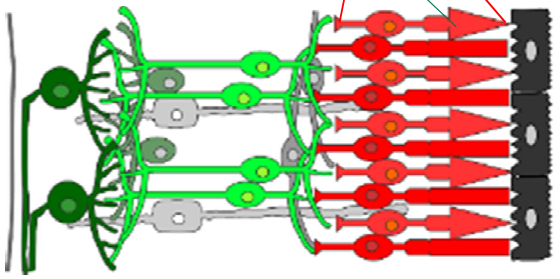
Transplanted cells

Retinitis pigmentosa



Photoreceptor cells

Normal retina



- Kobe Eye Center Hospital applied for clinical research
- Sumitomo Dainippon Pharma is in charge of cell production

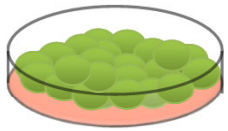
Regenerative Medicine/Cell Therapy: Progress of Existing Project

Treatment of Spinal Cord Injury Using Precursor Nerve Cells Derived from iPS Cells

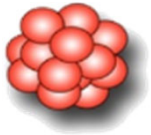
Sumitomo Dainippon Pharma

Partnering: Keio University (Prof. Okano)/Osaka National Hospital

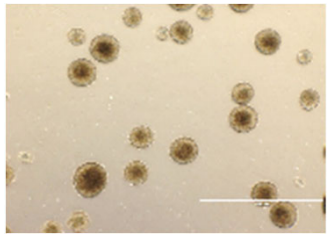
Outline of cell transplantation therapy for spinal cord injury (SCI)

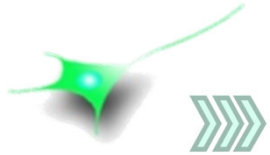


iPS cells



Neural precursor cells

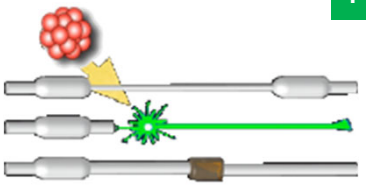




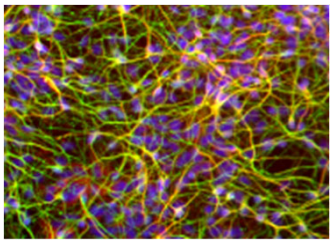
Neuron

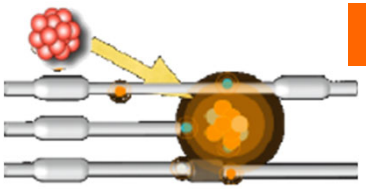
Astrocyte

Oligodendrocyte

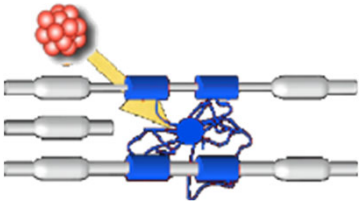


Relay damaged neural circuit





Release of neurotrophic factor



Smooth transmission of neural information

- **Clinical research ongoing at Keio University**

Regenerative Medicine/Cell Therapy

Pursuit of Open Innovation

Sumitomo Dainippon Pharma

Industry

- Biotech companies: Initial development
- Companies of other industries: devices, production equipment

Sumitomo Dainippon Pharma

- Overall coordination
- Research & Development, Manufacture, Sales

Swift decision making
Cutting-edge science/
Cell manufacturing technology

Academia

- Basic research for new seeds
- Clinical research/ Clinical study

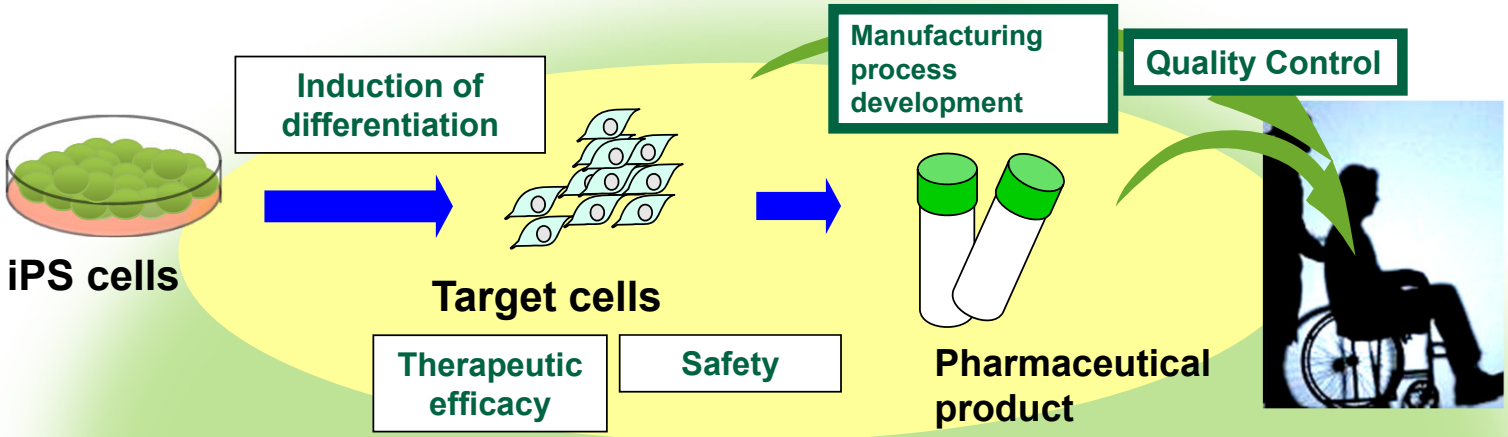
Government

- PMDA: Clarify development path
- MHLW: Drug designated for SAKIGAKE
- AMED: Research Grant

PMDA: Pharmaceuticals and Medical Devices Agency
MHLW: Ministry of Health, Labor and Welfare
AMED: Japan Agency for Medical Research and Development

Promotion of business using open innovation

In Order for Cells to Become “Medicines"

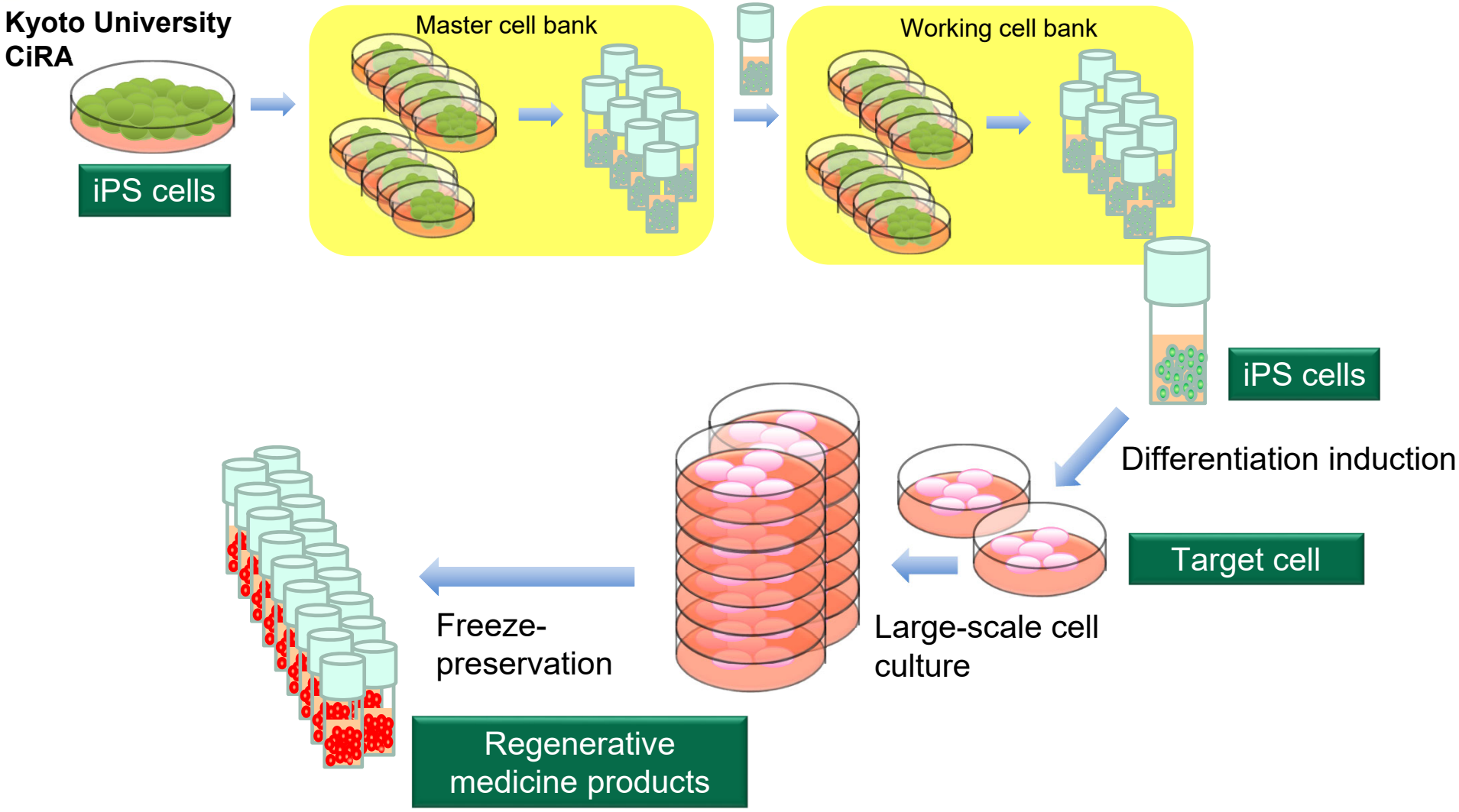


Pharmaceutical product means:

stable supply of cells of the same specifications

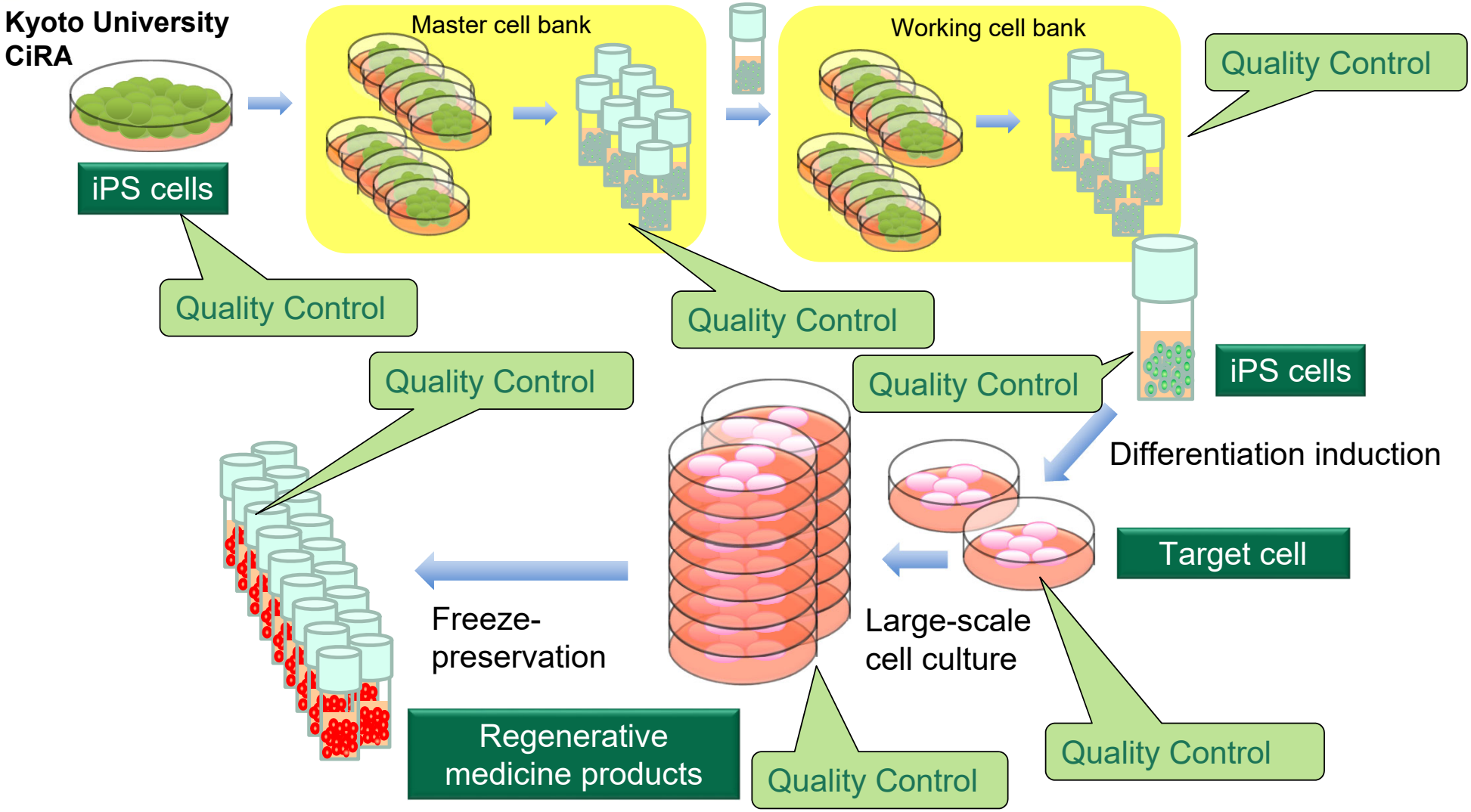
* Long-term, sterile, mass culture
* Established quality specifications
* Guaranteed safety
* Low cost

For the Manufacture of Regenerative Medicine Products



Regenerative Medicine/Cell Therapy

For the Manufacture of Regenerative Medicine Products



Building a Stable and High-Quality Production System

Sumitomo Dainippon Pharma

Improvement of work environment

"Aseptic room" + Safety cabinet

Isolator

Securing stability and reducing costs by automating production processes

High speed cell sorter

Remove non-target cell and collect the target cells only

Expansion culture of iPS cells
Induction of differentiation of mass culture cells

Closed automatic cell culture

Profile of SMaRT

Sumitomo Dainippon Pharma

SMaRT: ***S****umitomo Dainippon* ***Ma****nufacturing Plant for* ***R****egenerative Medicine & Cell* ***T****herapy*

- **Building area: 1,997㎡, Total floor area: 2,915㎡, Structure: 12-m-tall steel construction with 2 above ground levels**
- **Construction cost: approximately 3.6 billion yen**
- **Function: Manufacturing of investigational agents and early-stage commercial production using retinal pigment epithelium (age-related macular degeneration), dopamine neural progenitor (Parkinson's disease), 3D retina (retinitis pigmentosa), neural progenitor (spinal cord injury), and other ailments**
- **Construction start in FY2016, construction end and operation in March 2018**

Mid-Term Strategy

Actively pursue open innovation-based unique growth model, integrating internal advanced manufacturing expertise and external cutting-edge science, to achieve early commercialization

Realize next-generation regenerative medicine (including application to peripheral organs)

- **Introduce next-generation seeds/technology**
  - iPS cell-derived organ (kidney, etc.)
  - Autologous iPS cell-derived cell/tissue
  - Gene transfer/modification
  - Next-generation stem cell
- **Contribute to early commercialization and expand pipeline**
  - MSC/somatic stem cell

Related business (diagnosis, rehabilitation, etc.)

Autologous cell therapy

Genome editing

Organ regeneration

Gene therapy

- **Allogenic iPS cell-derived tissue**
  - 3D-Retina
- **Allogenic iPS cell-derived differentiated cell**
  - Dopaminergic neuron progenitor
  - Retinal pigment epithelium
  - Neural progenitor
- **Mesenchymal stem cell (MSC)**
  - Collaboration with DS Pharma Animal Health

Accelerate on-going projects (mainly in Neurology and Ophthalmology)

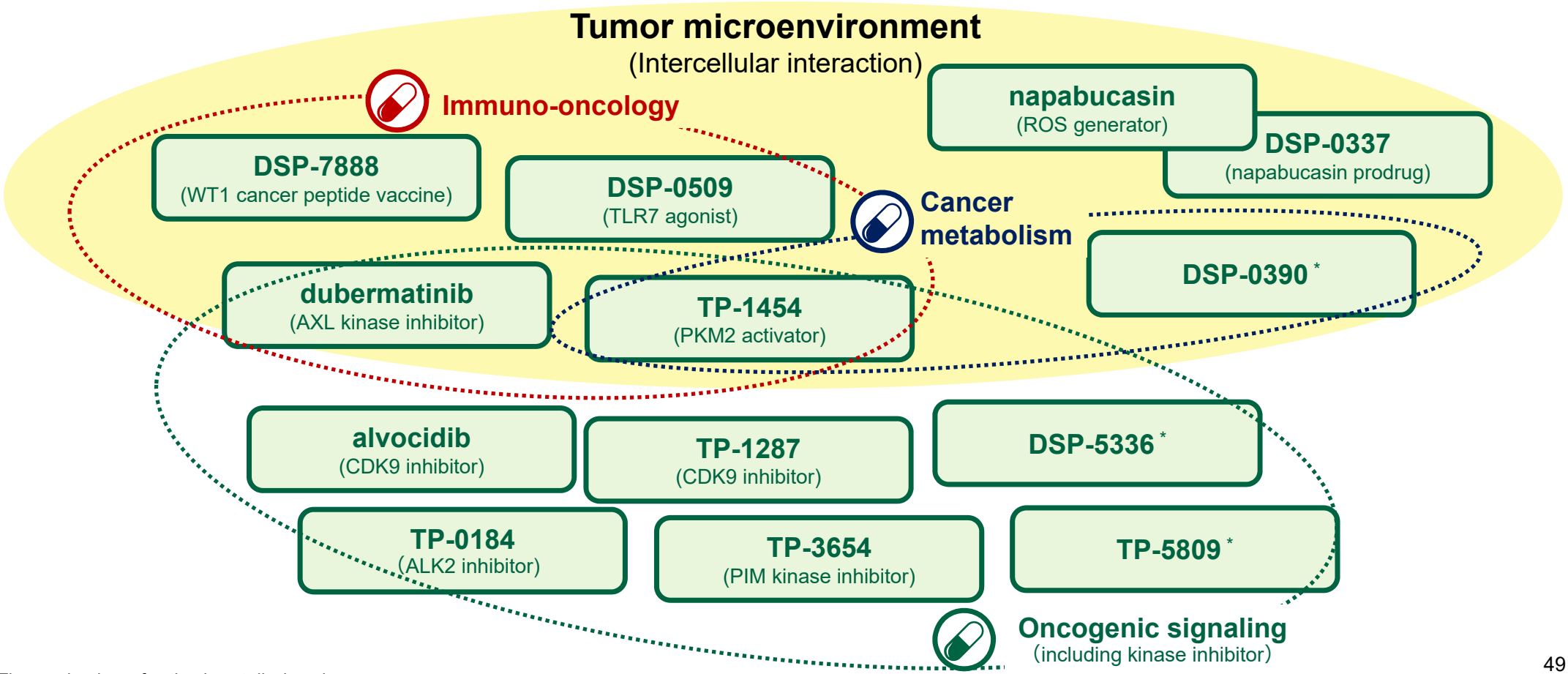
Aim to realize financial contributions during the next MTBP period (FY2023 to FY2027)

Oncology

Kazuo Koshiya, Ph.D.
Senior Executive Officer
Global Head of Oncology

Oncology's Initiative

Build diversified and innovative development pipeline through discovery research focused on tumor microenvironment (intercellular interaction) and other key cancer pathways



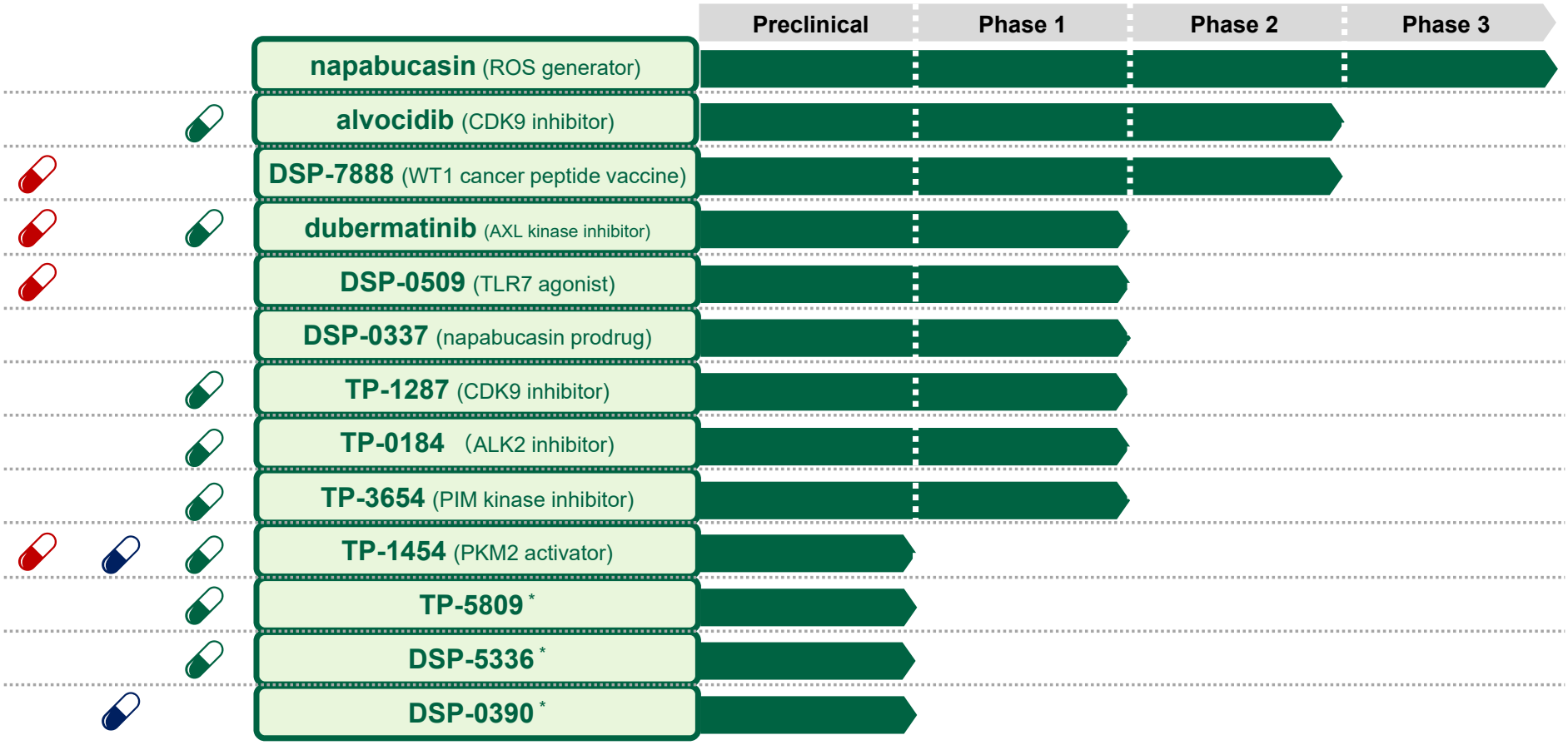
* The mechanism of action is not disclosed

Oncology

Development Pipeline

Sumitomo Dainippon Pharma

Immuno-oncology　Cancer metabolism　Oncogenic signaling（including kinase inhibitor）



* The mechanism of action is not disclosed

DSP-7888 (Immuno-oncology)

- **Cocktail vaccine containing "peptide inducing WT1-specific CTL" and "peptide inducing helper T cells"**
  - One of the front-runner WT1 peptide vaccines
  - Treatment with DSP-7888 resulted in longer, overall survival (OS) in WT1-positive patients compared with WT1-negative patients (Figure 2)

Figure 1: The mechanism of DSP-7888

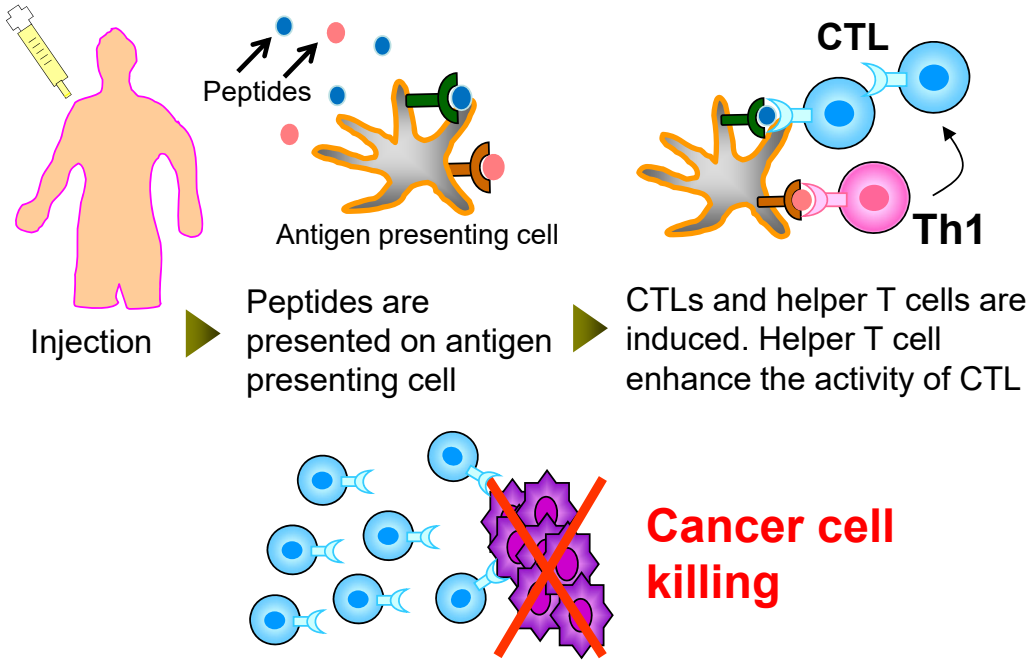
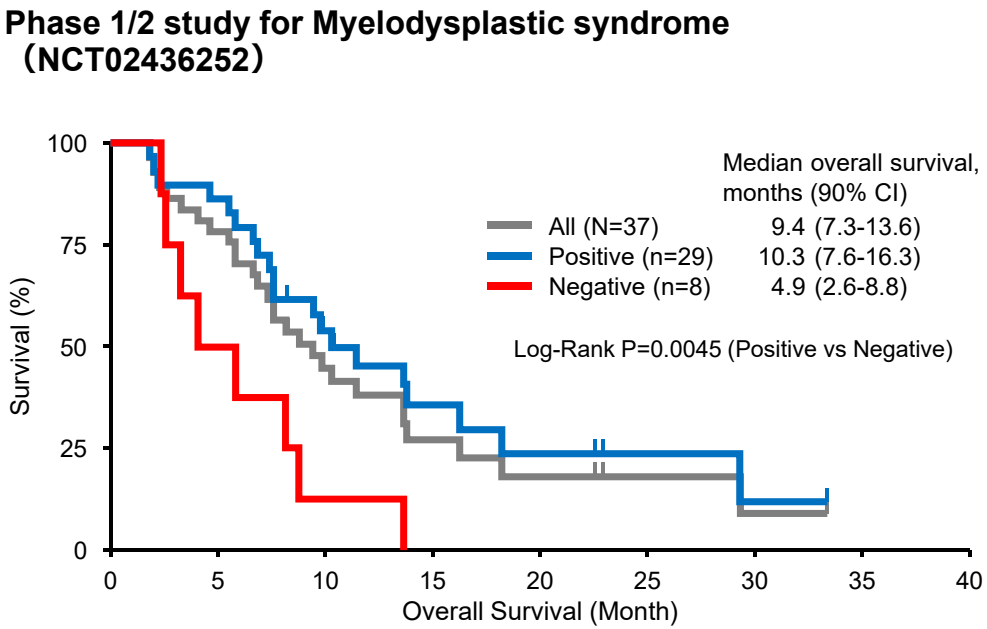


Figure 2: Overall survival and WT1 immune response



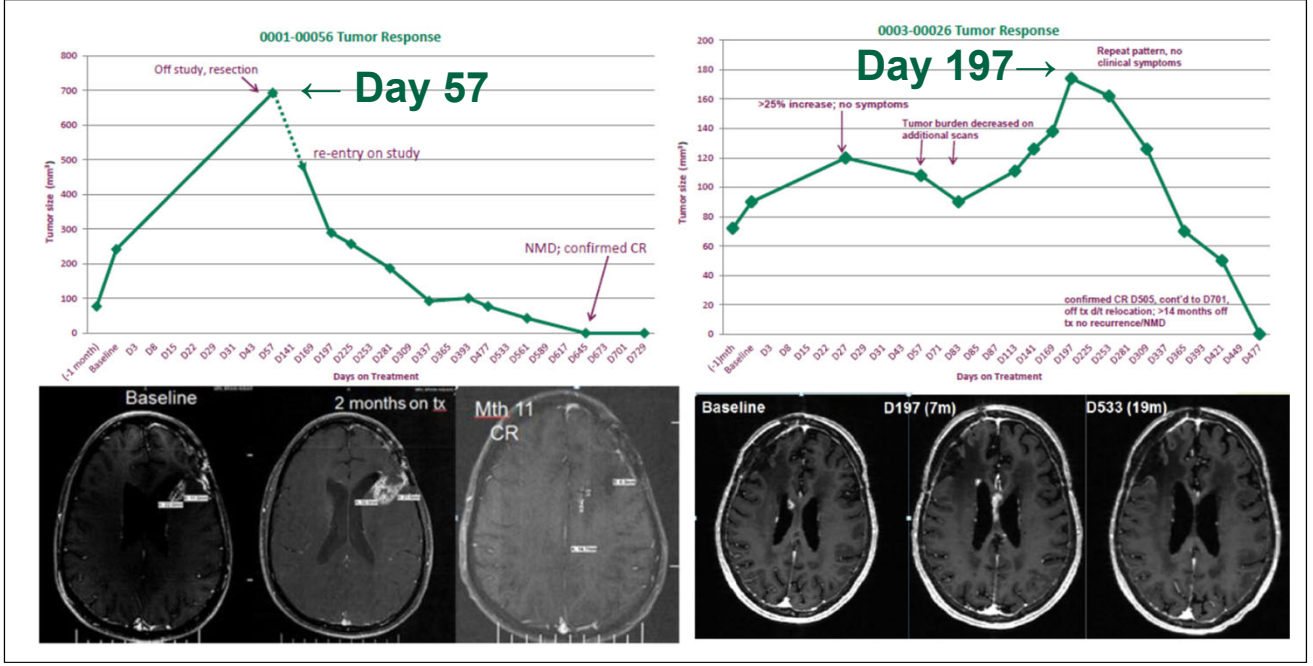
EHA 2019 (#1344)

DSP-7888 (Immuno-oncology)

Sumitomo Dainippon Pharma

- **In a Phase 1 study of WT1 peptide vaccine WT2725, complete response (CR) was observed in 2 patients with glioblastoma (GBM)**

Figure: Clinical results of WT2725



ASCO 2017 (#2066)

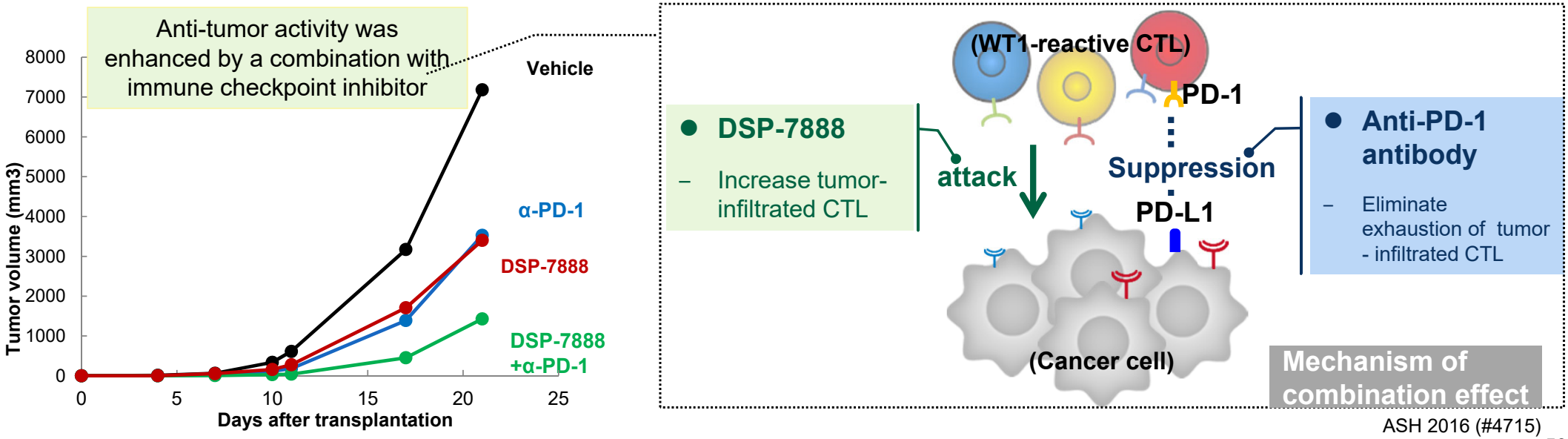
- **A global Phase 2 study of DSP-7888, a next-generation drug after WT2725, is ongoing in patients with glioblastoma (GBM) (WIZARD-201G study, NCT03149003)**
  - ➢ Patient recruitment has been completed, and follow-up of overall survival is ongoing

DSP-7888 (Immuno-oncology)

Sumitomo Dainippon Pharma

- **A phase 1/2 study of DSP-7888 in combination with an immune checkpoint inhibitor is ongoing**
  - Synergic effect of DSP-7888 in combination with immune checkpoint inhibitor was confirmed in mice (Figure)
  - Tolerability in human subjects has been confirmed and the recommended dose is determined
  - Progressed to Phase 2 study in patients with platinum-resistant ovarian cancer who do not respond well to immune checkpoint inhibitor monotherapy

Figure: Preclinical result in mice resistant to immune checkpoint inhibitors



ASH 2016 (#4715)

Oncology

Dubermatinib（TP-0903）

(Immuno-oncology, Oncogenic signaling)

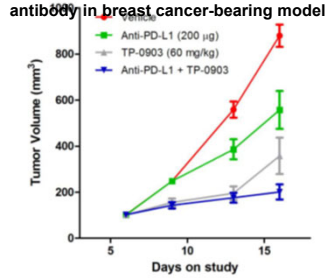
Sumitomo Dainippon Pharma

- **An inhibitor of multikinase including AXL[1] kinase, being explored in various indications**
  - Discovered by phenotypic screening targeting epithelial-to-mesenchymal transition (EMT) which is involved in tumor proliferation, infiltration, and metastasis and therapeutic resistance
  - Potent inhibitory activity against multiple kinases including AXL, potential targets of tumor therapy
  - A Phase 1b basket study to explore indications is ongoing

: tumor types in the basket study

Combination with PD1/PD-L1

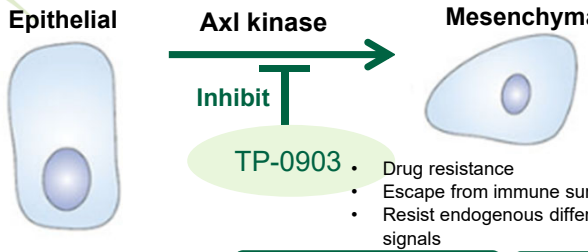
Co-administration effect of anti-PD-L1 antibody in breast cancer-bearing model



EORTC-NCI-AACR 2018 (#413)

Involved in treatment resistance of immunotherapy

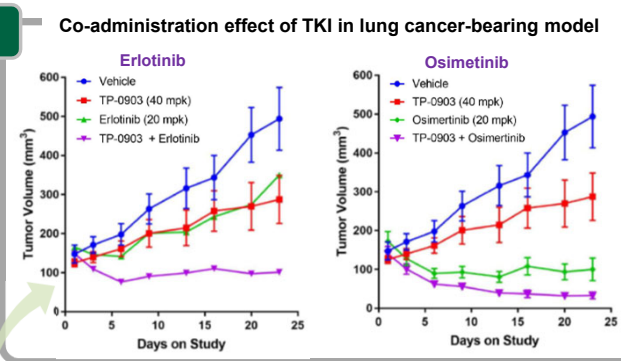
The mechanism of dubermatinib



- Drug resistance
- Escape from immune surveillance
- Resist endogenous differentiation signals

NSCLC

Co-administration effect of TKI in lung cancer-bearing model



AACR2019 (#3804)

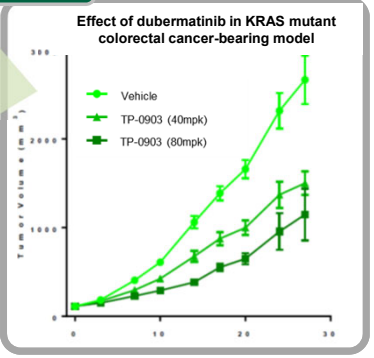
Involved in BRAF / MEK inhibitor and immunotherapy resistance

Involved in epithelial-mesenchymal transition (EMT)

Involved in treatment resistance of anti-EGFR antibody and EGFR-TKI

Colorectal cancer

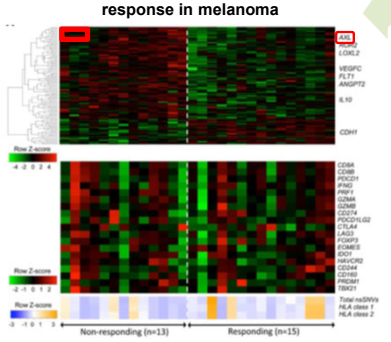
Effect of dubermatinib in KRAS mutant colorectal cancer-bearing model



AACR 2019 (#2630)

Melanoma

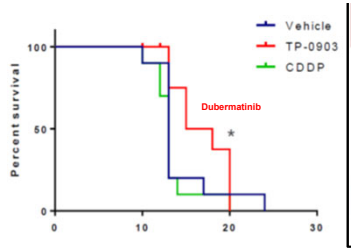
AXL expression and cancer immune response in melanoma



Hugo et al. 2016 Cell

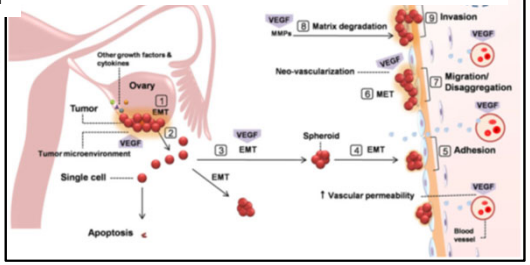
Ovarian cancer

Dubermatinib overcomes Pt agent in ovarian cancer peritoneal transplant model



AACR 2019 (#2006)

Relationship between EMT and peritoneal metastasis in ovarian cancer



Cancer Metastasis Rev. 2012 June; 31(1-2): 143–162.

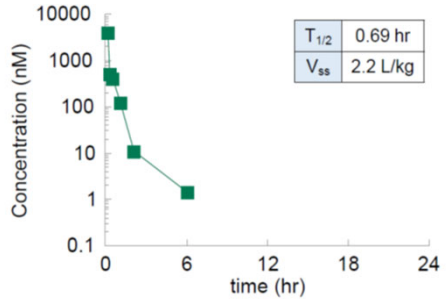
1) AXL receptor tyrosine kinase inhibitor

DSP-0509 (Immuno-oncology)

Sumitomo Dainippon Pharma

- **Systemically deliverable TLR7 agonist with anti-tumor efficacy by activating dendritic cell for cytokine induction and CTL activation**
  - Rapid elimination from the body ensures safety with maintaining efficacy and makes intravenous administration possible (Figure 1)
  - Long-lasting anti-tumor immunity is expected through induction of immune memory T-cells (Figure 2)
  - Anti-tumor activity mediated by CTL activation (Figure 3)
  - Synergistic effect was confirmed in mice treated with DSP-0509 in combination with immune checkpoint inhibitor (Figure 4)
  - Phase 1 study (dose escalation therapy) is ongoing for monotherapy and combination therapy

Figure 1: PK profile (rat)



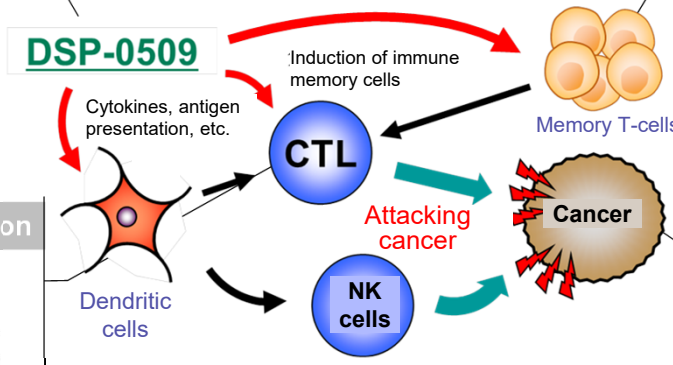


Figure 2: Induction of memory T-cells in combination therapy with immune checkpoint inhibitor

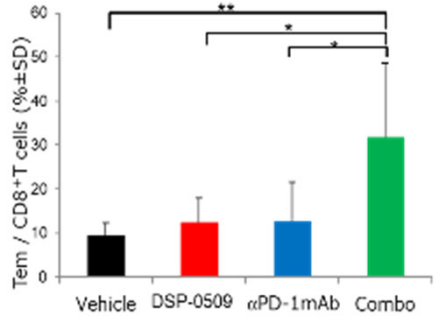


Figure 3: CTL activation mediated by immunomodulation

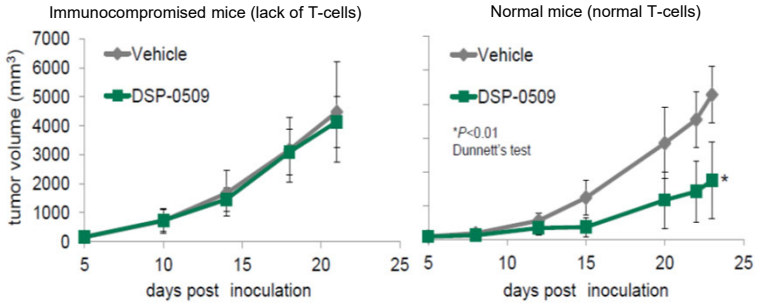
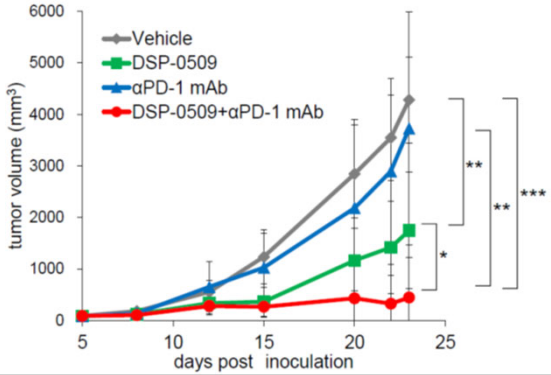


Figure 4: Synergic effect with immune checkpoint inhibitor (mice)



AACR 2018 (#4726)

TP-3654 (Oncogenic signaling)

- **Expected efficacy in the treatment of myelofibrosis patients with high unmet medical needs**
  - PIM kinases are main effector molecules in JAK/STAT signaling pathway and play an important role in cell proliferation and oncogenesis (Figure 1)
  - Expression of PIM kinases is increased in myelofibrosis patients and hematopoietic cells of animal models (Figure 2)
  - In animal model, TP-3654 in monotherapy and in combination with ruxolitinib[1)] showed reduction in fibrosis in the spleen and bone marrow (Figure 3)
  - A Phase 1 study with myelofibrosis patients is ongoing

Figure 1: Mechanism of action of TP-3654

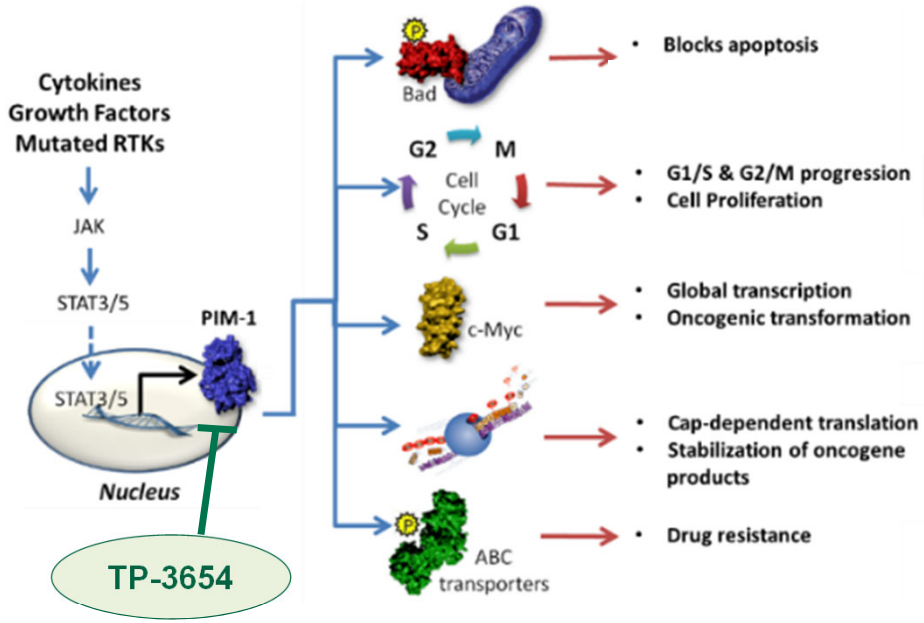
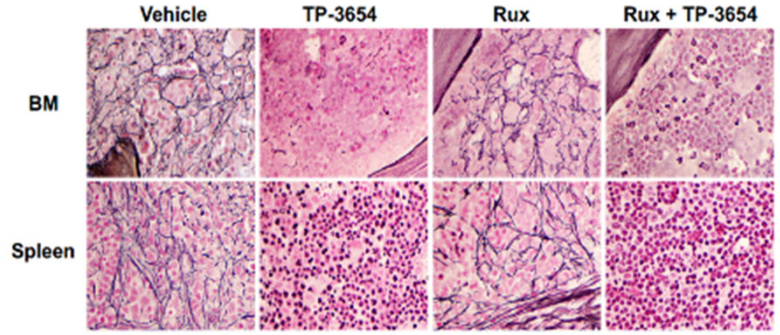


Figure 2: Increased expression of PIM kinases

図Figure 3: Suppression of fibrosis in JAK2



1) JAK inhibitor

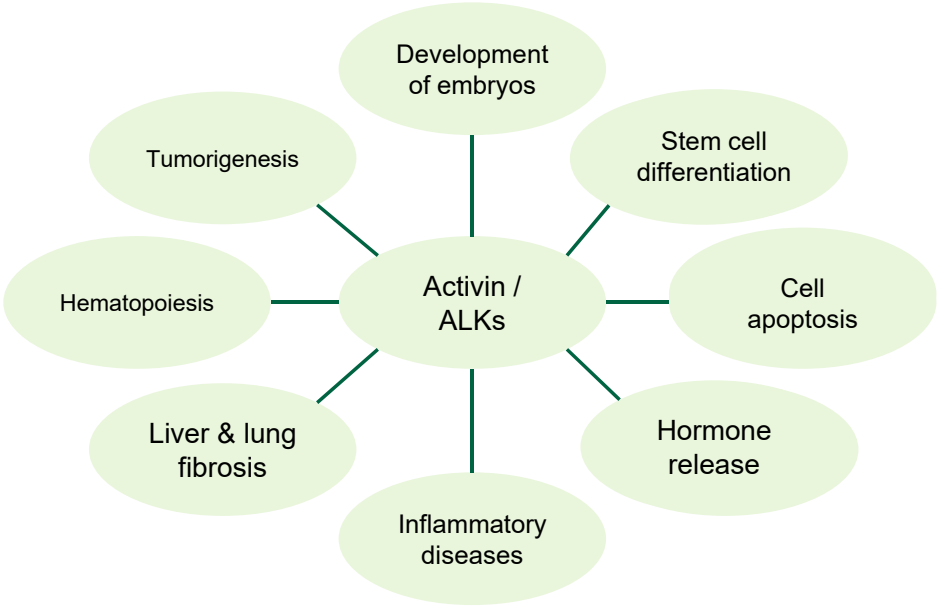
ASH2018, #54

TP-0184 (Oncogenic signaling)

Sumitomo Dainippon Pharma

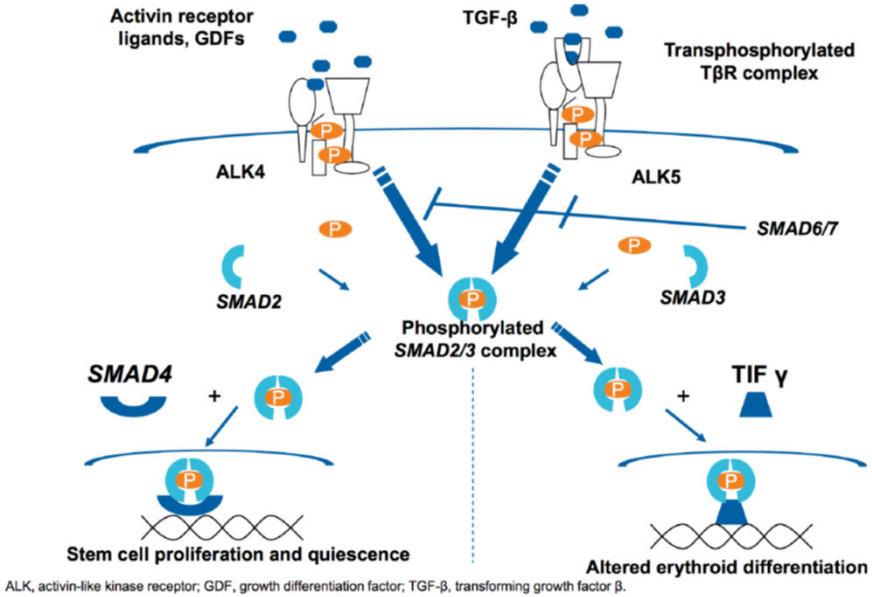
- **Expected to treat various cancer types through inhibition of ALK2, ALK5, and other members of the TGF-β superfamily**
  - TGF-β regulates cell differentiation, proliferation, and apoptosis and is involved in a variety of physiological and pathological processes including cancer (Figure 1)
  - Genetic mutation of ALK2 is found in various types of cancer including endometrial cancer, melanoma, colorectal cancer, bladder cancer, breast cancer
  - In myelodysplastic syndrome (MDS), ALK5- pathway is activated, increasing the downstream SMAD2/3 complex phosphorylation and resulting in altered erythroid differentiation (Figure 2)
  - A Phase 1 study in solid cancer is ongoing, and a Phase 1 study in hematologic cancer will be started

Figure 1: Physiological/pathological processes in which TGFβ is involved



Xueling C. et.al Molecular Medicine Report *19*, 2019

Figure 2: ALK2 signaling pathway



Zhou L. et.al Blood *112*, 2008

1) ALK: Activin-like receptor kinase

TP-1454 (Immuno-oncology, Oncogenic signaling, Cancer metabolism)

Sumitomo Dainippon Pharma

- **With a new mechanism influencing on glucose metabolism in tumor cells to improve immune environment, anti-tumor efficacy in combination with immune checkpoint inhibitor is expected**
  - Promotes formation of PKM2 tetramer (highly active form) from its dimeric form which is predominant in tumor cells
  - Activation of PKM2 converts anaerobic environment of tumor cells into aerobic conditions (Figure 1)
  - Synergistic effect was confirmed in mice treated with DSP-1454 in combination with immune checkpoint inhibitor (Figure 2)

  A phase 1 study is scheduled to start in Q1 FY2020

Figure 1: Major mechanism of action of TP-1454

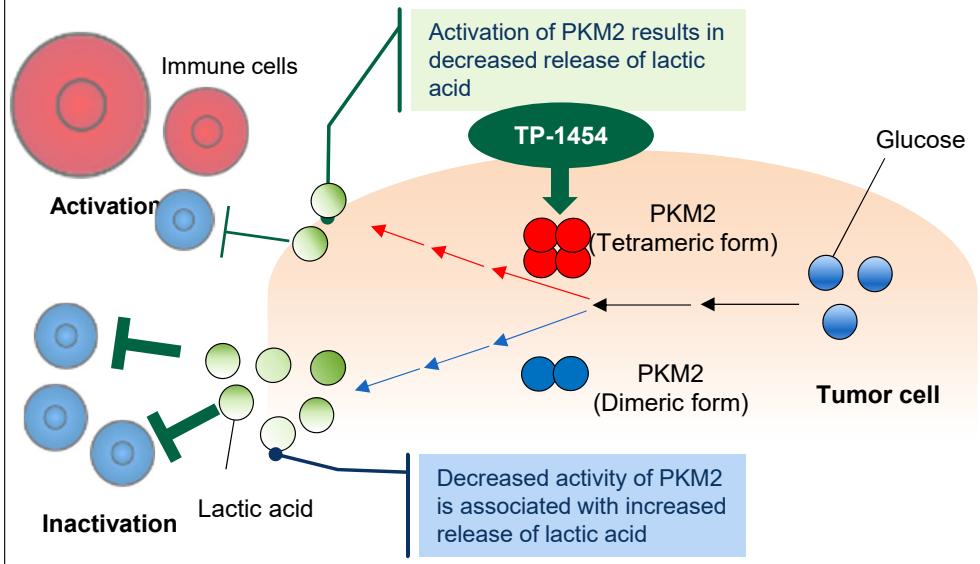
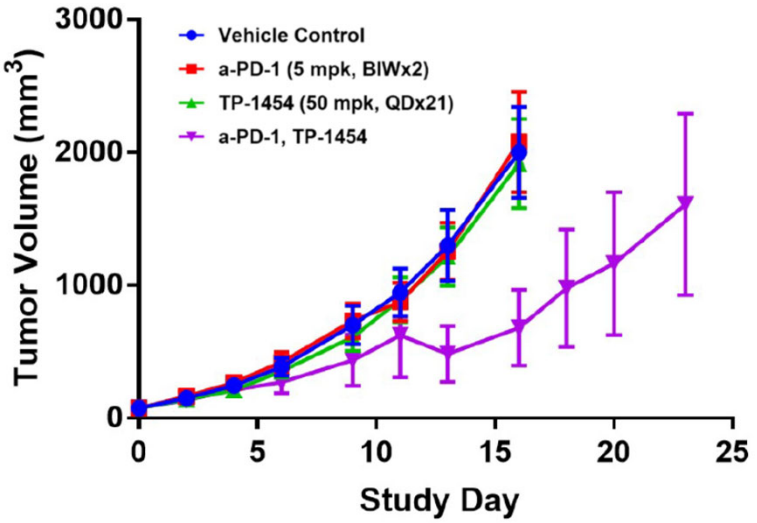


Figure 2: Synergic effect with immune checkpoint inhibitor (mice)



AACR-NCI-EORTC 2019, #B080
AACR2019, #B080

1) PKM 2 : Pyruvate kinase M2

Reinforcement of Development

Sumitomo Dainippon Pharma

Characteristic features of Oncology Area

- Segmented diseases
- More flexible and rapid regulatory path
- Standard therapies continue to change rapidly
- Frequent collaborative development (e.g. consortium)
- Importance of biomarkers
- Opportunities for expanding indications
- Ready to adopt advanced technology (such as AI)
- High expectations for fulfilling unmet medical needs

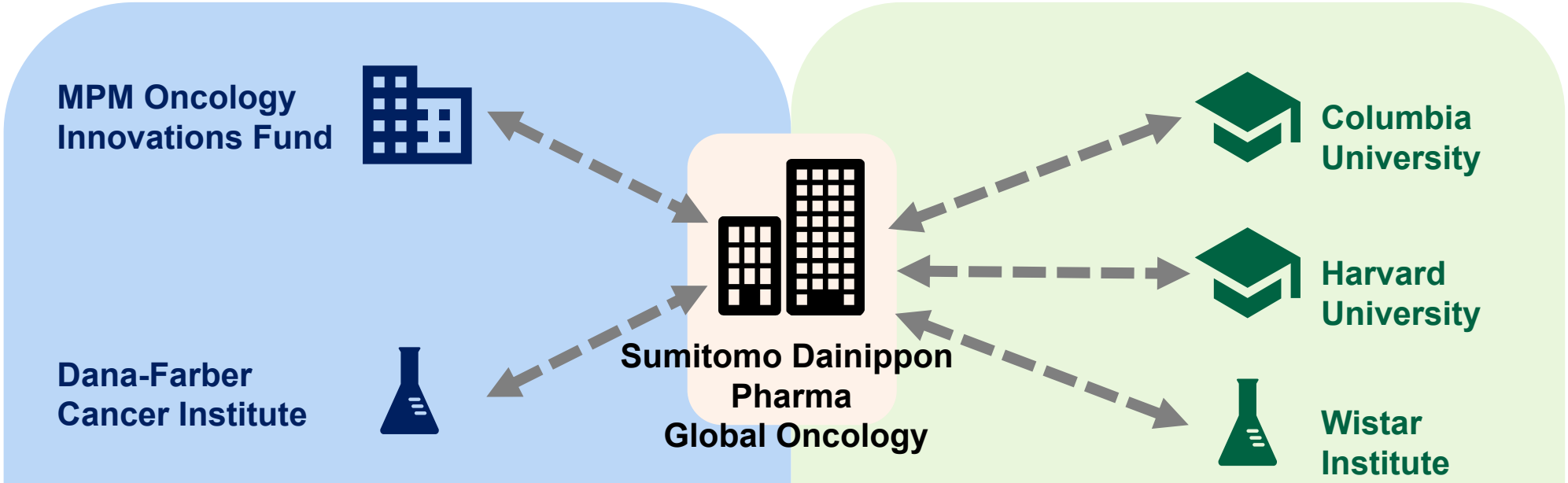
Pursuing R&D with higher success rate, more agility and more compact than before, by utilizing cutting-edge technologies, regulatory systems, and development methodology unique to Oncology Area

- Cutting-edge analytic technology
- Network-oriented R&D
- Cutting-edge regulatory affairs systems
- R&D process
- Cutting-edge diagnostic tools and biomarkers
- Cutting-edge clinical trial designs

Highly Efficient R&D

Toward the Future: Bring in External Innovations

With the objective to bring in external innovations, such as cutting-edge technologies and candidate drugs, venture capital investment specialized in oncology and collaboration with academia have been initiated through Boston Biomedical, Inc. as the Hub, in addition to the ongoing DSK project with Kyoto University.



- Investment has been made into MPM Oncology Innovations Fund, a venture fund that makes investments mainly in drug discovery seeds from Dana-Farber Cancer Institute

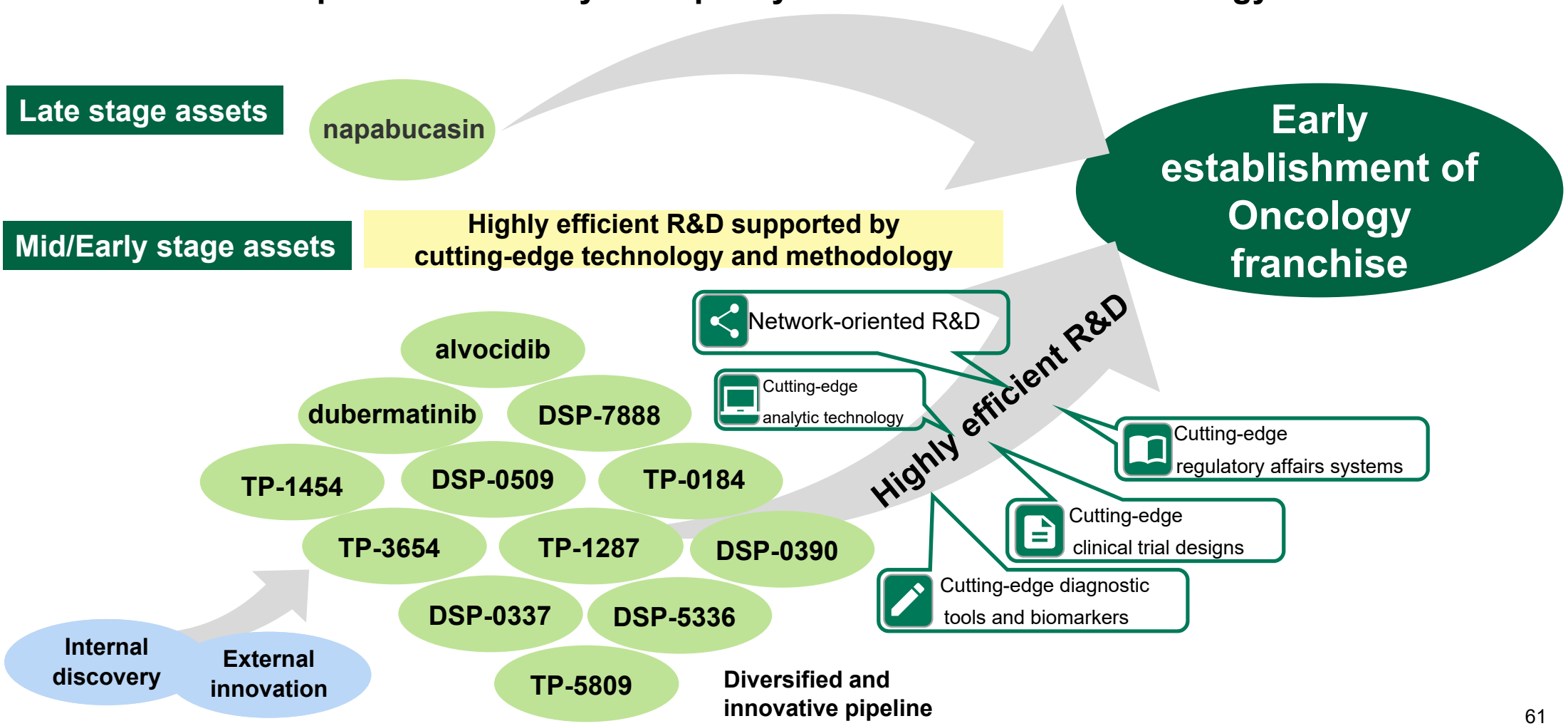
- Alliance in research with Columbia University, Harvard University, and Wistar Institute has been initiated

Oncology

Mid-Term Strategy

Sumitomo Dainippon Pharma

To advance development in a steady and speedy manner to establish oncology franchise



Development Pipeline: SEP-363856

Advancing Life-Transforming Therapies in Neuropsychiatry

Kenneth S. Koblan, Ph.D.
Chief Scientific Officer
Sunovion Pharmaceuticals Inc.

Development Pipeline: SEP-363856

Global Neuropsychiatric Challenges with Significant Need

Sumitomo Dainippon Pharma

SEP-363856 has the potential to treat the positive and negative symptoms of schizophrenia, including cognitive impairment, as well as the hallucinations and delusions commonly experienced by patients with Parkinson's disease (PD)

SCHIZOPHRENIA

- Affects **23 million** people worldwide[1]
- Approximately **2.4 million** people diagnosed in the U.S.[2]
- Limited treatment options exist, and currently available products:
  - Have significant side effects that may affect adherence
  - No new MOAs approved in >60 years – target either dopamine 1 and/or dopamine 2 receptors and Serotonin 5-HT_{2A}
- Significant cognitive impairment is common, affecting up to 75% of patients,[5] with no currently approved therapies

PARKINSON'S DISEASE PSYCHOSIS (PDP)

- PD is the second most common neurodegenerative disease and is expected to affect **~1.2 million people** in the U.S. and an **~10 million people** worldwide within the next 10 years[3]
- Affects up to **60 percent** of patients with PD[3]
- Includes hallucinations and delusions
- Is a strong predictor of nursing home placement and mortality[4]
- Current treatment options are limited

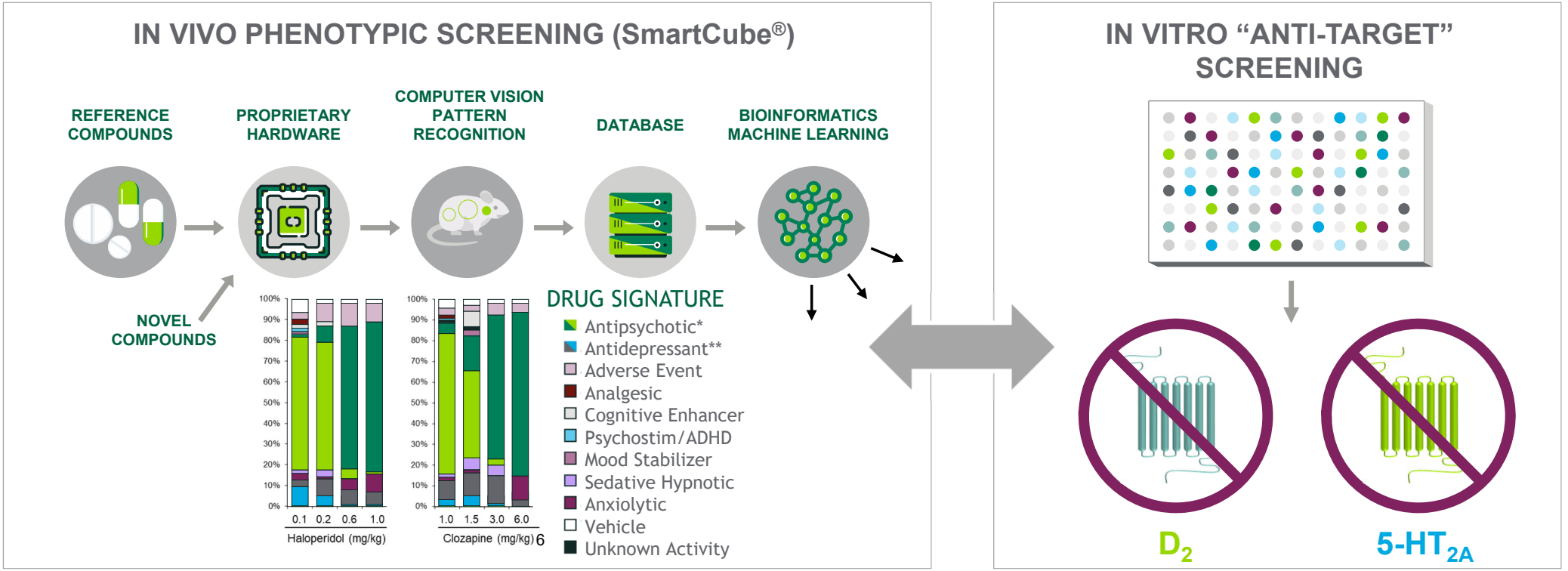
[1] World Health Organization. Mental Disorders. [Internet]. Available from: https://www.who.int/news-room/fact-sheets/detail/mental-disorders. Accessed September 2018.
[2] Regier DA, Narrow WE, Rae DS, Manderscheid RW, Locke B2, Goodwin, FK. The de Facto US Mental and Addictive Disorders Service System. Arch Gen Psychiatry. 1993;50:85-94. Calculated by extrapolating from the 2008 United States Census Bureau population estimates.
[3] Parkinson's Disease Foundation Website: https://www.parkinson.org/about-us/Press-Room/Press-Releases/New-Study-Shows-Over-1-Million-People-in-the-United-States-Estimated-to-be-Living-with-Parkinsons-Disease-by-2030. Accessed December 2019.
[4] Aarsland 2000 Journal of American Geriatric Society, v48, pg 938, conclusion
[5] Talreja 2013 Industrial Psychiatry Journal v22(1), pg 47-53, conclusion

Development Pipeline: SEP-363856

Sunovion Discovery Platform Enables Multiple CNS Compounds

Sumitomo Dainippon Pharma

Sunovion's phenotypic discovery approach is target agnostic and begins with in vitro anti-target screening and *in vivo* screening followed by additional medicinal chemistry efforts based on our deep expertise in neuropsychiatry



[6] Dedic N, Jones P, Hopkins S, Lew R, Shao L, Campbell J, Spear K, Large T, Campbell U, Hanania T, Leahy E and Koblan K, SEP-363856, A Novel Psychotropic Agent with a Unique, Non-D2 Receptor Mechanism of Action *Journal of Pharmacology and Experimental Therapeutics* 2019; 371: 1-14.

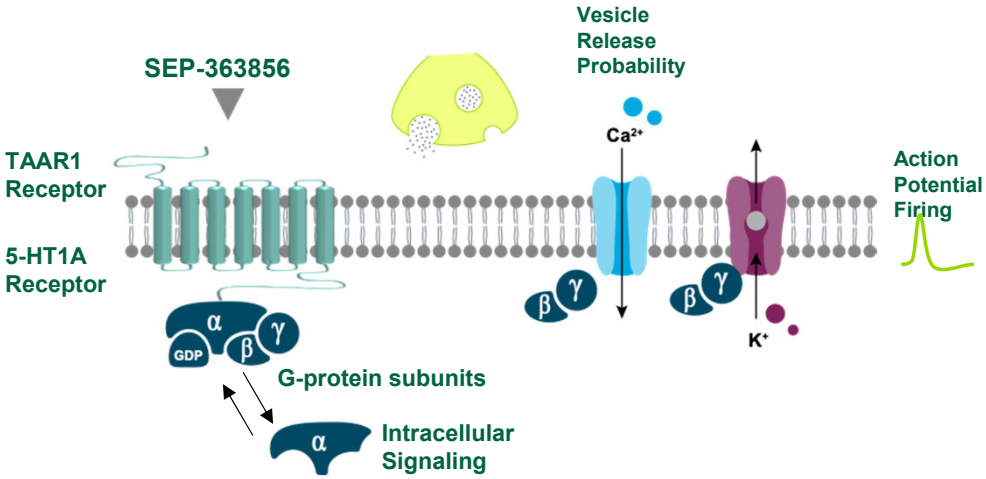
Sunovion discovered SEP-363856 in collaboration with PsychoGenics based in part on a mechanism-independent approach using the in vivo phenotypic SmartCube® platform and associated artificial intelligence algorithms.

Development Pipeline: SEP-363856

A TAAR1 Agonist

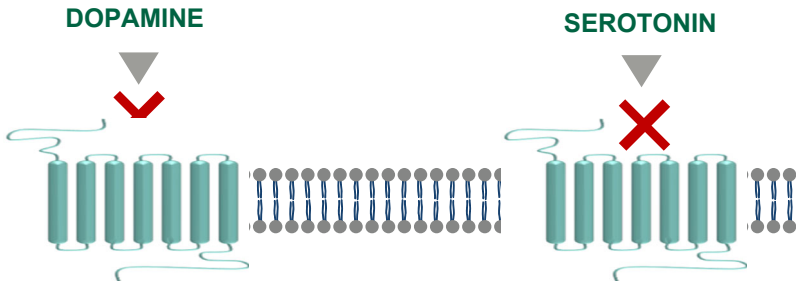
- SEP-363856 does not bind to D_2 or to serotonergic receptors (except for 5-HT_{1A}), which are thought to mediate the effects of currently available antipsychotic medicines
- SEP-363856 is a TAAR1 (trace amine-associated receptor 1) agonist in development for the treatment of schizophrenia

NEW CLASS: SEP-363856



MONOAMINE RECEPTOR ACTIVATION

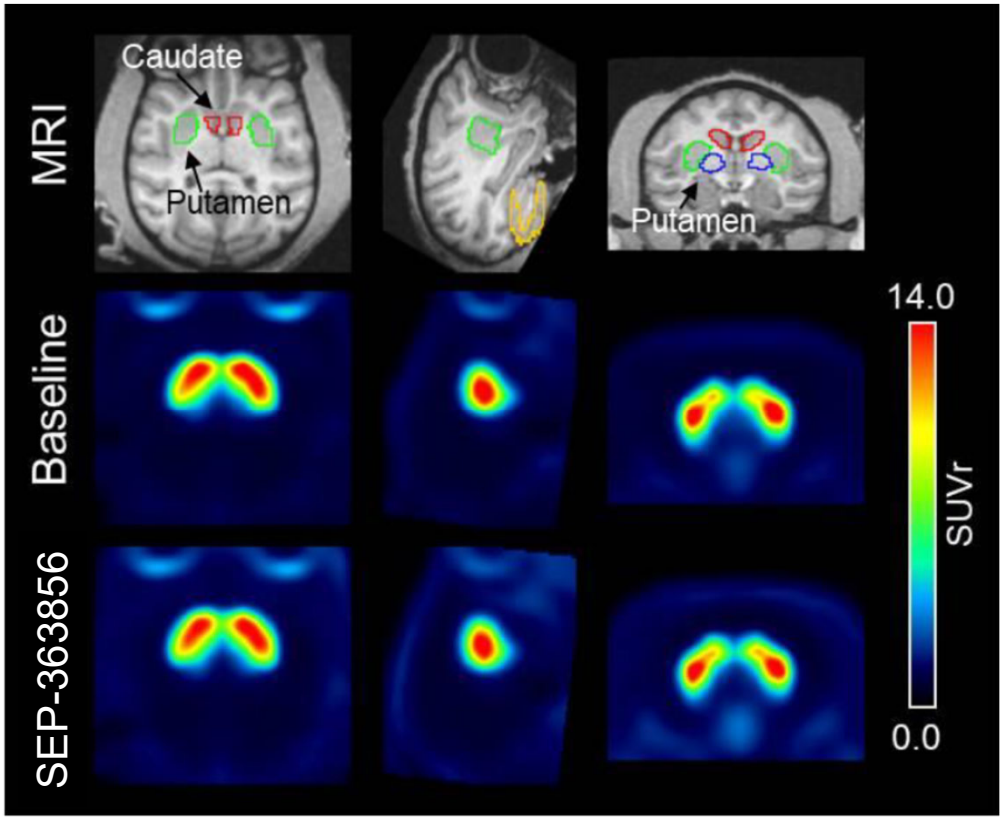
EXISTING ANTIPSYCHOTIC CLASS: D_2/5-HT_{2A}



MONOAMINE RECEPTOR BLOCKADE

Development Pipeline: SEP-363856 PET Imaging

Lack of Blockade of Dopamine D_2 Receptors in All Animal Species Tested

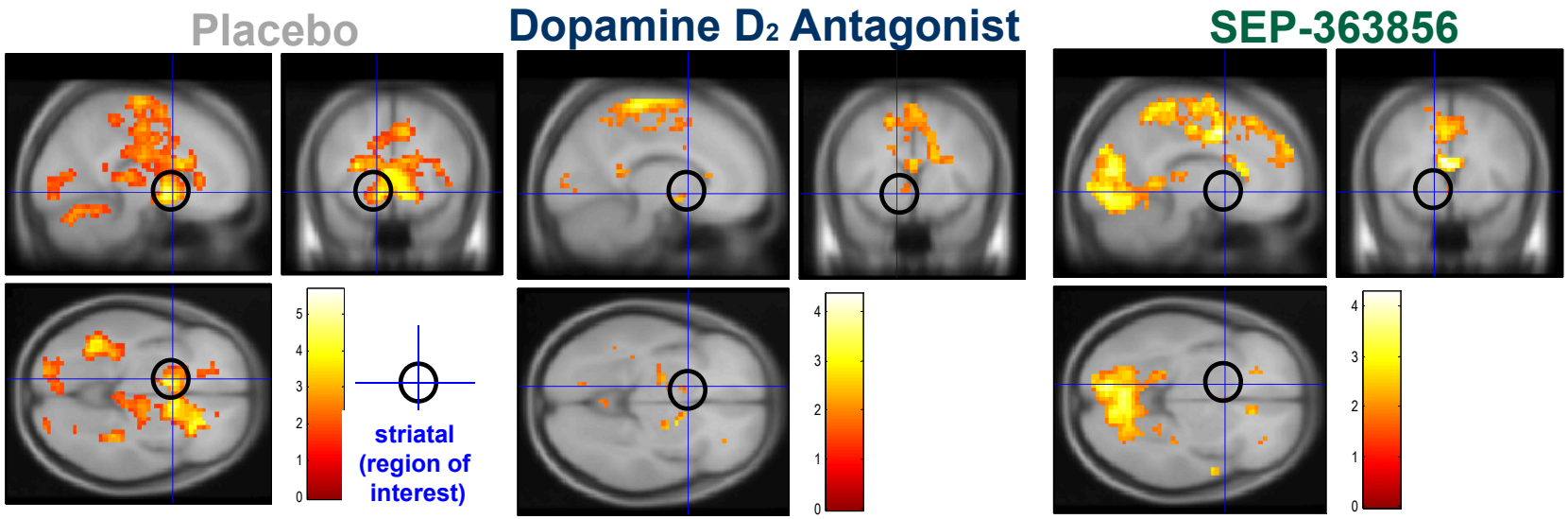


in vivo PET imaging of [^{18}F]-fallypride binding to D_2 receptors in rhesus at 20x effective clinical concentrations of SEP-363856

Development Pipeline: SEP-363856 Functional Magnetic Resonance Imaging (fMRI)

Mechanism of Action on Dopamine Neurocircuitry

fMRI probes core dopaminergic reward circuitry including ventral striatum, insula and medial orbitofrontal cortex (mOFC) brain regions

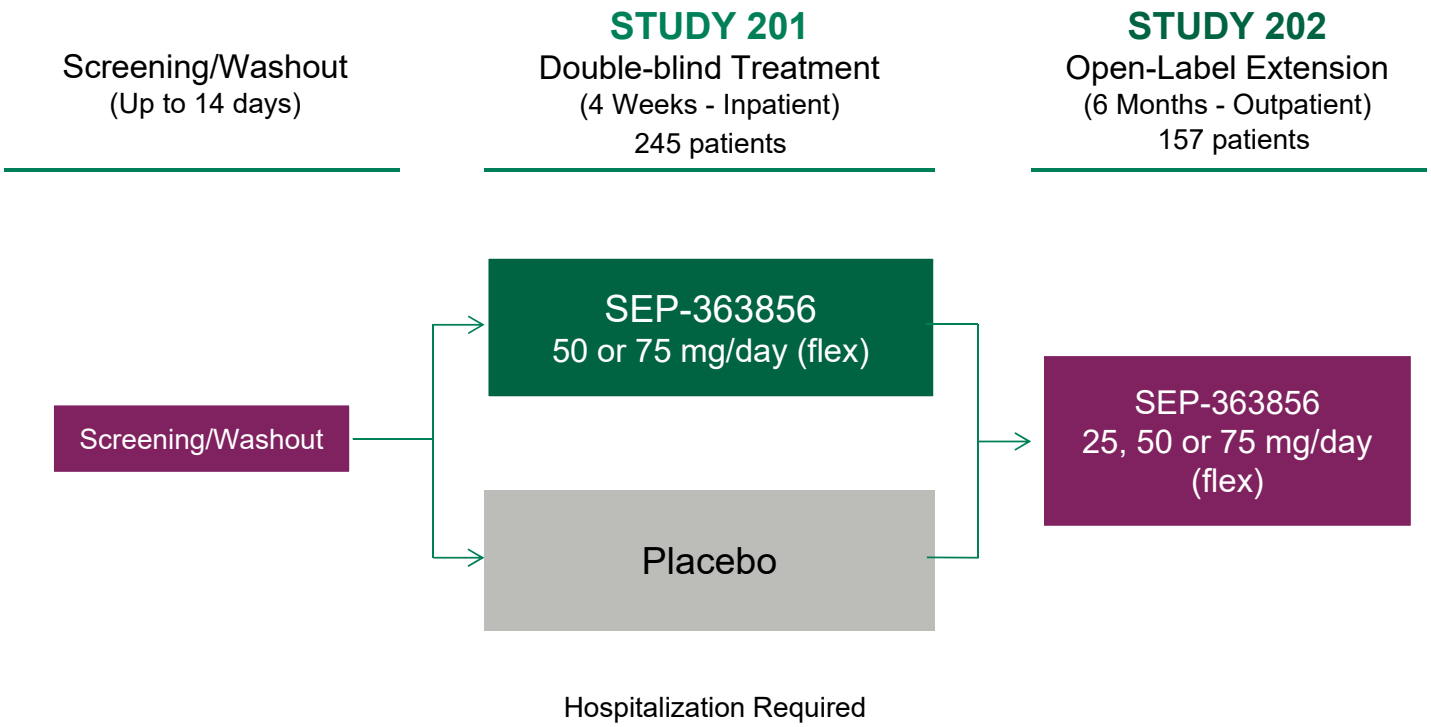


Development Pipeline: SEP-363856

Unique "Proof-of-Concept" Development Approach

Sumitomo Dainippon Pharma

Designed global, registration studies to evaluate SEP-363856



201 PRIMARY ENDPOINT:

- Change from baseline in Positive and Negative Syndrome Scale (PANSS) total score versus placebo at Week 4

201 SECONDARY ENDPOINTS:

- CGI-S score
- PANSS subscale scores
- Brief Negative Symptom Scale (BNSS) total score
- Montgomery Asberg Depression Rating Scale (MADRS) total score
- Proportion of PANSS responders (>20% decrease in PANSS total score)

SAFETY/TOLERABILITY:

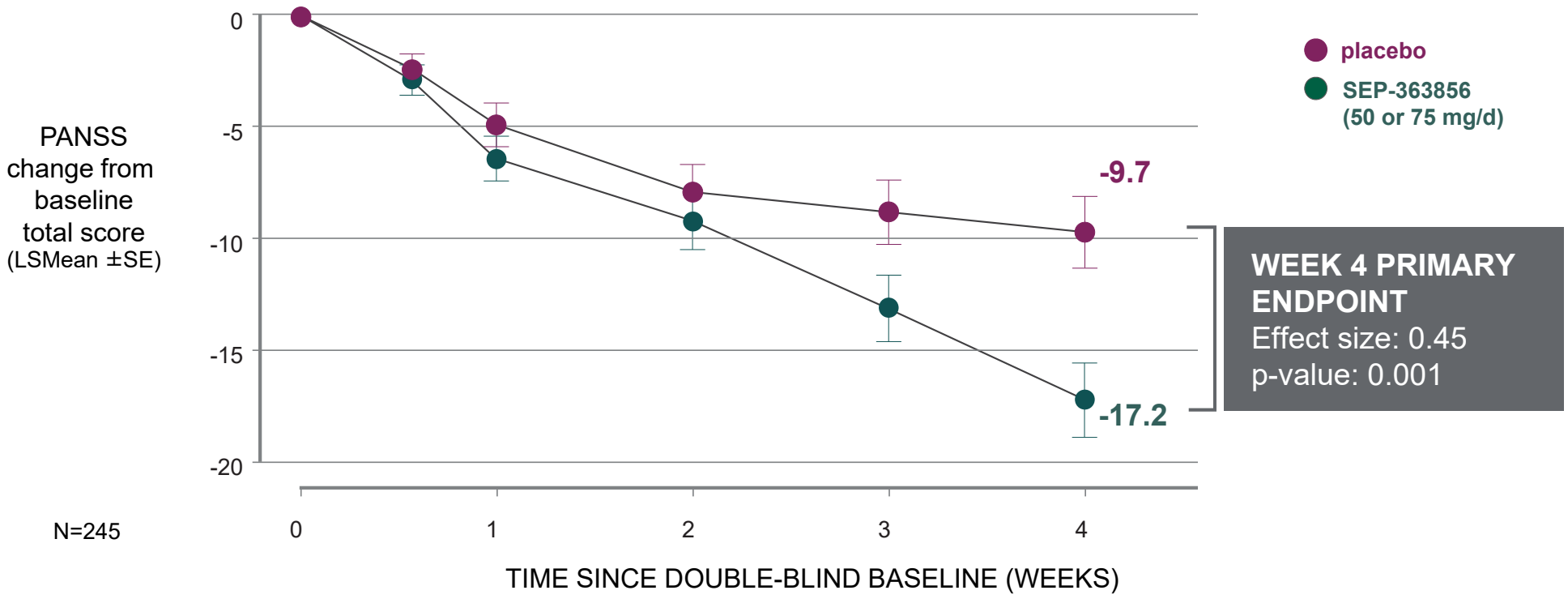
- Incidences of adverse events, serious adverse events, and adverse events leading to discontinuation from study

Development Pipeline: SEP-363856 201 study

Primary Endpoint Met, Demonstrating a Statistically Significant and Clinically Meaningful Result

Sumitomo Dainippon Pharma

SEP-363856 showed statistically significant and clinically meaningful improvement in the Positive and Negative Syndrome Scale (PANSS) total score compared to placebo after four weeks of treatment (-17.2 vs. -9.7, respectively; p=0.001)

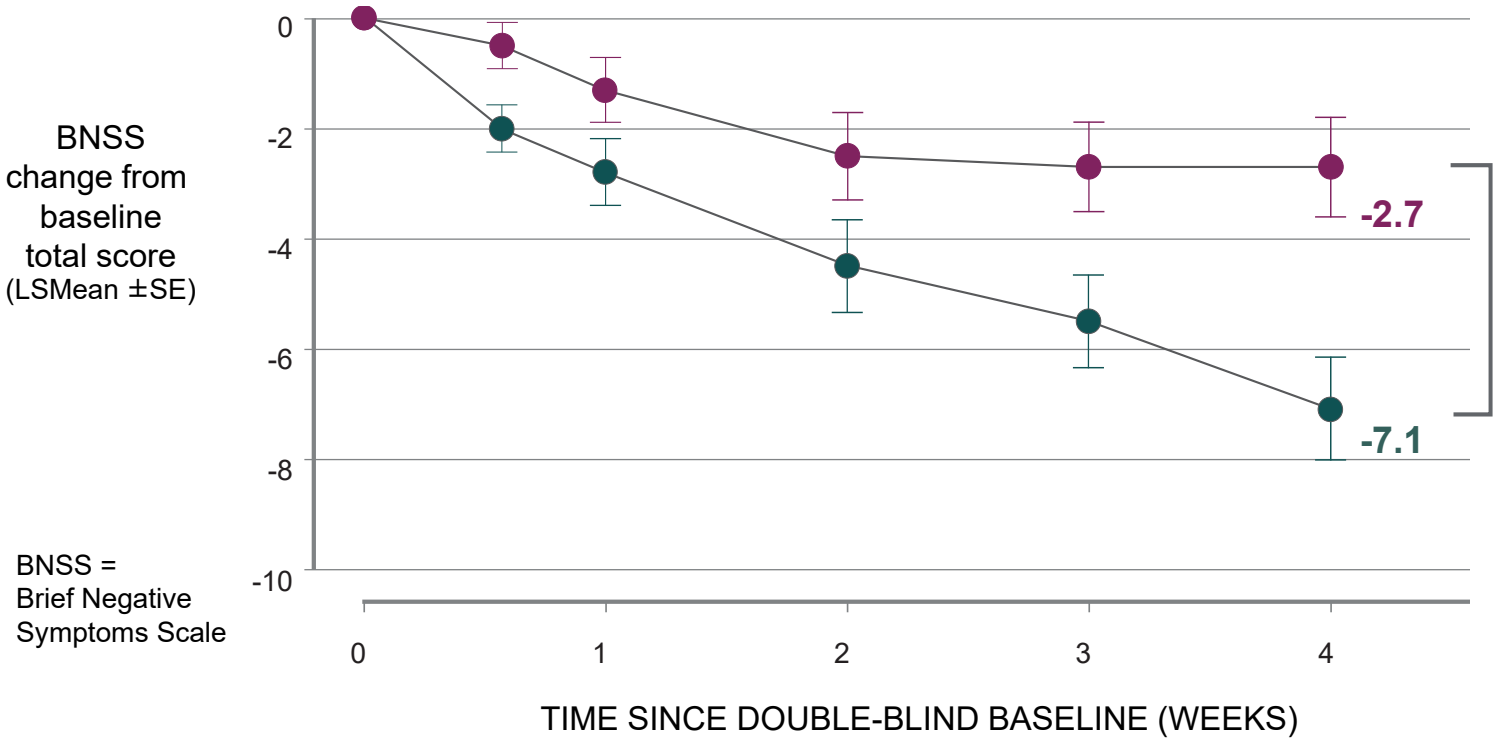


Development Pipeline: SEP-363856 201 study

Statistically Significant Improvement in Brief Negative Symptom Scale (BNSS) Score Over Four Weeks

Sumitomo Dainippon Pharma

Improvement was found in the the Brief Negative Symptom Scale (BNSS) total score (p<0.001) and all major PANSS (positive, negative and general psychopathology) subscales (p<0.02)



BNSS = Brief Negative Symptoms Scale

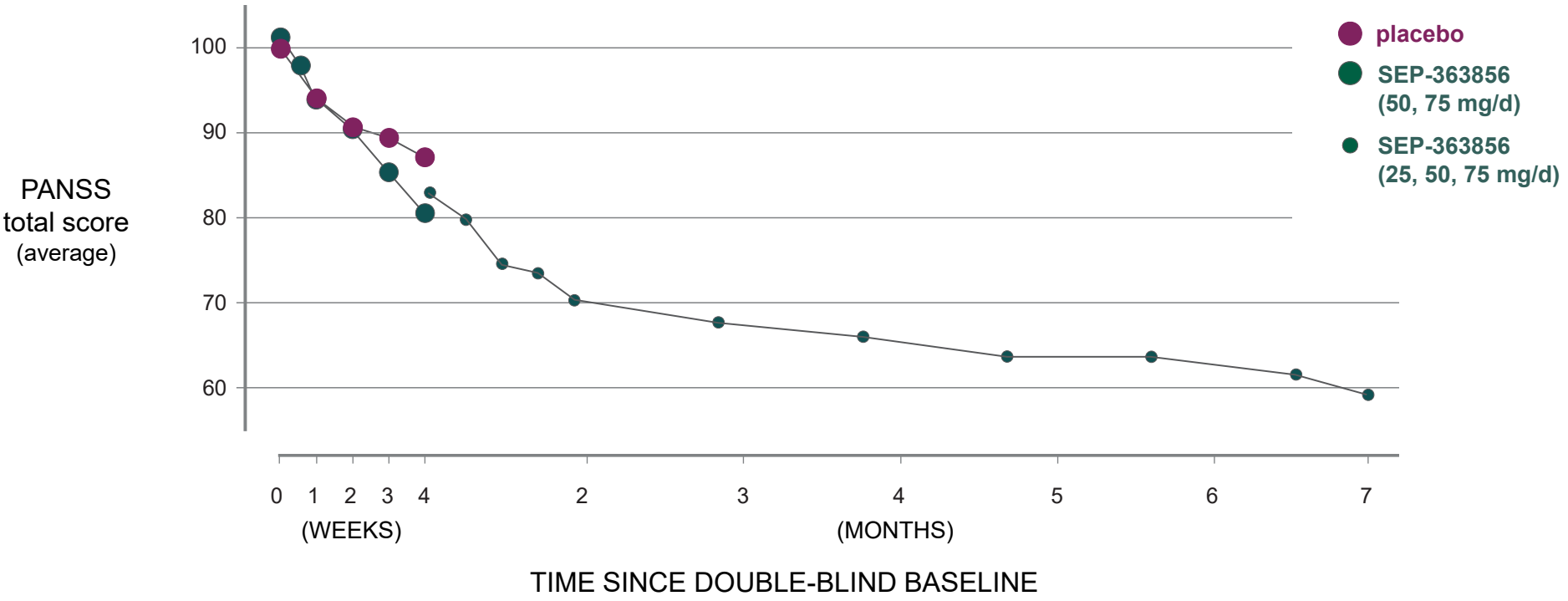
WEEK 4 SECONDARY ENDPOINT
Effect size: 0.48
p-value: <0.001

Development Pipeline: SEP-363856 201/202 studies

Effectiveness Sustained Over Six Months

Sumitomo Dainippon Pharma

Clinically meaningful improvement seen in the Positive and Negative Syndrome Scale (PANSS) total score

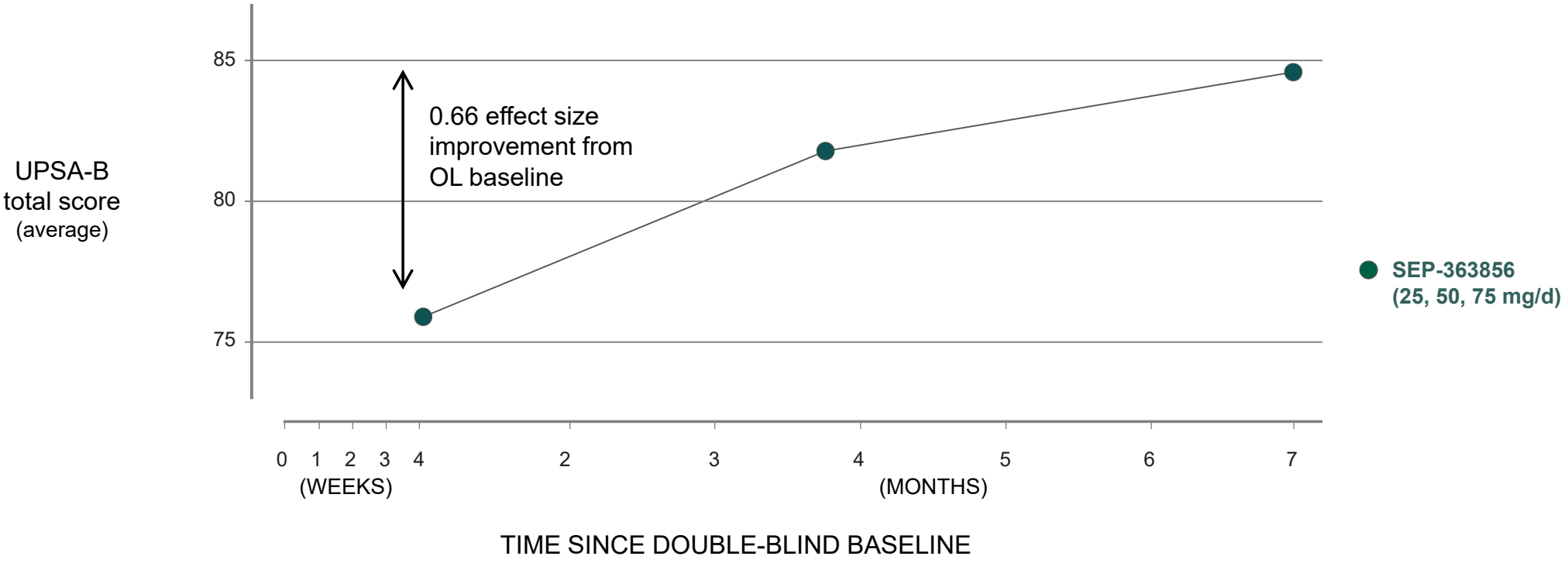


Development Pipeline: SEP-363856 202 study

Significant Improvement in Functioning Measured by UCSD Performance-Based Skills Assessment (UPSA-B)

Sumitomo Dainippon Pharma

SEP-363856 was associated with functional improvement as measured by the UPSA-B over six months



Development Pipeline: SEP-363856

Safety and Tolerability Comparable to Placebo

Sumitomo Dainippon Pharma

No new safety or tolerability effects during the 6-month open label period

4-WEEK DOUBLE-BLIND PERIOD

Preferred Term	Placebo (N = 125)	SEP-363856 (N = 120)
	n (%)	n (%)
Somnolence	6 (4.8%)	8 (6.7%)
Agitation	6 (4.8%)	6 (5.0%)
Nausea	4 (3.2%)	6 (5.0%)
Insomnia	13 (10.4%)	4 (3.3%)
Diarrhea	1 (0.8%)	3 (2.5%)
Dyspepsia	0	3 (2.5%)
Anxiety	9 (7.2%)	2 (1.7%)
Patients with any extrapyramidal symptom	4 (3.2%)	4 (3.3%)
RETENTION RATE	**79.2%**	**78.3%**

CLINICAL SAFETY AND TOLERABILITY

Favorable profile, without class-related side-effects of currently marketed antipsychotics

Effects on extrapyramidal symptoms, weight, lipids, glucose, prolactin, and ECG parameters did not differ significantly from placebo

Low discontinuation rates

Development Pipeline: SEP-363856

Phase 3 DIAMOND Program Underway

- End of Phase 2 meeting with U.S. Food and Drug Administration (FDA) completed
- DIAMOND program determined to be suitable to support registration, if successful
  - ✓ Replication of pivotal SEP856-201 study
- Global, multicenter program includes four studies that are designed to evaluate the safety, efficacy and tolerability of SEP-363856

DIAMOND 1

A six-week, randomized, double-blind, parallel-group, placebo-controlled, fixed-dose, multicenter study to evaluate the efficacy and safety of SEP-363856 in acutely psychotic adults and adolescents (13 to 17 years of age) with schizophrenia [ClinicalTrials.gov: NCT04072354]

DIAMOND 2

A six-week, randomized, double-blind, parallel-group, placebo-controlled, fixed-dose, multicenter study to evaluate the efficacy and safety of SEP-363856 in acutely psychotic adults with schizophrenia [ClinicalTrials.gov: NCT04092686]

DIAMOND 3

A 52-week, outpatient, multicenter, flexible-dose, open-label long-term safety and tolerability extension study of SEP-363856 in adults and adolescents with schizophrenia who completed either the DIAMOND 1 or DIAMOND 2 study [ClinicalTrials.gov: NCT04109950]

DIAMOND 4

A 52-week, randomized, double-blind, active comparator-controlled long-term safety and tolerability study of SEP-363856 in adults with schizophrenia [ClinicalTrials.gov: NCT04115319]

Development Pipeline: SEP-363856

Summary and Next Steps in the SEP-363856 Program

Sumitomo Dainippon Pharma

SEP-363856

- Is a novel agent with a non-D_2 mechanism of action, distinct from currently marketed antipsychotics
- Efficacy, safety and tolerability demonstrated in multi-center global 4-week study and 6-month extension study
- Absence of movement disorder symptoms; no weight, metabolic impairment observed to date

Innovative drug profile

- Non binding to dopamine D_2 receptor
- Potential for high efficacy to treat positive and negative symptoms
- Potential for major improvement in differentiated drug safety and tolerability

SCHIZOPHRENIA

- Breakthrough Therapy Designation received (May 2019)
- Phase 3 studies (DIAMOND) underway
  - Data readouts expected to begin in FY2021
  - Includes both adolescents and adults

ADDITIONAL INDICATIONS

- Phase 2 Parkinson's disease psychosis (PDP) results expected in 1H2020
- A number of additional indications are under consideration, including mood disorders

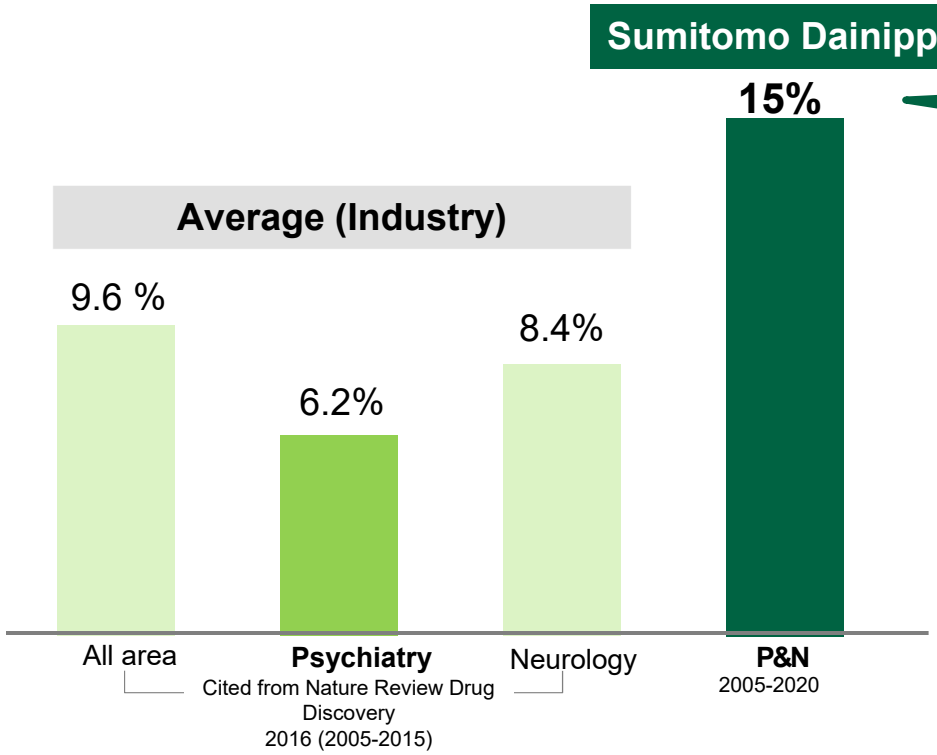
Appendix

Strength in Productivity to Produce Psychiatry & Neurology Drugs

Sumitomo Dainippon Pharma

● Success rate in R&D

(Ratio of drugs approved/drugs entered in clinical phase 1)



Historically productive in this area, with higher success rate than industrial average

27 compounds in Clinical phase

4 products launched

- LONASEN (2008)
- TRERIEF (2009)
- LATUDA (2011)
- APTIOM (2014)

Success Rate in Psychiatric & Neurologic area has been very low industry-wide; our success rate above industry average

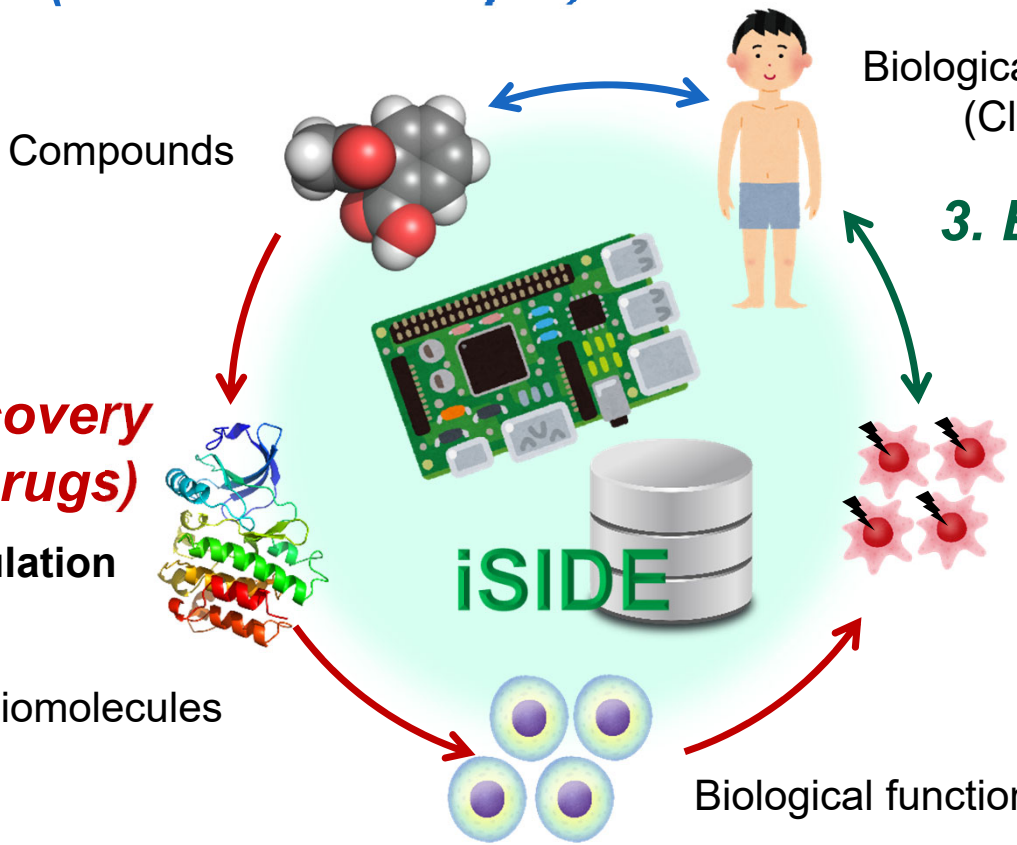
In-Silico Driven First-In Class Drug Discovery in Our Company

Sumitomo Dainippon Pharma

The series of sophisticated in-silico technologies to create real drug on computer

1. Seed exploration (Effective Concepts)

Integrated analysis of scientific big data
Validation with real word data



3. Biomarker identification (Efficacy Evidences)

Deep biomedical profiling of patients

Biological response (Non-clinical)

2. Lead discovery (Effective Drugs)

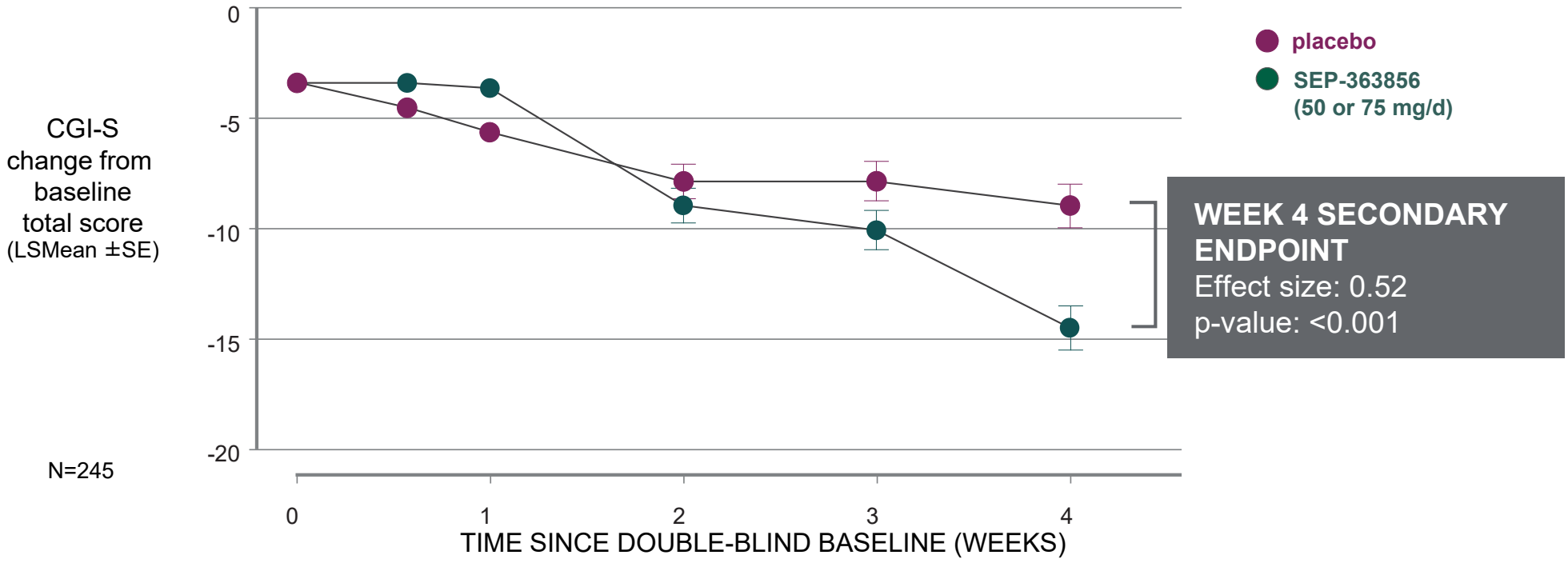
Synergy of AI and simulation

Appendix (Development Pipeline: SEP-363856 SEP856-201 study)

Statistically Significant Improvement in Clinical Global Impression Scale Over Four Weeks

Sumitomo Dainippon Pharma

Patients treated with SEP-856 showed improvement in the overall severity of illness as assessed by the Clinical Global Impression Scale - Severity (CGI-S) (p<0.001)

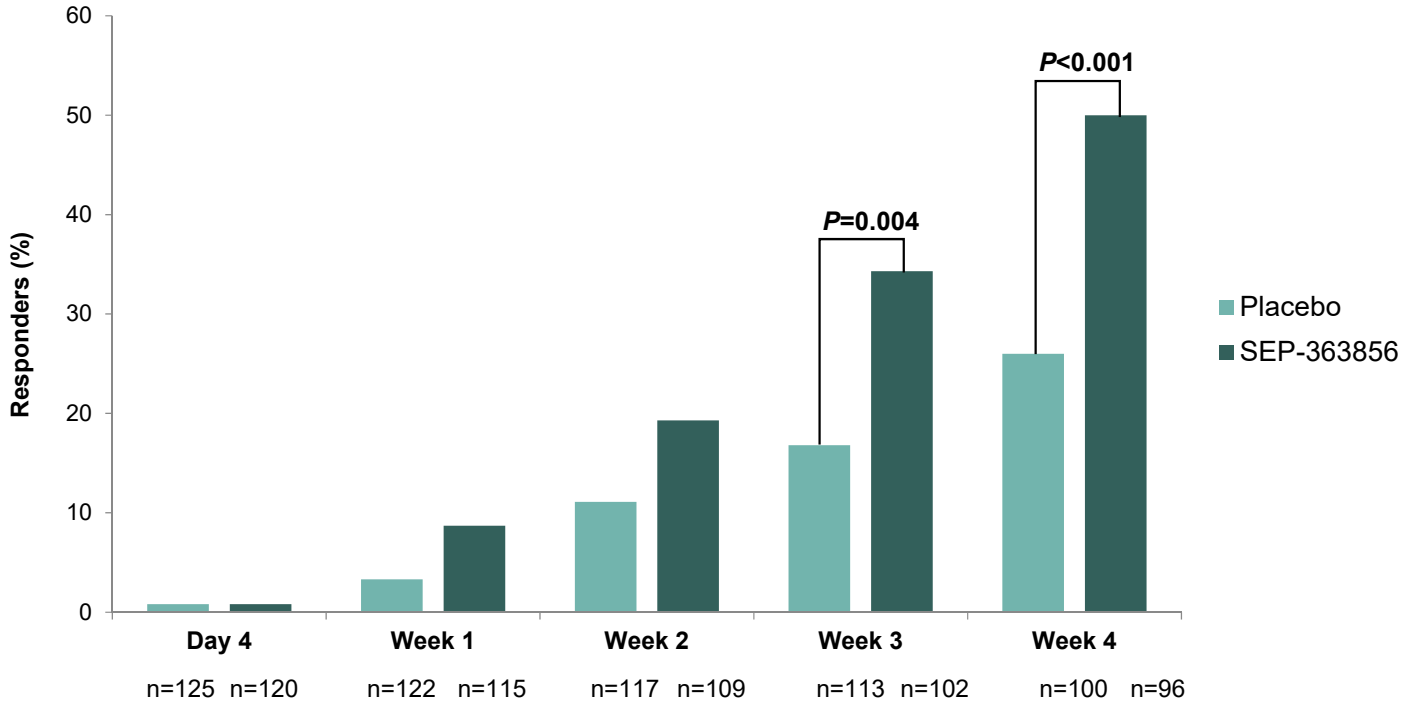


Appendix (Development Pipeline: SEP-363856 SEP856-201 study)

Statistically Significant Improvement in Proportion of PANSS Responders Over Four Weeks

Sumitomo Dainippon Pharma

PANSS responders increased 30% from baseline over time



Appendix

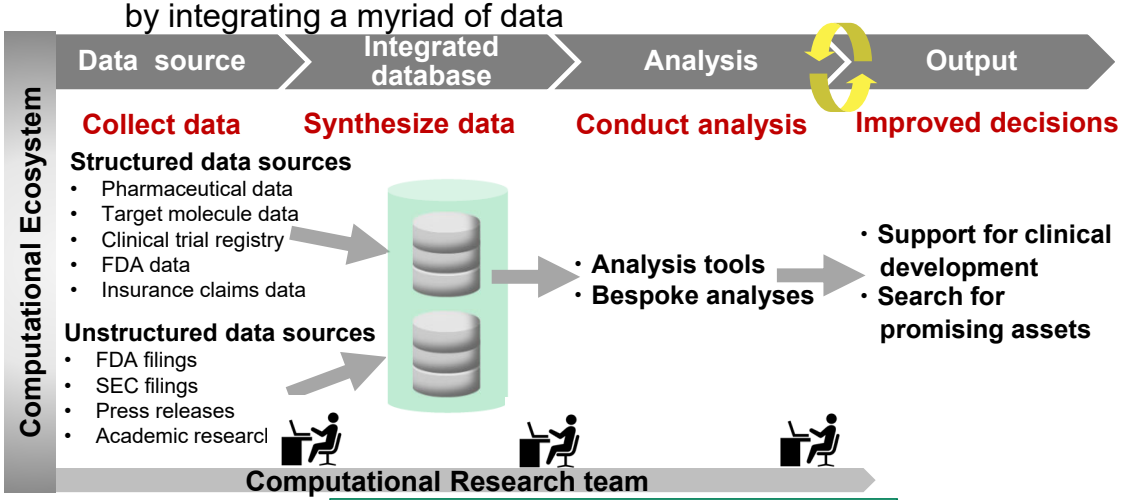
Becoming a Data-Driven Pharmaceutical Company

Sumitomo Dainippon Pharma

For greater efficiency in R&D, Global Data Design Office in cooperation with Sumitovant is considering utilization of DrugOme and Digital Innovation within the Sumitomo Dainippon Pharma Group

DrugOme

- ✓ Computational Ecosystem centering around a Computational Research Team with a high degree of professional knowledge in data science
- ✓ Swiftly provides high quality solutions to various business problems by integrating a myriad of data

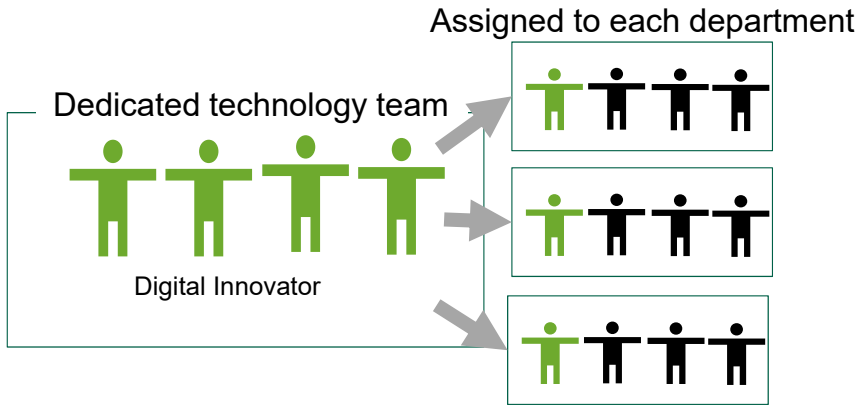


Example Digital Solutions

New asset idea generation	*Interactive map of asset landscape*	*Detailed market assessment*
Formulation of development strategy	*Toxicology risk assessment*	*Clinical trial enrollment*

Digital Innovation

- ✓ Dedicated Digital Innovators will be assigned to each business department. Applying digital technologies, Digital Innovators will help solve business problems and improve business efficiency
- ✓ Application of successful measures to other groups with similar problems



Example Digital Solutions

Rare disease patient identification	*Operational risk monitoring*	*Salesforce optimization*
Automation of trial oversight	*Automated sub-group efficacy analyses*	

Sumitomo Dainippon Pharma

Innovation today, healthier tomorrows