APPLICATION NOTE

A1R HD25 Confocal Microscope

Capturing the physiological complexity of human tissues *in vitro* with organ-on-a-chip

3D cell cultures enable the recreation of physiological compositions and spatial arrangements of cells *in vitro* more accurately than 2D cell cultures. This application note shows that we have developed a 3D tissue culture model using OrganoPlate®(MIMETAS) and Nikon's A1R HD25 confocal microscope system.

3D cell cultures enable the recreation of physiologically relevant conditions *in vitro*

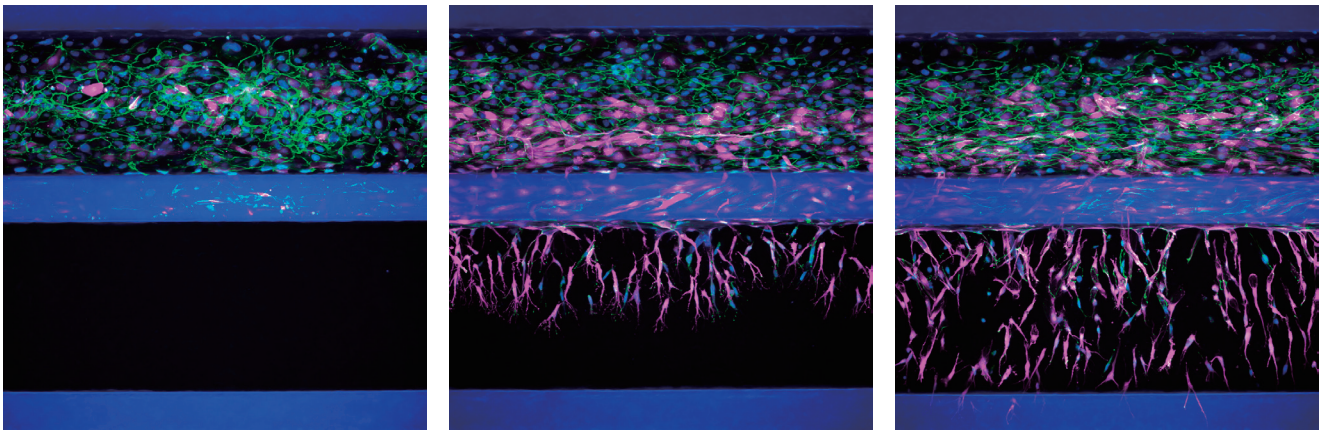
A common challenge in any drug development process is finding sufficiently accurate models that capture key aspects of disease development and progression. Conventional drug screening models often rely on simple 2D culture systems that fail to recapitulate the complexity of the organ's situation. 3D cell cultures represent yet another step towards recapitulating the complexity of human tissues, and focus on mimicking normal cell-matrix and cell-cell interactions. Along with microfluidic or organ-on-a-chip systems, 3D cell cultures offer researchers an unparalleled ability to recreate physiological compositions and spatial arrangements of cells *in vitro*.

3D angiogenesis model development using OrganoPlate®

The OrganoPlate® 3D tissue culture platform is capable of capturing the physiological complexity of human tissues *in vitro* to study relevant 3D tissue biology by incorporating perfused tubules, co-cultures, and full control over the tissue microenvironment.

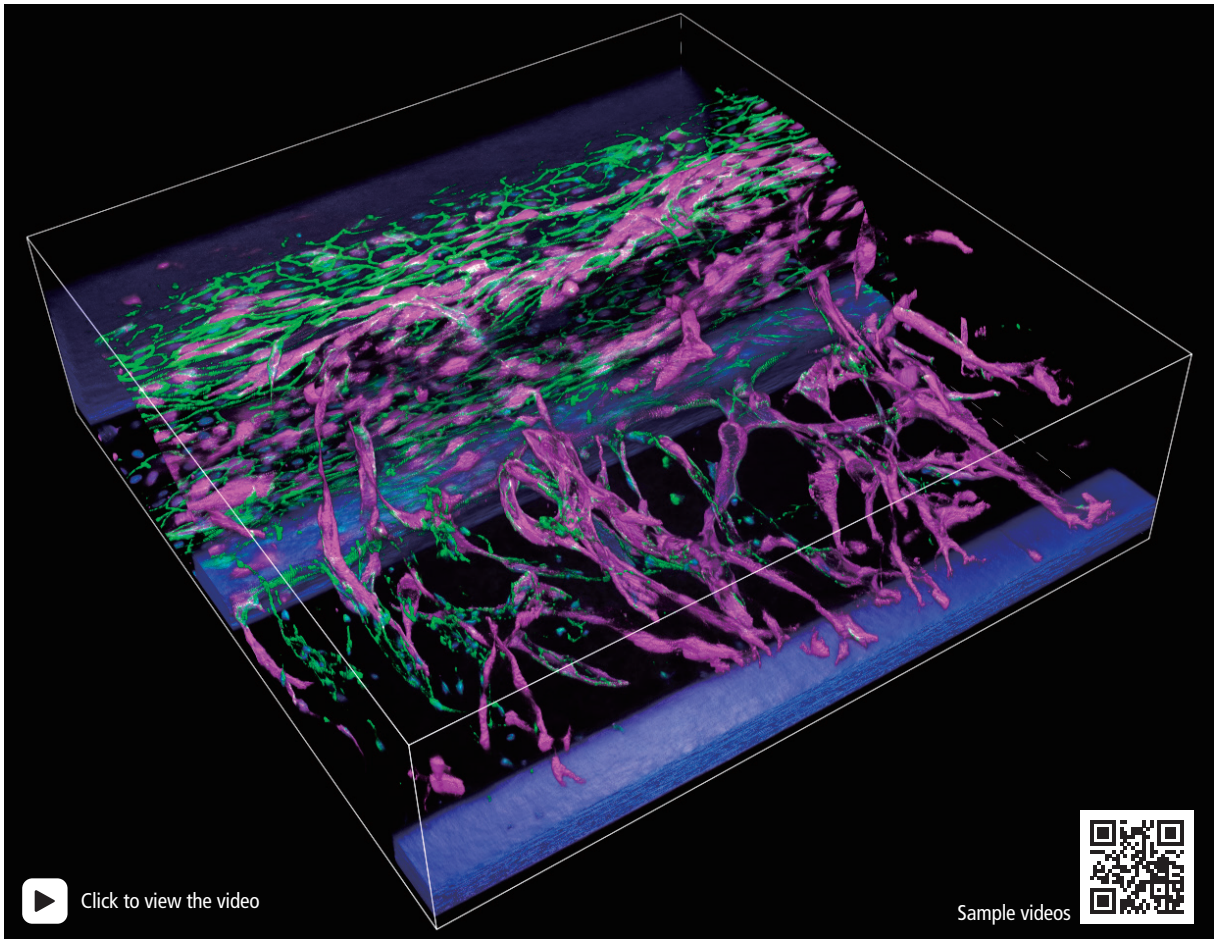
Here, we describe how we have developed a 3D angiogenesis model (*in vitro* perfused angiogenesis model).

Not only could we obtain immunohistochemistry images of our developed 3D tissue models, but we could also observe the sprouting behavior over time.



Day 0 Day 2 Day 4

Figure 1. Observation of angiogenesis model over time (maximum intensity projection images for Z stack images)
Sample condition: Human umbilical vein endothelial cells (HUVECs) stained with adherence junction marker VE-cadherin (green), ActinRed (magenta), DAPI (blue)
(Day 0, Day 2, Day 4 from the induction of angiogenesis)
Microscopy: ECLIPSE Ti2 + A1R HD25
Objective lens: CFI apochromat LWD Lambda S 20XC WI (NA: 0.95 WD: 0.95mm)
Water immersion dispenser
Acquisition of Z stack images for 3 colors (408 / 450, 489 / 525, 561 / 595) using resonant scanner (pitch: 2 µm, range: 250 µm)



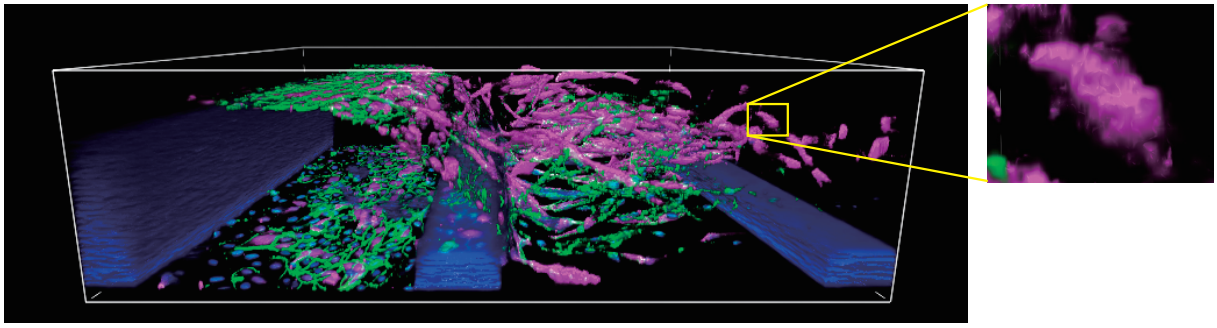


Figure 2. 3D images of angiogenesis model

Sample condition: Human umbilical vein endothelial cells (HUVECs) stained with adherence junction marker VE-cadherin (green), ActinRed (magenta), DAPI (blue)
(Day 4 from the induction of angiogenesis)
Microscopy: ECLIPSE Ti2 + A1R HD25
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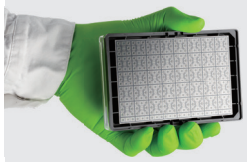
3D cell culture platform

OrganoPlate® 3-lane 40

(Product no. 4004-400-B :MIMETAS)

The OrganoPlate® 3-lane 40 features 40 independent culture chips. Each chip contains one in-gel culture channel and two perfusion channels, supporting one or multiple in-gel or tubular cultures. With direct access to apical and basolateral sides of the tubules, the platform enables barrier integrity and transport assays.



Inquiries about products: MIMETAS

Product Information

A1 HD25 Confocal Microscope

A high-speed, high-resolution, large field of view resonant scanner that allows imaging with less phototoxicity and minimal photobleaching.

- High resolution: up to 1K at (1024x1024 pixels)
- High throughput with a large 25 mm field-of-view