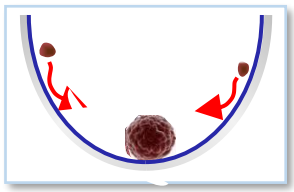
3D Cell Culture Plate

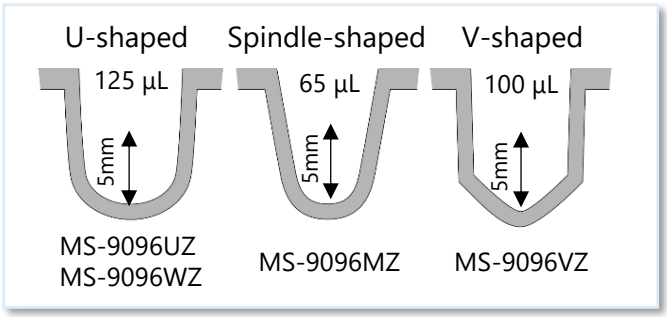
PrimeSurface™

FEATURES

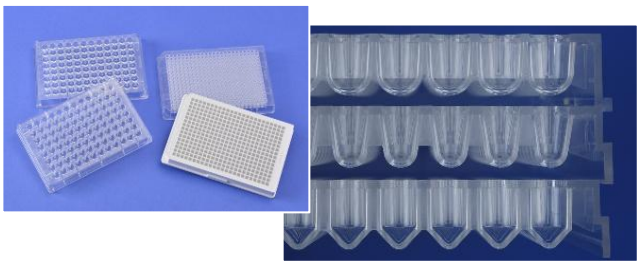
- **PrimeSurface™** cultureware are ultra low attachment (ULA) dishes and plates that promote scaffold free, self assembly of spheroid formation. The plates are pre-coated with unique ultra hydrophilic polymer that enables spontaneous spheroid formation of uniform size and shape.



- Various well bottom shapes of ULA plates provide options for optimum spheroid growth and compactness for different cell type.



- Plates are available in 96 well and 384 well formats.
- PrimeSurface™ has been used for many years in a wide range of research fields, including regenerative medicine and cancer research.



Slit-well Plate

Product number：MS-9096S

- With the introduction of PrimeSurface® 96 Slit-well Plate, media exchange for 96 well plates can be efficiently handled with one step dispensing or aspiration for all 96 wells decreasing the pipetting time by over 80% while minimizing the risk of spheroid damage.

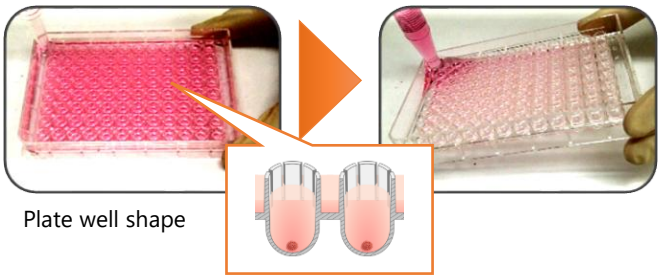


Plate well shape

	Product Number	Product Name	Well	Color	Well Shape (Culture area)	Well Volume	Package (Qty per Case)
Plate	MS-90240	PrimeSurface™ Plate24F	24	Clear	Flat(1.8cm^2)	3.4 mL	10
	MS-9096UZ	PrimeSurface™ Plate96U	96	Clear	U-Shaped	300 µL	20
	MS-9096WZ	PrimeSurface™ Plate96W	96	White	U-Shaped	300 µL	20
	MS-9096MZ	PrimeSurface™ Plate96M	96	Clear	Spindle-shaped	200 µL	20
	MS-9096VZ	PrimeSurface™ Plate96V	96	Clear	V-shaped	300 µL	20
	MS-9384U	PrimeSurface™ Plate384U	384	Clear	U-Shaped	100 µL	20
	MS-9384W	PrimeSurface™ Plate384W	384	White	U-Shaped	100 µL	20
	MS-9096S	PrimeSurface™ Plate Slit-well	96	Clear	Spindle-shaped		20
Dish	MS-90350	PrimeSurface™ Dish35	–	Clear	Flat(9cm^2)	–	20
	MS-90600	PrimeSurface™ Dish60	–	Clear	Flat(21cm^2)	–	20
	MS-90900	PrimeSurface™ Dish90	–	Clear	Flat(57cm^2)	–	20

Personalized Vascularized Models of Breast Cancer Desmoplasia Reveal Biomechanical Determinants of Drug Delivery to the Tumor

Giovanni S. Offeddu, Elena Cambria, Sarah E. Shelton, Kristina Haase, Zhengpeng Wan, Luca Possenti, Huu Tuan Nguyen, Mark R. Gillrie, Dean Hickman, Charles G. Knutson and Roger D. Kamm
Adv Sci (Weinh). 2024 Oct;11(38):e2402757. https://doi.org/10.1002/advs.202402757

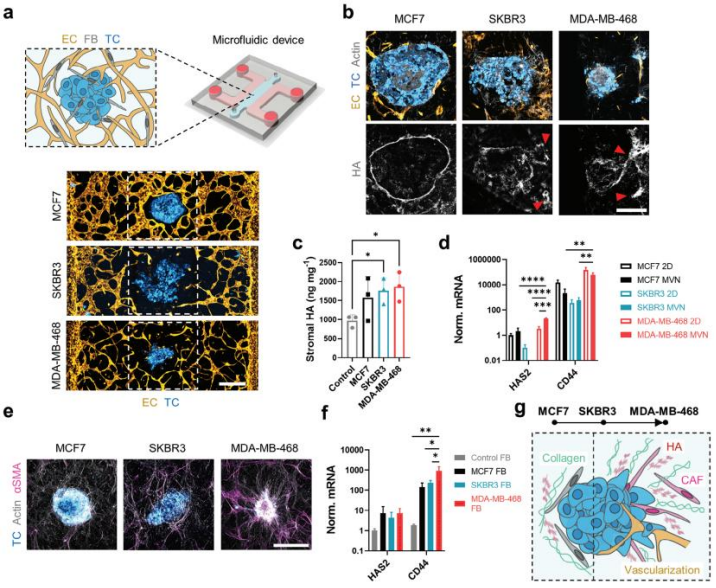
【Background】

Desmoplasia in breast cancer is characterized by aberrant extracellular matrix (ECM) and vasculature, leading to impaired drug delivery within the tumor microenvironment. It is a key challenge to identify of personalized therapeutic strategies. While patient-derived tumor models and microphysiological systems are useful for evaluating treatment responses, current models fail to fully replicate the complexity of desmoplasia. Harnessing microphysiological models to discover new therapeutic approaches and improve clinical care for breast cancer patients is essential.

【Research Achievements】

In this study, tumoroids formed in PrimeSurface™ 96M plates using breast cancer cell lines and patient-derived breast cancer cells were cultured in microphysiological systems including perfusable microvasculature reproduce key aspects of stromal and vascular dysfunction causing impaired drug delivery.

Differences were observed in stromal hyaluronic acid deposition, vascular permeability, and interstitial fluid pressure among cell lines. Interleukin 8 secretion is found responsible for vascular dysfunction and loss of vascular HA. This developed MPS model can be personalized by using patient-derived cells and can be applied to discover new molecular therapies for the normalization of the tumor microenvironment.



【Fig.1】 Tumoroids assembled from breast cancer cell lines differentially remodel their surrounding stroma

【Use of PrimeSurface™ in this study】

Establish MPS model with MVNs incorporating tumoroids:

- 4000 tumor cells and 5000 fibroblasts (FBs) were cocultured using PrimeSurface™ 96M plates to form tumoroids for over 4 days.
- Endothelial cells (ECs), FBs and tumoroids were co-injected with fibrin gel within the central channel of the microfluidic device and cultured for 7 days.
- A monolayer of ECs was seeded on the gel surfaces in the side channels on day 4
- Drug permeability evaluations were conducted using this device (MPS model)

(For details, please refer to the paper)

ASPSCR1::TFE3 orchestrates the angiogenic program of alveolar soft part sarcoma

Tanaka, M., Chuaychob, S., Homme, M., Yamazaki Y., Lyu R., Yamashita K., Ae K., Matsumoto S., Kumegawa K., Maruyama R., Qu W., Miyagi Y., Yokokawa R. and Nakamura T.
Nat Commun 14, 1957 (2023). https://doi.org/10.1038/s41467-023-37049-z

【Background】

Tumor angiogenesis is one of the most important processes in the malignant progression and distant metastasis of cancer.

Alveolar soft part sarcoma (ASPS) is a rare cancer that typically occurs in young adults and is characterized by poor prognosis. While ASPS has low invasiveness at the primary site, it has a high propensity for metastasis. ASPS is characterized by a vascular-rich alveolar structure and its highly integrated vascular network is responsible for the frequent metastases. Understanding the mechanism of angiogenesis in ASPS is further expected to lead to the development of new treatment methods.

【Research Achievements】

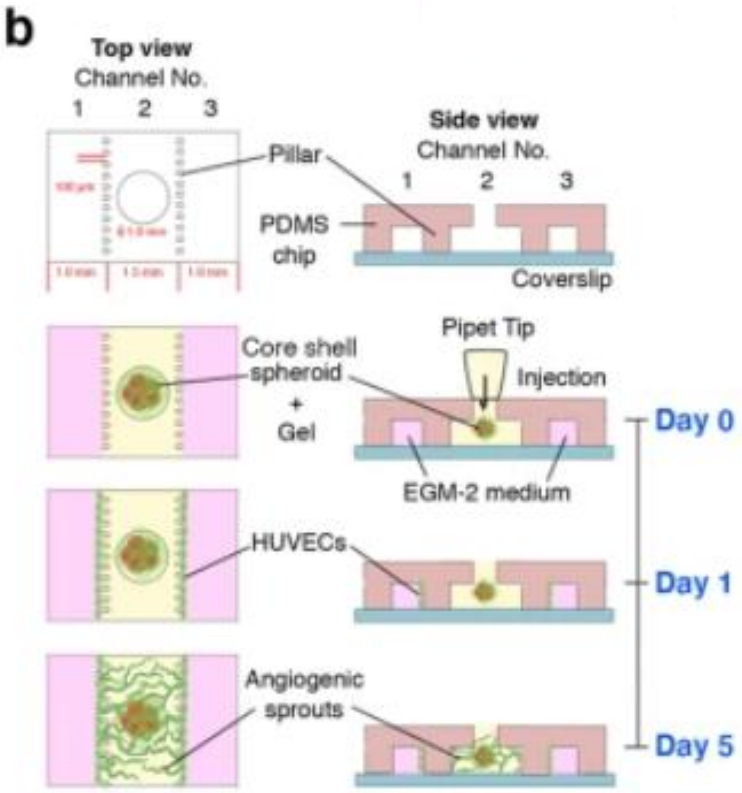
The fusion transcription factor ASPSCR1::TFE3 is necessary for tumor development in vivo. The group also created a model reflecting alveolar structure in vivo to evaluate angiogenic potential.

【Use of PrimeSurface™ in this study】

A core shell structure containing ASPS tumor cells covered with pericytes was formed using PrimeSurface and an innovative organ-on-a-chip system:

1. 5.0 × 10^4 cells/mL ASPS cells were cultured for 2 days in a PrimeSurface 96U plate.
2. 7.5 × 10^4 cells/mL Pericytes were added to the ASPS cell spheroid core for shell formation
3. The formed spheroids with a core shell structure were then introduced into a microfluidic device, as shown in the figure (Day 0).
4. HUVEC cells were seeded into the different channels (Day 1) and co-cultured with the spheroids. Vascular formation was evaluated 4 days later (Day 5).

Results: significant HUVEC sprouting toward the tumor spheroids of ASPS cells and Pericytes was observed during co-culturing.



【Fig. 6 b】
The structure of spheroid formation on the three-channel microfluidic device
(For details, please refer to the paper)

PrimeSurface™ Plate 96V application

Blood-brain barrier (BBB)

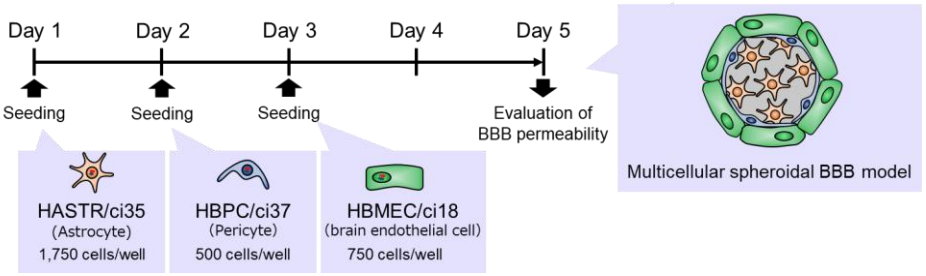
【Data Provided】
Prof. Tomomi Furihata, Ph.D., Assist. Prof. Hanae Morio, Ph.D., and Mr. Seiya Ohki, School of Pharmacy, Tokyo University of Pharmacy and Life Sciences、Tokyo, Japan

Background

The human brain is an important organ composed of numerous neurons and is protected by the blood-brain barrier (BBB), which restricts the movement of substances from the blood to the brain and prevents the entry of toxic substances. However, it also limits the delivery of drugs into the brain, posing a significant obstacle in the development of therapeutics for central nervous system disorders. There is a need to develop a functional *in vitro* BBB models model to evaluate BBB permeability for delivery mechanism for therapeutics to the brain.
Here, we introduce a new human BBB model developed by Professor Furihata's group at Tokyo University of Pharmacy and Life Sciences. This multicellular spheroidal BBB model, which is formed by using PrimeSurface™ Plate 96V, has been used to evaluate BBB permeability study and is expected to be useful in understanding the molecular mechanisms of BBB physiology and pathophysiology.

BBB model formation

The cells to form BBB spheroid were seeded on PrimeSurface™ Plate 96V as follows:



Multicellular spheroidal BBB model (self-assemble astrocytes and brain pericytes as a spheroid core covered with brain endothelial cells as an outer layer) is formed using PrimeSurface™.

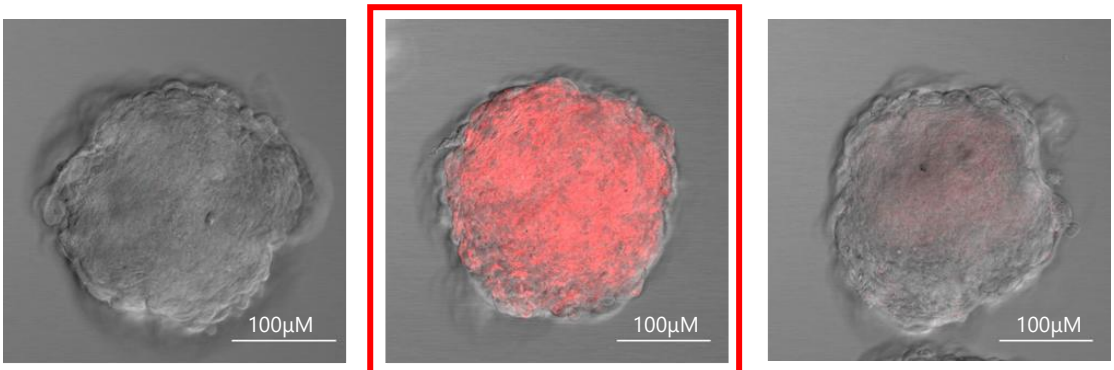
Please refer to the paper for more details:
Generation of a Human Conditionally Immortalized Cell-based Multicellular Spheroidal Blood-Brain Barrier Model for Permeability Evaluation of Macromolecules.
Isogai R, Morio H, Okamoto A, Kitamura K, Furihata T. Bio Protoc. 2022;12:e4465.

Evaluation of BBB permeability

Receptor-mediated transcytosis is a known transport pathway that involves the transport of macromolecules such as transferrin and insulin (peptide hormones and proteins) across the BBB using intracellular vesicles. In this BBB model, a novel peptide (labeled with Cy5), which is expected to be used as a brain drug delivery system, was tested for permeability in the brain.

[Methods]
1.Collect spheroids on Day 5 and wash them with HBSS (+). Add the peptide to the medium to achieve a final concentration of 1 μM.
2.Treat the spheroids at 37°C for 40 minutes and wash them with PBS (+).
3.Fix the spheroids with 4% PFA and mount them on glass slides for observation using confocal microscopy.

[Results]
Red fluorescence from Cy5 was observed inside the spheroid, confirming that the novel peptide has BBB permeability.



Brightfield image of the spheroid | Peptides with BBB permeability | Peptides without BBB permeability

PrimeSurface™ can be used to form multicellular spheroids with a structure close to BBB *in vivo*.

(ver. 2025-06)

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