CytoVu®

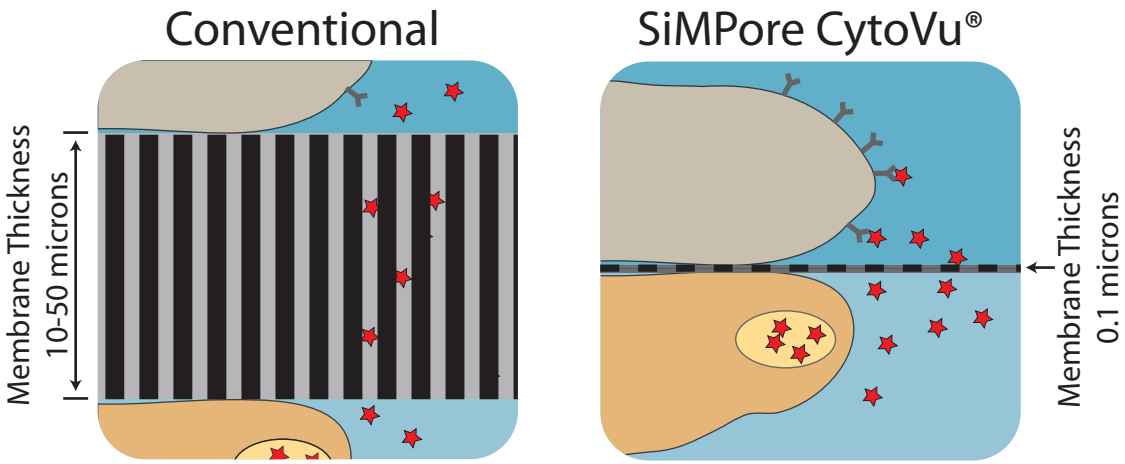
Nanotechnology comes to cell co-culture

Relevant Paracrine Communication

Nanotechnology from SiMPore has enabled a co-culture device that makes possible relevant studies in paracrine communication. CytoVu® employs an optically transparent membrane that is the thinnest and most permeable membrane ever created. Co-culturing cells on a membrane that has 50 nm pores and that is just 0.1 µm thin allows them to be in perfect communication. For the first time, researchers can study paracrine communications and the microenvironments they establish *in vitro*.

Features/Advantages

1. CytoVu® membranes are **thin** (0.1 µm), allowing you to co-culture cells at relevant distances for establishing **paracrine communication.**
2. Our membranes are **highly permeable** providing efficient diffusion of signals, drugs, and other molecules to establish a more **physiological microenvironment** *in vitro*.
3. Cell layers are physically separated to enable **imaging of distinct cell types**.
4. You can obtain high quality images directly on the culture slide at because CytoVu® membranes are **optically transparent**.
5. A unique design allows you to **co-culture, experiment, and image on the same CytoVu® slide.**
6. Varying basal well depths allows **more imaging opportunities.**

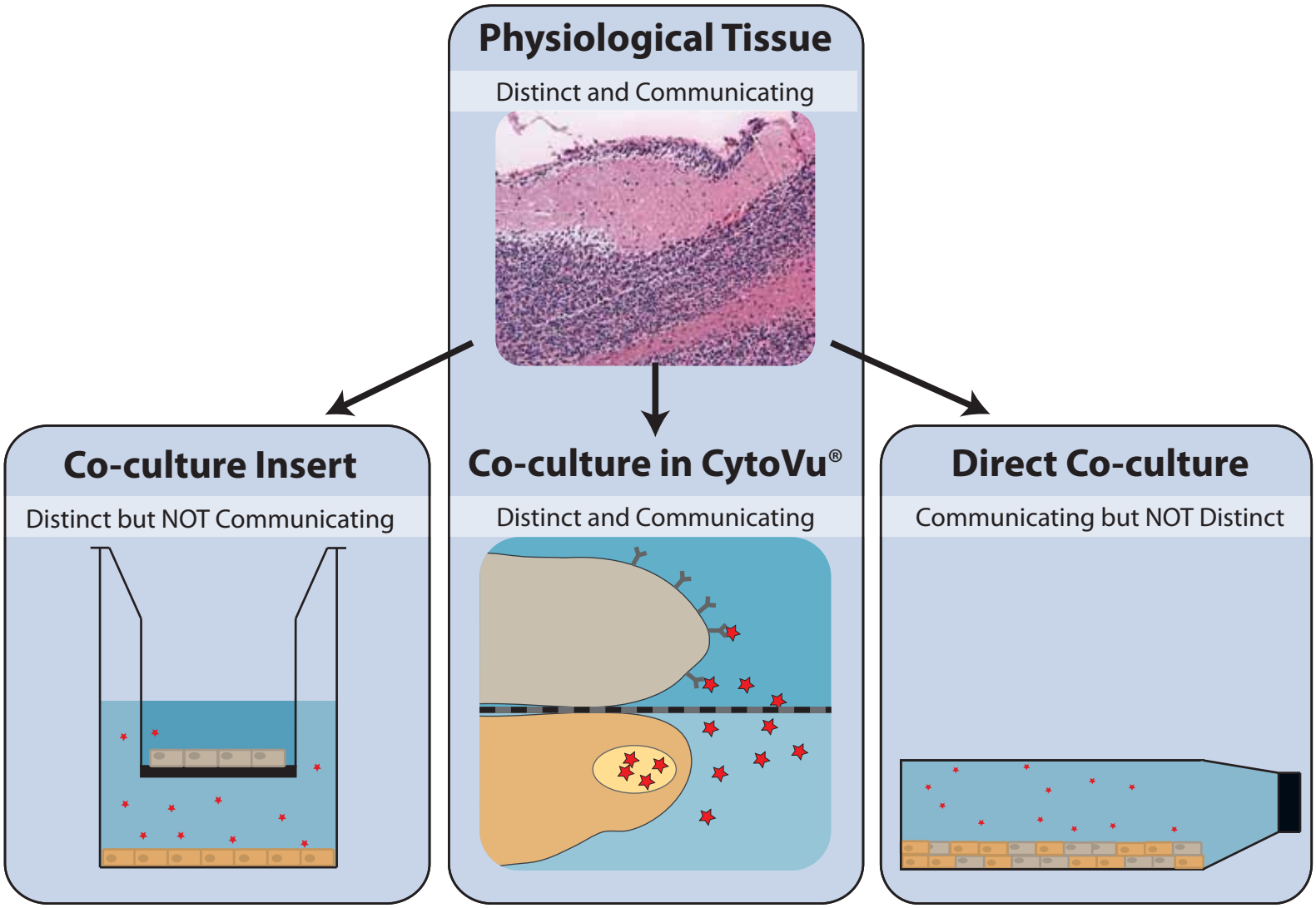


For more information and ordering details, please visit **www.SiMPoreStore.com** or call **(888) 323-NANO**.

SiMPore Inc.
Precision Separation Technologies

Physiological Tissue

CytoVu® from SiMPore allows a novel opportunity to do more physiologically relevant co-culture studies. In a physiological tissue, cell types are distinct but still communicate to form a complex microenvironment. Efficient paracrine communication between cells is essential to determine proper cellular responses.



	Distinct	Physiologically Communicating	Intercellular Distance	Relevant Model
CytoVu®	Yes	Yes	0.1 **µm**	Yes
Insert	Yes	No	1.5 **cm**	No
Direct	No	Yes	0	No

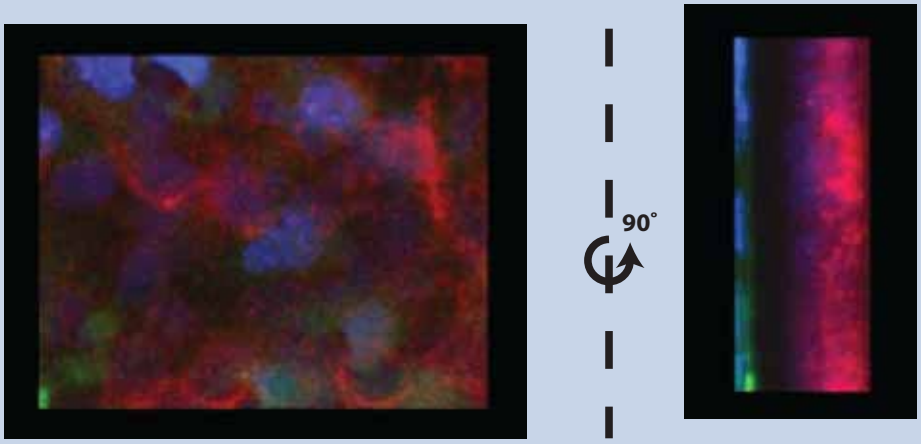
In vitro Models

CytoVu® membranes physically separate cells by only 0.1 µm while maintaining their ability to communicate through highly permeable nanopores. Previous co-culture systems separate the cells too much (~1.5 cm) or not at all, making research with true communication between the cells impossible. CytoVu® enables true paracrine interactions in a more physiologically relevant *in vitro* model.

Model Blood-Brain Barriers

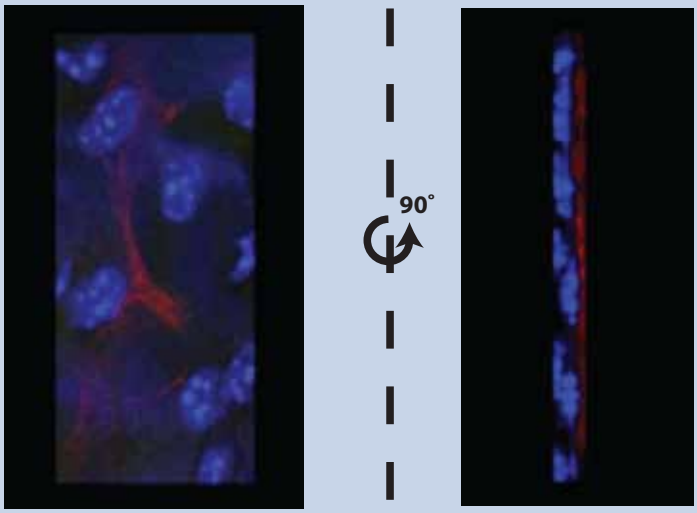
We co-cultured endothelial and glial cells to form a model blood brain barrier (BBB) on a CytoVu® membrane and a conventional insert's membrane.

Conventional Insert



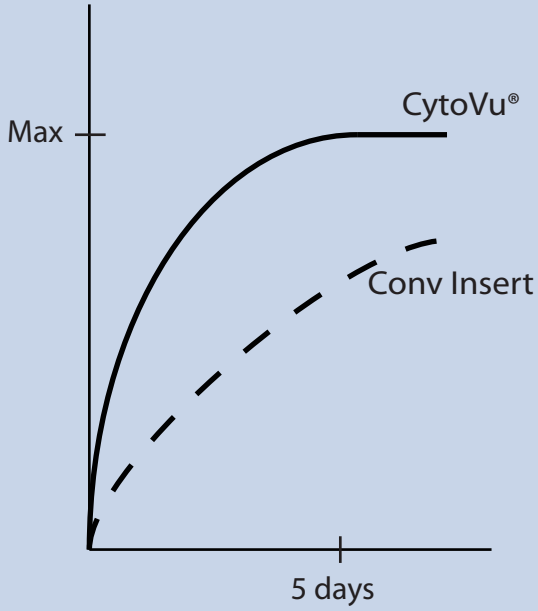
Cells were co-cultured on the top and bottom of a conventional insert's membrane by disassembling the insert. A z-stack of the fluorescent cells was taken to create a 3D image. Note the black space in between the co-cultured cells. This is the 10 µm that the insert's membrane occupies.

CytoVu®



Cells were co-cultured on the top and bottom of a CytoVu® membrane by pipetting cells into the apical and basal wells. A z-stack of the fluorescent cells was taken to create a 3D image. Note the lack of visible black space between the co-cultured cells that signifies the CytoVu™ membrane. The gap is not visible because the cells are co-cultured only 0.1 µm apart.

Transendothelial Electrical Resistance



The transendothelial electrical resistance (TEER) measures the efficiency of the co-culture system. Model blood-brain barriers co-cultured in the CytoVu® system reached the maximum TEER in 5 days. In comparison, the same cells co-cultured on a conventional insert's membrane took more than 8 days to reach the maximum TEER.

Physiological co-culture

Since the CytoVu® co-cultured cells were only separated by a 0.1 µm porous membrane, the CytoVu® BBB established a physiologically relevant transendothelial electrical resistance significantly faster than the cells co-cultured on a conventional insert. Communications are able to efficiently cross the CytoVu® membrane allowing the co-cultured cells to establish a more physiological microenvironment and react more as they would *in vivo*.

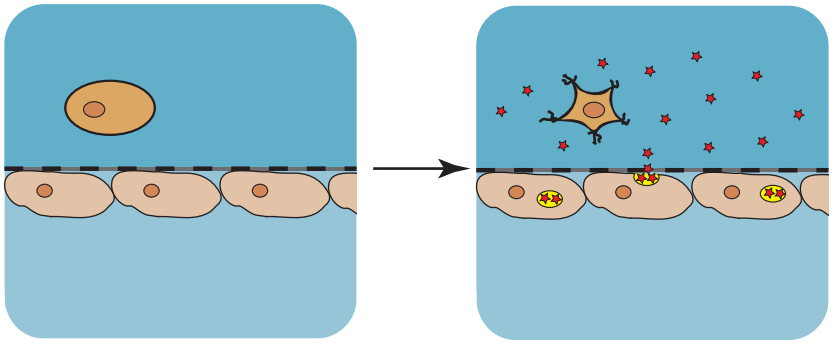
Data provided by Drs. Barrett Nehilla and James McGrath at the University of Rochester

Sample Procedure

1. Coat the membrane to improve attachment properties.
2. Seed 800 cells/µl in the apical well and allow cells to attach in the incubator.
3. Seed 800 cells/µl in the basal well, invert and allow cells to attach in the incubator.
4. Allow cells to grow to confluence while replacing media daily.
5. Add stimulant/drug/molecule of choice to apical and/or basal well.
6. Place slide on microscope and conduct live/fluorescent/confocal imaging at desired timepoint(s).

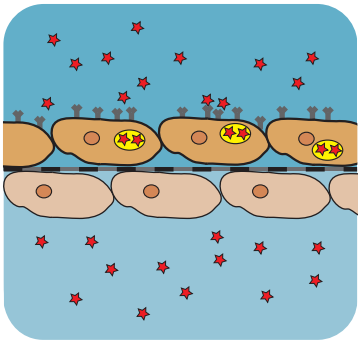
Sample Applications

Intercellular Communication:
With CytoVu® researchers can up-reregulate a secreted protein/molecule in the basally-plated cells, then study its effect on the apically-plated cells. By comparing the effect of the microenvironment between normal and up-regulated conditions, researchers can identify the effect of a specific secreted molecule.



CytoVu® users are currently investigating tumor-stroma interactions, stem cell differentiation, organization of transmembrane proteins, and factors that effect metastasis regulation.

Drug Targeting:
CytoVu® enables researchers to conduct preliminary studies on drug targeting. By co-culturing cell lines, a researcher can administer a drug and look for selective/preferential uptake by a specific cell line by analyzing phenotypic changes. CytoVu® creates a more physiological microenvironment that will better duplicate the condition *in vivo* and aid translatability of results to living models.



CytoVu® users are currently investigating selective drug toxicity of nanoparticles and drug uptake through model physiological barriers.

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Porous nanocrystalline silicon membranes as highly permeable and molecularly thin substrates for cell culture. Agrawal, A. A., Nehilla, B. J., Reisig, K. V., Gaborski, T. R., Fang, D. Z., Striemer, C. C., Fauchet, P. M. & McGrath, J. L. **Biomaterials** (2010) 31, 5408-5417.

Charge- and size-based separation of macromolecules using ultrathin silicon membranes. Striemer, C. C., Gaborski, T. R., McGrath, J. L. & Fauchet, P. M. **Nature** (2007) 445, 749-753.