FY2021 Q3 Financial Results

Company

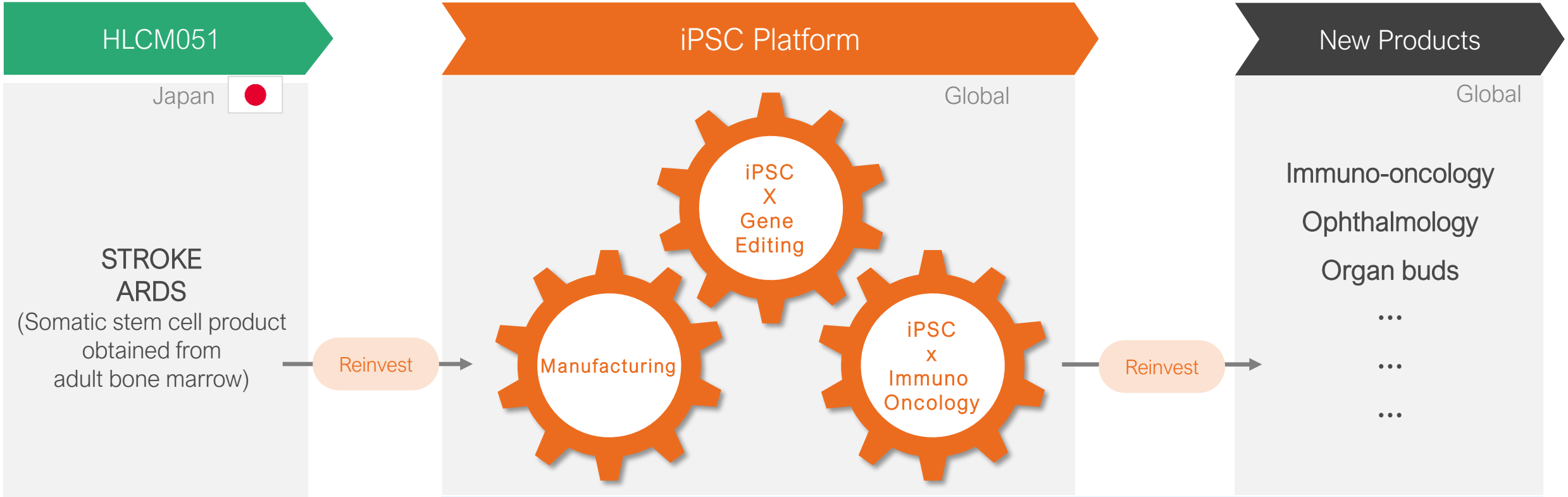
HEALIOS K.K. (TSE 4593)

Date

November 12, 2021

Hybrid Strategy

- Generate near term profits in stroke and ARDS indications
- Reinvest profits in our world-leading engineered iPSC platform to create next generation therapies for the global market



Engage deeply with regenerative medicine innovation around the world through our venture fund activities

Important informational insights | **Building relationships with promising companies** | **High return investments**

Saisei Ventures LLC (US based) has made its initial investments in Japan and US private venture companies.

Pipeline

Update

Healios

Clinical pipeline

	Development Code	Indication	Country/ Region	Pre-clinical test	Clinical trial (Regenerative medical products)	Preparation for application	Apply/ Approved	On Market	Progress status
Inflammatory Conditions	HLCM051	Ischemic Stroke	Japan		Phase2/3 Non-clinical / CMC package submitted		SAKIGAKE Designation System		Patient enrollment completed Rolling submission in progress via SAKIGAKE Designation System
		ARDS	Japan		Phase2		Orphan regenerative medicine product		Preparing for application

	Development Code	Indication	Country/ Region	Pre-clinical test	Phase 1 trial	Phase 2 trial	Phase 3 trial	Preparation for application	Apply/ Approved	On Market	Progress status
Immuno-Oncology	HLCN061	Solid Tumors	Japan US/EU	→							Research and development of genetically modified NK cells Joint research with the National Cancer Center Japan

* NK Cells: Natural Killer Cells

	Development Code	Indication	Country/ Region	Pre-clinical test	Phase 1 trial	Phase 2 trial	Phase 3 trial	Preparation for application	Apply/ Approved	On Market	Progress status
Replacement Therapies	HLCR011	Wet AMD	Japan	→							Preparing for clinical trial by Sumitomo Dainippon Pharma
	HLCR012	Dry AMD	US/EU	→							
	HLCL041	Metabolic Liver Disease	Japan	→							Joint research with Yokohama City University

Research pipeline

	Development Code	Target Organ	Country/ Region	Pre-clinical test	Phase 1 trial	Phase 2 trial	Phase 3 trial	Preparation for application	Apply/ Approved	On Market	Progress status
UDC Platform	–	Pancreatic β Cells	–	→							Joint research with the National Center for Global Health and Medicine
	–	Photoreceptor Cells	–	→							

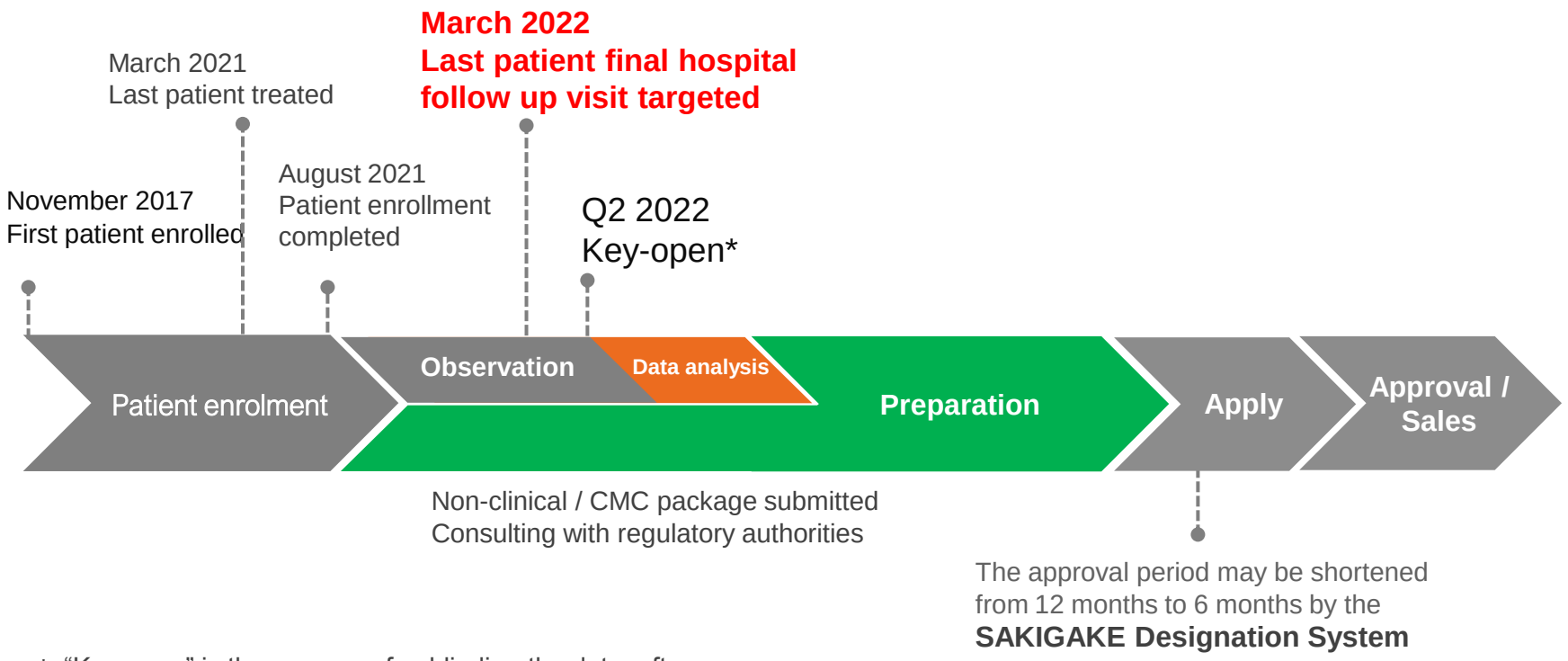
HLCM051 Stroke: TREASURE Study

Update

Healios

Based on the advice of the regulatory authority, in order to avoid any potential bias to the 365-day data (and related secondary endpoints) that could result from unblinding and disclosure of 90-day data (primary endpoint), the decision was made that the 90-day unblinding, data analysis and release would take place after the 365-day data is locked.

Development Plan



＊ “Key-open” is the process of unblinding the data, after which analysis can be completed. Results will be released promptly post key-open and completion of analysis.

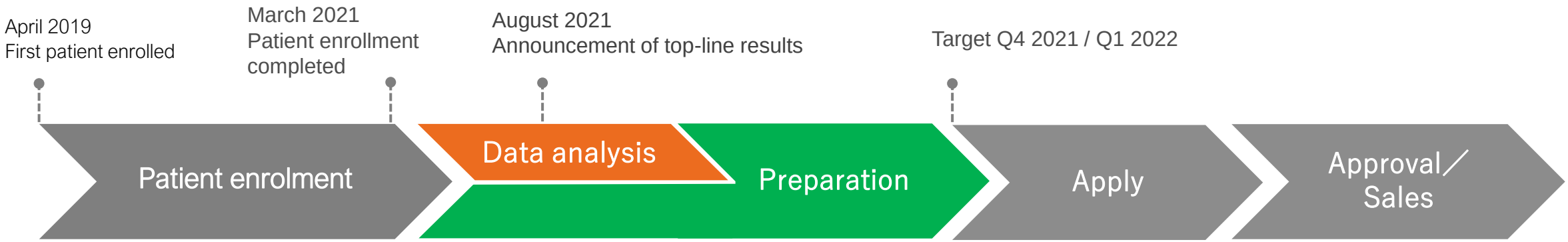
Overview

Trial	Placebo-Controlled, Double-Blind, Phase 2/3 Efficacy and Safety Trial of HLCM051 (MultiStem®) in Patients With Ischemic Stroke （TREASURE study）
Subjects	Ischemic stroke within 18 to 36 hours
Conditions	Placebo-Controlled, Double-Blind
Enrollment	220 (HLCM051 [n=110], placebo [n=110], randomized)
Primary Endpoints	Proportion of subjects with an excellent outcome defined by functional assessments [Time Frame: Day 90]
Secondary Endpoint (one among several)	Proportion of subjects with an excellent outcome defined by functional assessments [Time Frame: Day 365]

“Excellent Outcome” is defined as achieving mRS ≤1, NIHSS ≤1, and BI ≥95. mRS, NIHSS, and BI are the three major indices of functional assessment for stroke patients.

HLCM051 ARDS: ONE-BRIDGE Study

Development plan



Patient data analysis / evaluation ongoing
Continuing consultation with regulatory authorities regarding the application

HLCM051 has been designated as an **orphan regenerative medicine product** for use in the treatment of ARDS by the Ministry of Health, Labor and Welfare. (It has received SAKIGAKE status for ischemic stroke.)

We are continuing to consult with the regulatory authorities in preparation to file for regulatory approval as soon as possible.

ONE-BRIDGE Study: Results at 180 days post administration

Update

Healios

The reduction in mortality at 180 days post administration was unchanged versus the 90-day data.

Cohort 1

No safety concerns.

The HLCM051 treated group demonstrated a 9-day higher median VFD than the standard therapy group.

The treated group saw a 39% reduction in mortality as compared to patients treated with standard therapy.

Cohort 2

No deaths, no safety concerns.

The ventilator was withdrawn within 28 days for all five patients and in three days or less for three of these patients.

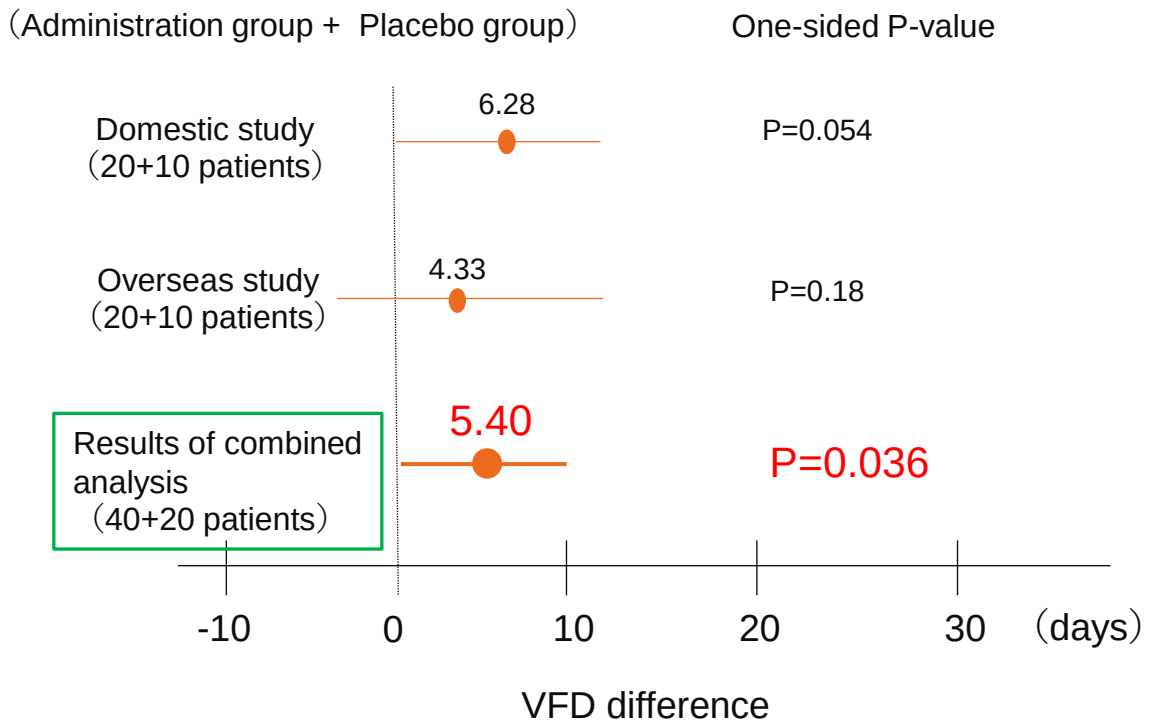
	Cohort 1	
	HLCM051	Standard therapy
Primary Endpoint		
VFD (the number of days out of 28 during which a ventilator was not used for the patient)	**20 days**	**11 days**
Secondary Endpoint		
Mortality (180 days after administration)	**26.3%**	**42.9%**

	Cohort 2
	HLCM051
Primary Endpoint	
Safety	**No safety issues**
Secondary Endpoint	
VFD	**25 days**
Mortality (180 days after administration)	**0%**

Reference: Combined analysis of domestic and overseas ARDS studies

For VFD, the results of the domestic study (ONE-BRIDGE study, Cohort 1) and an overseas study (Athersys's MUST-ARDS study) were combined and analyzed.

Combined analysis results



Summary

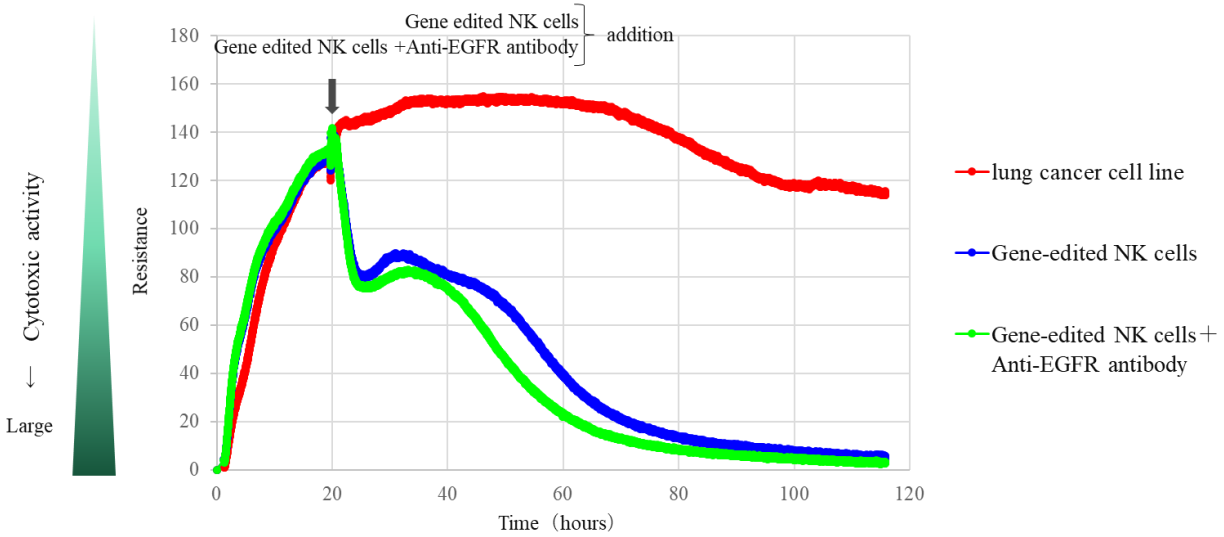
After adjusting for baseline age and PF ratio as continuous risk factors, the average improvement in 28-day VFD for the two trials on a combined basis was 5.40 days with a one-sided p-value of 0.036.

The tendency of HLCM051 **to improve VFD** in ARDS patients was further reinforced.

Note: In the VFD analysis of each study, analysis of covariance was performed with the treatment method, P / F ratio (PaO2 / FIO2 ratio, gas exchange index in the lungs), and age as independent variables. In the combined analysis, covariance analysis was performed in the same manner, and adjustments were made based on the P / F ratio, age, test, interaction between P / F ratio and test, and interaction between age and test. The results of the combined analysis suggest that the 90% confidence interval exceeds 0 (90% CI: 0.48 to 10.32, one-sided P-value 0.036, which is suggestive of the above conclusion).

New Healios

In vitro anti-tumor effect of gene-edited NK cells on lung cancer cell line

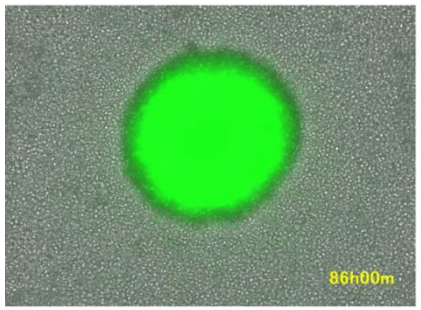


Gene-edited NK cells have demonstrated a robust *in vitro* anti-tumor (cytotoxic) effect in a lung cancer cell line (A549, non-small cell lung cancer).*

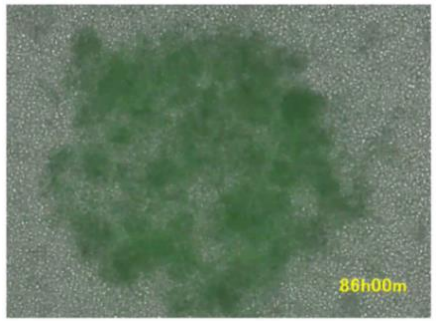
* Their cytotoxic activity was determined by measuring the change in electrical resistance resulting from the addition of the NK cells, as illustrated in the left chart. In addition to testing the gene edited NK cells alone against the cancer line, we also tested the gene edited NK cells in combination with an anti-EGFR antibody used as an anti-cancer drug, which resulted in enhanced cancer cytotoxicity.

State at 86 hours after addition*

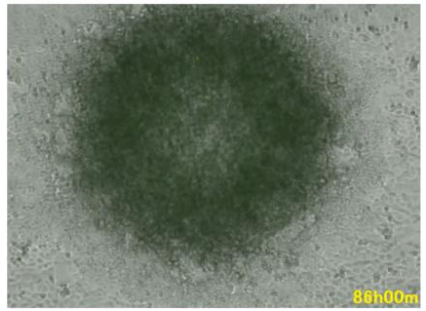
Gene-edited NK cells alone



Gene-edited NK + anti-EGFR antibody



＜Reference＞
Anti-EGFR antibody alone



*You can view three different videos in which the cancer cell spheroid is attacked and killed by each addition. (Please click each title.)

（Source）in-house data

HLCN061: Joint Research with the National Cancer Center Japan

Update

Healios

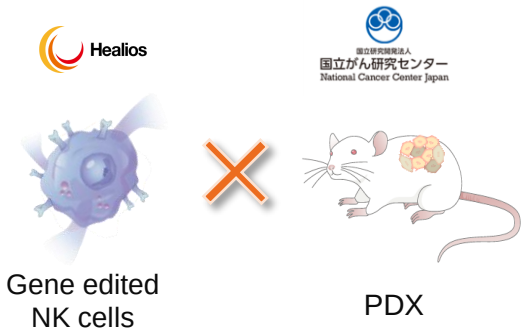
Research utilizing PDX（Patient-Derived Xenograft)

≪Results of first stage of joint research≫

Expression of molecules recognized by Healios gene-edited NK cells using NCCJ-PDX from multiple types of human solid cancers is confirmed by RNA sequencing and immunostaining.

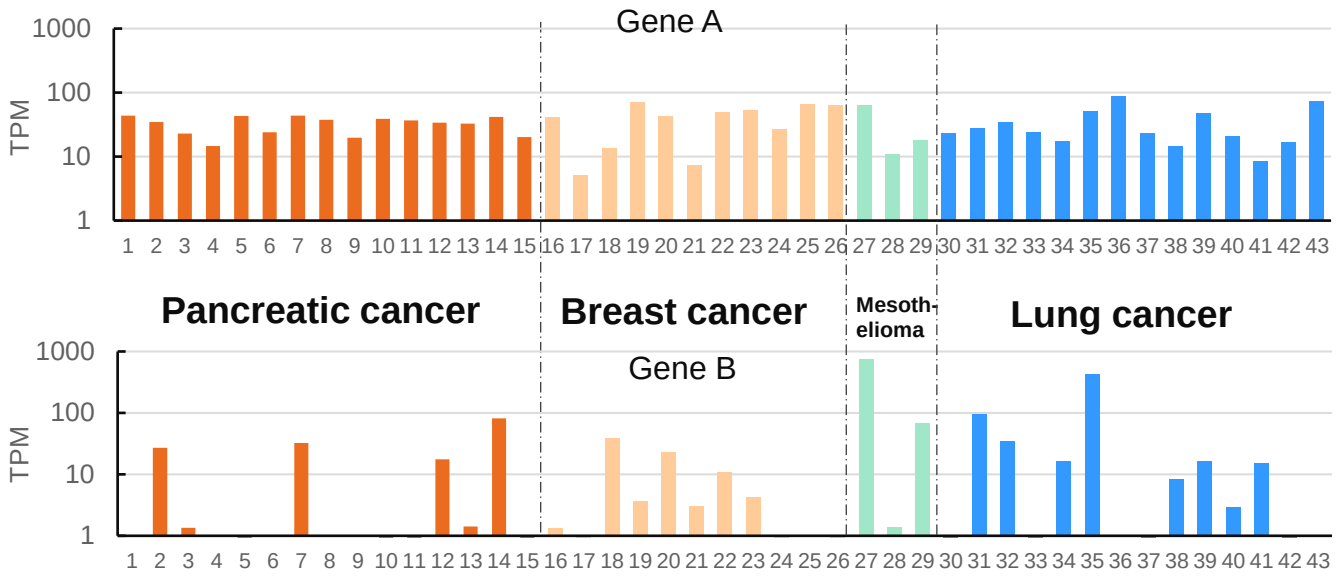
≪In the near future≫

-After optimizing the dosage and frequency of administration in mice through ongoing in-house experiments, we plan to investigate efficacy in a mouse PDX model*.
-We will continue to examine not only the four solid cancers examined in this study, but also various other solid cancers.

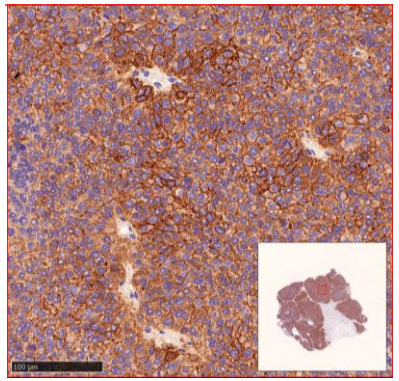


＊ PDX models: Involve the transplantation of human patient cancer tissue into immunodeficient mice. Dramatically improves the predictability of clinical response.

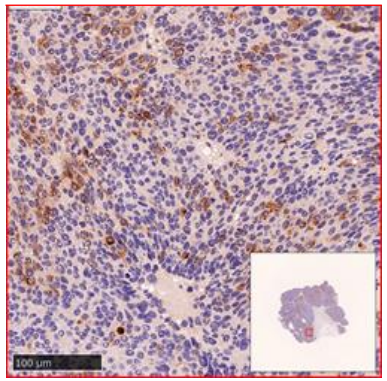
Target gene expression level (RNA seq data)



Example of immunostaining for target genes



Gene A



Gene B

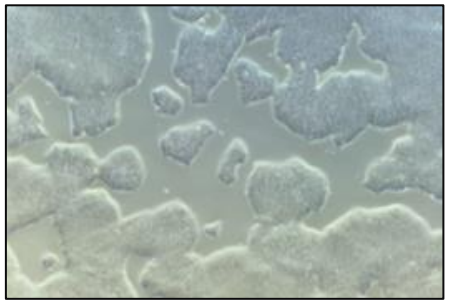
（Source）in-house data

iPSC Platform: Differentiation and induction of pancreatic β-cells from UDCs

New Healios

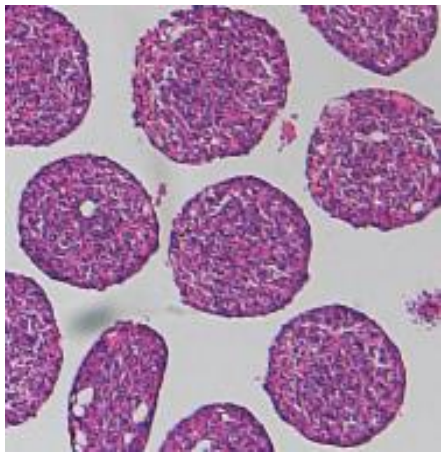
Joint research with the Department of Regenerative Medicine at the National Center for Global Health and Medicine in Tokyo

Pancreatic β-cells



UDC

Differentiation and induction



UDC-derived pancreatic β cells (HE staining)

(Photo provided by the National Center for Global Health and Medicine)

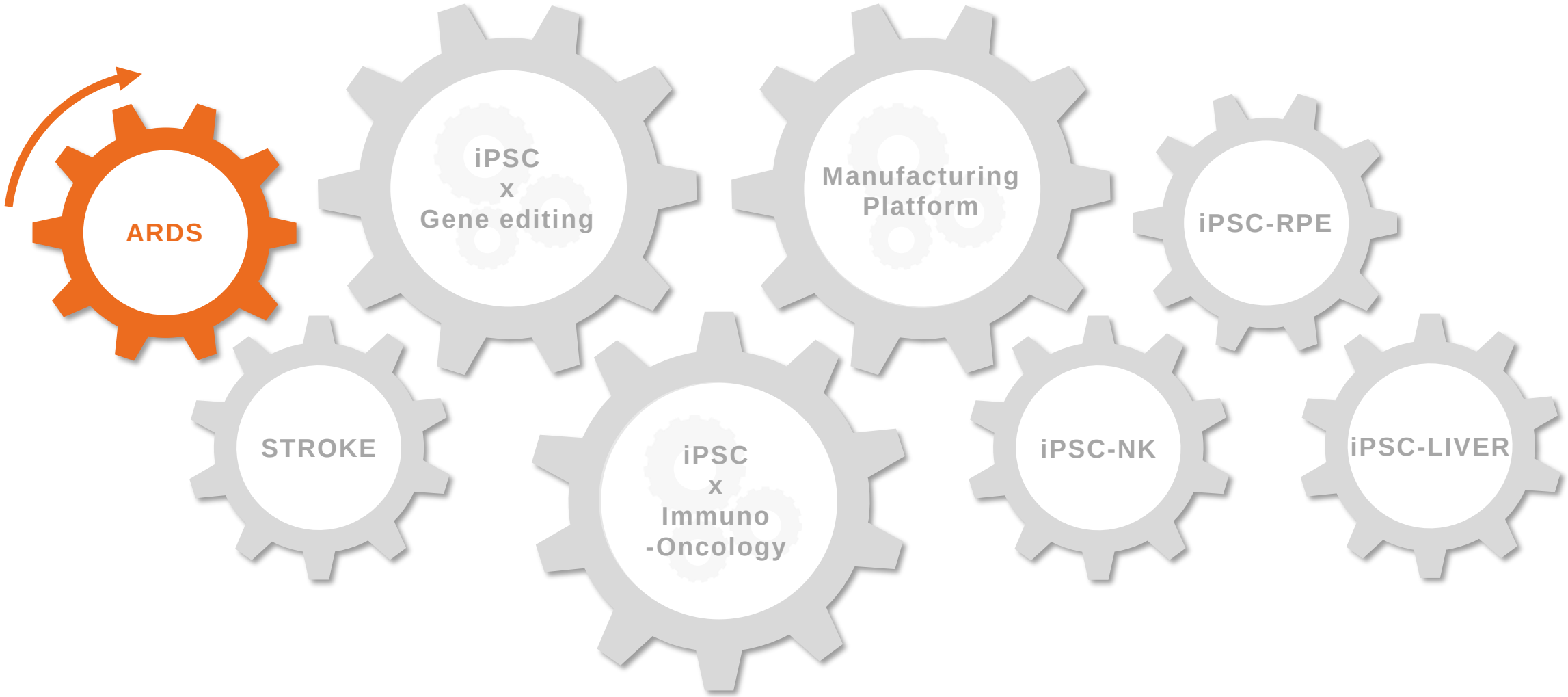
Pancreatic β-cells are a type of cell present in the islets of Langerhans within the pancreas. They produce and secrete insulin in response to blood glucose levels and serve to regulate the amount of glucose in the bloodstream.

In our joint research with the Department of Regenerative Medicine at the National Center for Global Health and Medicine in Tokyo, we have been aiming to establish a method for inducing differentiation of human iPS cells into pancreatic β-cells for use in clinical applications such as the treatment of diabetes, and we are pleased to announce that **we have successfully confirmed the differentiation of UDCs into pancreatic β-cells.**

Moving forward, our joint research will work on optimizing the process and verifying the efficacy and safety of these cells in animal models of diabetes. Through this achievement, we hope to develop a new more effective therapeutic approach for diabetes and further expand the value and impact of our company's iPSC platform

(Source) Joint research data

HLCM051 ARDS



Target disease: About Acute Respiratory Distress Syndrome (ARDS)

There is demand for new treatments for ARDS that will lead to improvements in patients' symptoms and prognosis

Number of ARDS patients in Japan estimated approximately 7,000 to 12,000 per year[*1]

About ARDS[*2]

Acute Respiratory Distress Syndrome (ARDS) is a general term for the symptoms of acute respiratory failure suddenly occurring in all seriously ill patients.

The mortality rate is approximately 30 to 58%[*2].

ARDS is a common cause of morbidity and mortality in severe COVID-19.

（Source）Athersys

Current Treatment

At present, there are no therapeutic drugs that can make a direct improvement to a patient's vital prognosis when ARDS develops.

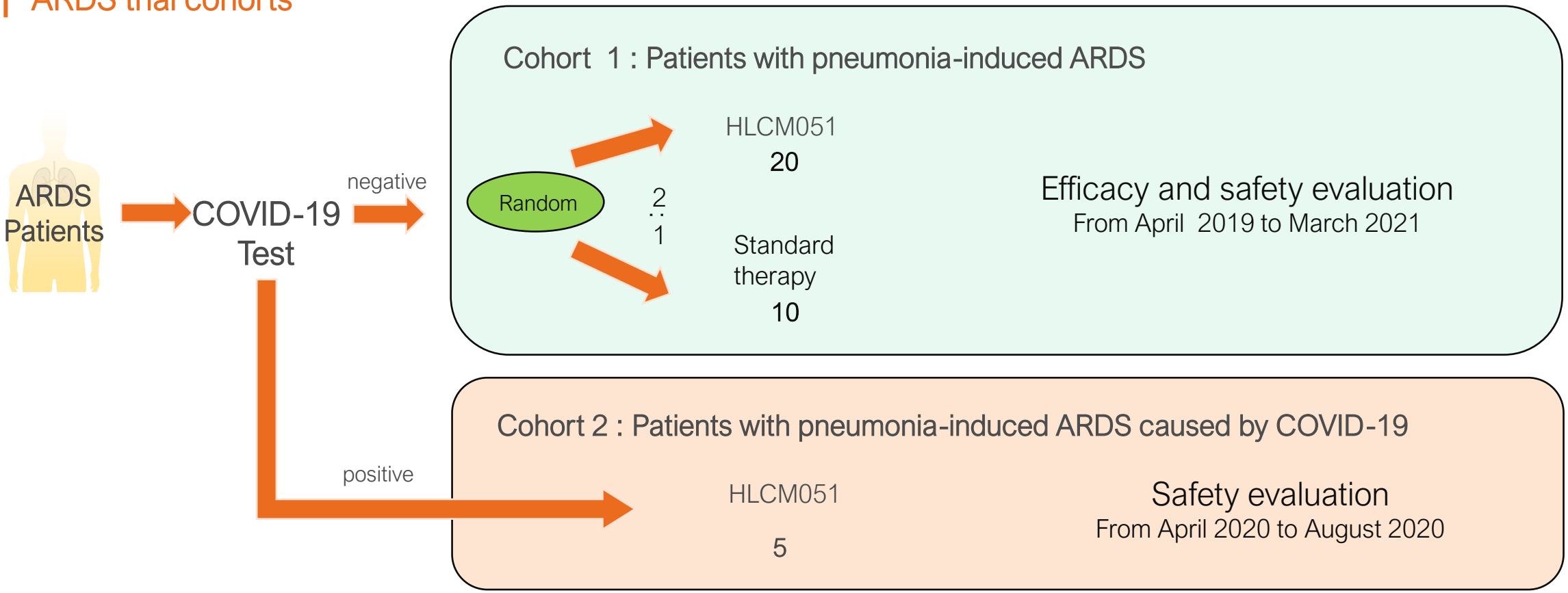
The only symptomatic treatment for respiratory failure includes artificial respiration.

(source)
＊1 The number of ARDS patients in Japan is estimated by Healios based on the incidence rate of epidemiological data and the total demographical population in Japan.
＊2 ARDS treatment guideline 2016

HLCM051 ARDS: ONE-BRIDGE Study

Phase II study investigating the efficacy and safety of HLCM051 in pneumonia induced ARDS patients

ARDS trial cohorts



Patient enrollment of COVID-19 pneumonia-derived cases (Cohort 2) was performed separately from the conventional clinical trial administration group (Cohort 1).

Phase II study investigating the efficacy and safety of HLCM051 in pneumonia induced ARDS patients

Overview of the ARDS trial

	Cohort1	Cohort 2
Enrolment	From April 2019 to March 2021	From April 2020 to August 2020
Subjects	Patients with pneumonia induced ARDS	Patients with pneumonia-induced ARDS caused by COVID-19
Enrollment	30 (HLCM051: 20, Standard therapy: 10)	Approximately 5 (HLCM051: 5)
Objective	Efficacy and safety evaluation	Safety evaluation
Primary Endpoint	The number of days out of 28 in which a ventilator was not used for the patient (i.e. ventilator free days)	Safety
Secondary Endpoint (Excerpt)	Mortality （28, 60, 90, 180 days after administration）	1) VFD 2) Mortality
Follow-up period	180 days after administration	180 days after administration

HLCM051 ARDS: Number of ARDS Patients

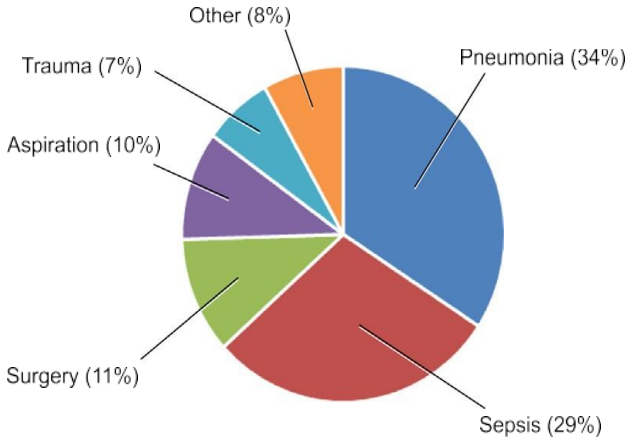
Number of ARDS patients in Japan estimated approximately 7,000～12,000 per year

Approximately 1/3 of ARDS cases caused by pneumonia

Epidemiological data

Epidemiological data	Incidence rate	The estimated number of ARDS patients in Japan＊1
Epidemiology, Patterns of Care, and Mortality for Patients With Acute Respiratory Distress Syndrome in Intensive Care Units in 50 Countries. Source：JAMA.2016; 315(8): 788-800	・0.42 cases per ICU bed ・10.4% of ICU admissions ・23.4% of patients requiring mechanical ventilation	11,937
Epidemiology of Acute Lung Injury (ALI) / Acute Respiratory Distress Syndrome (ARDS) in Chiba Prefecture Source：Journal of Japanese Association for Acute Medicine 2007; 18(6): 219-228	6.1 per 100,000 persons	7,320

Underlying diseases of ARDS



(Source) Respiratory Investigation; 55(4): 257-263

Approximately one-third of ARDS cases are caused by pneumonia. Seasonal infections may progress from pneumonia to ARDS. Some data indicate that approximately 71%[*2] of avian-origin influenza A (H7N9) infections result in ARDS.

＊1（Source）The number of ARDS patients in Japan is estimated by Healios based on the incidence rate of epidemiological data and the total demographical population in Japan.
＊2（Source）Gao HN. et al., *N Engl J Med.* 2013 Jun 13;368(24):2277-85.

Results of Double-blind Study Conducted by Athersys <ARDS>

Based on one-year follow-up summary results, an evaluation of quality-of-life suggests further potential benefits from MultiStem treatment including faster rehabilitation.

No serious adverse events were observed.

Analysis of the Double-blind study conducted by Athersys

	MultiStem	Placebo
Mortality	25%	40%
Ventilator- free (VF) days	12.9 days	9.2 days
Intensive Care Unit (ICU) free days	10.3 days	8.1 days

Post-hoc Analysis of patients in severe condition and pneumonia-induced ARDS

	MultiStem	Placebo
Mortality	20%	50%
Ventilator- free (VF) days	14.8 days	7.5 days
Intensive Care Unit (ICU) free days	12.0 days	5.0 days

In the above analysis based on data obtained 90 days after administration, the mortality rate and the number of ventilator-free days (VFD) within a 28-day post-administration period et al. tended to improve in the MultiStem group compared with the placebo group. The results of the 1-year follow-up after administration showed a similar trend.

Overview of the Analysis

Clinical trial	Exploratory clinical trial （Phase 1/2) conducted by Athersys in US and UK （MUST-ARDS study)
Subjects	ARDS patients administered MultiStem or Placebo intravenously（In Phase 2 trial, MultiStem 20, Placebo 10)
Endpoints	- Mortality - Ventilator Free days (The number of the days out of 28 in which a ventilator was not used for the patient) - ICU Free Days The number of the days out of 28 in which the patient was out of Intensive Care Unit

【Reference】

Athersys' research contents on MultiStem's mechanism of modulating the inflammatory response in critical care indications（Link to Athersys' Website June 30, 2021）

Published in Scientific Reports, an international peer-reviewed journal covering various areas in the natural and clinical sciences.

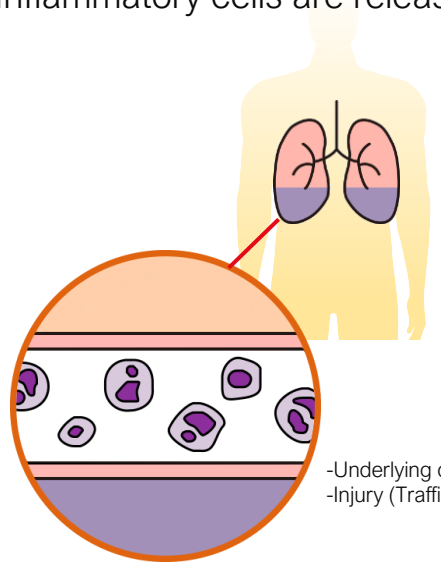
（Source）Athersys

HLCM051 Expected Mechanism of Action

Expected effects of HLCM051, bone marrow-derived somatic stem cells

- Relief of inflammation, regulation of immune function
- Promotion of angiogenesis
- Promote protection and repair of injured cells and tissues
- Improvement of lung tissue and respiratory function

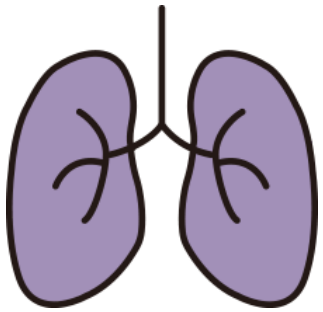
Inflammatory cells are released



-Underlying disease (pneumonia, etc.)
-Injury (Traffic accident, etc.)

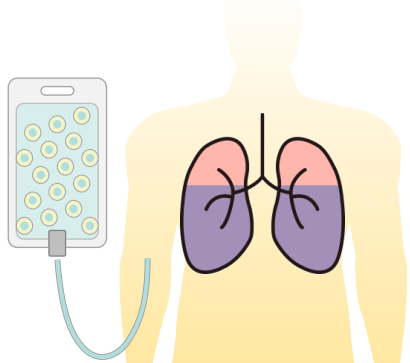
When the tissue is damaged, inflammatory cells are released in large quantities.

Inflammatory cells attack the lungs



The inflammatory cells attack the lungs. As a result, hypoxia develops and the patient falls into severe respiratory failure.

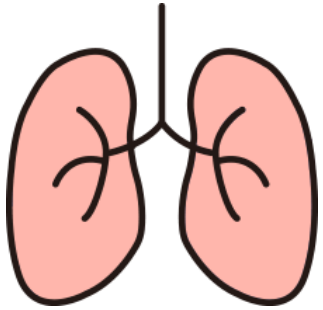
HLCM051 administered



- Suppresses excessive inflammation in the lungs.
- Protects damaged tissue and facilitates healing.

HLCM051 accumulates in the lungs as a result of intravenous administration.

Lung function improves



We can anticipate earlier ventilator removal and a lower mortality rate.

HLCM051 can be the first available therapeutic medicine for ARDS

- Currently only artificial respiration and ECMO (Extracorporeal Membrane Oxygenation) are available as coping therapies.
- ECMO has a limited number of installations at medical institutions, requires multiple medical staff with special skills, and has a high cost of management.

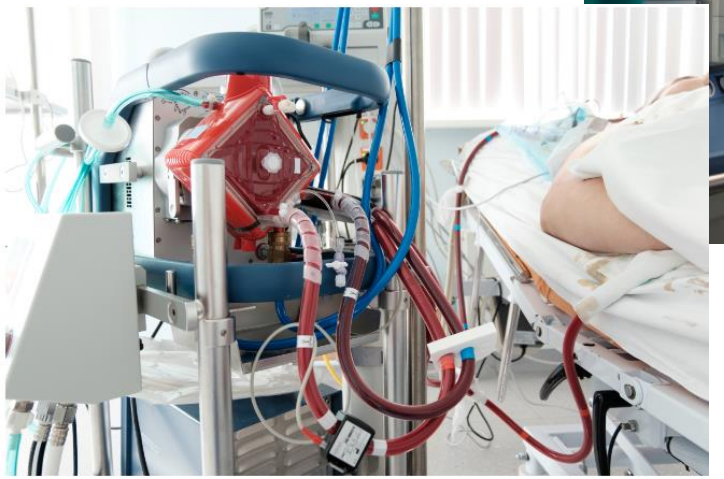
Contribution to patients ⇒ Providing new treatment
Improvement of mortality and QOL

- Improving patient lifesaving rate and QOL
- Shortening the treatment period (ICU use, length of hospital stay, etc.)

Contribution to medical ⇒ Reducing the burden on medical staff and hospitals

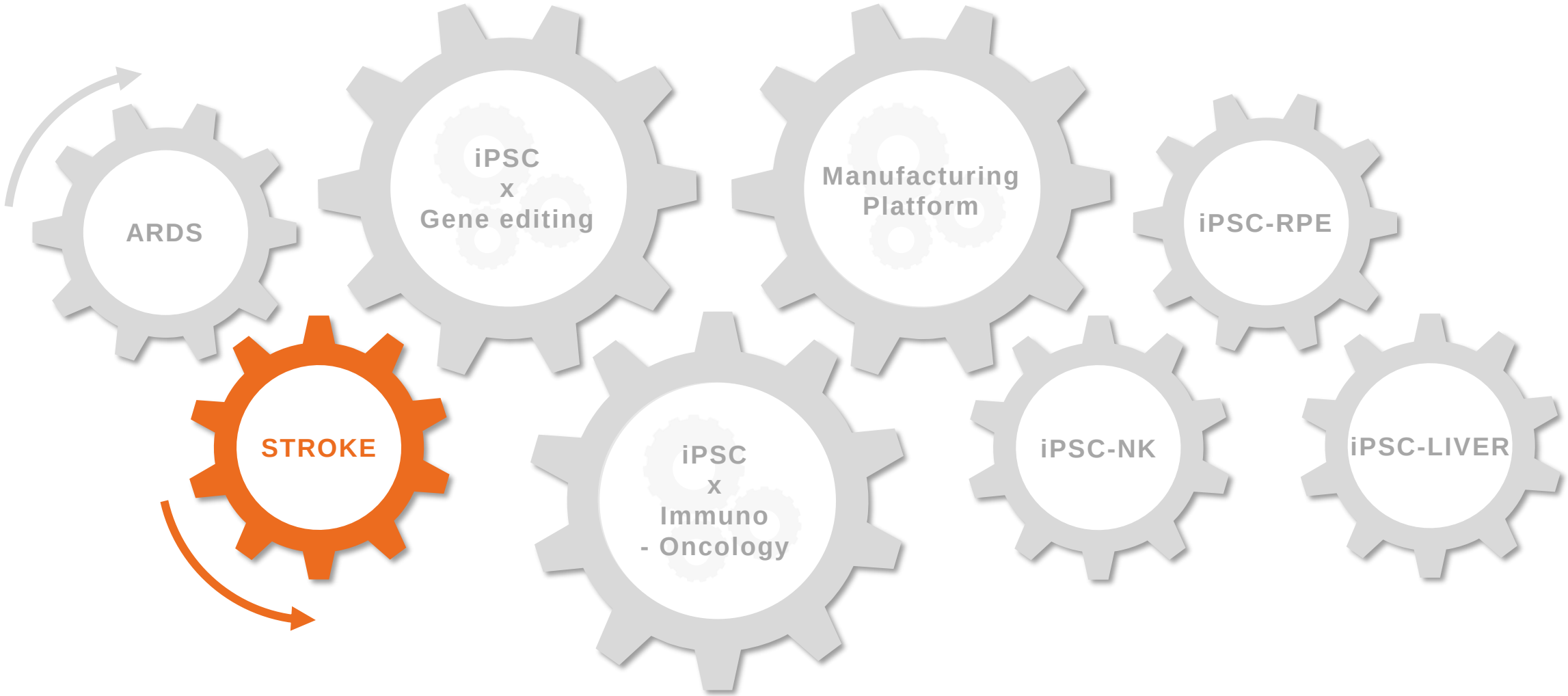
- Improving effective use of artificial respiration including ECMO
- Curbing medical resources per patient

ECMO



Artificial Respiration

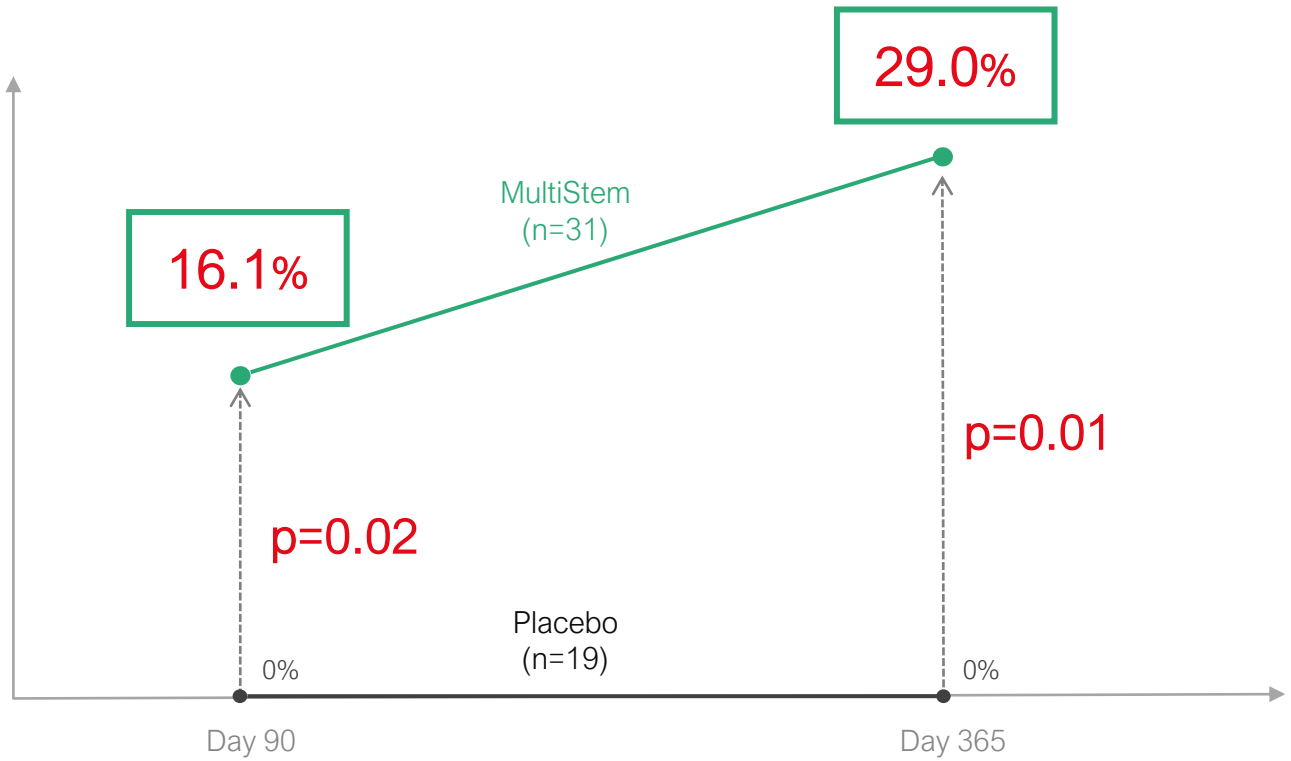
HLCM051 STROKE



Results of Double-blind Study Conducted by Athersys <Stroke>

The proportion of patients who achieved Excellent Outcome was statistically significant in the group of patients who received MultiStem within 36 hours of the onset of cerebral infarction

Analysis of the Double-blind study conducted by Athersys



(Source) This material was based on *Lancet Neurol*. 2017 May;16(5):360-368; 16 360–68 Supplementary appendix Table 5

Overview of the Analysis

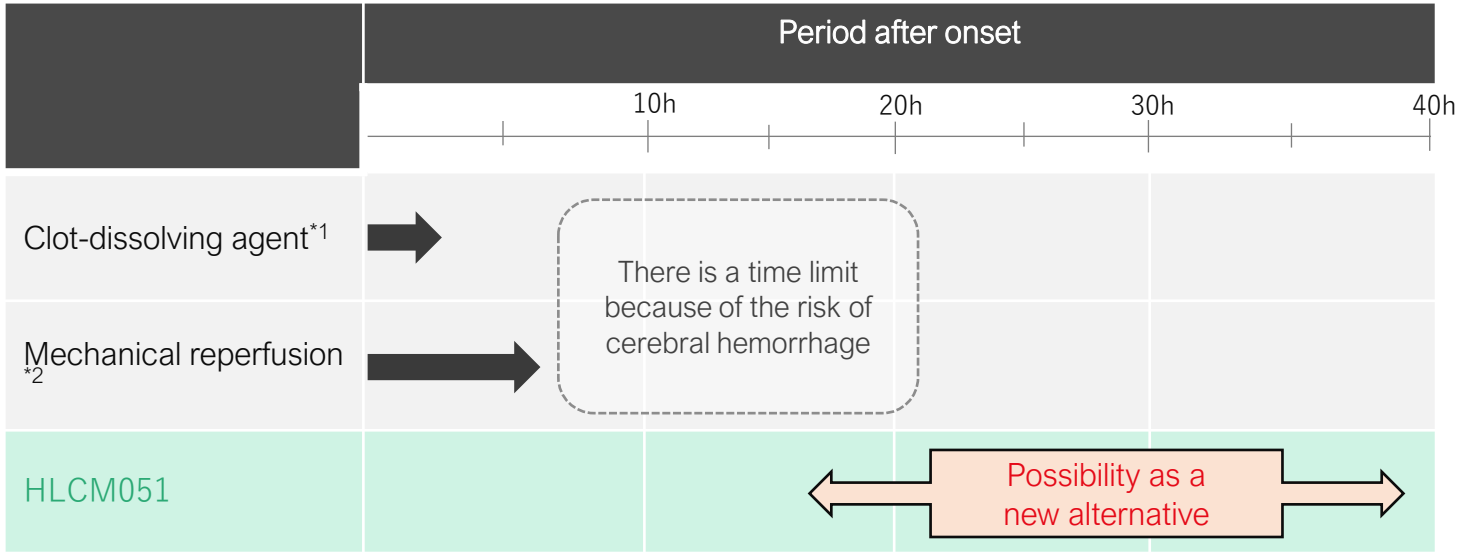
Trial	The placebo-controlled double-blind Phase 2 study conducted by Athersys in the US and the UK （MASTERS study)
Subjects	Administered MultiStem or Placebo within 36 hours of the onset of stroke
Endpoint	Proportion of subjects with an Excellent Outcome on Day 90 and Day 365

*<Excellent Outcome> is defined as mRS score of ≤1 (scale, 0 to 6), NIHSS score of ≤1 (scale, 0 to 42), and BI score of ≥95 (scale, 0 to 100).

HLCM051 Stroke: Outline of Ischemic Stroke in Japan

Expected development of a new therapy that can be applied in a longer treatment window period following the onset of ischemic stroke (ability to help more patients)

Treatment in Accordance with the Period After Onset



※1 Dissolves blood clots in the brain vessels
※2 Insertion of the catheter into a blood vessel and recovery of the thrombus directly with a wire.

(Note) This material was prepared to explicitly describe the major therapeutic options for ischemic stroke and their treatment window periods after onset. Appropriate treatments are conducted according to patients' conditions and classification of their symptoms. Experimental or investigational treatments not included in the above are also performed.

Ischemic Stroke

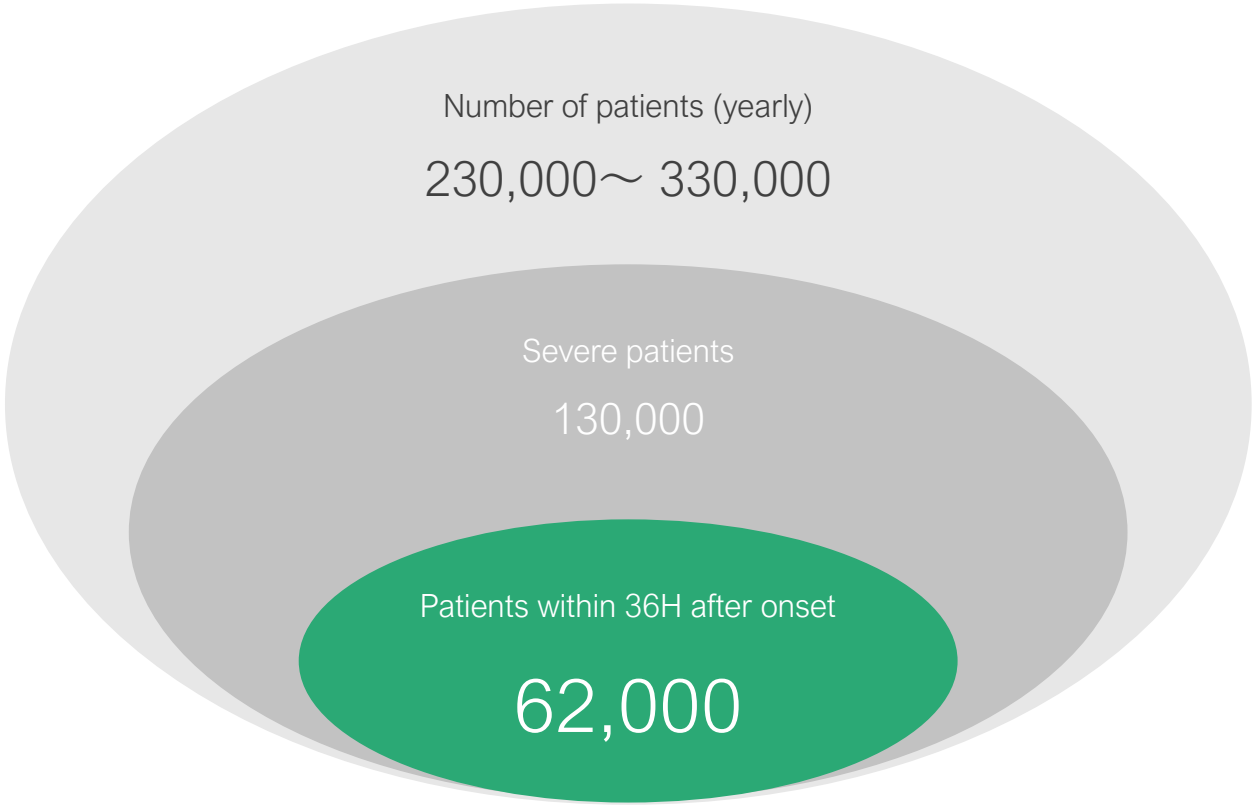
Ischemic stroke, which represents the most common form of stroke (70 - 75% of cases in Japan), is caused by a blockage of blood flow in the brain that cuts off the supply of oxygen and nutrients, resulting in tissue loss.

(Source) Athersys

It is estimated that 37.9% of bedridden patients and 21.7% of persons who were in need of care were affected by ischemic stroke.

HLCM051 Stroke: Annual number of New Patients with Ischemic Stroke in Japan

The number of patients in Japan targeted for HLCM051 is estimated to be 62,000 a year



Number of patients with ischemic stroke in Japan (yearly)

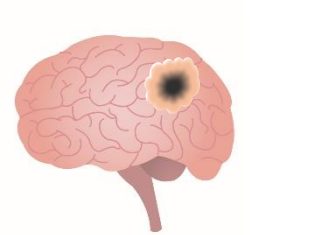
Severe patients （atherothrombotic and cardiogenic cerebral infarction)

Patients within 36 hour after onset

(Source) Healios estimated the annual number of new patients with ischemic stroke in Japan according to materials issued by the Fire and Disaster Management Agency, the Ministry of Internal Affairs and Communication, and the Ministry of Health, Labour and Welfare – DATAMONITOR epidemiological estimates also shown as upper end of range.
(Source) Healios estimated the percentage of patients who reach the hospital within 36 hours after onset at 47% according to the results of its market research.

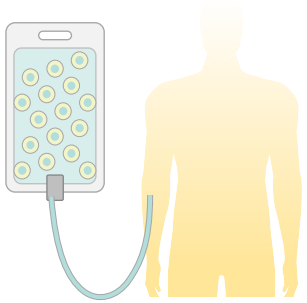
HLCM051 Stroke: Mechanism of HLCM051 Treatment

Stroke-induced neuronal damage

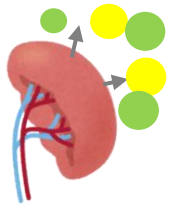


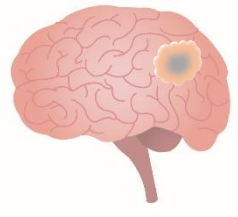
Primary Damage

With HLCM051



HLCM051
-suppress the mobilization/ release of inflammatory cells (lymphocytes, cytokines)
-activate the mobilization/ release of anti-inflammatory cells



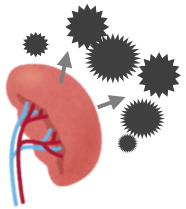


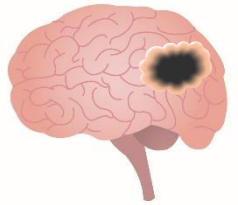
Attenuate neuronal damage in the acute phase of stroke caused by inflammatory cells

Secondary Damage mitigation

Without HLCM051

Activate mobilization / release of inflammatory cells (lymphocytes, cytokines) in the spleen



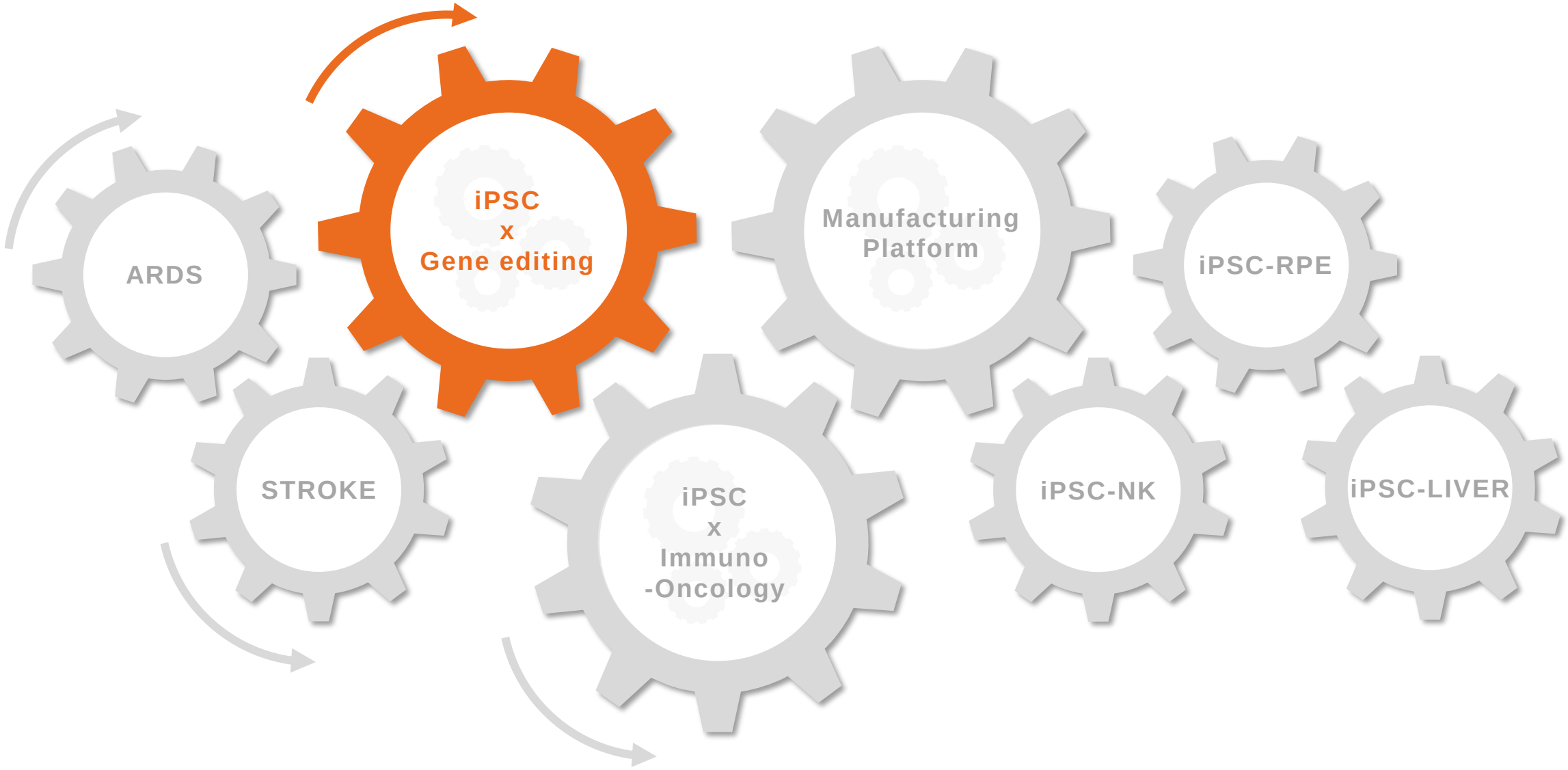


Neuronal damage exacerbated by inflammatory chemokines/cytokines
Inflammatory cells are released from the spleen and exacerbate the neuronal damage of the ischemic site.

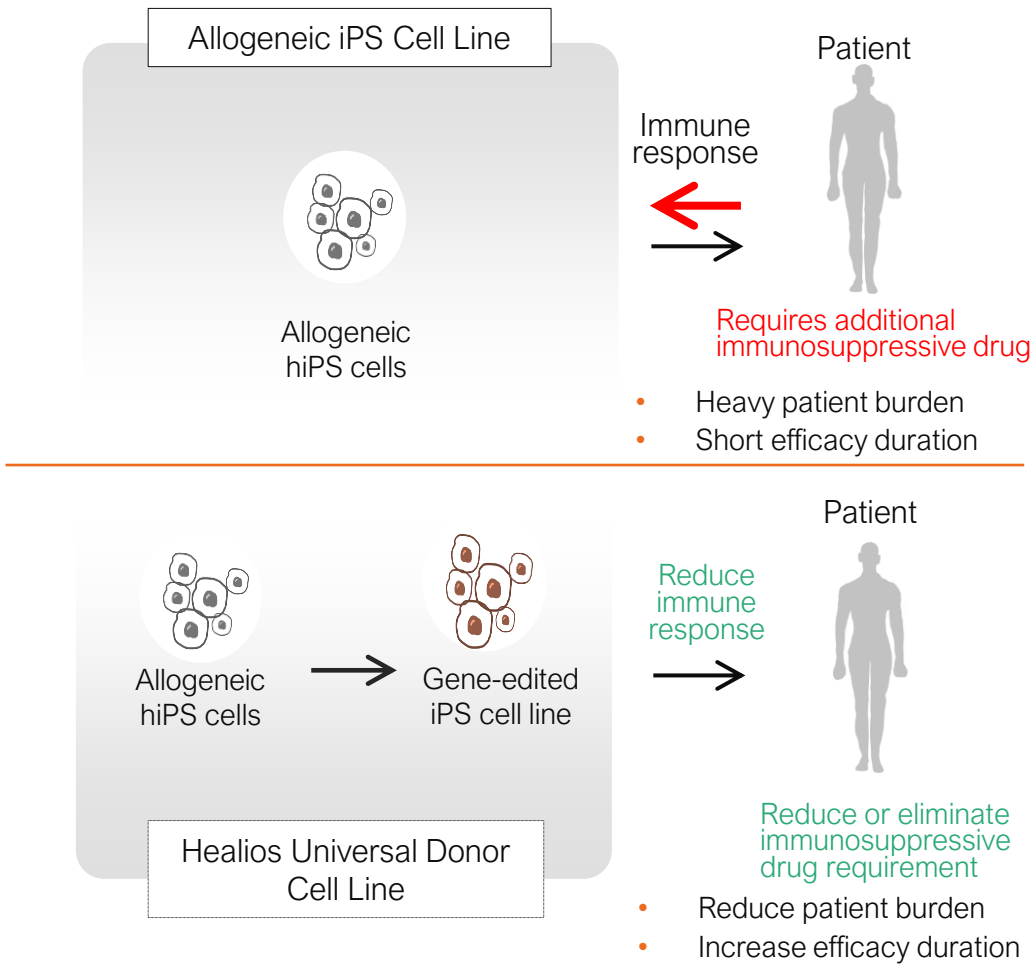
Secondary Damage

（Source） This figure was based on Stroke. 2018 May;49(5):1058-1065.Fig.2

iPSC Platform



World-leading engineered “universal” iPSC platform: “Universal Donor Cells” / “UDC”



Targeted cell programming through gene-editing

- In October 2020, Healios established a clinical grade universal donor IPS cell line that can be clinically applied to humans in each of Japan, the United States and Europe.
- Healios has led the development of high-quality, universal donor iPS cells in accordance with global standards.
- Consultations with the FDA and PMDA led to no concerns in relation to clinical use of UDC derived therapeutics.
- The UDC line differentiates readily into various in-house made cells (e.g. NK cells, liver progenitor cells, vascular endothelial cells, etc.).
- Active discussions with several companies and academic institutions in relation to use with various therapeutic candidates.

iPSC Platform

	Autologous iPS cells	Allogeneic iPS/ES cells	UDC
Immune rejection	None	Occurs (Immunosuppressive drugs are required)	None
Manufacturing term	Several months to 1 year (Need to make from each patient)	Off-the-shelf (Single line)	Off-the-shelf (Single line of gene-edited cells)
Cost	Very high	Low	Low

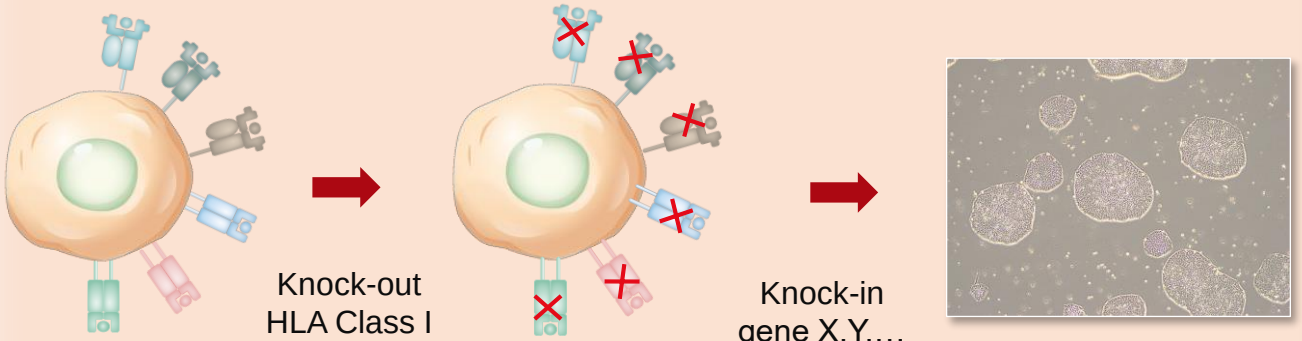
iPSC Platform: Production of Engineered, Universal iPS Cells

Engineered, universal iPS cells unlock full potential of iPSC therapies

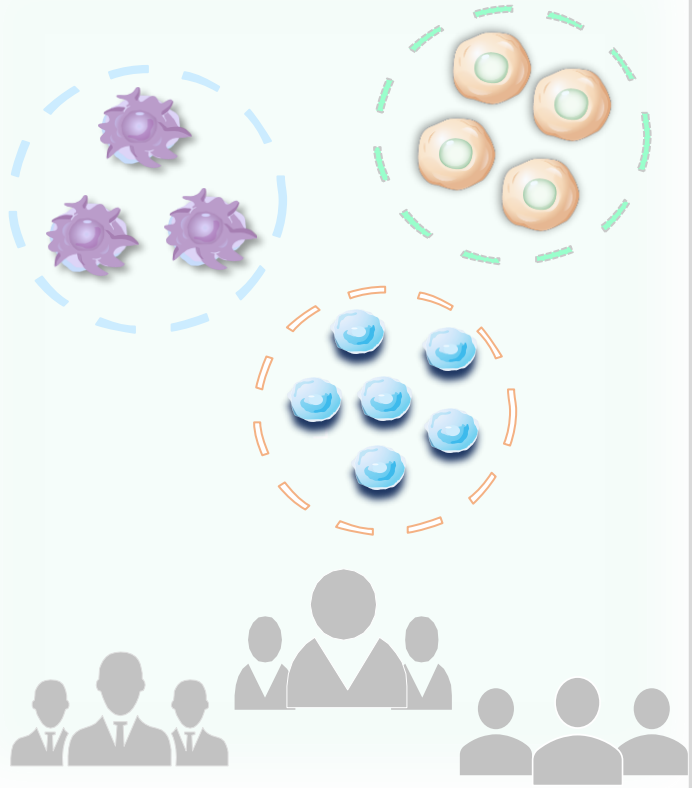
Clinical grade MCB

HLA Class I/II KO (intermediate)

HEALIOS Universal Donor Cells



Universal iPSC regenerative medicines



- Off-the-shelf, scalable and cost-efficient
- Address broad population with single product
- Enhanced level and duration of efficacy

（Source）in-house data

iPSC Platform: Removal of HLA Proteins and Addition of Immunosuppression-related Molecules

Results of gene editing in clinical grade UDC

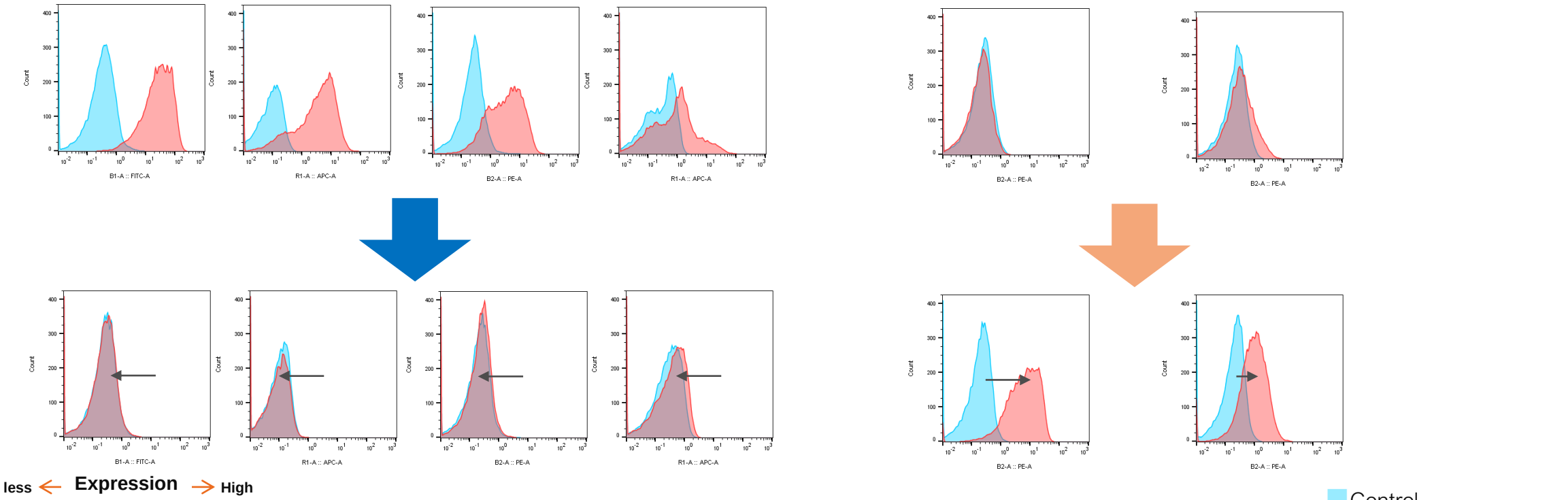
HLA protein knock-out

Immunosuppression-related molecules knock-in

HLA-A | HLA-B | HLA-C | HLA-DR,DP,DQ | Gene X | Gene Y

Parent-iPSC

Clinical grade UDC

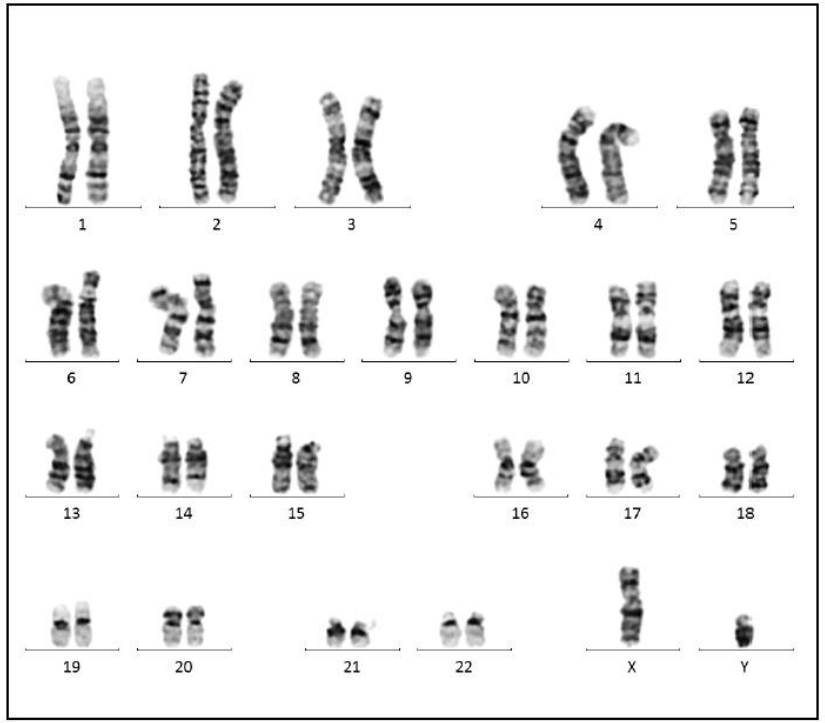


Post-gene editing disappearance of HLA proteins and enhanced expression of immunosuppression-related genes

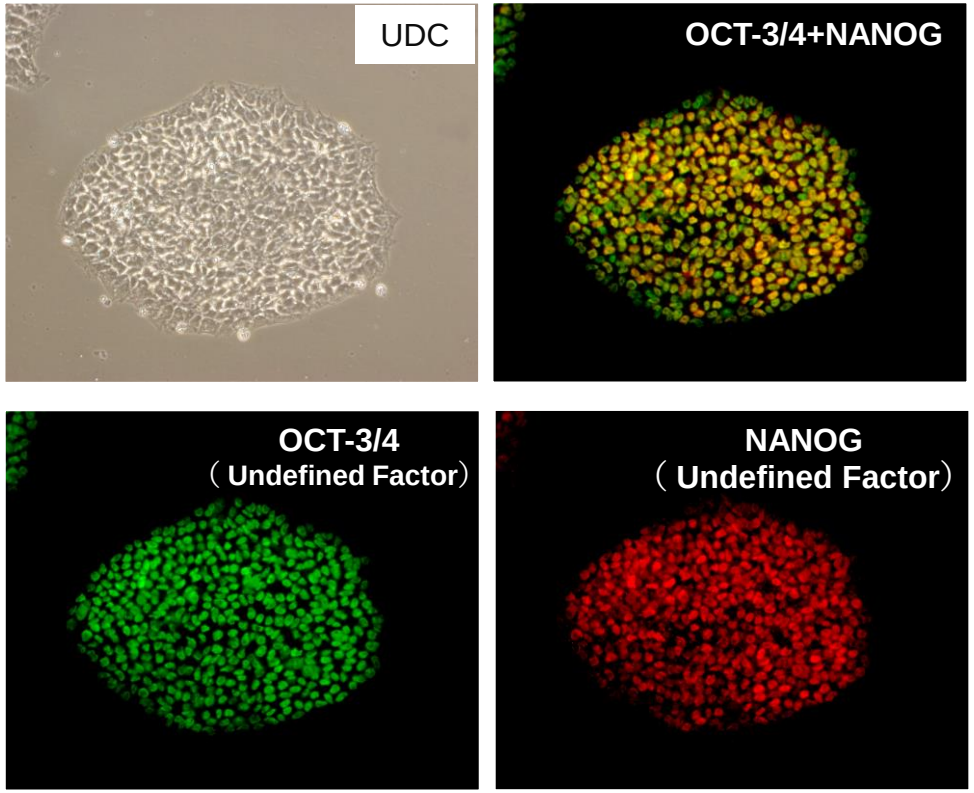
（Source）in-house data

Characteristics of Clinical grade UDC

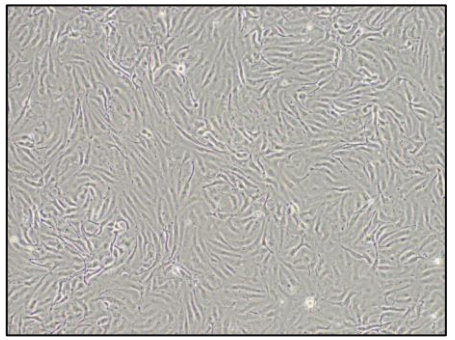
46 (X,Y)



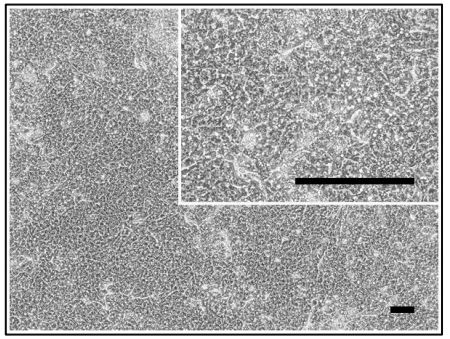
Expression of Pluripotency Markers



Differentiation



Endothelial cell



Hepatocyte

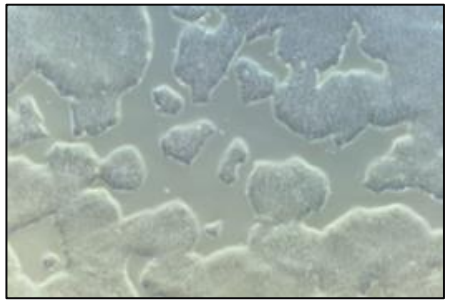
No post gene-editing karyotypic aberrations

iPSC pluripotency maintained

（Source）in-house data

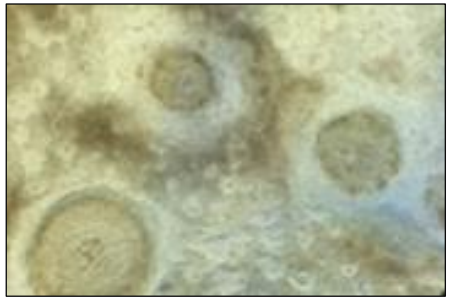
iPSC Platform : Differentiation and induction of photoreceptor cells from UDCs

Photoreceptor cells



UDC

Differentiation and induction

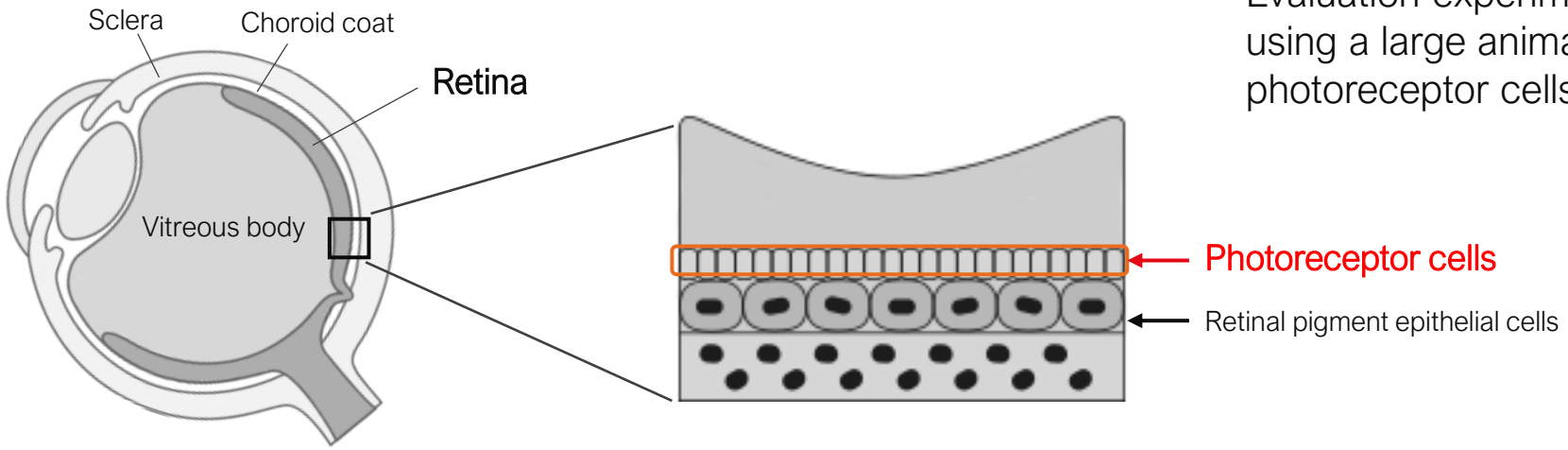


Photoreceptor cells From UDC

Photoreceptor cells are one of the cells that compose the retina and are particularly responsive to light.

Through our joint research, we have succeeded in the culturing of photoreceptor cells from iPS cells. We have also successfully differentiated and induced photoreceptors from UDCs.

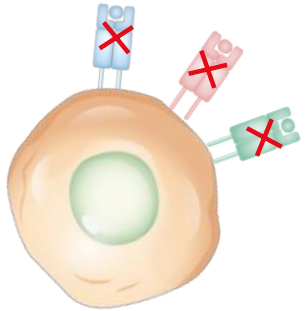
Evaluation experiments are currently underway using a large animal disease model in which photoreceptor cells are damaged.



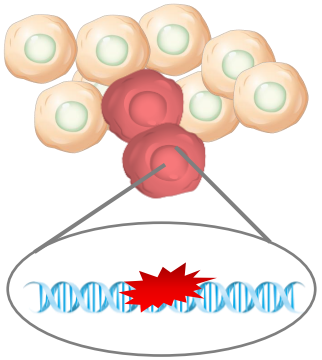
(Source) Joint research data

iPSC Platform: UDC Production Process Checklist

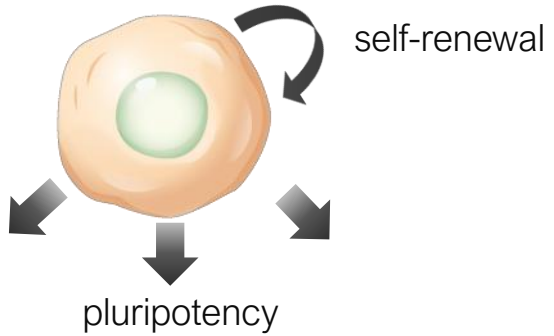
①Confirmation of gene editing



②Absence of malignant mutations



③ Retention of iPS cell properties

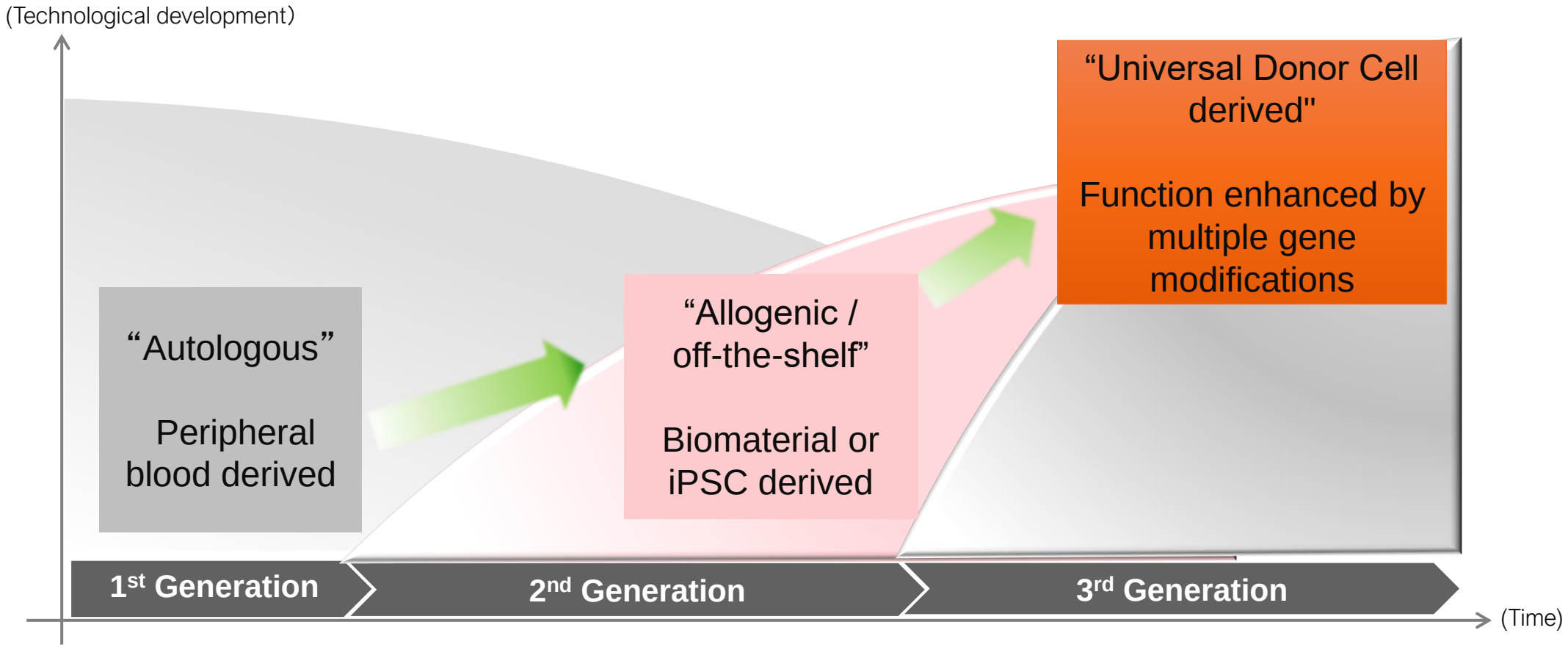


Quality check item	Contents
Confirmation of gene editing	Identification of target region sequence
Expression level of HLA proteins	Loss of HLA Class I expression
	Loss of HLA Class II expression
Transgene expression	Expression of immune suppression associated molecules
	Expression of suicide genes
Gene mutation	No off target issues
	Normal karyotype
	No cancer associated genes
Attribution	Sterility
	Endotoxin free
	Mycoplasma free
	Gene expression analyses (Comparison with the parent cell line)
	Expression of undifferentiated markers
	Pluripotency (triploblastic differentiation)
	Absence of immunogenicity
	Function of suicide genes

iPSC Platform: Unlocking the Full Potential of iPS Cells

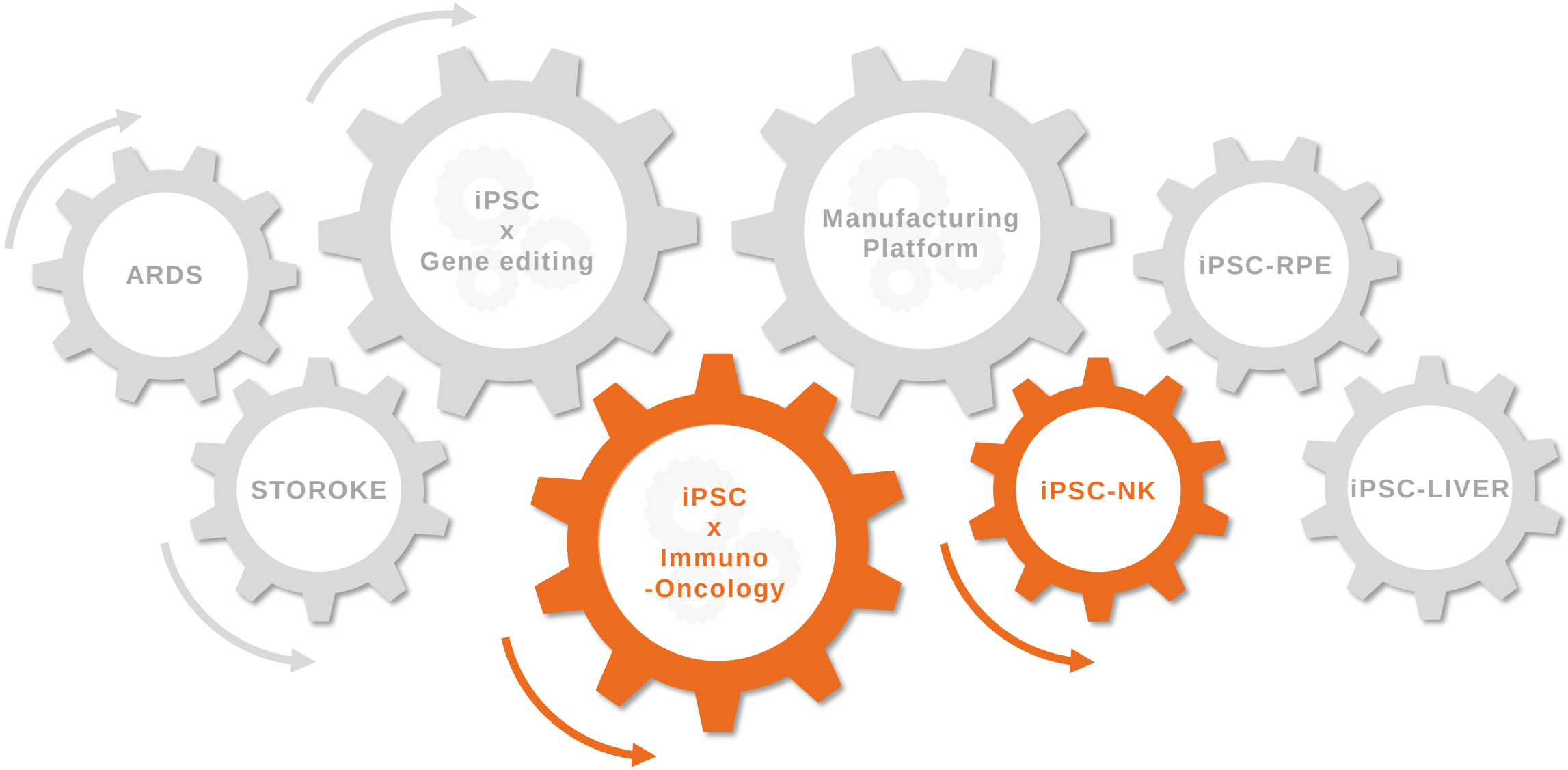
By using UDCs, graft rejection may be avoided, and sustained efficacy may be expected.

Target an off-the-shelf product: stable production and quality with lower cost of goods.



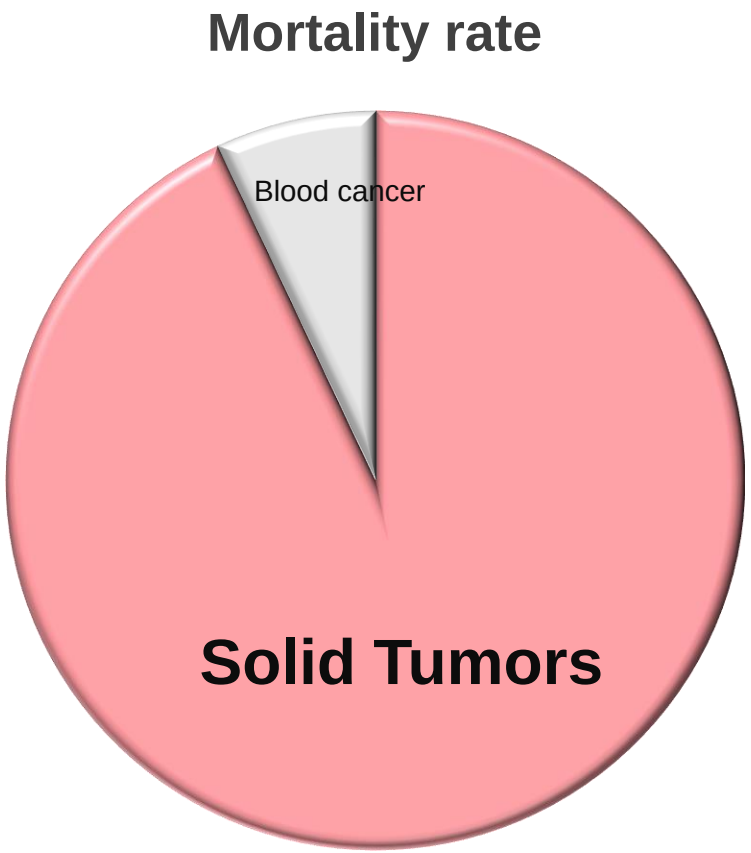
＊See Appendix for additional explanation.

HLCN061



HLCN061 Cancer is the Leading Cause of Death in Japan

The No.1 cause of death in Japan is cancer (approximately 90% of which are caused by solid tumors)



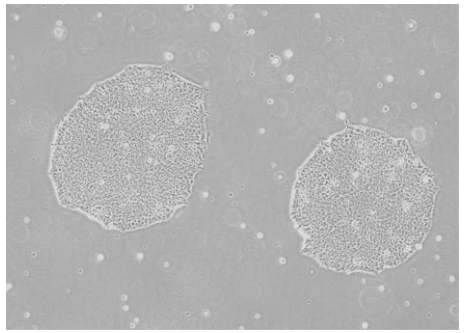
（Source） data from National Cancer Center, Center for Cancer Control and Information Service, 2018

HLCN061: Leading the Development of iPSC Derived Gene-Modified NK Cells

Natural killer (NK) cells, a type of white blood cell, play a central role in a cell mediated defense system that human bodies naturally have, and attack cancer cells and virus-infected cells.

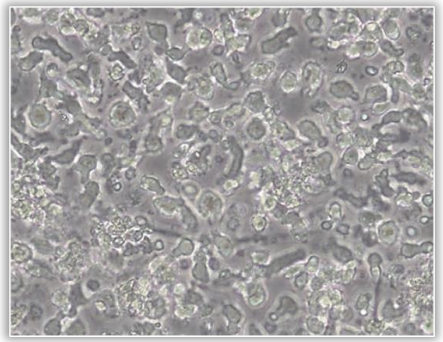
- Best in class, enhanced anti-tumor efficacy by introducing/modulating various factors related to NK cells killing activity
- Broad applicability across tumor types irrespective of specific cancer antigens

Production of NK cells

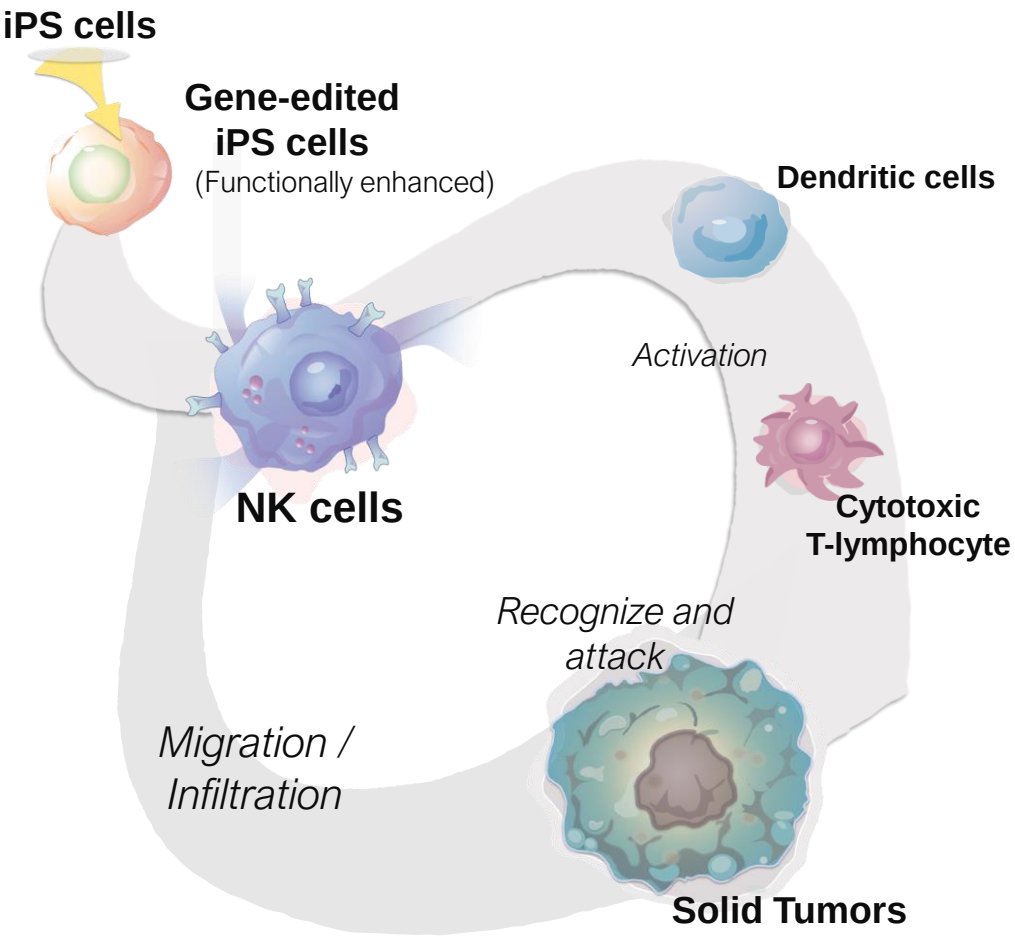


Gene-edited iPS cells

Induction of differentiation



NK cells

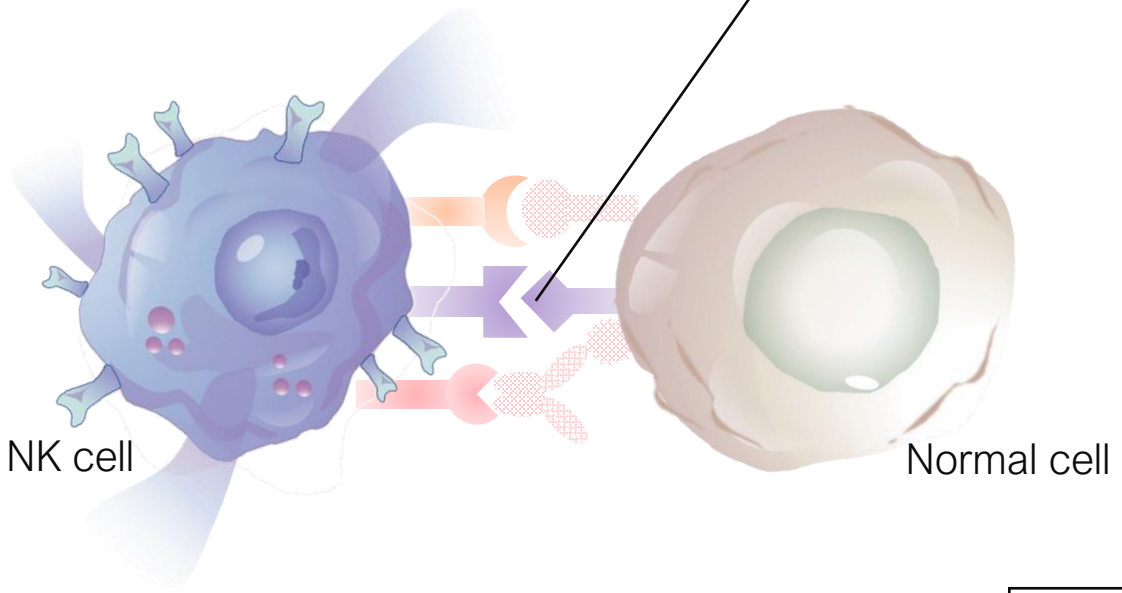


（Source）in-house data

HLCN061: Mechanism of NK Cell Attack of Cancerous or Virus-Infected Cells

Normal cells

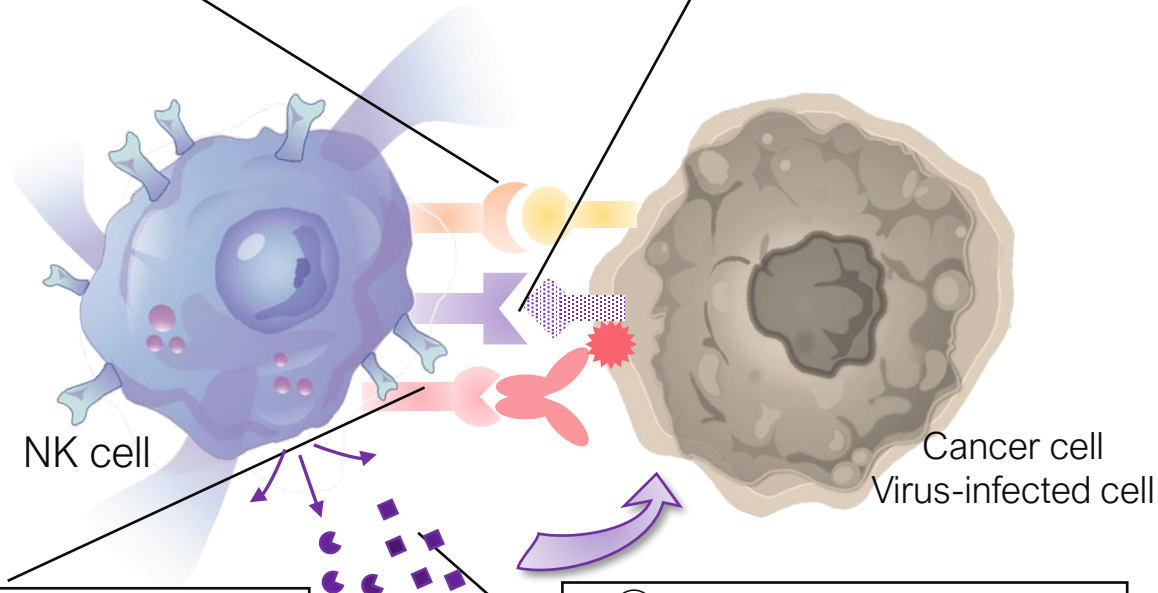
NK cells do not attack normal cells by recognizing normal marker



Cancerous or virus-infected cells

① Activated by abnormal markers

② Release the brake allowing for the attack

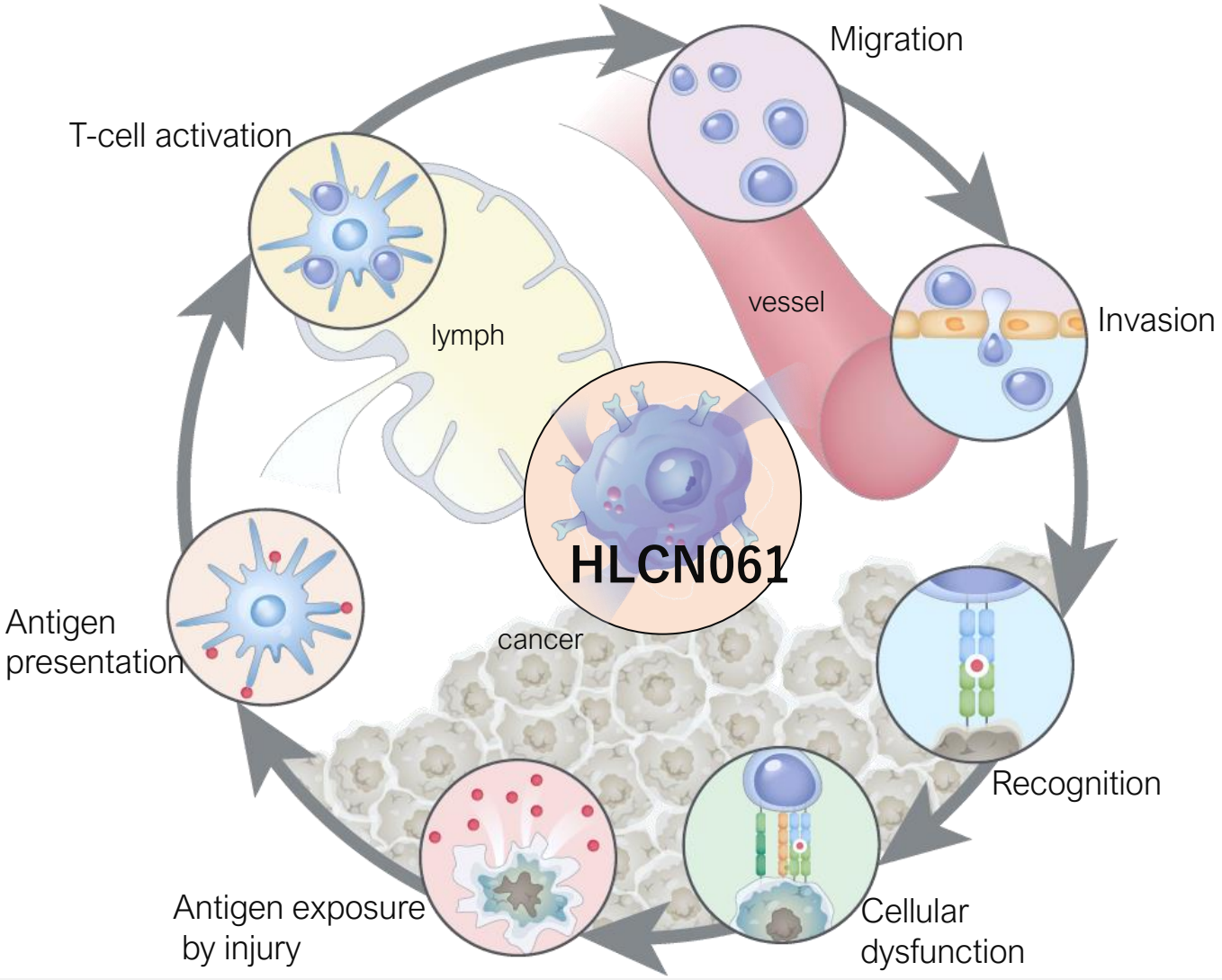


③ Recognize the antibodies that are attacking the cancer and further activate.

④ Release the degrading enzymes and destroy cancer cells

HLCN061: Enhancement of Anti-cancer Functions through Gene Modification

Enhancing Anticancer Function at Each Stage of the Cancer-Immunity Cycle



Cancer-Immunity Cycle

NK cells recognize and kill cancer cells

↓

Exposed to cancer antigen

↓

Activation of the cancer immunity cycle and induction of cytotoxic T-lymphocytes

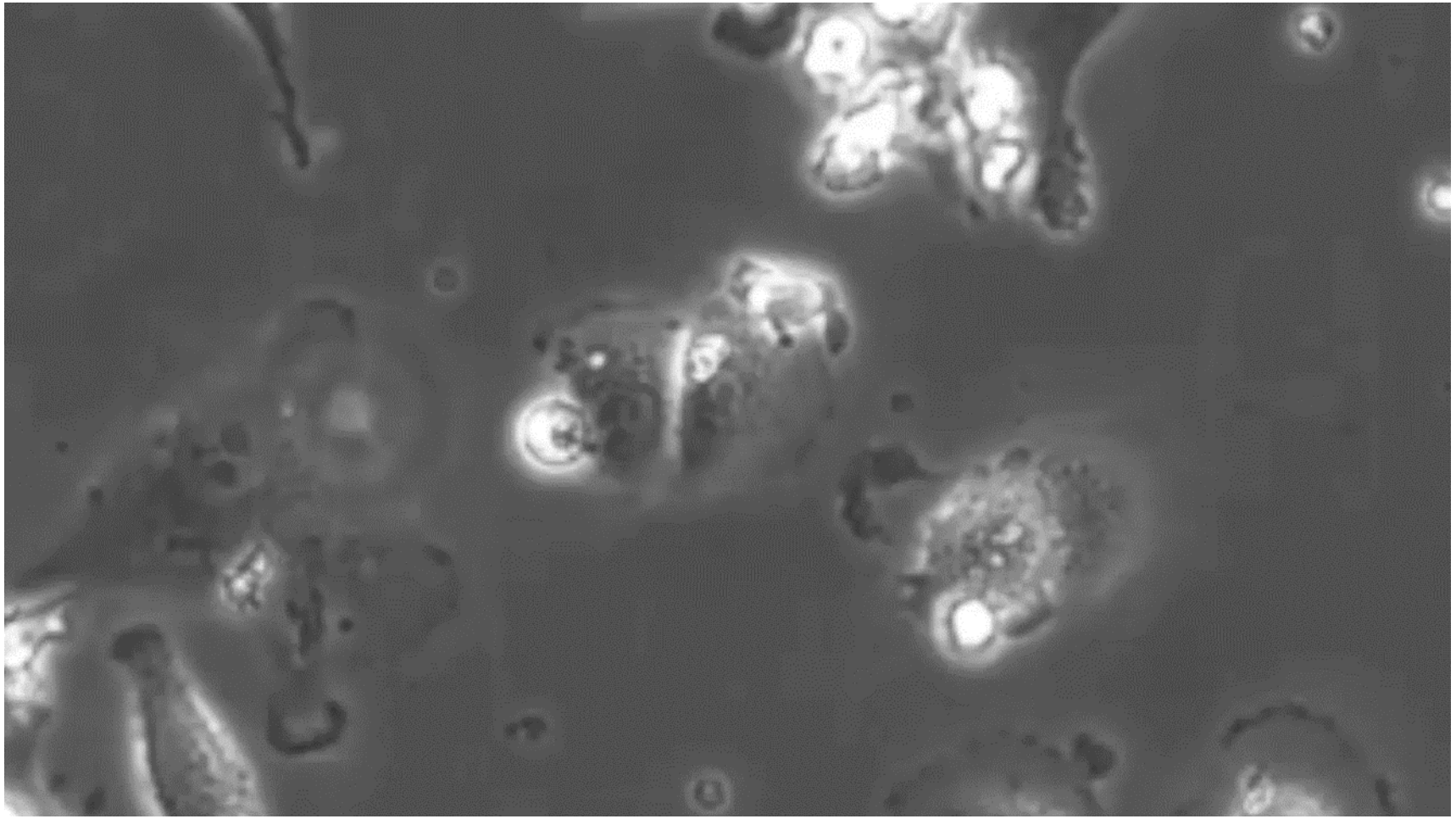
↓

Degeneration of cancer

（Source） This material was based on Daniel S.Chen and Ira Mellman.,Immunity. 2013;39(1):1-10.

HLCN061: iPSC derived NK Cells Effectively Kill Cancer Cells

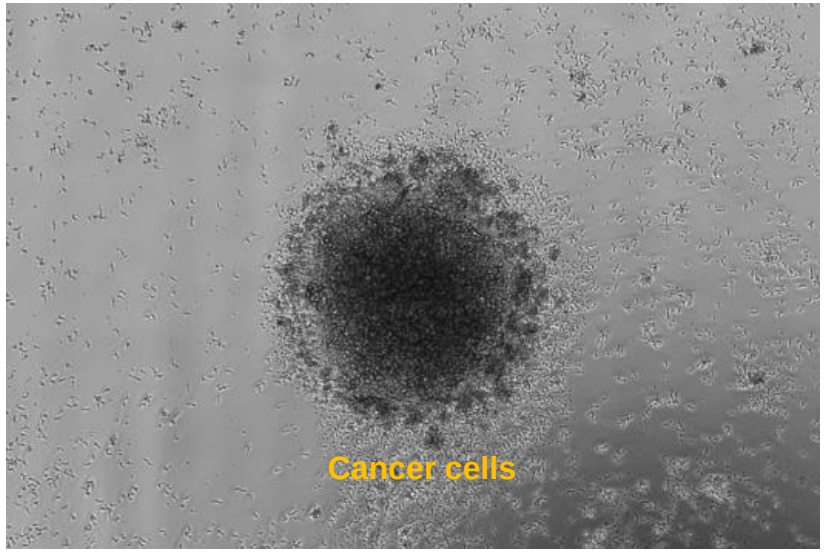
Healios produced iPSC derived natural killer (NK) cells kill lung cancer.



（Source）in-house data

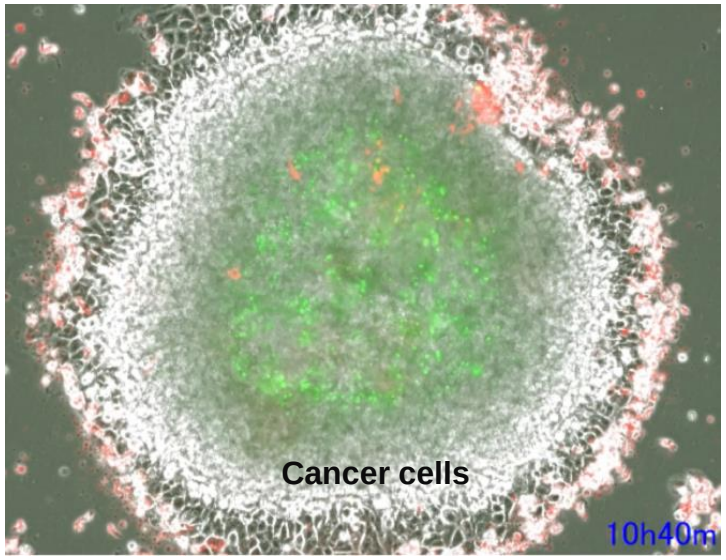
HLCN061: Healios' iPSC derived NK Cells - Migration, Invasion and Degeneration

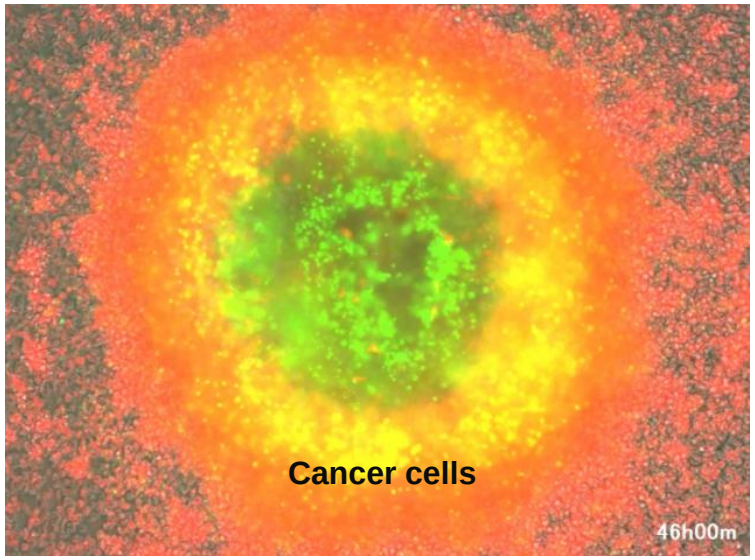
Functional evaluation



Confirmed that iPSC derived NK cells migrate toward cancer cells.

Injury activity to cancer cells





Confirmed that iPSC derived NK cells invade and attack inside the cancer cells spheroid and eliminate it.

Red fluorescence : Healios' iPSC derived Cells

Green fluorescence : Detect cell death

（Source）in-house data

HLCN061: Market Leading Range of Functional Enhancements

	HEALIOS	Company-A		Company-B		Company-C
	iPS Cell	iPS Cell①	iPS Cell②	Cell①	Cell②	Cord blood
Recognizes cancer cells	✓		✓		✓	✓
Enhanced function in combination with antibodies	✓	✓	✓	✓	✓	
Migrates to cancer cells	✓					
Attracts host immune cells	✓					
Activates surrounding T-cells and dendritic cells	✓		✓			✓
Self-activation and maintenance of survival	✓		✓			✓
Avoids immune rejection in patients	✓					

（Source） Adapted by Healios from public information

Development of a facility for cell processing and manufacturing

Started preparations for in-house manufacturing of clinical trial products for iPSC regenerative medicine

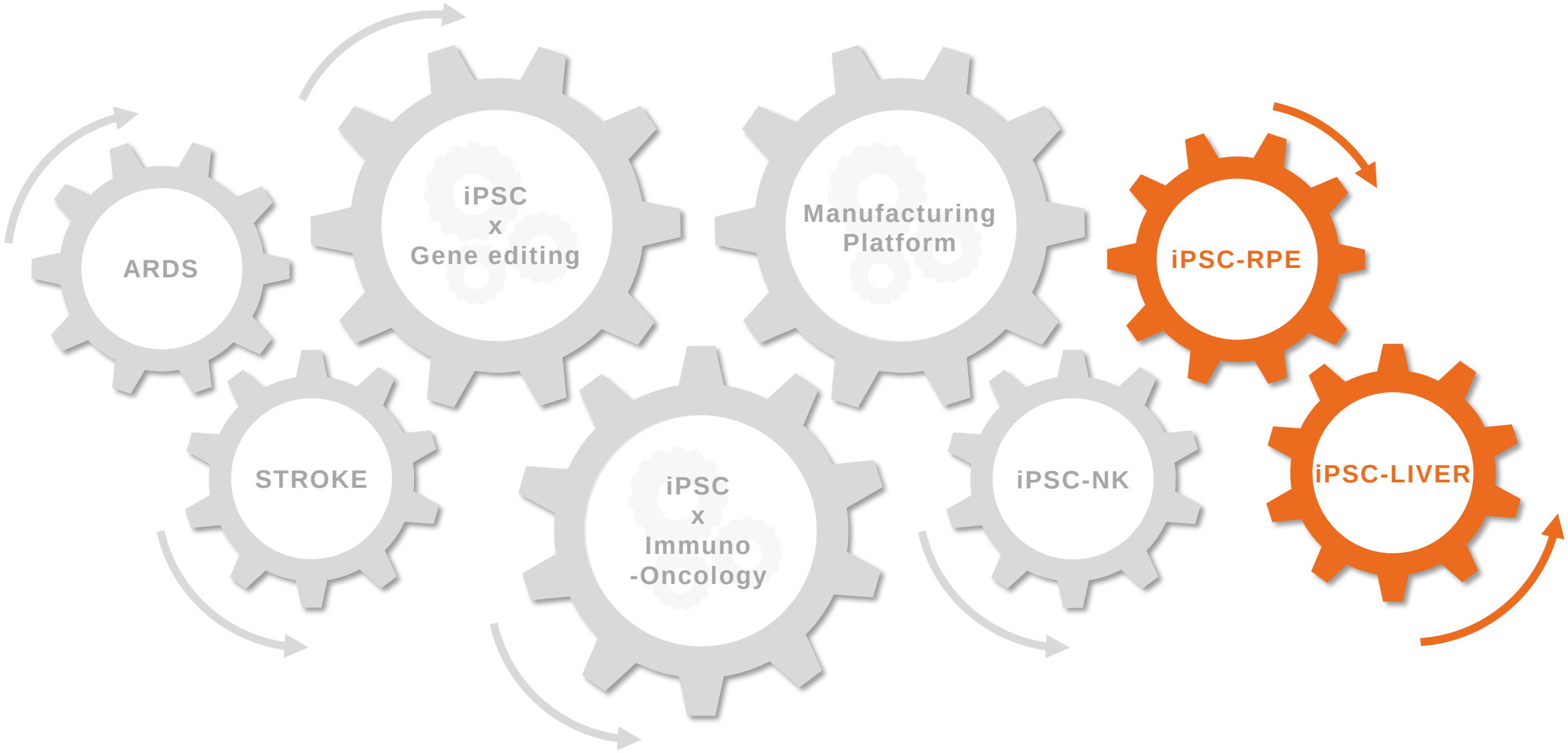
May 2021 Healios decided to develop a facility for cell processing and manufacturing (CPC) at the facility established by Foundation for Biomedical Research and Innovation in Kobe

Preparations for GCTP / GMP-compliant manufacturing of clinical trial products of iPSC regenerative medicine including HLCN061 for solid tumors

Healios will be able to control the schedule and quality of clinical trial product manufacturing.

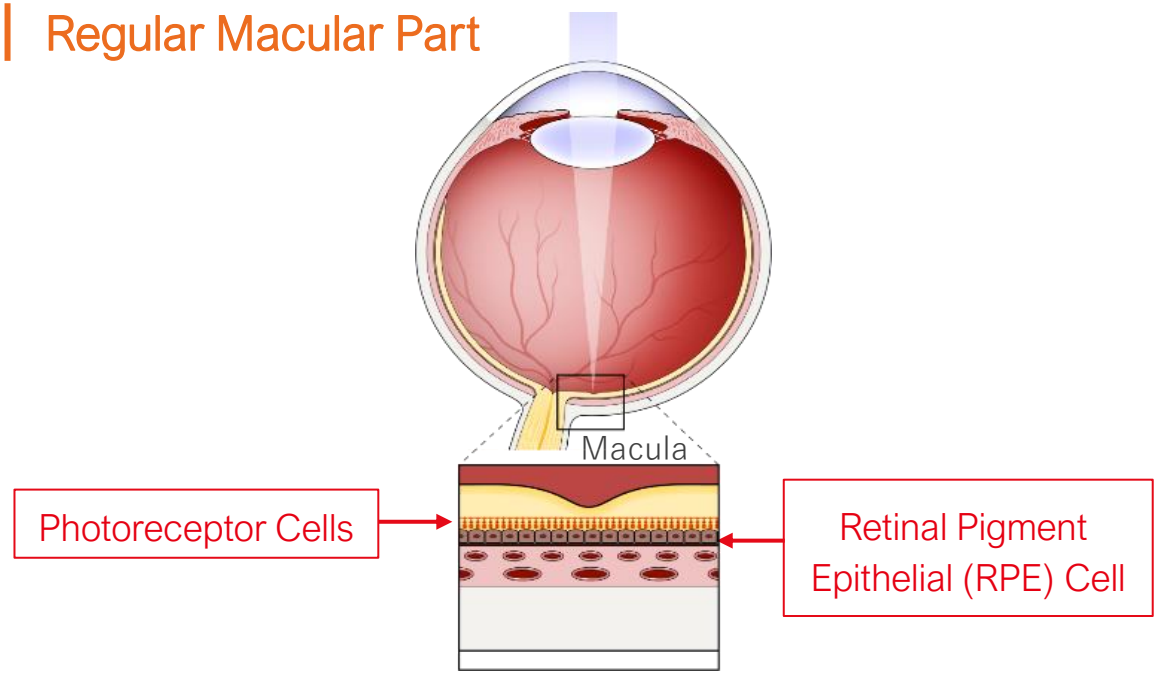
KCMI（Kobe Center for Medical Innovation）where the CPC will be established

HLCR011 AMD／HLCL041 Liver Organ Bud Platform



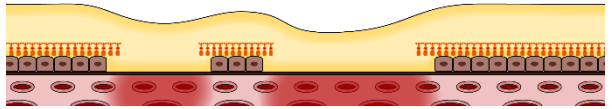
Age-related Macular Degeneration(AMD) causes Retinal Pigment Epithelial (RPE) cells to degenerate, which damages function

Regular Macular Part



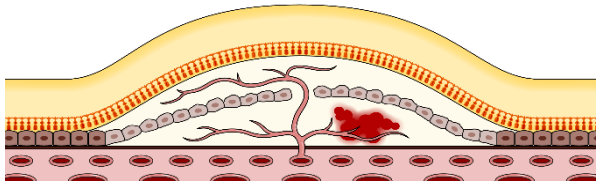
Developed Dry-AMD

Immunity barrier maintained
→ Degeneration of photoreceptor→ Dry AMD



Wet AMD

Destruction of immunity barrier → Invasion of immune cells
→ Inflammation → Wet AMD



Joint Development

In Japan, HEALIOS and Sumitomo Dainippon Pharma jointly develop a treatment using iPS cell-derived RPE cells.

- Sumitomo Dainippon Pharma takes the lead in preparing for clinical trials

HLCL041: Liver Organ Bud Platform

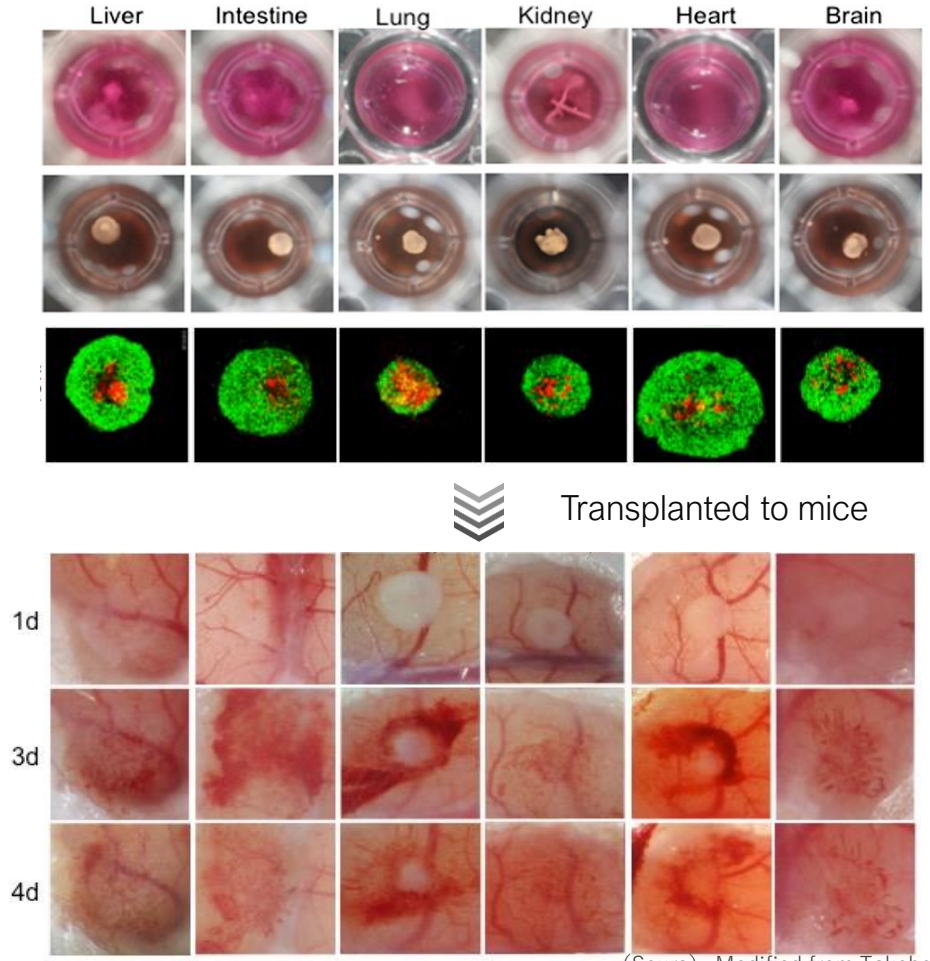
By creating an "Organ Bud" of each organ with iPS cells, we have laid the groundwork for paradigm shifting therapies to emerge for various severe diseases.

UDCs allow for the realization of organ replacement using organ buds.

*movie

The vascularization was confirmed in vivo by transplantation to mice.

（Sours） Japan Science and Technology Agency　Science News “Diverse Approaches in Regenerative Medicine from Cell to Tissue/Organ” (Distributed October 3, 2013)
https://sciencechannel.jst.go.jp/M130001/detail/M130001005.html



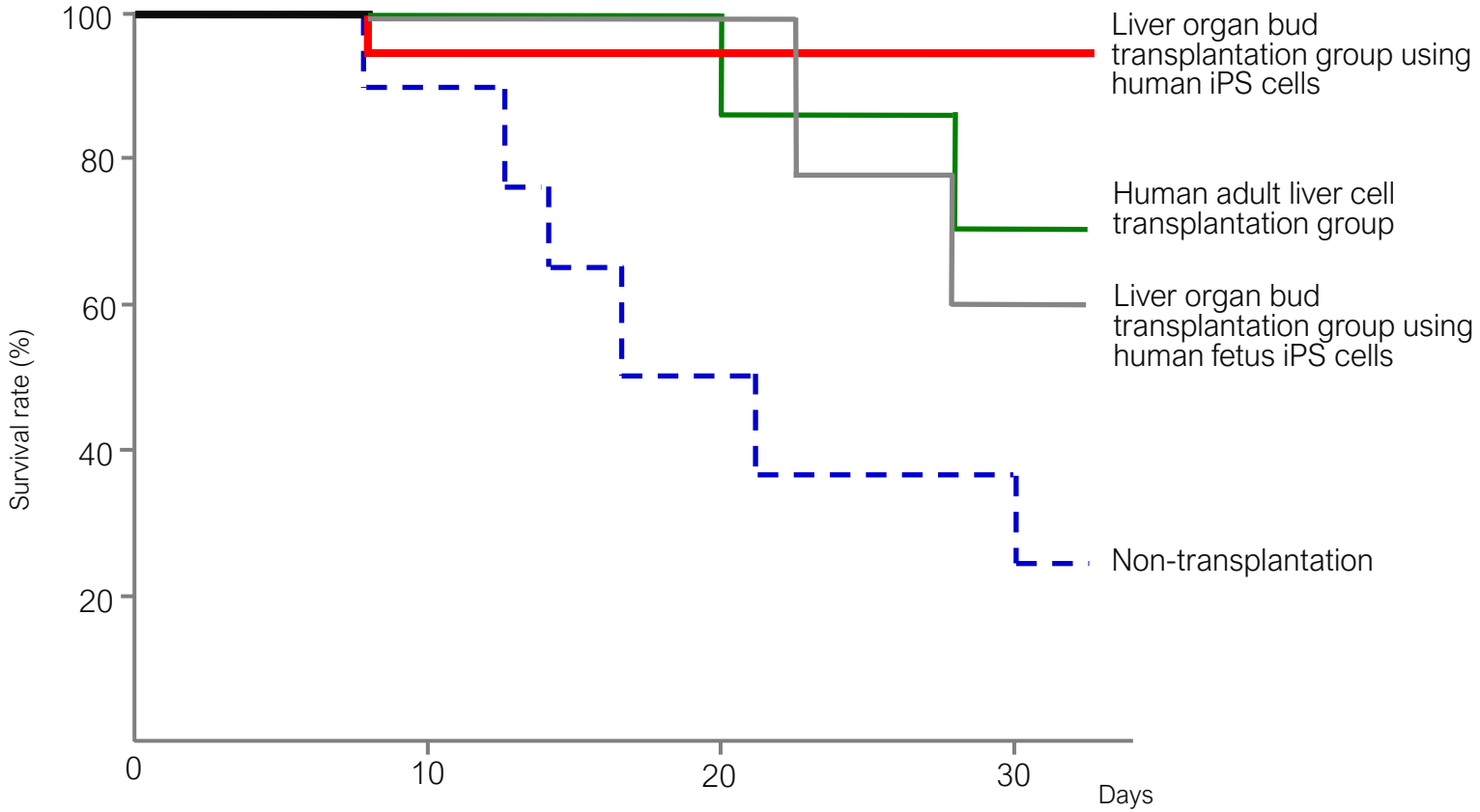
Green：Cells of each organ
Red：Vascular endothelial cell
Black：MSC

（Sours） Modified from Takebe T. et al., Cell Stem Cell, 2015

HLCL041: Liver Organ Bud Platform: Survival Rate of Liver Failure in Mouse Model

Survival rate improves significantly in transplantation experiments

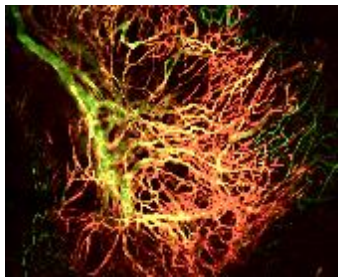
Treatment effects of liver bud transplantation to mouse using hiPSC

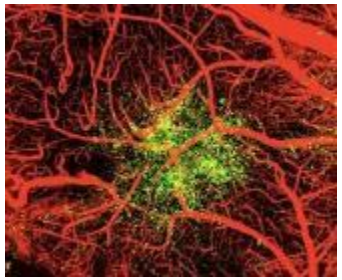


（Source） Adapted by Healios from Takebe. T, et al. Nature, 499 (7459), （2013）

Process

Process by which organ forms from organ bud links mouse‘s vascular network autonomously





（Source） Takebe,T., et al.
Nature Protocols, 9, 396–409 (2014)

Financial Highlights

Consolidated Statements of Income

Update

Healios

(Units: one million US dollars)

	FY2020 Q3 (YTD)	FY2021 Q3 (YTD)		
			YoY variance	Main reasons for increase/decrease
Revenue	0.19	0.28	0.09	
Operating profit	-27.21	-35.66	-8.45	Mainly due to increase in SG&A expenses −$3.83mn and increase in R&D expenses −$4.56mn.
Profit	-37.33	-34.03	3.30	Mainly due to decrease in financial expenses +$5.28mn and increase in financial income +$6.58mn (Please refer to the next page for details)
R&D expenses	19.01	23.56	4.56	
Number of employees	110	115	5	

(Note) * For details of the financial figures, please refer to the summary of the financial results announced today.
* Adopt average exchange rate (JPY/USD) over respective 9-month periods for P&L; FY2020 Q3 107.54 yen per dollar and FY2021 Q3 108.58 yen per dollar.

Supplemental Explanation of Financial Income and Financial Expenses

Details of financial income and financial expenses

In the third quarter, we recorded financial income of ¥715 million and financial expenses of ¥516 million. Financial income was mainly due to the recording of ¥715 million in gain on valuation of derivatives*1. Financial expenses was mainly due to the recording of ¥402 million in interest on bonds*2, the recording of ¥82 million in loss on valuation of warrants and ¥30 million in interest expenses.

*1. Gain or loss on valuation of derivatives

Gain or loss on valuation of derivatives are the net unrealized gains/losses on the convertible bond-type bonds with subscription rights to shares, which our company issued to overseas investors in July 2019, at fair value as of the end of the third quarter. These are non-cash items booked in accordance with the International Financial Reporting Standards (IFRS), which was introduced by in the first quarter of the fiscal year ending December 2020.

*2. Interest on bonds

Of the total interest on bonds of ¥402 million, ¥372 million was charged to income using the amortized cost method. As in *1 above, this is a non-cash expense recorded in accordance with the International Financial Reporting Standards (IFRS), which was introduced in the first quarter of the fiscal year ending December 2020.

Under JGAAP, convertible bond issuances were accounted for as liabilities and issue fees were accounted for as expenses. Under IFRS, however, proceeds, after deducting issue fees from convertible bond issuances, are accounted for as liabilities and equity, based on a certain standard. As a result, the difference between the face value of convertible bonds and the amount recorded as liabilities is amortized (expensed) over the period.

Consolidated Statement of Financial Position

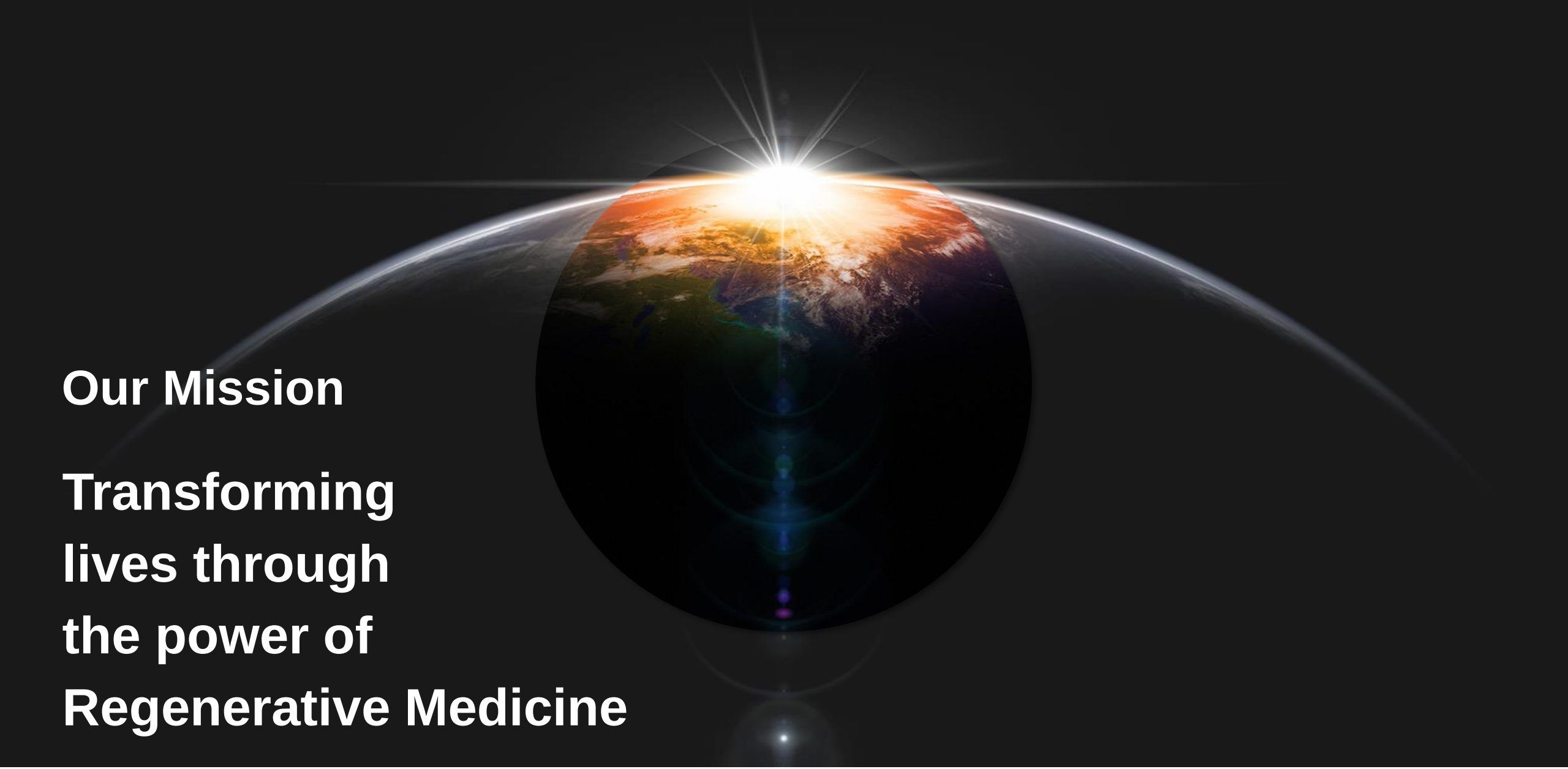
Update

Healios

(Units: one million US dollar)

		December 31, 2020	September 30, 2021		
				Variance	Main reasons for increase/decrease
	Current assets	144.99 (64.8%)	160.31 (68.8%)	15.32	Mainly due to increase in cash equivalents $15.50mn. (cash equivalent balance at 9/30/21 was $150.03mn). New share issuance during the period raised $62.19mn of new cash.
	Non-current assets	78.89 (35.2%)	72.55 (31.2%)	-6.34	
Total assets		223.88 (100.0%)	232.85 (100.0%)	8.98	
	Current liabilities	25.95 (11.6%)	61.00 (26.2%)	35.05	Increase in bonds and loans (primarily convertible bonds) payable +$41.29mn and decrease in other financial liabilities -$7.70mn, mainly due to the maturity of already existing convertible bonds now falling within a one-year time frame.
	Non-current liabilities	122.07 (54.5%)	77.55 (33.3%)	-44.52	Decrease in bonds and loans payable (primarily convertible bonds) -$46.01mn, mainly due to the maturity of already existing convertible bonds now falling within a one-year time frame.
Total liabilities		148.02 (66.1%)	138.55 (59.5%)	-9.47	
Total equity		75.86 (33.9%)	94.30 (40.5%)	18.44	Mainly due to net loss -$34.03mn, issuance of new shares ＋$60.33mn, and decrease in other components of equity -$4.37mn as a result of a decline in the price of Athersys shares.
Total liabilities and equity		223.88 (100.0%)	232.85 (100.0%)	8.98	

(Note) * For details of the financial figures, please refer to the summary of the financial results announced today.
* Adopt spot rate (JPY/USD) at end of fiscal period for B/S ; FY2020 Q4 103.50 yen per dollar and FY2021 Q3 111.92 yen per dollar.



Our Mission

Transforming lives through the power of Regenerative Medicine

Healios

Appendix

Overview of Healios

Update

About us

Company Overview

Company Name	HEALIOS K.K.
Representative	Hardy TS Kagimoto, MD, Chairman and CEO
Establishment	February 24, 2011
Paid in Capital	6,173 million yen(As of September 30, 2021)
Head office	Yurakucho Denki Bldg. North Tower 19F, 1-7-1 Yurakucho, Chiyoda-ku ,Tokyo 100-0006, Japan
Number of Employees	115 (As of September 30, 2021)
Business	Research, development and manufacturing of cell therapy/ regenerative medicine products
Research Institution	Kobe (88：(Ph.D. Holders :Over 30 people) As of September 30, 2021) Yokohama
Affiliated Company	Sighregen Co., Ltd. (Joint Venture with Sumitomo Dainippon Pharma Co., Ltd.)
Subsidiary	・Healios NA Inc. (Established in February 2018) ・Organoid Neogenesis Laboratory Inc. (Established in June 2018 to promote the practical use of organ bud technology) ・Saisei Ventures LLC (Established in January 2021 as a venture fund investment advisor) ・Saisei Capital Ltd. (Established in January 2021 as a venture fund general partner) ・Saisei Bioventures, L.P. (Established in January 2021 as a venture fund limited partnership)

Company History

	Company	In the field of iPSC Regenerative Medicine	In the field of Somatic Stem Cell Regenerative Medicine
2011	Establishment of the company		
2012	Tokyo office opened		
2013		A patent licensing agreement concluded with RIKEN Joint Development Agreement with Sumitomo Dainippon Pharma Co., Ltd.	
2014		Joint research with Yokohama City University on Organ buds	
2015	Listed on Tokyo Stock Exchange (MOTHERS)		
2016		Start universal donor cell research	HLCM051 license agreement with Athersys, Inc. Clinical trial for ischemic stroke initiated
2017	A business and capital alliance with Nikon BBG250 Business transfer		
2018	Establishment of Healios NA, Inc. in the US Establishment of Organoid Neogenesis Laboratory Inc	CRADA with National Eye Institute Sighregen establishes a manufacturing facility in SMaRT	Strategic investment and collaboration expansion with Athersys ARDS development & clinical trial initiated
2019	Expansion of alliance with Nikon	Changes in joint development framework with Sumitomo Dainippon Pharma	
2020	Establishment of Sales and Marketing Department Establishment of a new Healios research facility	In-house development of gene-modified natural killer cells（HLCN061） Establishment of UDC research line and clinical grade line Joint research with the National Cancer Center Japan	COVID-19 induced ARDS clinical trial cohort enrollment completed
2021	Established venture fund related subsidiaries, including Saisei Ventures LLC in the United States		Announcement of results (Flash report) of ARDS clinical trial Patient enrollment of the clinical trial for ischemic stroke completed

HEALIOS K.K. Leadership

Management Team

Since July 2019

Jun Narimatsu	Richard Kincaid	David Smith	Michael Alfant	Gregory Bonfiglio	Yoshinari Matsuda	Seigo Kashii
Accountant Supporting various venture companies in the field of IT/ Healthcare	**Executive Officer CFO** Experienced at Nezu Asia Capital Management (hedge fund)	Served at Lonza Extensive experience in cell manufacturing	Group Chairman & CEO, Fusion Systems, Co., Ltd. Presidents Emeriti, ACCJ	Founder & Managing Partner of Proteus, LLC. (Investment in RM ventures)	Attorney-at-Law, Senior Management Partner of Uruma Law Offices Legal Professional Corporation	Ex-corporate auditor of Astellas Pharma

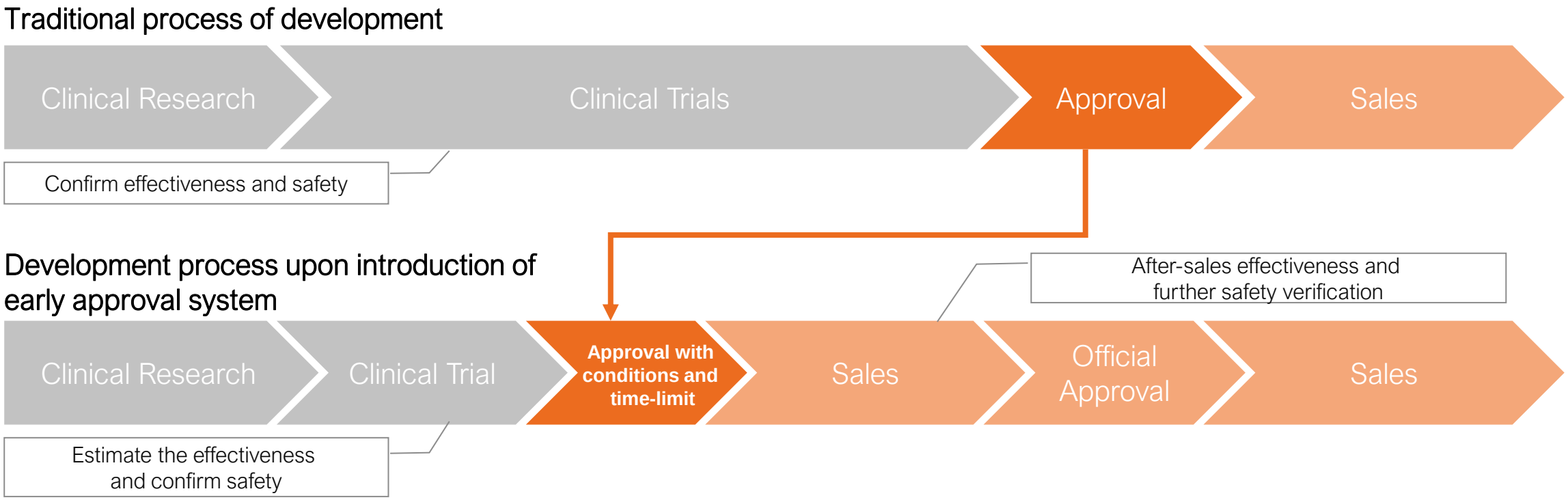
Masanori Sawada	Hardy TS Kagimoto	Kouichi Tamura	Michihisa Nishiyama	Koji Abe
Executive Vice President, CMO (Chief Medical Officer) MD, PhD, MBA	**Chairman and CEO** MD, Founder	**Executive officer Research and Manufacturing field** Ex-Astellas US Director of Laboratories Expertise in Immunosuppressant Research	**Executive Officer Development field** Constructed network for Tacrolimus approval and sales at Astellas in the US and Europe	**Executive Officer HR & GA field** Over 30 years experience in HR

Historical Relaxation of Japanese Regulations

Drastic reduction in the trial time period and number of patients with “Conditional and Time-limited Authorization System.”

Insurance is listed at ‘Conditional and Time-limited Authorization’ stage.

Conditional and Time-limited Authorization System



About Orphan Regenerative Medicine Designation

Orphan regenerative medicine designation is available in cases of rare diseases with small patient numbers and no existing direct treatments.

【Criteria for designation as a rare disease】

1． Number of patients with this disease in Japan is lower than 50,000

2． Unmet medical needs

- A serious target disease with very high medical needs
- No alternative drug, medical device, regenerative medicine, or therapy exists
- A significantly higher efficacy and safety than that of existing drugs, medical devices, or regenerative medicines can be expected

3． A theoretical basis for using regenerative medicines exists and the developmental plan is considered appropriate

【Benefits of receiving orphan designation】

- Granting of subsidies to reduce development expenses
- Tax measures, priority advice and consultations and priority review
- Longer Reexamination period

ARDS is also a rare disease with an estimated incidence of 7,000 to 12,000 patients per year.

((source)Definition of the Ministry of Health, Labour and Welfare：https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000068484.html

Entered Comprehensive Agreement with Athersys in Preparation for Commercialization

- Amended certain terms of the license agreement and acquired new rights for commercialization.
- Received warrants that would enable Healios to make further strategic investments in Athersys in the future.

Key points

① Manufacturing license

- Healios obtained a license to manufacture MultiStem at Healios selected contract manufacturers, allowing for streamlined manufacturing management by Healios in Japan.

② Shared manufacturing investment

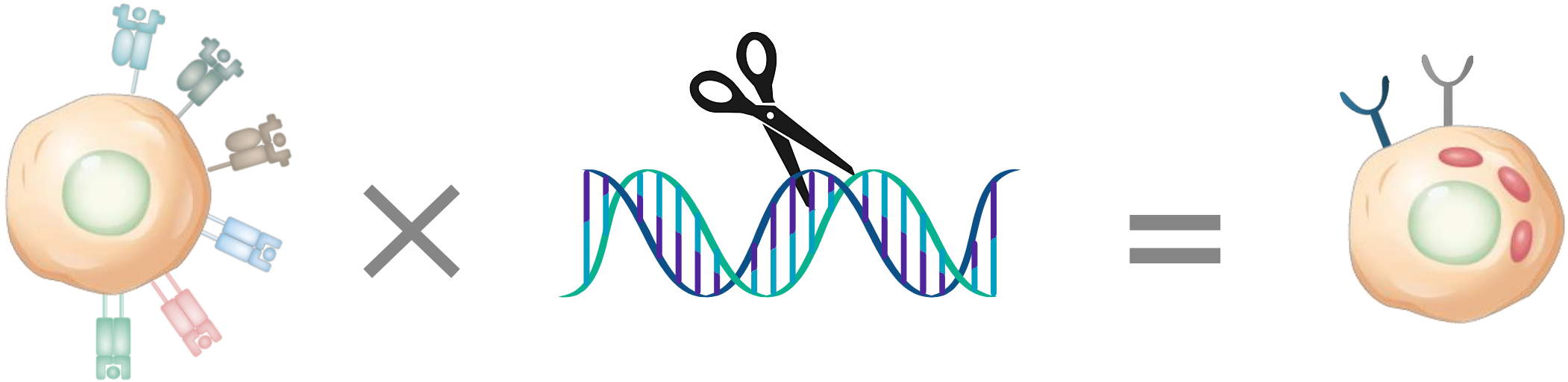
- Healios and Athersys will share investments in relation to manufacturing preparation and the expansion of production capacity for Japan and in this context have adjusted certain financial elements of the license agreement affecting milestones and royalties.

③ Enhancements to the mutual incentives and alignment between the companies

- Healios obtained a license for the research, development, manufacture and sale of MultiStem for up to two new indications other than Ischemic Stroke and ARDS in Japan, enabling Healios to further leverage its existing investments in relation to MultiStem in Japan.
- Established a new milestone of up to US $8 million payable by Healios in relation to commercial manufacturing activity such as the preparation of large-scale manufacturing for Japan.
- Healios received a warrant to purchase up to 10 million new Athersys shares to enable strategic investments in the future.

iPSC Platform

iPSC Platform: Universal Donor Cell



iPS cell
(pluripotent stem cell)

Gene-Editing

Universal Donor Cell
(Safe and versatile stem cells)

By using gene editing technology to produce iPS cells that avoid immune rejection, it is possible to realize universal iPS cells that can respond to the need for “one cell for all patients."

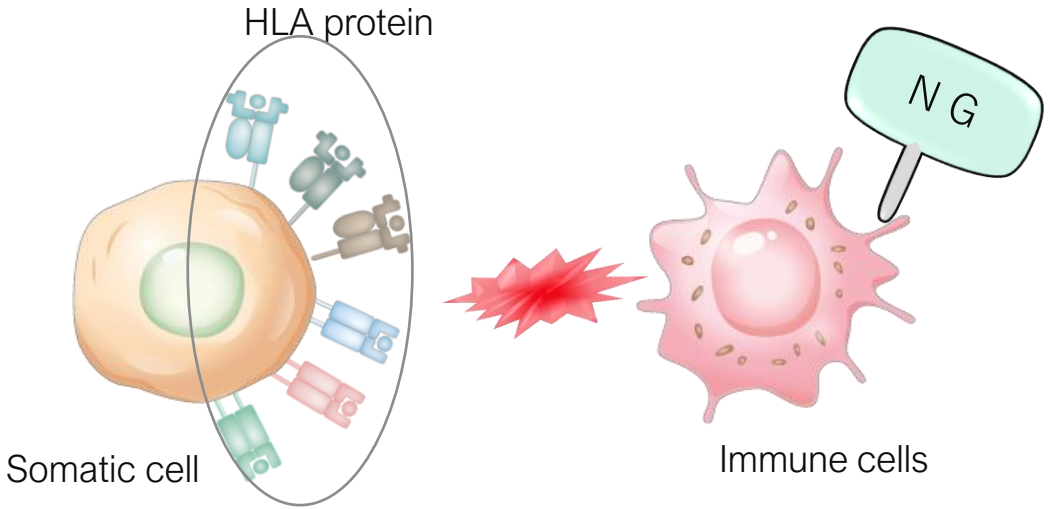
iPSC Platform: Self-recognition of HLA Protein and UDC

HLA (human leukocyte antigen) protein:

・ HLA is a group of cell-surface proteins that are encoded by the MHC (major histocompatibility complex) gene and responsible for the regulation of the immune system.

・There are a myriad of HLA variations

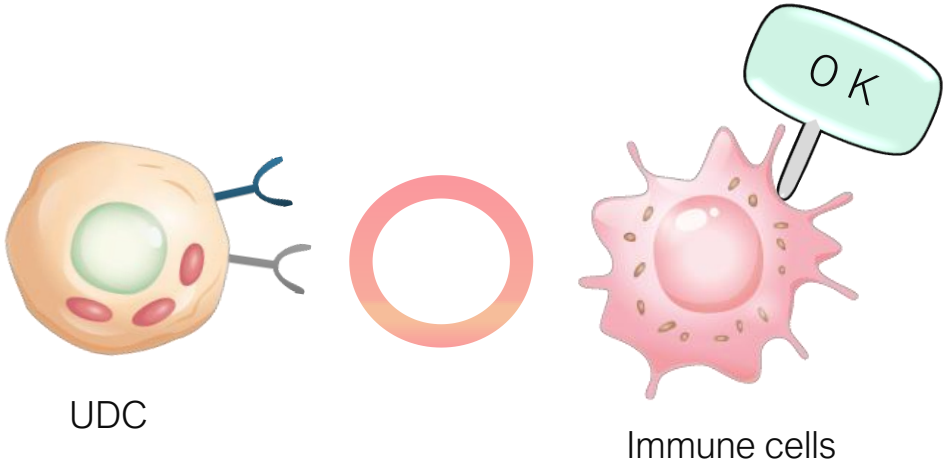
・Immune cells distinguish between autologous and allogeneic cells and tissue.



HLA protein mismatch causes immune rejection

UDC:

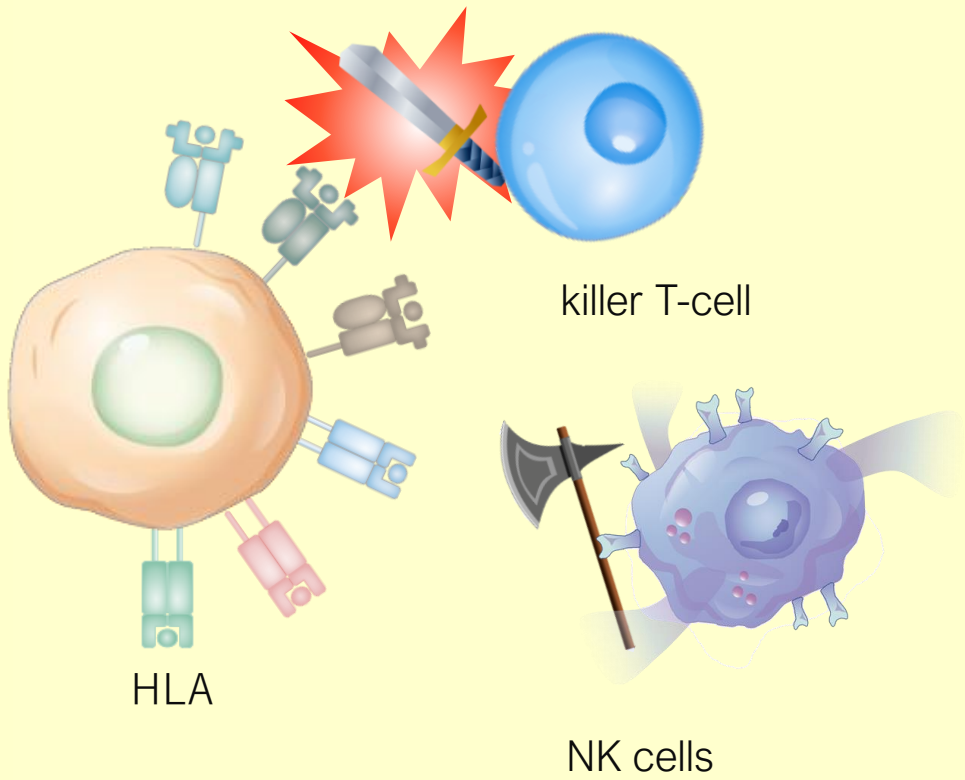
- Deletion of HLA protein
- Introduction of immunosuppression-related molecules
- Introduction of suicide genes as a safety mechanism



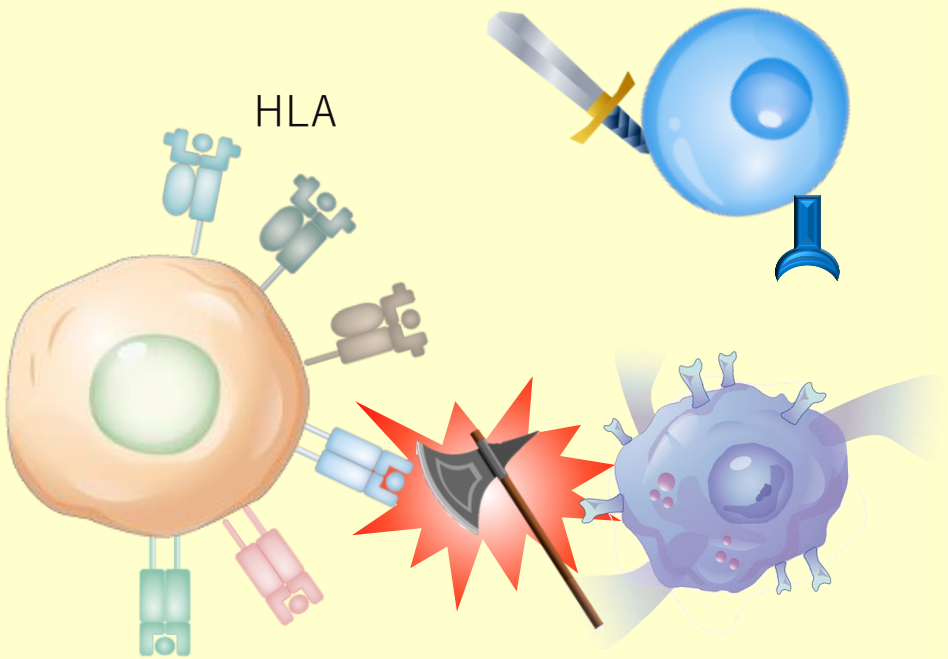
UDC is a safer and more versatile iPS cell

iPSC Platform: Rejection of Cell Transplant

HLA type mismatch

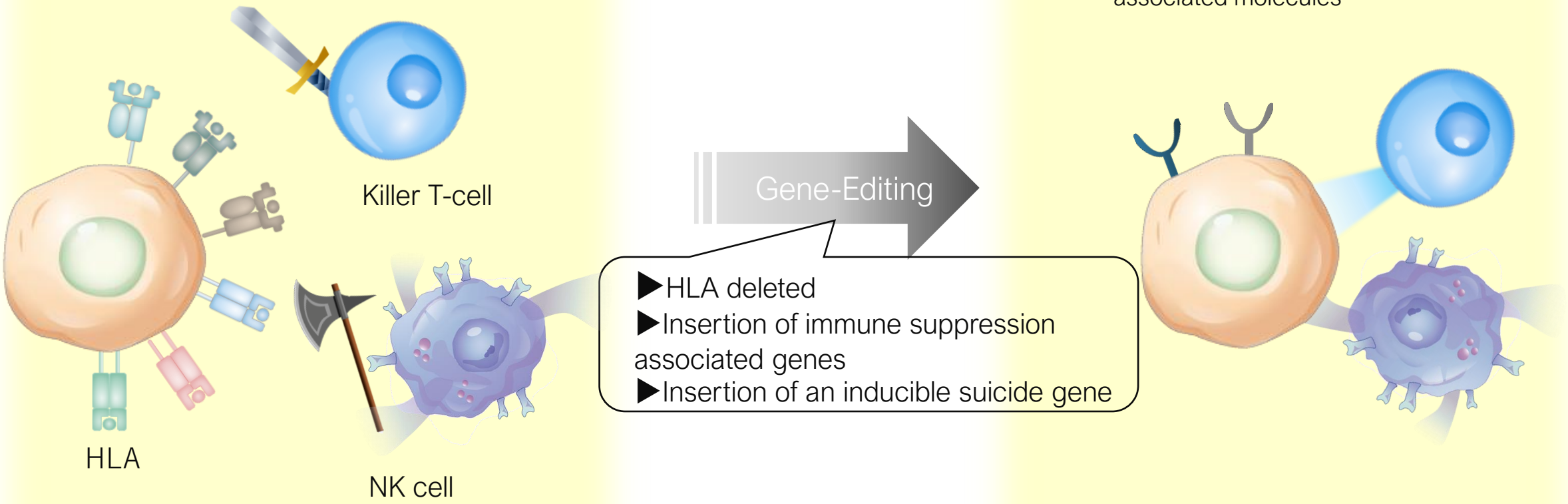


HLA protein deletion



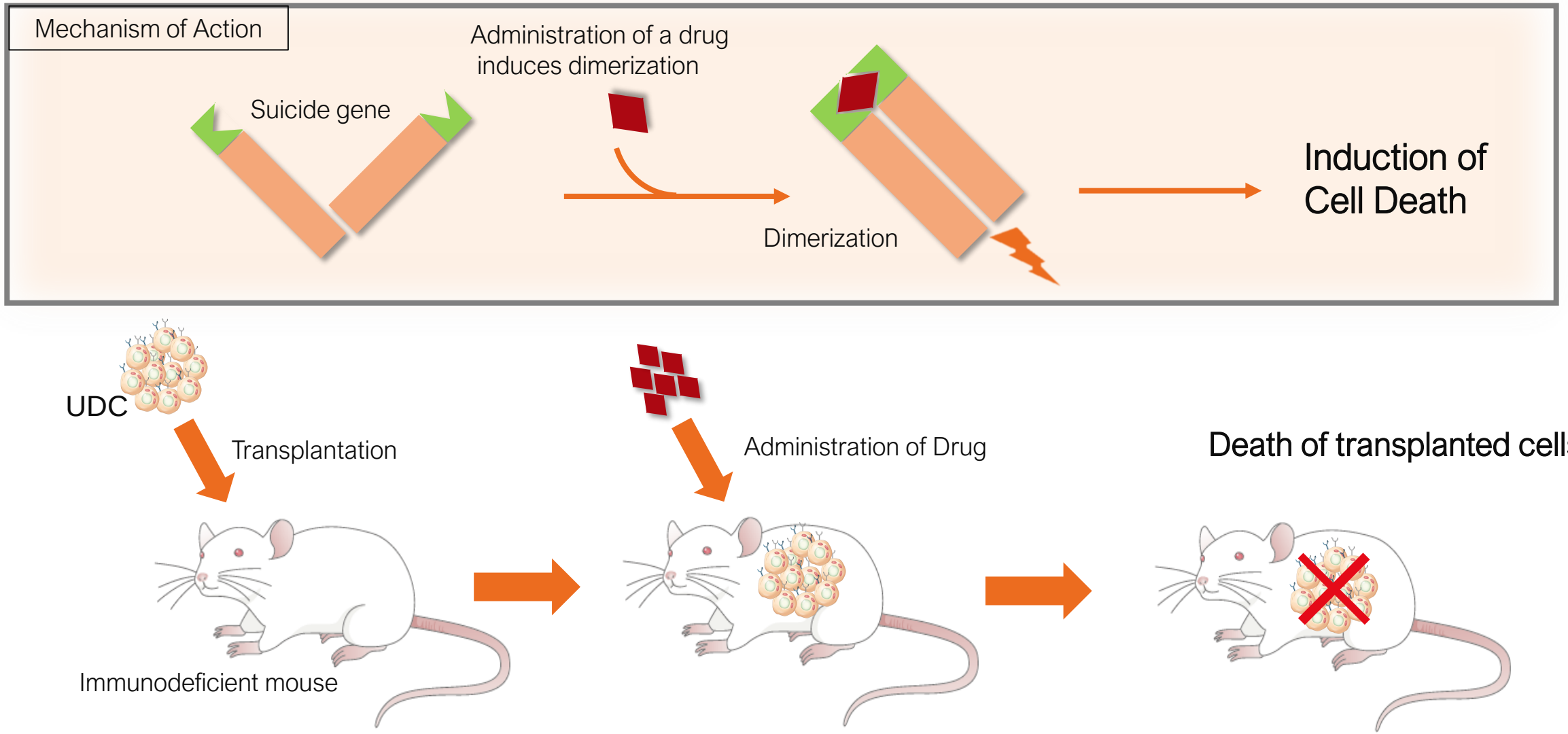
Immune response

iPSC Platform: Avoid Rejection Due to Immune Response



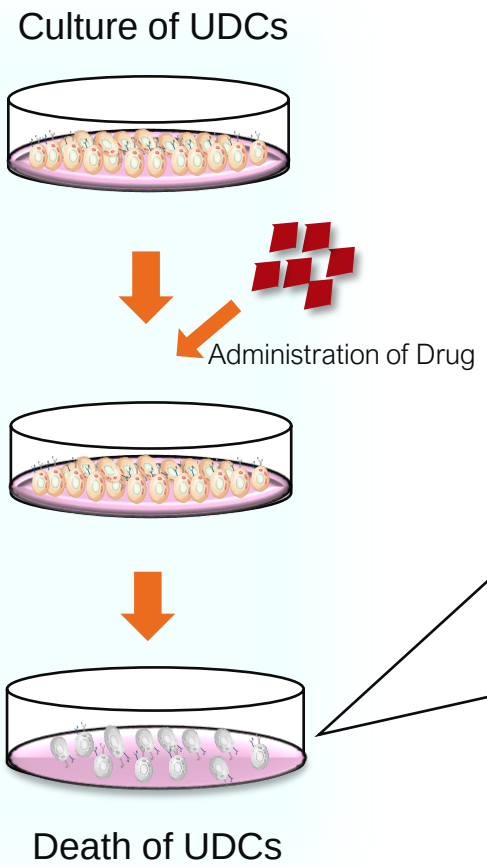
We produce immune rejection free iPS cells to realize safe and universal cell therapies.

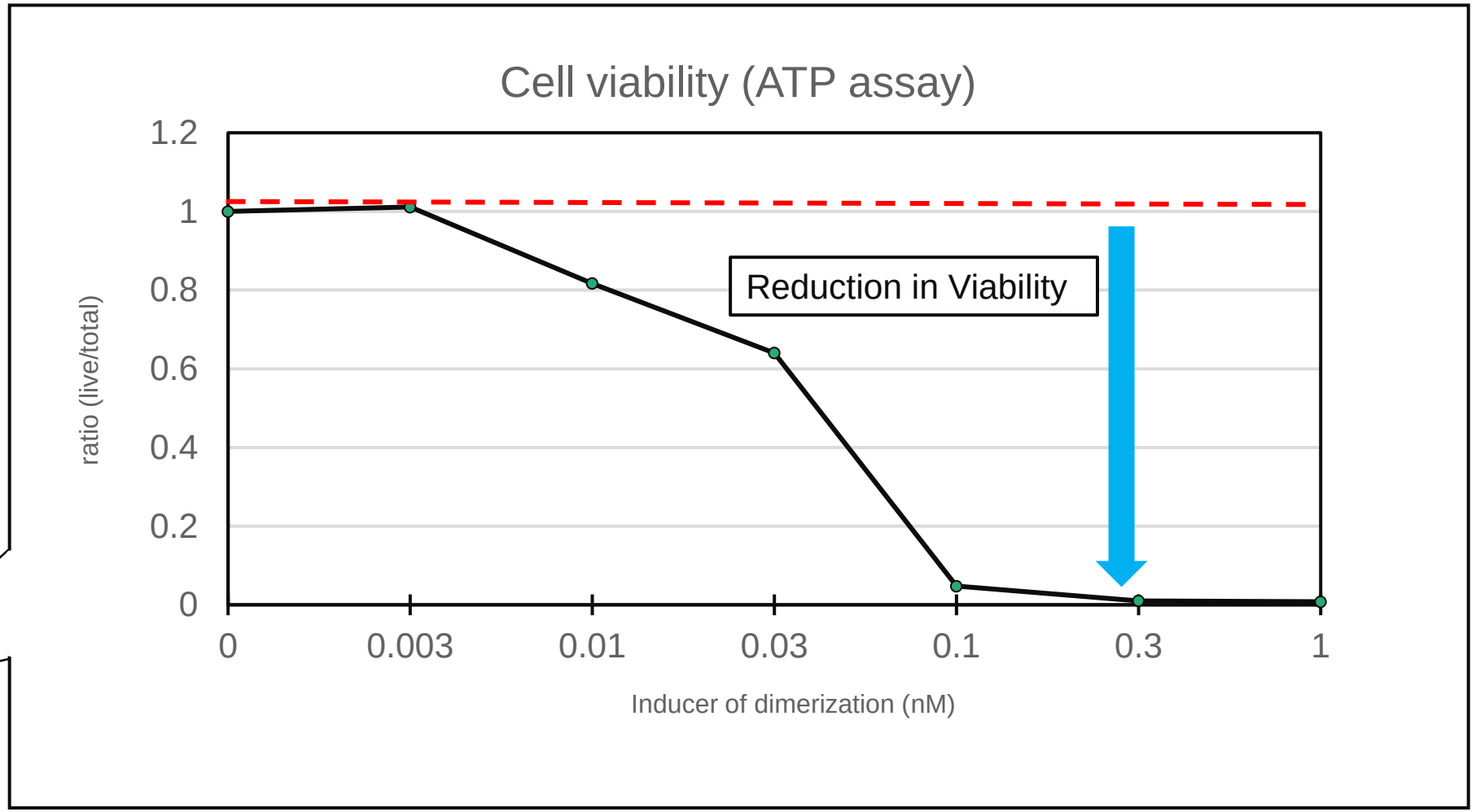
iPSC Platform: Evaluation of UDC Inducible Suicide Genes *In Vivo*



Confirmed suicide gene activity in immunodeficient mice

iPSC Platform: Evaluation of UDC Inducible Suicide Genes *In Vitro*





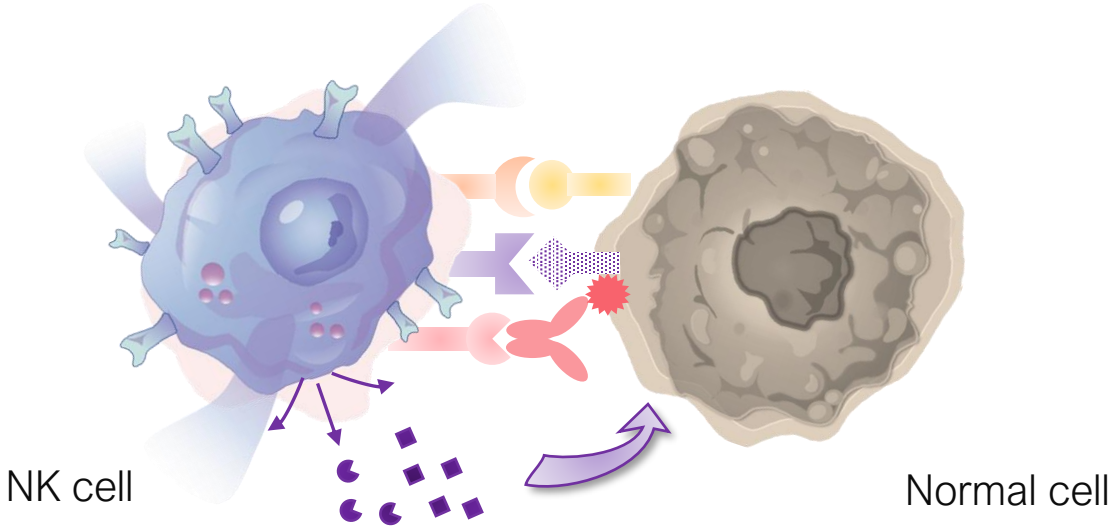
After induction of suicide genes, target cells die by apoptosis

（Source）in-house data

NK Cells

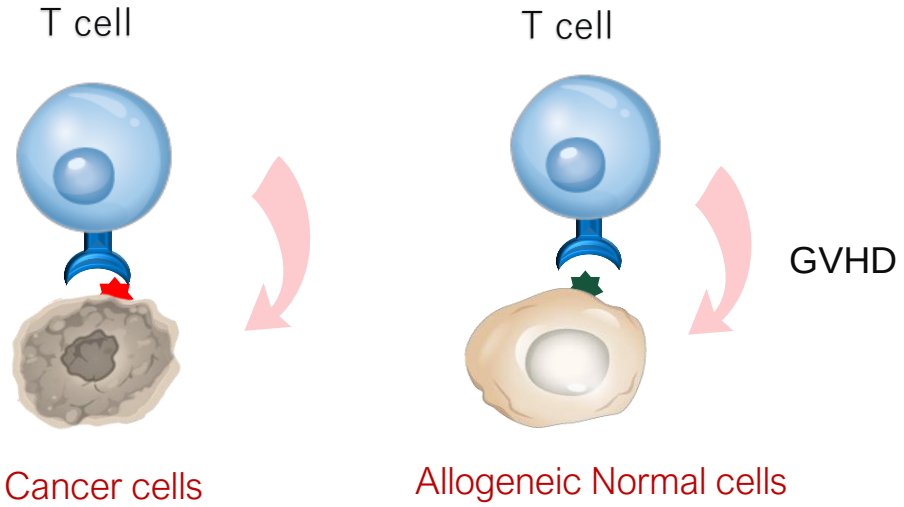
HLCN061: NK Cells

NK Cells



・NK cells are large granular lymphocytes (LGL) and critical to the innate immune system. The role of NK cells is to recognize and attack abnormal cells, such as cancer cells and virus-infected cells.

Superiority of NK cells to T cells

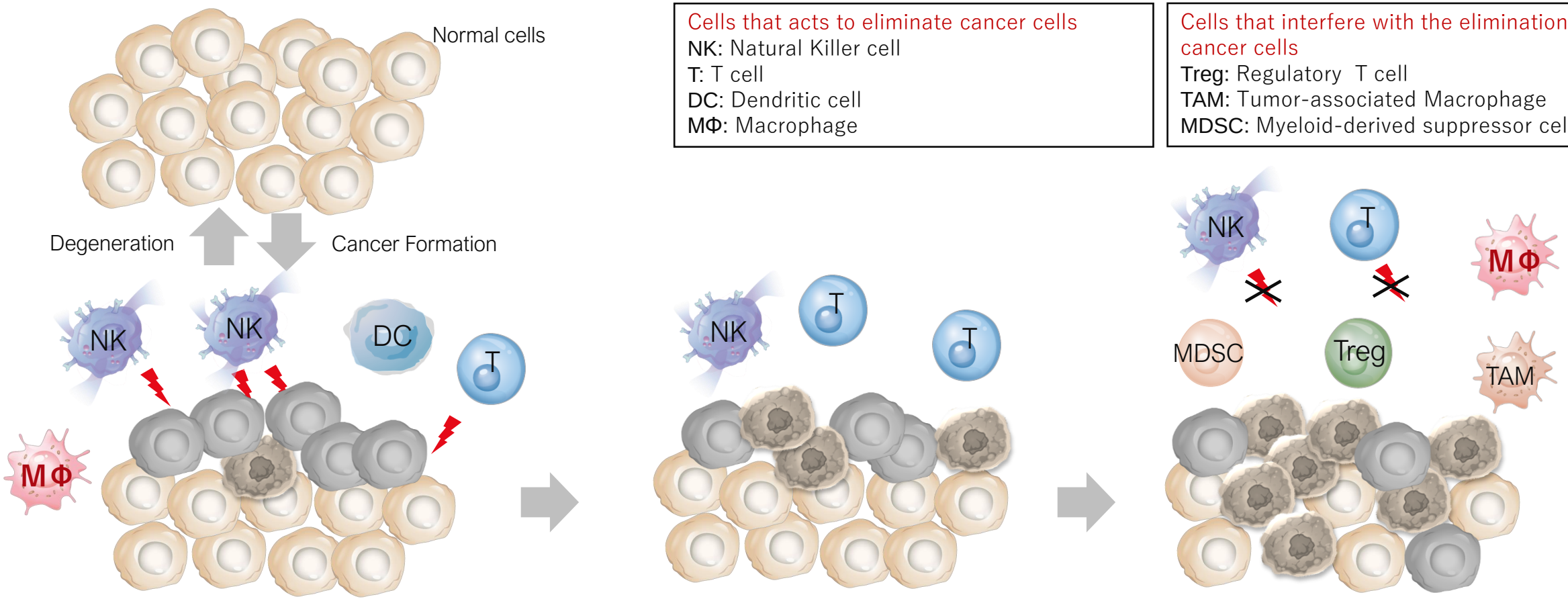


- Graft-versus-host disease (GVHD) occurs with allogeneic T cells
- Solid cancers are heterogeneous and have few relevant targets of cancer antigens
- Cytokine syndrome occurs with T cells

HLCN061: Theory of Cancer Immunoediting

Cells that acts to eliminate cancer cells
NK: Natural Killer cell
T: T cell
DC: Dendritic cell
MΦ: Macrophage

Cells that interfere with the elimination of cancer cells
Treg: Regulatory T cell
TAM: Tumor-associated Macrophage
MDSC: Myeloid-derived suppressor cell



Elimination

- NK and T cells attack and eliminate cancerous cells

Equilibrium

- Equilibrium between cancer growth and clearance by immune system

Escape

- Cancer cells avoid immunity
- Appearance of immune suppressive cells

(Source) modified from Schreiber et al., Science 2011, 331 (6024): 1565

Important Note on Future Events, etc

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