NEW CELL CULTURE STANDARD

Invigorating the world through cell culture

InnoCell™

What is InnoCell™ ?
InnoCell™ is a next-generation cell culture solution developed highlighting the specialized characteristics of Mitsui Chemicals' functional materials.

Invigorating the world through cell culture

Mitsui Chemicals has continually sought out earth's unique resources.
By combining leading edge technology and innovative ideas,
Mitsui Chemicals has created valuable materials.

We evaluated how our unique materials can further contribute to
the greater societal good and to bring joy to our customers
in the way only Mitsui Chemicals can.

Our next challenge is to bring innovation to the life sciences
by harnessing the power of chemistry.

Mitsui Chemicals will continue to provide innovative solutions
for cell culture to researchers and all who wait
for advancements in the world.

What kind of future will proliferate through advances in cell culture?

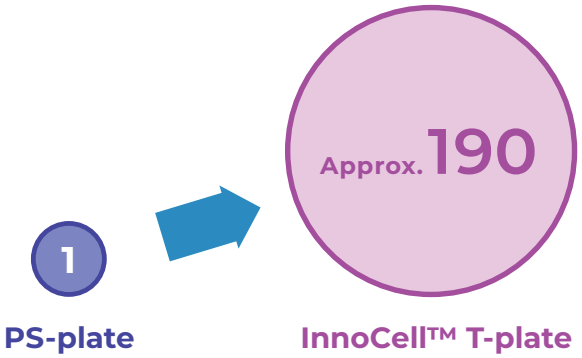
Invigorating the world through cell culture.

Oxygen Permeability Control

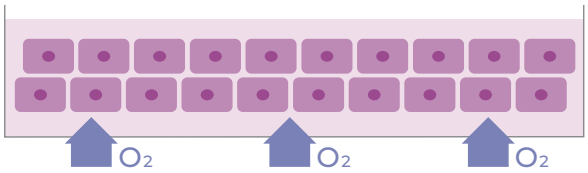
Mitsui Chemicals' original material × Precision processing technology

• Data obtained by Mitsui Chemicals

Relative Comparison of Oxygen Permeability



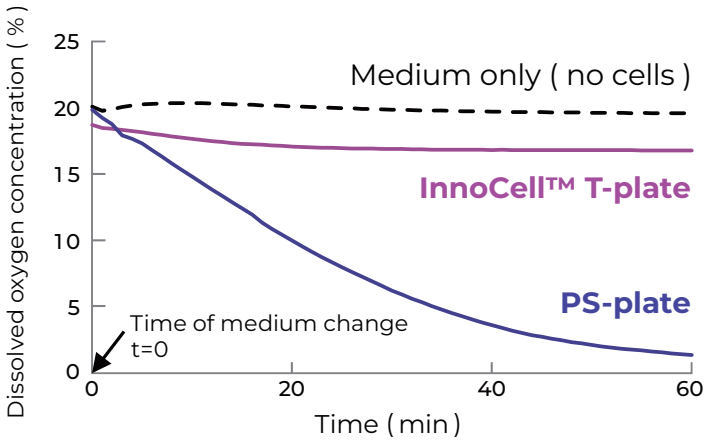
Efficient oxygen supply from the culture bottom



Utilizing Mitsui Chemicals' original material × precision processing technology, InnoCell™ T-plate can supply approximately 190 times more oxygen to cells compared to conventional polystyrene plates.

Changes in oxygen concentration near cells

• Data obtained by Mitsui Chemicals



Conditions

[Cell] Frozen rat hepatocytes
[Number of seedings] 1.0 × 10^5 cells / cm^2
[Culture period] 1 day
[Plate type] InnoCell™ T-plate FP series (flat bottom)
Collagen-coated (C type)

InnoCell™ T-plate can stably supply oxygen to cells from the bottom.

High-density culture of frozen rat hepatocytes

• Data obtained by Mitsui Chemicals

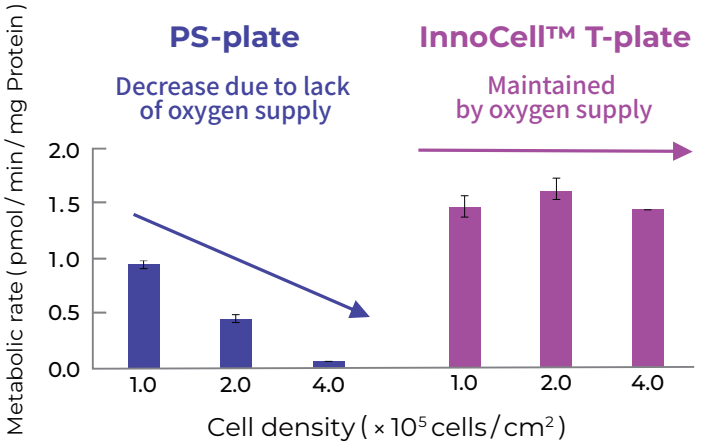
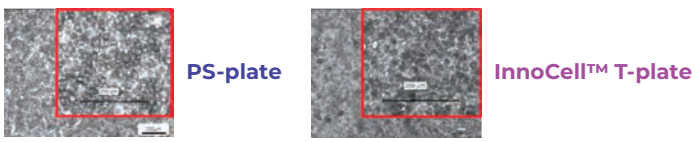


Image (4.0 × 10^5 cells / cm^2)



Conditions

[Cell] Frozen rat hepatocytes
[Culture period] 1 day
[Plate type] InnoCell™ T-plate FP series (flat bottom)
Collagen-coated (C type)

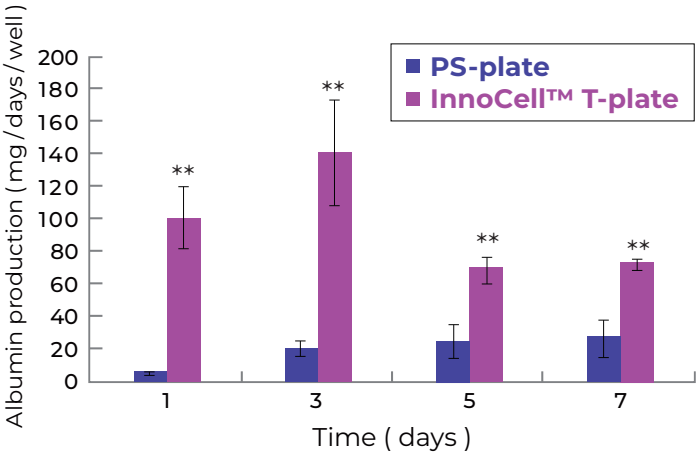
Using InnoCell™ T-plate, hepatocytes which require a high oxygen environment, could be cultured at high density while maintaining metabolic activity.

[Abbreviation] ・PS : Polystyrene ・PDMS : Poly (dimethylsiloxane) ・FEP : Fluorinated ethylene-propylene

Oxygen Permeability Control 2

Culture of primary rat hepatocytes

• Data provided by Dr. Sakai, Dr. Nishikawa, The University of Tokyo
• Reference: Accurate Evaluation of Hepatocyte Metabolisms on a Noble Oxygen-Permeable Material With Low Sorption Characteristics. *Front. Toxicol.*, 4: 810478, (2022).



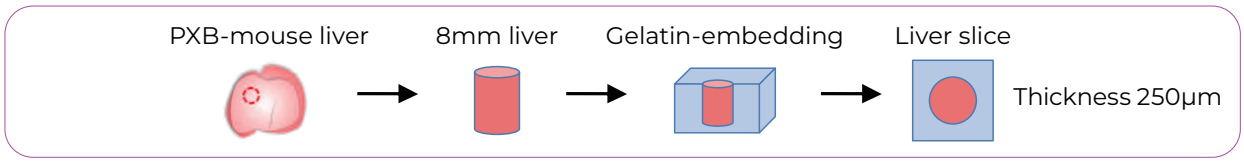
Conditions

[Cell] Primary rat hepatocytes
[Seeding density] 1.0 × 10^5 cells / cm^2
[Plate type] InnoCell™ T-plate FP series (flat bottom)
Collagen-coated (C type)
[Incubator oxygen concentration]
InnoCell™ T-plate : 10% PS-plate : 20%

InnoCell™ T-plate enabled primary rat hepatocytes to maintain a high albumin production capacity for an extended period of time.

Culture of PXB-mouse liver slices

• Data provided by PhoenixBio Co., Ltd.



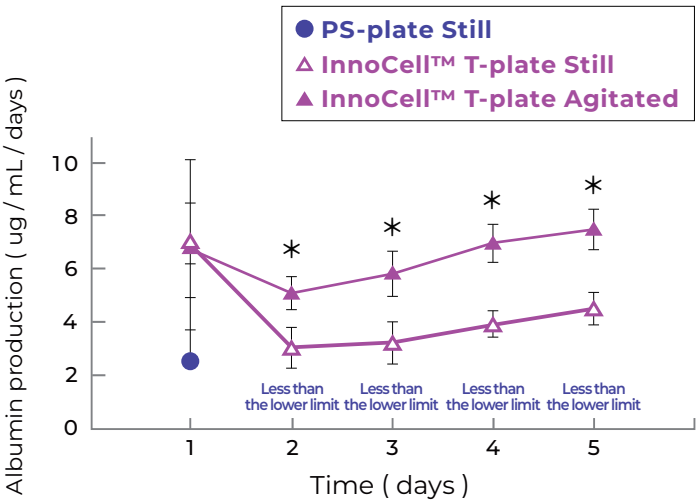


Image of liver slice in the plate

Conditions

[Slice] PXB-mouse liver
[Plate type] InnoCell™ T-plate FP series (flat bottom)
Non-treated (N type)

InnoCell™ T-plate even enabled liver slices to maintain a high albumin production capacity for an extended period of time.

[Abbreviation] • PS : Polystyrene • PDMS : Poly (dimethylsiloxane) • FEP : Fluorinated ethylene-propylene

Low drug adsorption

Drug adsorption to the culture substrate

• Data provided by Dr. Arakawa, Kanazawa University

Drug	log P	clinicalC$_{max}$ (μM)	Residual rate after 24 hours (% vs 0 hours) Drug concentration 100nM			
			PS-plate	FEP-plate	PDMS-plate	InnoCell™ T-plate
Aripiprazole	5.21	0.067	64.2±0.4	54.7±1.2	26.3±0.9	69.9±2.2
Alectinib	5.59	1.4	72.9±1.8	53.7±2.8	45.1±0.8	70.3±2.9
Sorafenib	4.12	17	73.0±1.7	56.4±2.5	59.2±0.4	68.0±3.4
Gefitinib	4.02	0.86	82.9±3.4	69.8±4.3	39.6±2.3	94.0±4.8
Pazopanib	3.59	132	86.7±2.1	59.5±1.8	82.1±2.1	87.8±0.6
Sunitinib	3.24	0.18	95.8±1.9	64.9±1.8	29.0±2.0	97.0±3.5
Ciprofloxacin	0.28	6.73	62.2±5.4	67.7±12.1	59.6±6.7	69.4±13.0

Conditions

[Plate type] InnoCell™ T-plate FP series (flat bottom)
Non-treated (N type)
[Measurement]
Liquid chromatograph-mass spectrometer (LC-MS / MS)

Drug adsorption to InnoCell™ T-plate is low. It can be utilized in toxicity studies, as well as drug efficacy / pharmacology studies during the drug discovery phase.

Drug adsorption to the culture substrate

• Data provided by Dr. Sakai, Dr. Nishikawa, The University of Tokyo
• Reference : Accurate Evaluation of Hepatocyte Metabolisms on a Noble Oxygen-Permeable Material With Low Sorption Characteristics. *Front. Toxicol.*, 4: 810478, (2022).

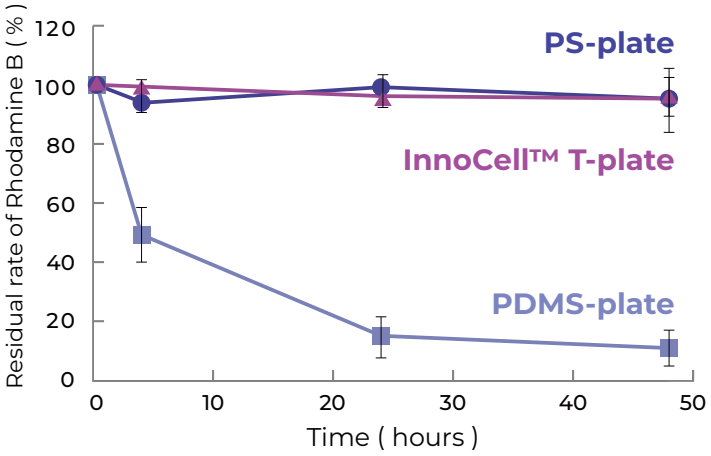
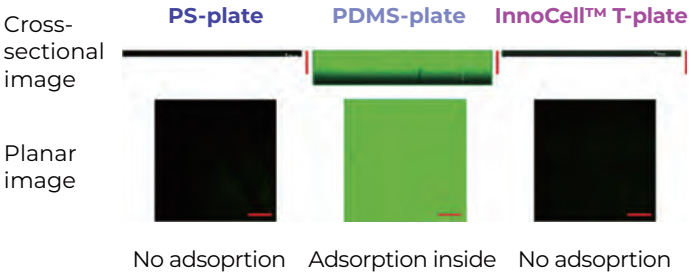


Image after 48 hours (Confocal microscope, 200μm from the bottom)

Rhodamine B



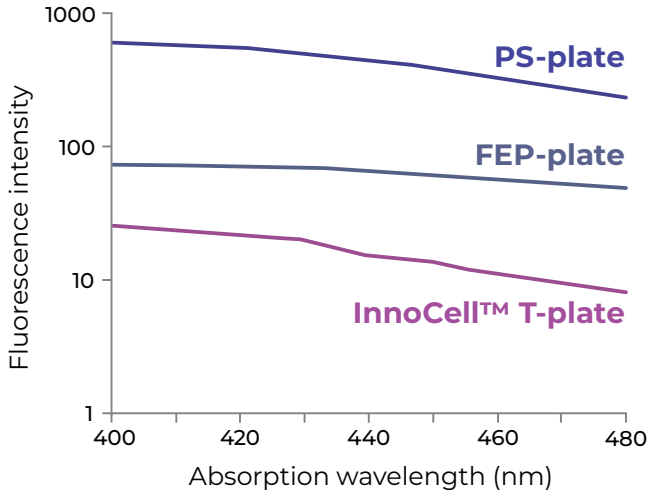
InnoCell™ T-plate is designed for and verified to have low drug adsorption into the culture substrate.

[Abbreviation] • PS : Polystyrene • PDMS : Poly (dimethylsiloxane) • FEP : Fluorinated ethylene-propylene

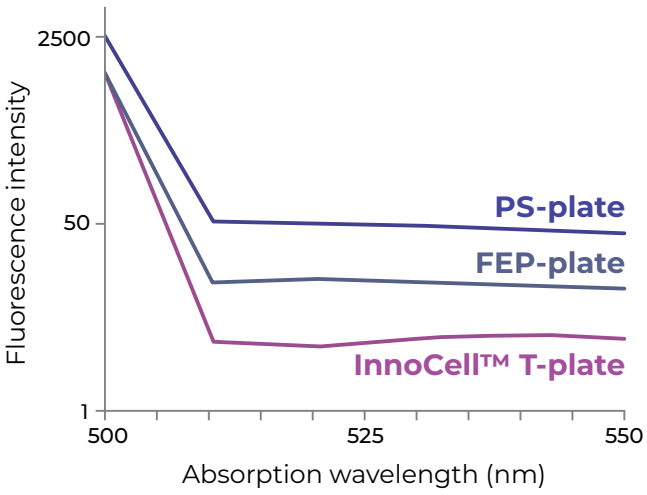
Low Autofluorescence

• Data obtained by Mitsui Chemicals

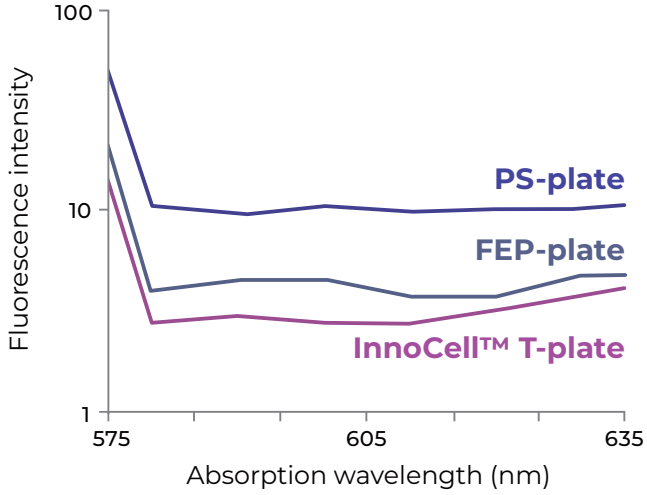
Excitation 360nm Blue fluorescence



Excitation 470nm Green fluorescence



Excitation 545nm Red fluorescence



Conditions

[Plate type] InnoCell™ T-plate FP series (flat bottom)
Non-treated (N type)
[Measurement] Plate reader

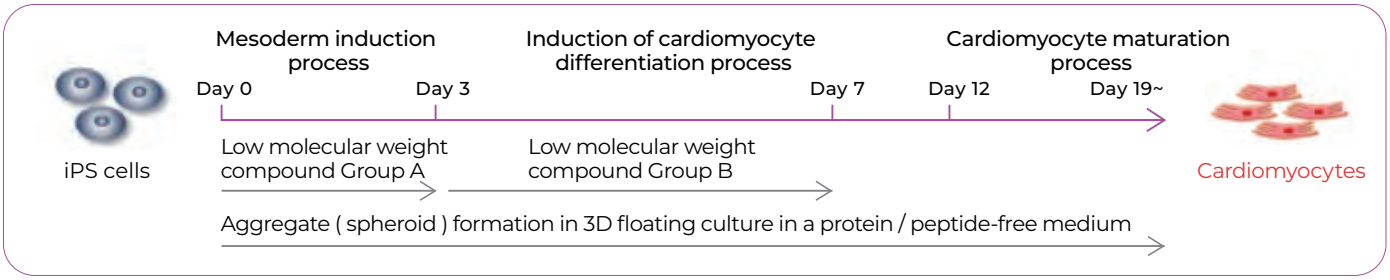
InnoCell™ T-plate has low autofluorescence at various wavelengths and clear fluorescent observation is also possible.

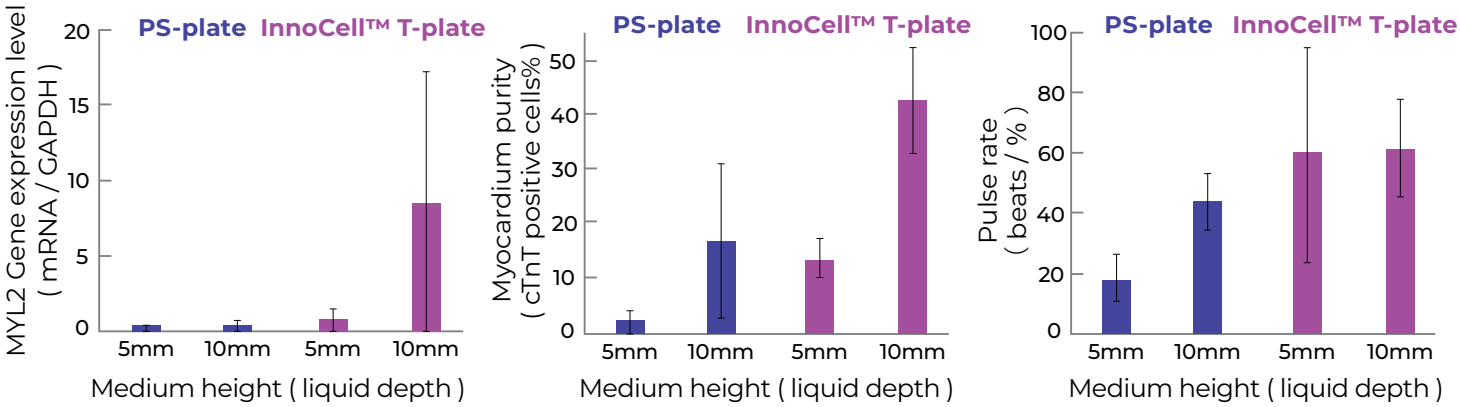
[Abbreviation] ・PS : Polystyrene ・PDMS : Poly (dimethylsiloxane) ・FEP : Fluorinated ethylene-propylene

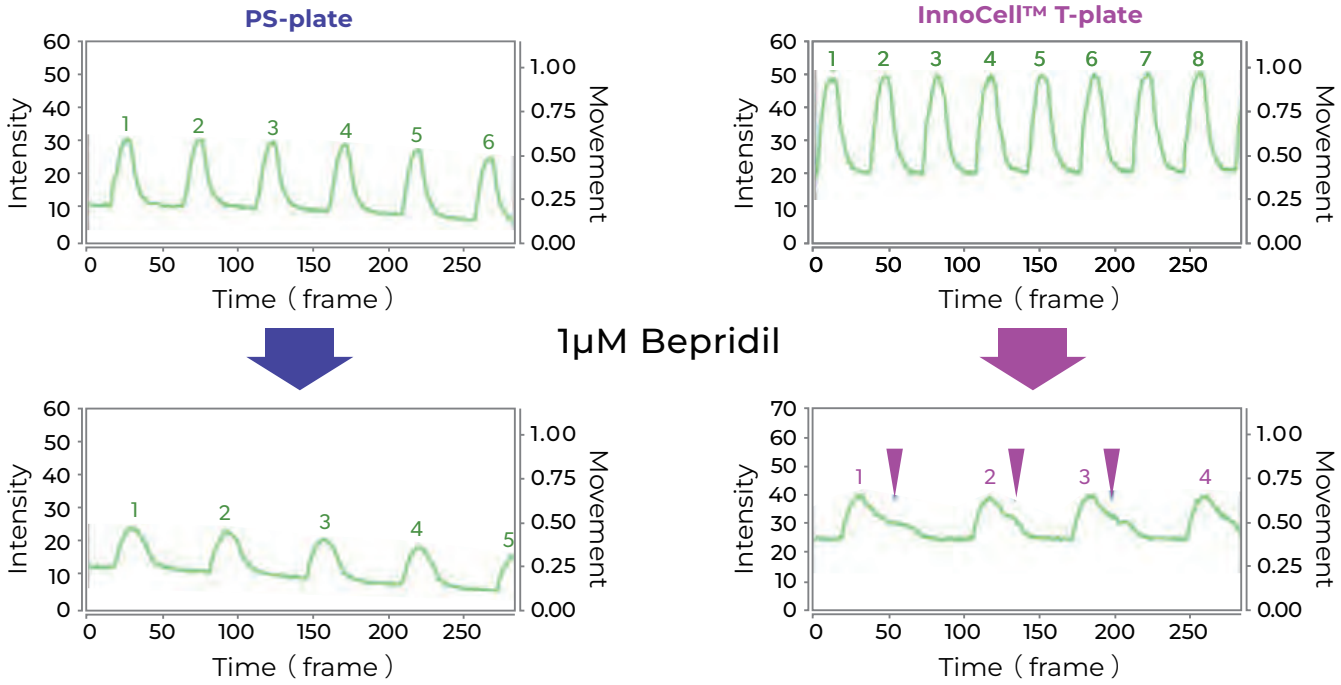
Stem Cell Research

Examples of Induction of cardiomyocytes differentiation from iPS cells and myocardial pharmacological response

• Data provided by Myoridge Co. Ltd.







Conditions

[Plate Type] InnoCell™ T-plate FP series (flat bottom)
Treated (P type)

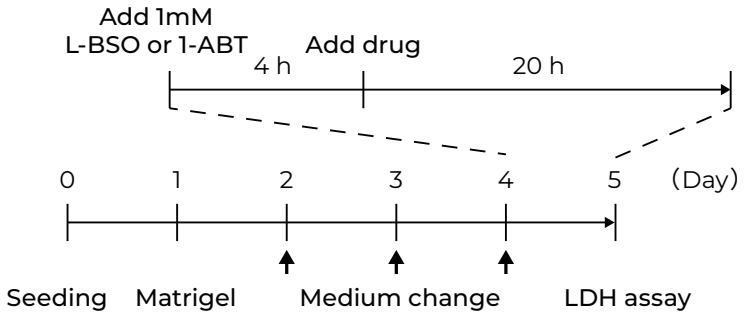
InnoCell™ T-plate yielded highly matured cardiomyocytes. Using iPS-derived cardiomyocyte culture, Bepridil-induced QT prolongation was observed in InnoCell™ T-plate.

[Abbreviation] • PS : Polystyrene • PDMS : Poly (dimethylsiloxane) • FEP : Fluorinated ethylene-propylene

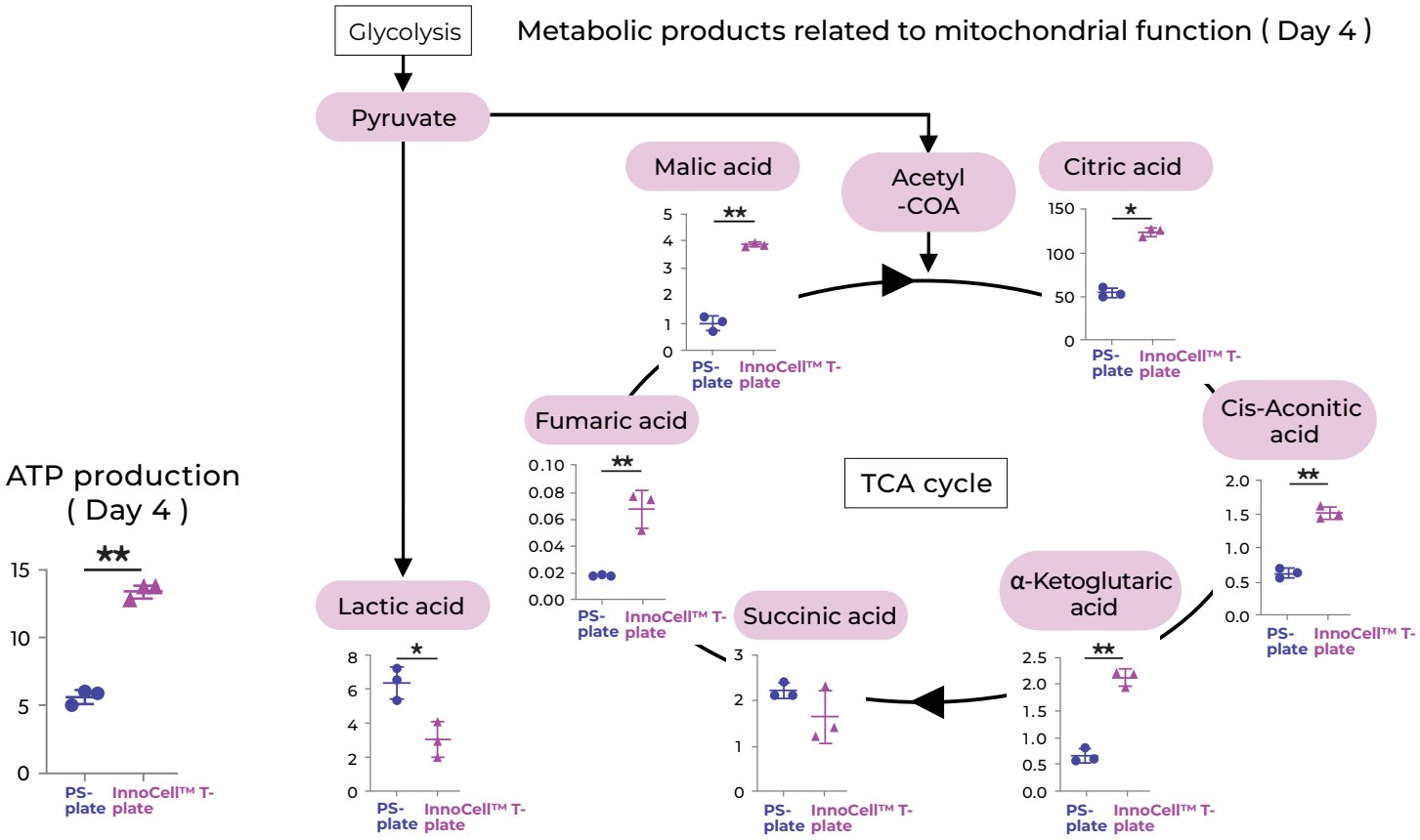
Drug Discovery Research

Example assay using primary rat hepatocytes (1/2)

• Data provided by Dr. Takemura, Chiba University
• Reference : New in vitro screening system to detect drug-induced liver injury using a culture plate with low drug sorption and high oxygen permeability. *Drug Metabolism and Pharmacokinetics*, 52: 100511, (2023).



- L-BSO
  : GSH synthesis inhibitor
- 1-ABT
  : Nonspecific CYP enzyme inhibitor



Conditions

[Animal] Male Sprague Dawley rat
[Seeding density] 1.25 × 10^5 cells / cm^2
[Plate type] InnoCell™ T-plate FP series (flat bottom)
Collagen-coated (C type)

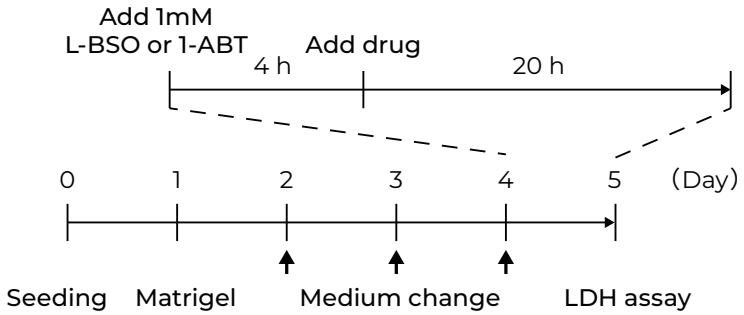
InnoCell™ T-plate has been shown to shift energy production of rat hepatocytes from the glycolytic system to the TCA cycle.

[Abbreviation] ・PS : Polystyrene ・PDMS : Poly (dimethylsiloxane) ・FEP : Fluorinated ethylene-propylene

Drug Discovery Research 2

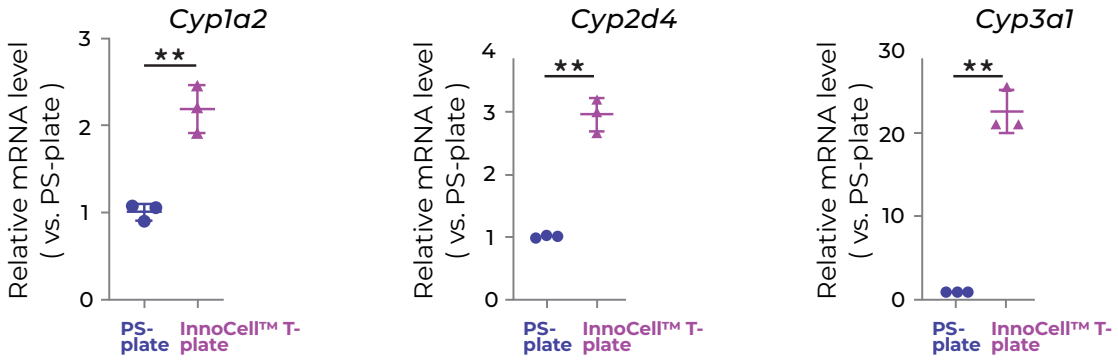
Example assay using primary rat hepatocytes (2/2)

• Data provided by Dr. Takemura, Chiba University
• Reference : New in vitro screening system to detect drug-induced liver injury using a culture plate with low drug sorption and high oxygen permeability. *Drug Metabolism and Pharmacokinetics*, 52: 100511, (2023).

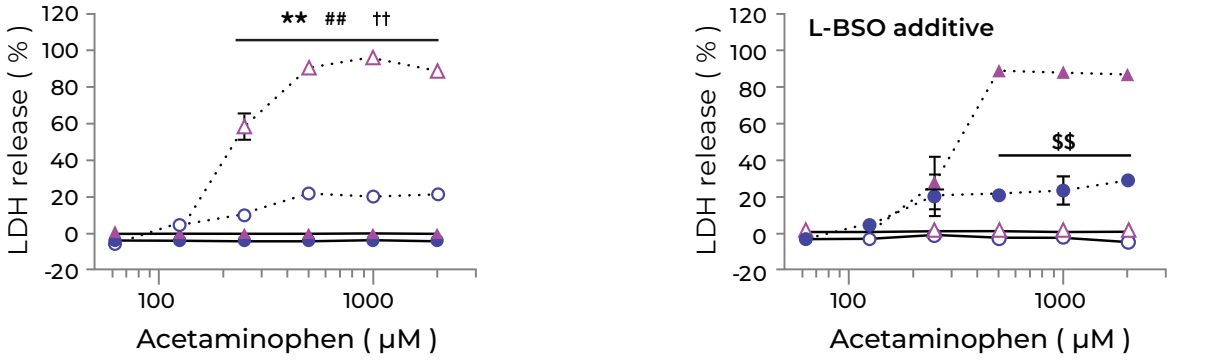


- L-BSO
  : GSH synthesis inhibitor
- 1-ABT
  : Nonspecific CYP enzyme inhibitor

CYP gene expression (Day 4)



Hepatocellular damage (Acetaminophen)



L-BSO not added : ● PS-plate | ▲ InnoCell™ T-plate
L-BSO Added : ○ PS-plate | △ InnoCell™ T-plate

1-ABT not added : ● PS-plate | ▲ InnoCell™ T-plate
1-ABT Added : ○ PS-plate | △ InnoCell™ T-plate

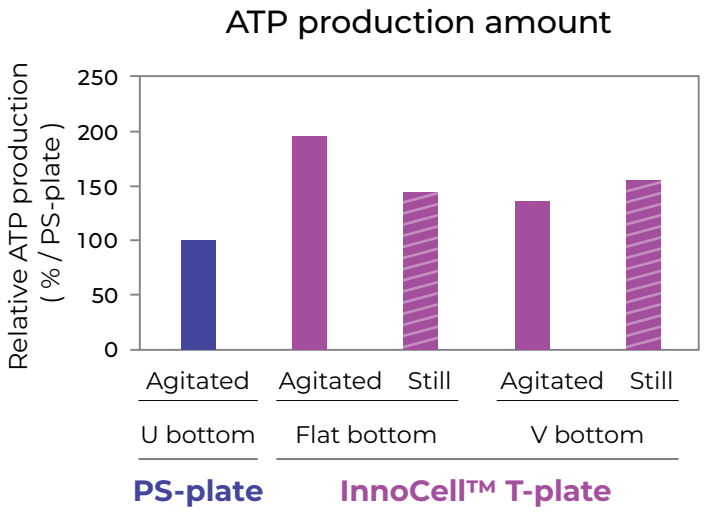
Using InnoCell™ T-plate, hepatocellular cytotoxicity due to acetaminophen was increased in the presence of L-BSO and attenuated by adding 1-ABT. Hepatocellular cytotoxicity caused by reactive metabolites may be detected with high sensitivity.

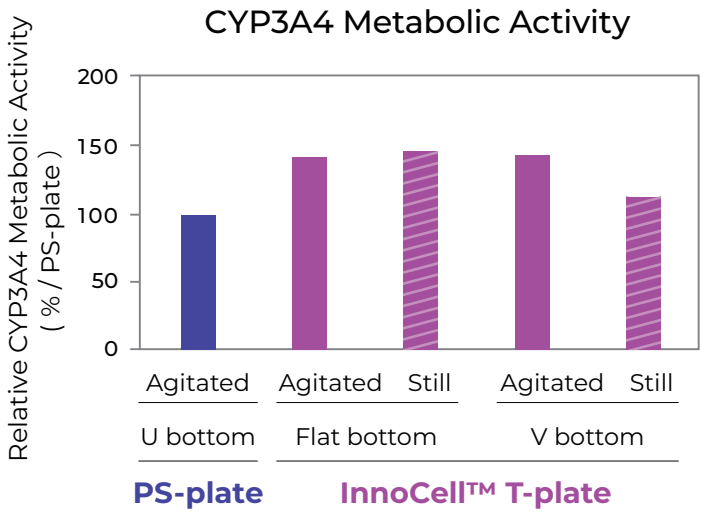
[Abbreviation] ・PS : Polystyrene ・PDMS : Poly (dimethylsiloxane) ・FEP : Fluorinated ethylene-propylene

Drug Discovery Research 3

Example assay using human 3D liver buds

・Data provided by Cyfuse Biomedical K.K.





Conditions

[Cell] Same company Human 3D liver buds
[Culture period] 6 days
[Plate type]
・InnoCell™ T-plate FP series (flat bottom)
Non-treated (N type)
・InnoCell™ T-plate FV series (V bottom for 3D culture)

InnoCell™ T-plate maintained higher ATP production and CYP3A4 metabolism in human 3D liver buds.

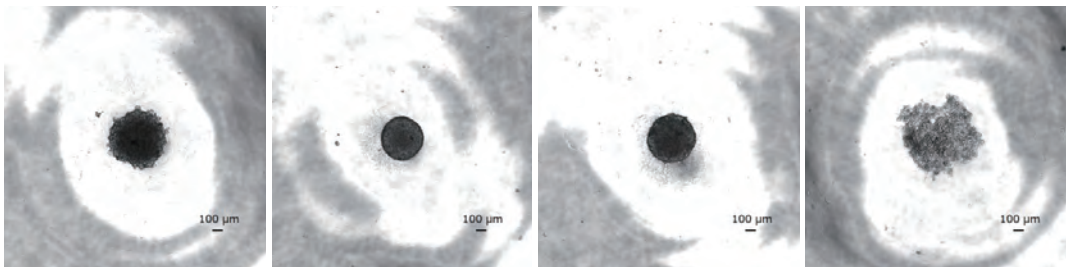
[Abbreviation] ・PS : Polystyrene ・PDMS : Poly (dimethylsiloxane) ・FEP : Fluorinated ethylene-propylene

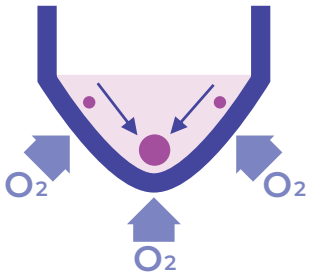
Additional Data

Examples of spheroid formation

• Data obtained by Mitsui Chemicals

Image of phase-contrast observation (3 days of culturing)





HeLa	MCF7	TFK-1	MIA-PaCa 2
(3,000 cells / well)	(3,000 cells / well)	(3,000 cells / well)	(3,000 cells / well)

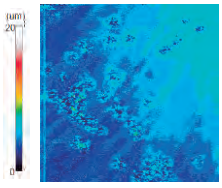
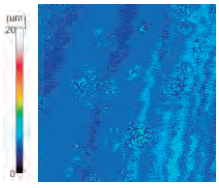
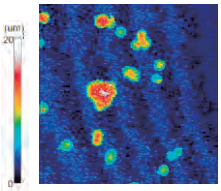
Conditions

[Plate type]
InnoCell™ T-plate FV series (V bottom for 3D culture)

InnoCell™ T-plate can be used for spheroid formation in a variety of cell types.

Cell3iMager Estier Analysis

• Data provided by SCREEN Holdings Co., Ltd.

	Manufacturer A (PS-plate)	Manufacturer B (PS-plate)	InnoCell™ T-plate
Cross-sectional image of interface (saturation)			
Measurement of thickness of single layer culture			

Conditions

[Equipment] Cell3iMager Estier
[Technology] Optical coherence tomography (OCT)
[Cell] MCF7
[Coat] iMatrix 511
[Culture period] 5 hours
[Plate type] InnoCell™ T-plate FP series (flat bottom)
Non-treated (N type)

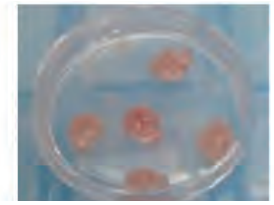
InnoCell™ T-plate enables clear viewing of the cell shapes in flat-surface culture using OCT imaging.

[Abbreviation] ・PS : Polystyrene ・PDMS : Poly (dimethylsiloxane) ・FEP : Fluorinated ethylene-propylene

Additional Data 2

FDSS / µCELL Kinetic Plate Imager Analysis

• Data provided by HAMAMATSU PHOTONICS K.K.

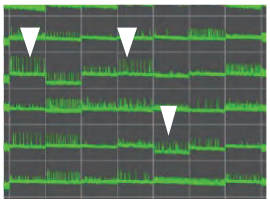


Rat cerebral cortex

+

Ca^{2+} dye

InnoCell™ T-plate



Ca^{2+} oscillation

Conditions

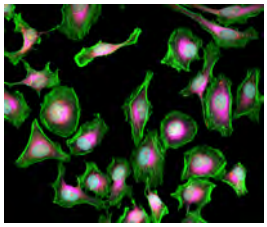
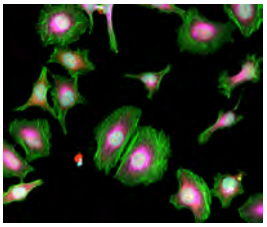
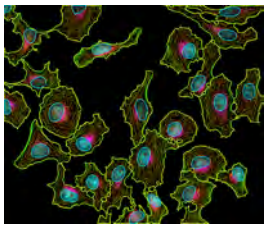
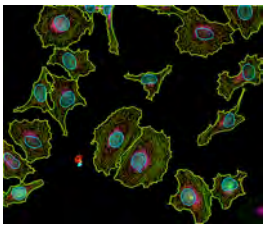
[Equipment] FDSS / µCELL Kinetic Plate Imager
[Tissue] Rat cerebral cortex
[Culture period] 15 days
[Plate type] InnoCell™ T-plate FP series (flat bottom)
Non-treated (N type)

InnoCell™ T-plate enables good Ca^{2+} oscillations in tissue culture of rat cerebral cortex.

CellVoyager CQ1 Analysis

• Data provided by Yokogawa Electric Corporation

Image by confocal microscope (× 40 objective lens)

	PS-plate	InnoCell™ T-plate	
Superimposed image			Nucleus : Hoechst 33342 (Cyan) Actin : Alexa Fluor 488 phalloidin (Green) Mitochondria : MitoTrackerRed CMXRos (Red) Tubulin : Alexa Fluor 647 (Magenta)
Analyzed image			Nucleus : Outline Light blue Cell body : Outline Yellowish-green Actin : Orange

Conditions

[Equipment] CellVoyager CQ1
[Analysis] CellPathfinder
[Cell] pkt1
[Plate type] InnoCell™ T-plate FP series (flat bottom)
Collagen-coated (C type)

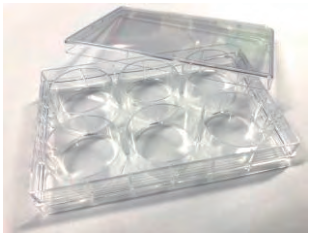
When using InnoCell™ T-plate in conjunction with the CellVoyager CQ1, high-definition confocal microscope images can be obtained for analysis.

[Abbreviation] ・PS : Polystyrene ・PDMS : Poly (dimethylsiloxane) ・FEP : Fluorinated ethylene-propylene

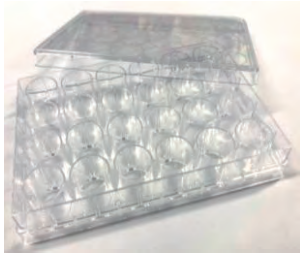
Product Lineup (Under Development)

InnoCell™ T-plate FP series (flat bottom)

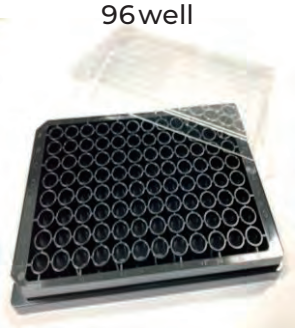
6well



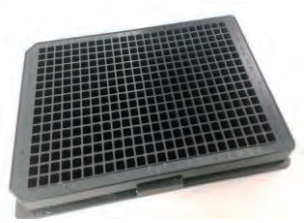
24well



96well



384well



＊A black case is used for 96 well and 384 well (transparent bottom).

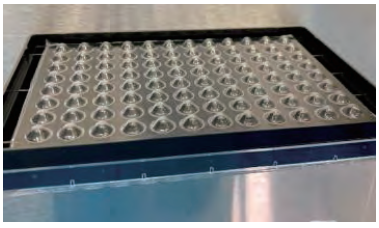
Culture surface	Description
Non-treated (N type)	Suitable for culturing non-adhesive cells and spheroids / organoids, etc. Can be stored at room temperature.
Treated (P type)	The surface of the base material has undergone hydrophilic treatment. Suitable for coating various scaffolding materials. Can be stored at room temperature.
Collagen-coated (C type)	The surface of the base material has undergone hydrophilic treatment. It is coated with Type I pig tendon-derived collagen. Can be stored at room temperature.

InnoCell™ T-plate FW series (gas barrier film)

The InnoCell™ T-plate FP series is treated with a release film with low oxygen permeability.
The gas barrier film can be peeled off and used as InnoCell™ T-plate FP series.

InnoCell™ T-plate FV series (V bottom for 3D culture)

Spheroids and organoids can be cultured while retaining the oxygen permeability of bottom.



Inquiry regarding Products and Techniques

MITSUI CHEMICALS, INC.
New Business Incubation Center, Marketing & Innovation Department
2-2-1 Yaesu, Chuo-ku, Tokyo 104-008, Japan, Tokyo Midtown Yaesu, Yaesu Central Tower
Email : InnoCell@mitsuichemicals.com

List of Developed Products

InnoCell™ T-plate FP series (flat bottom)

Product No.	Product Name	Quantity	Package	Remarks
T-FP006N-01	InnoCell™ T-plate non-treated 6 well	5	1	
T-FP006P-11	InnoCell™ T-plate treated 6 well	5	1	
T-FP006C-01	InnoCell™ T-plate collagen-coated 6 well	5	1	
T-FP024N-01	InnoCell™ T-plate non-treated 24 well	5	1	
T-FP024P-11	InnoCell™ T-plate treated 24 well	5	1	
T-FP024C-01	InnoCell™ T-plate collagen-coated 24 well	5	1	
T-FP096N-01	InnoCell™ T-plate non-treated 96 well	5	1	
T-FP096P-11	InnoCell™ T-plate treated 96 well	5	1	
T-FP096C-01	InnoCell™ T-plate collagen-coated 96 well	5	1	
T-FP384N-01	InnoCell™ T-plate non-treated 384 well	5	1	Order by inquiry
T-FP384P-11	InnoCell™ T-plate treated 384 well	5	1	Order by inquiry
T-FP384C-01	InnoCell™ T-plate collagen-coated 384 well	5	1	Order by inquiry

InnoCell™ T-plate FW series (gas barrier film)

Please send an inquiry for the products of interest.

InnoCell™ T-plate FV series (V bottom for 3D culture)

Product No.	Product Name	Quantity	Package	Remarks
T-FV096N-01	InnoCell™ T-plate V bottom non-treated 96 well	5	1	Order by inquiry
T-FV096H-01	InnoCell™ T-plate V bottom ultra-low attachment 96 well	5	1	Order by inquiry

Important Points

• This product is for experimental and research use only. Not to be used for diagnosis, treatment, or direct use on human body.
• The culture bottom of this developed product consists of a thin film. Please be aware that damage to the bottom may occur when using a pipette tip or sharp item.
• Although thorough attention has been paid to ensure the quality of the product, please check for scratches and tears before use.
• As this product is in the development stages, Mitsui Chemicals is unable to offer assurances regarding quality, intellectual property protection, or guarantees against potential third party patent infringement claims.
• Please do not conduct any product analysis for any purpose other than research.
• This product is under development. Please note that prior notification to Mitsui Chemicals is necessary before filing any patent applications pertaining to this product.

Inquiries

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