Overview

MIMETAS develops Organ-on-a-Chip-based models for evaluation of new medicines. Our unique microfluidic technology enables testing of compounds on miniaturized 3D organ models in high-throughput. These models will show better predictivity as compared to laboratory animals and conventional 2D cell culture models, without compromising throughput or ease of use.

The OrganoPlate™

- Easy to operate
- 96 tissues per plate
- Flexible tissue and experiment design
- Standard microtiterplate footprint
- Stand alone, pump-free perfusion
- Phaseguide-based tissue patterning
- 3D cell culture embedded in ECM

High-throughput culture of epithelial boundary tissues

In OrganoPlates™, extracellular matrix (ECM) gels can be freely patterned in microchambers by the use of PhaseGuide™ technology. PhaseGuides™ (capillary pressure barriers) define lanes within microchambers that can be used for extracellular matrix deposition or medium perfusion.

In a two-lane layout, an epithelial boundary is grown against an ECM gel. Following stable attachment of the cells on the ECM gel, perfusion is started. First, cells typically form a confluent monolayer, followed by formation of a tube-like structure in the perfusion channel. This offers unique experimental culture options, including sampling and compound exposure from the apical side, and real time imaging of epithelial transport and leakage.

Primary Human Renal Proximal Tubule Cells in OrganoPlate™

Primary Human Kidney Proximal Tubule Cells (hRPTC, BioreclamationIVT, M03805) were seeded against a collagen I ECM to develop into a tube structure covering the perfusion channel and the ECM.

The hRPTC tubes stained positive for tight junctions (ZO-1). Cilia could be visualized by staining for acetylated tubulin (anti-acetylated tubulin).

Leakage of FITC-Dextran across the barrier was analyzed by time-lapse fluorescent microscopy. No barrier was observed in chips without cells as the dye diffused homogeneously into the gel. By contrast, hRPTCs tubules cultured in OrganoPlates™ strongly reduced FITC-Dextran diffusion into the ECM as a result of a partially leak tight epithelial barrier.

Conclusions

- hRPTC cells express typical polarization markers for epithelial cells
- hRPTC tubes form partially leak tight boundaries in OrganoPlates™
- Leakage test can be used for cytotoxicity and transport assays