Product Manual

CytoSelect™ 8-Channel ECM Microfluidic Biochips

Catalog Number

CBA-003	2 chips
CBA-003-5	10 chips

FOR RESEARCH USE ONLY
Not for use in diagnostic procedures

Introduction

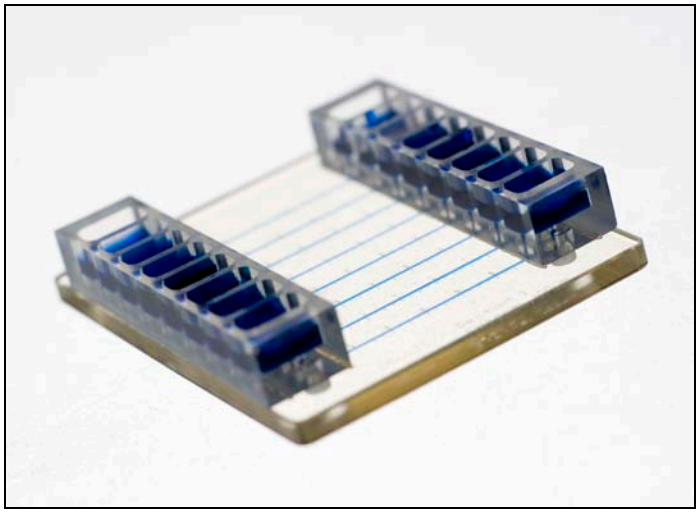
Shear stresses are continually created in the body by many physiological processes including the flow of blood through arteries and veins, the movement of saliva over teeth and mucus membranes, and even mucus movement inside the airways of the lungs. These *in vivo* shear stresses create forces that can affect the activation state of cell surface receptors. Traditional *in vitro* cell-based assays for measuring cell adhesion, cell rolling and cell migration do not take these shear stress forces into account.

CytoSelect™ Biochips provide a microfluidic environment that closely mimics *in vivo* shear stresses. CytoSelect™ Biochips are useful for measuring cell adhesion and related processes while providing more physiologically relevant data than traditional static assays. The Biochips are versatile and are available in a variety of formats for a wide variety of applications:

- Cell adhesion, rolling and migration
- Cell proliferation
- Thrombosis
- Cell-cell interactions
- Endothelial / epithelial cell monolayer culture
- Single cell / platelet analysis
- Immunostaining

Assay Principle

The CytoSelect™ 8-Channel ECM Biochip is a self-contained unit containing 8 channels with an inlet/outlet port at both ends of each channel. The channels of the 8-Channel ECM Biochip are first coated with one or more ligands, e.g. adhesion molecules such as collagen, fibrinogen, by dispensing the ligand into one of the ports. After an incubation period, the channel is washed to remove excess ligand. Then the cells to be assayed are added using a microfluidic syringe pump at a specified flow rate that mimics *in vivo* shear stresses. Cell adhesion may be visualized by brightfield or phase contrast microscopy.



Kit Components

CytoSelect™ ECM Microfluidic Biochip (Part No. 100301): Two 8-channel chips

Related Products

1. CBA-004: CytoSelect™ 8-Channel Endothelial Microfluidic Biochips
2. CBA-050: CytoSelect™ 48-Well Cell Adhesion Assay (Fibronectin-Coated, Colorimetric Format)
3. CBA-053: CytoSelect™ 48-Well Cell Adhesion Assay (Collagen I-Coated, Fluorometric Format)
4. CBA-056: CytoSelect™ 48-Well Cell Adhesion Assay (Laminin-Coated, Colorimetric Format)
5. CBA-059: CytoSelect™ 48-Well Cell Adhesion Assay (Fibrinogen-Coated, Fluorometric Format
6. CBA-060: CytoSelect™ 48-Well Cell Adhesion Assay (Collagen IV-Coated, Colorimetric Format)
7. CBA-071: CytoSelect™ 48-Well Cell Adhesion Assay (ECM Array, Fluorometric Format)

Materials Not Supplied

1. Suspension cells
2. Cell culture medium
3. Cell culture incubator (37ºC, 5% CO_2 atmosphere)
4. Humidified box
5. Single channel micropipette with disposable tips
6. Syringe pump
7. Bright field or phase contrast microscope

Storage

Store Biochips at room temperature.

Preparation of Samples

Resuspend cells in culture medium at a concentration of 2-5 x 10^6 cells/mL. Suitable samples for the CytoSelect™ 8-Channel ECM Biochip include the following:

- T-cells, primary and established cell lines (e.g. HUT 78)
- Monocytes, primary and established cell lines (e.g. THP-1)
- Eosinophils
- Neutrophils
- Platelets
- PBMCs
- Whole blood

Assay Protocol

1. Coat each channel of the Biochip by dispensing 10 µL of desired protein (e.g. collagen, fibrinogen, etc.) into the proximal port at one end of each channel. Excess liquid will collect in the ports at both ends.

2. Place the Biochip into a humidified box and seal. Incubate for 2 hours at room temperature or overnight at 4ºC.

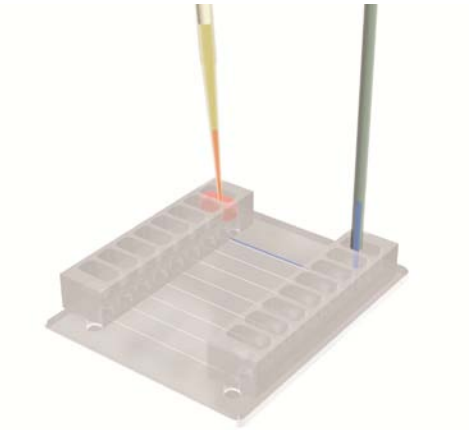
3. Add 10 µL of 0.1% BSA into each channel to ensure specificity of binding during the assay.

4. Place the Biochip back into a humidified box and seal. Incubate for 30 min at room temperature.

5. Set up a syringe pump to dispense culture media. Dispense a small amount of media (1-2 µL) from the connector cable into a waste container, and then insert the connector cable into the proximal port of the Biochip.

6. Dispense 40 µL of media at a shear stress of 40 dynes/cm^2, a shear rate of 4000 s^{-1}, or a flow rate of 160 µL/min. This washes the Biochip of excess ligand and BSA. Repeat for each channel.
7. Aspirate media collected in the port at the opposite end of each channel.

8. Using a standard micropipette, add 10 µL to 100 µL of cell suspension to the opposite port of each channel.



9. With the connector cable of the syringe pump in the proximal port, apply the desired shear stress, shear rate, or flow rate to the channel. Cells will move from the opposite port through the channel. Suggested ranges for pump settings may be found in Table 1.

Sample Type	Shear Stress Range (dynes/cm^2)	Shear Rate Range (s^{-1})	Flow Rate Range (µL/min)
Cell Suspensions	0.05 – 10	5 – 1000	0.2 – 40
Whole Blood	2.25 – 450	50 – 10,000	2 – 400

Table 1. Recommended Shear Stress, Shear Rate or Flow Rate to Mimic *In Vivo* Forces.

10. Using brightfield, phase contrast, fluorescence or confocal microscopy, acquire 3 to 5 images along the length of each channel using a magnification of 60X to 100X.

Example of Results

The following figures demonstrate typical results with the CytoSelect™ 8-Channel Biochip. One should use the data below for reference only. This data should not be used to interpret actual results.

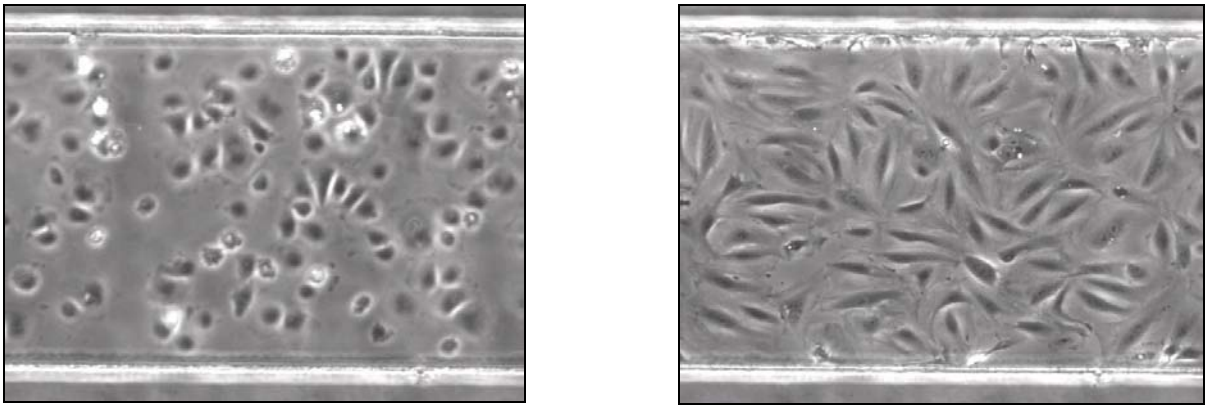


Figure 1. Human Endothelial Cell Adhesion. Left: Cells under static conditions. **Right**: Cells under flow conditions at a shear stress of 10 dyne/cm^2.

Warranty

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