CytoVu® imaging slides

Nanotechnology builds a better bidimensional barrier

CytoVu® from SiMPore is the most permeable and easiest to use bidimensional barrier device available. CytoVu® has a porous membrane that is only 0.1 µm thick. This allows molecules to diffuse more efficiently and gives researchers a more physiological model system. CytoVu® was designed with drug, migration, and mechanistic studies in mind.

CytoVu® imaging slide

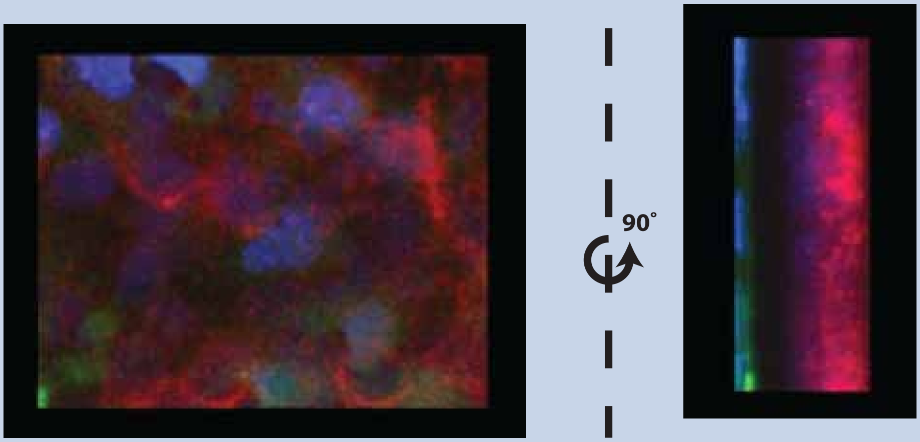
- **0.1 µm Thin**
  - Perfect intercellular communication.
  - Paracrine, autocrine, and endocrine signaling.
- **Porous**
  - Highly permeable and diffusable.
- **Microscopy Ready**
  - Live, fluorescent, and confocal compatible.
- **Small Volumes**
  - Use less reagents, dyes, and drugs.
  - Easily invertable.

SiMPore Inc.
Precision Membrane Technologies

Model Blood-Brain Barriers

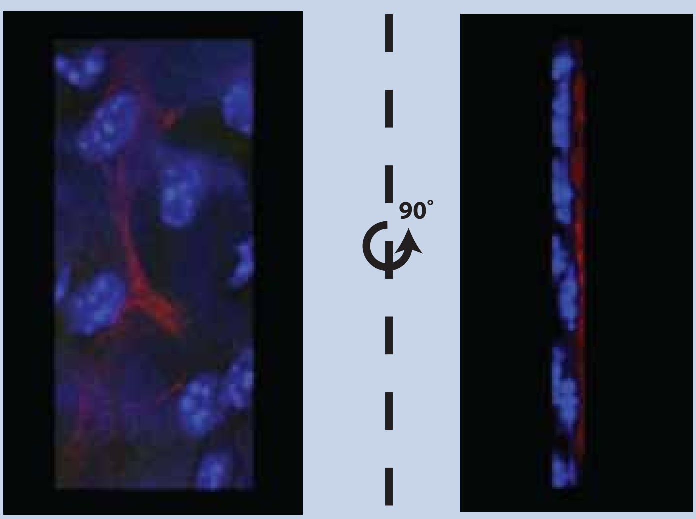
Collaborators at the University of Rochester co-cultured endothelial and glial cells to form a model blood brain barrier (BBB) on a CytoVu® membrane and a conventional insert's membrane.

Conventional Insert



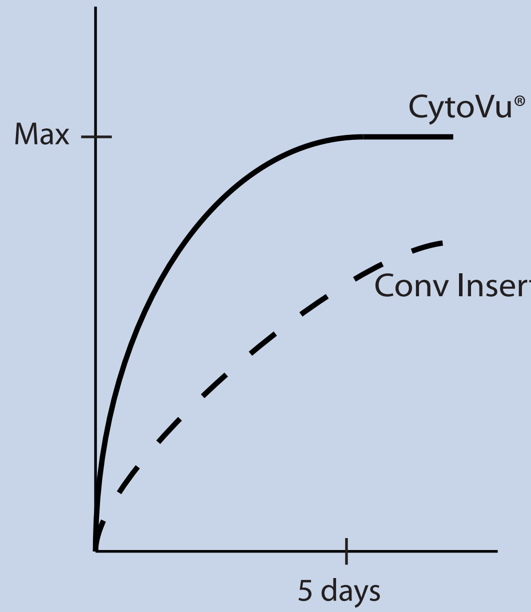
Cells were co-cultured on the top and bottom of a conventional insert's membrane by disassembling the insert. A z-stack of the fluorescent cells was taken to create a 3D image. Note the black space in between the co-cultured cells. This is the space taken up by a semi-permeable10 μm thick conventional insert.

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 represents 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 more physiologically relevant transendothelial electrical resistance significantly faster than the cells co-cultured on a conventional insert. The small distance allows both autocrine and paracrine signals 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 Barrier Procedures

These procedures are intended as a general outline and will change depending on your experimental conditions. For additional assistance, see our YouTube channel @SiMPoreInfo or give us a call.

Co-culture

1. Add media or specific ECM protein to apical and/or basal wells to coat membrane.
2. Seed 400-800 cells/μl in the apical well and allow to attach to membrane (apical) in incubator.
3. Seed 400-800 cells/μl in the basal well, **invert** and allow cells to attach to membrane (basal) in incubator.
4. Grow cells to confluence in perfect intercellular communication.
5. Replace media daily.

Drug Penetration

6. Seed reporter cells (to membrane (apical or basal) or to coverglass) and allow to attach and grow.
7. Add stimulant/drug/molecule of choice to apical and/or basal well.
8. Place CytoVu® on microscope and conduct live/fluorescent/confocal imaging at desired timepoint(s).

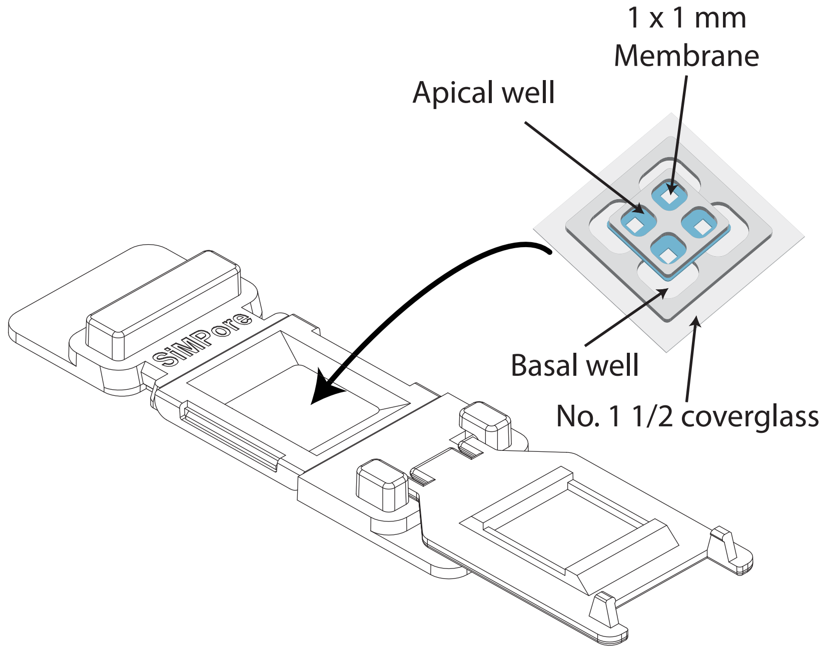
Mechanistic Studies

6. Add stimulant/drug/molecule of choice to apical and/or basal well.
7. Place CytoVu® on microscope and conduct live/fluorescent/confocal imaging at desired timepoint(s).

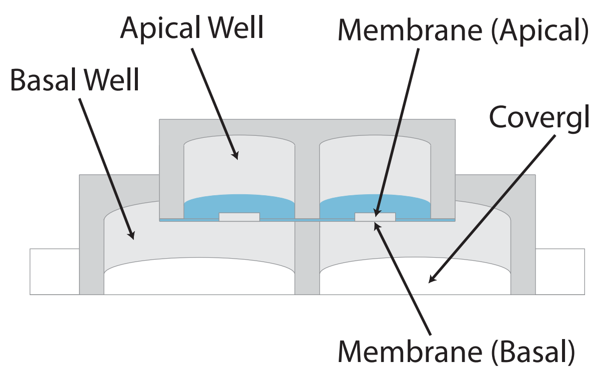
Trans-barrier Migration

6. Seed migrating cells.
7. Add stimulant/drug/chemoattractant of choice to apical and/or basal well.
8. Place CytoVu® on microscope and conduct live/fluorescent/confocal imaging at desired timepoint(s).

CytoVu® Schematic



Cross Sectional View



CytoVu™ Formats

	with NanoBarrier™	without NanoBarrier™	Degradable NanoBarrier™
Pore Size	3 or 8	3 or 8	∞
1000 μm Basal Well Depth	Available	Available	Available
300 μm Basal Well Depth	Available	Available	Available
Cell-Cell Contact	Restricted	Allowed	Full
Permeability	High	High	High
Migration	None	Possible	Possible

Specification Guide

	with NanoBarrier™		without NanoBarrier™		Degradable NanoBarrier™	
Cell-Cell Contact	Restricted		Allowed		Full	
Thickness (µm)	0.1		0.1		0.1	
Effective Pore Size (µm)	.050		3.0 or 8.0		∞	
Visible Pore Size (µm)	3.0 or 8.0		3.0 or 8.0		∞	
Active Dimensions (mm)	1.0 x 1.0		1.0 x 1.0		1.0 x 1.0	
Stability in Culture	2 weeks		4 weeks		1-3 days	
Basal Well Depth (µm)	300	1000	300	1000	300	1000
Apical Well Volume (µl)	10	10	10	10	10	10
Basal Well Volume (µl)	10	25	10	25	10	25
CytoVu® 3 Micro P/N	C300-MP3NP50	C1000-MP3NP50	C300-MP3	C1000-MP3	---	---
CytoVu® 8 Micro P/N	C300-MP8NP50	C1000-MP8NP50	C300-MP8	C1000-MP8	---	---
CytoVu® P/N					C300-NP50-D	C1000-NP50-D

For additional technical or sales information, please visit **www.SiMPoreStore.com** or call us at 585-214-0585 or toll free at 888-323-6266

Publications

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.

A structure-permeability relationship of ultrathin nanoporous silicon membrane: a comparison with the nuclear envelope. Kim, E., Xiong, H., Streimer, C. C., Fang, D. Z., Fauchet, P. M.,, McGrath, J. L., Amemiya, S., **J. Am. Chem. Soc.** (2008) 130, 4230-4231

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.

SiMPore Inc.
Precision Membrane Technologies

150 Lucius Gordon Drive, Suite 119
West Henrietta, NY 14586
Tel: 888-323-NANO
Tel: 585-214-0585
Fax: 888-249-2935
Email: info@simpore.com
Web: www.SiMPoreStore.com
Web: www.SiMPore.com

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Patent Pending