

Instrumentation in 3D biology

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eastport.cz



2D Pre-culture



Development of 3D Cultures



3D Culture



Monitoring Growth & Development



Analysis



1

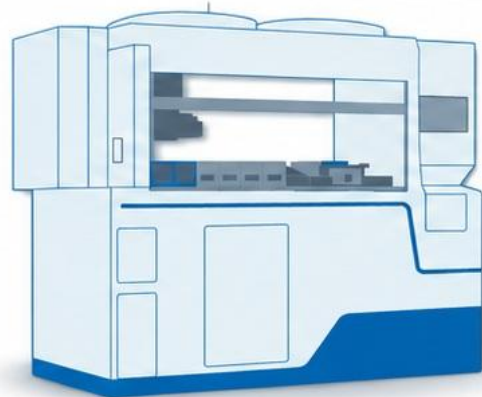
2

3

4

5

Incubation
Liquid Handling
Imaging

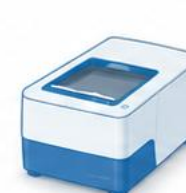


CellXpress.ai

Seeding
Feeding
Monitoring
Passaging

Imaging Analysis

Functional Analysis



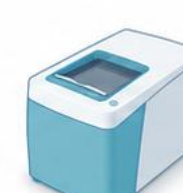
ImageXpress
Pico



ImageXpress
HCS.ai



OMNI



Maestro Z



Maestro Pro



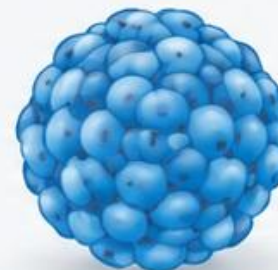
2D Pre-culture



Development of 3D Cultures



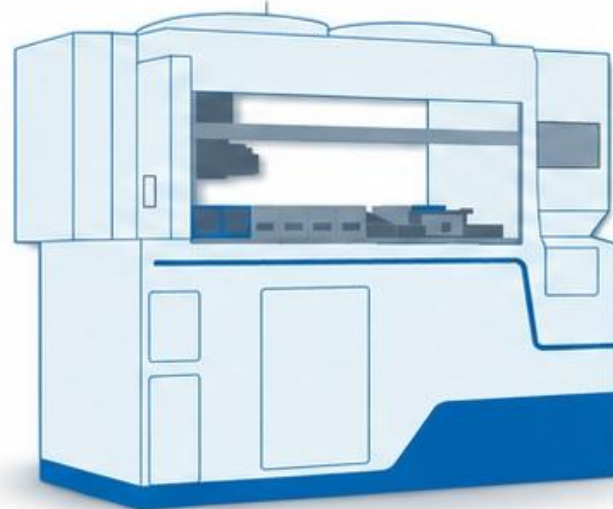
3D Culture



1

Incubation
Liquid Handling
Imaging

2



CellXpress.ai

3

Seeding
Feeding
Monitoring
Passaging

Liquid Handler

- Feeding, Seeding, Passaging
- HEPA filtration / UV lamp
- Media Storage:
 - 8 x 370mL media troughs

Large Volume Media Storage

- 2 x 2L vessels
- 4° storage with in-line heating

Access Ports

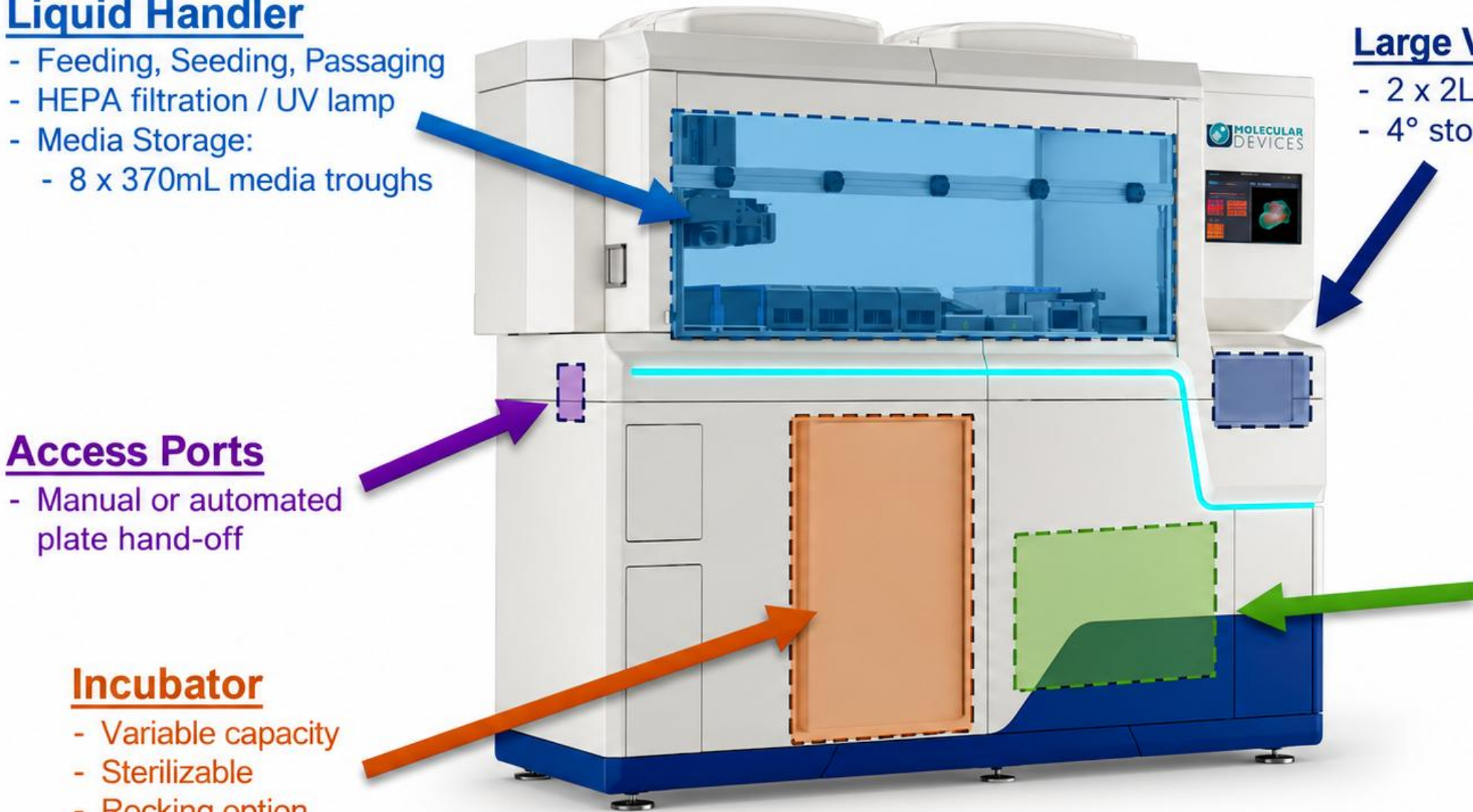
- Manual or automated plate hand-off

Incubator

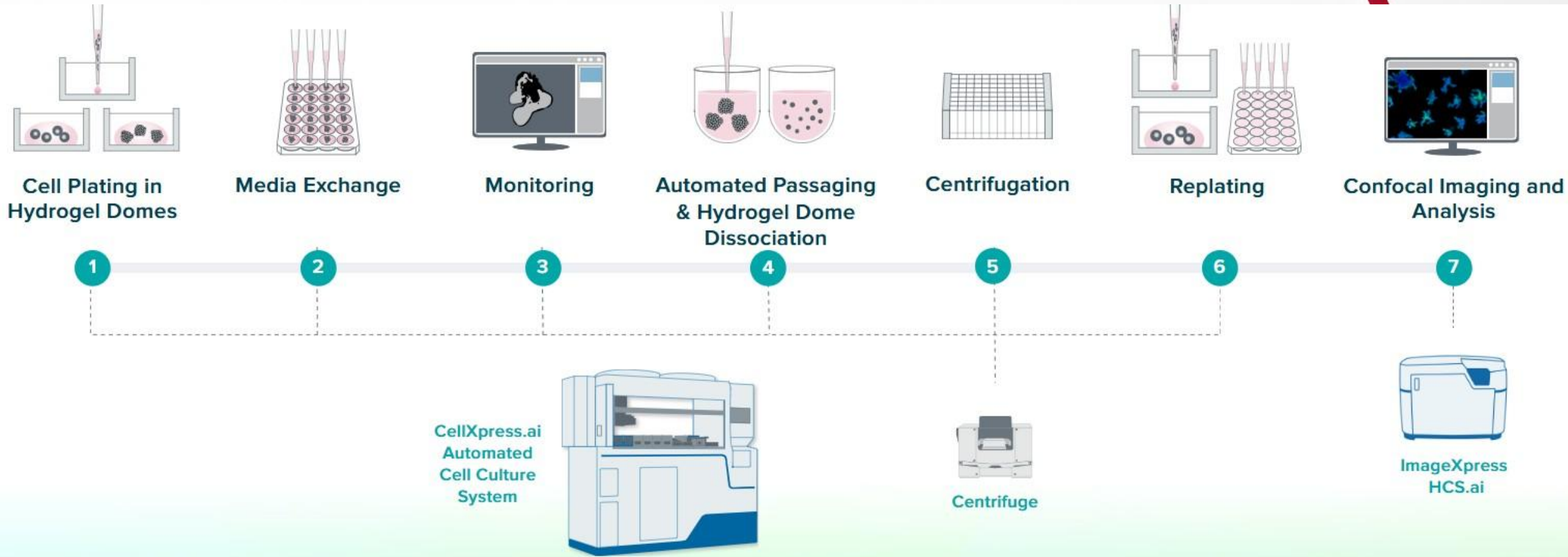
- Variable capacity
- Sterilizable
- Rocking option

Imager - Monitor

- 2x - 40x objectives
- Brightfield
- 6 Fluorescent channels



One software controls everything.
Optimized for 2D and 3D cell handling



Intestinal Organoid Workflow

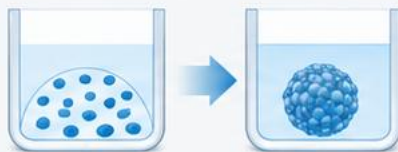


2D Pre-culture



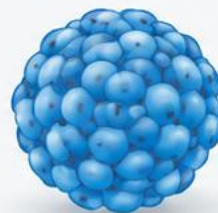
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Development of 3D Cultures



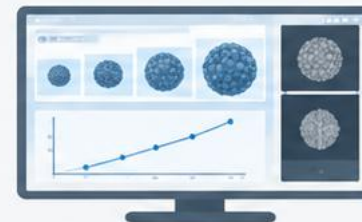
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3D Culture



3

Monitoring Growth & Development



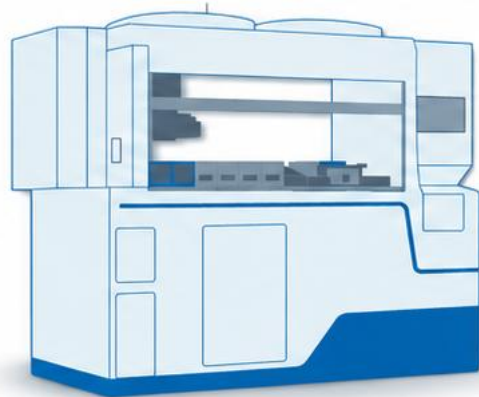
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Functional Analysis





Imaging Analysis



**ImageXpress
Pico**



**ImageXpress
HCS.ai**



OMNI



OMNI Live-Cell Imaging Microscope

- ✕ Live-cell imaging microscope with brightfield and optional fluorescence
- ✕ Scans the entire culture vessel (plates, Petri dishes, flasks)
- ✕ Two fluorescent channels for red and green fluorescence
- ✕ Analysis, pictures, videos through cloud upload
- ✕ Several types of image analysis algorithms
 - ✕ Wound healing
 - ✕ Confluency
 - ✕ Clonogenic module
 - ✕ **iPSC module**
 - ✕ **Organoid module**
 - ✕ Fluorescence module

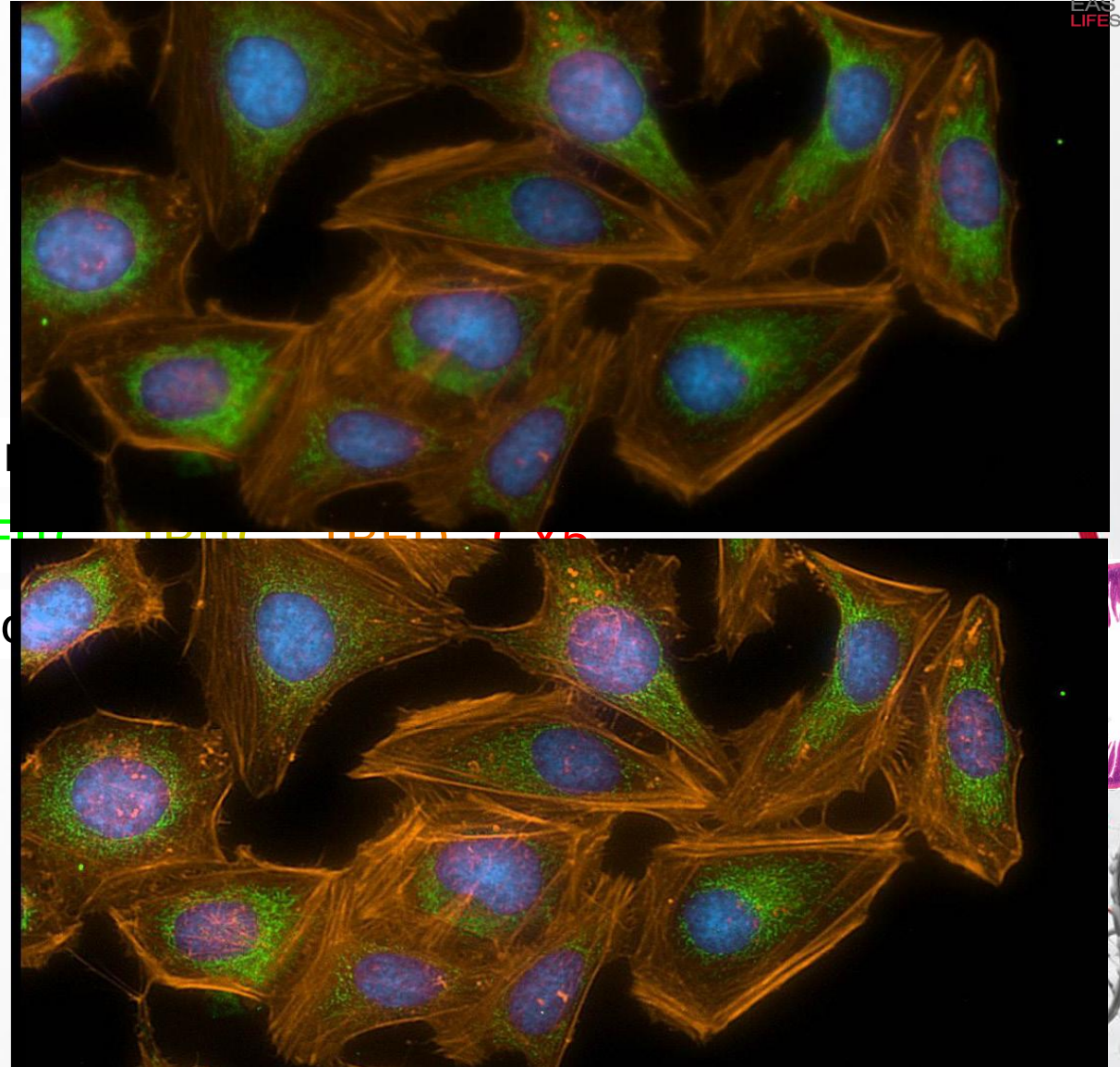


ImageXpress Pico, benchtop, but high-throughput



- ✂ Microtiter plates slides, petri dishes
- ✂ 4 objectives: 4x - 10x - 20x - 40x / 63x
- ✂ Z-stack acquisition with maximal projection
- ✂ 6 fluorescence wavelengths: DAPI - CFP - FITC - TRITC - PE - APC
- ✂ Brightfield (for label free) and colorimetric (for colorimetric)
- ✂ Live Preview mode and ROI selection
- ✂ Hardware and Image-based Autofocus
- ✂ Built-in CO₂, O₂, and humidity control

Digital Confocal – 2D on-the-fly deconvolution



ImageXpress HCS.ai



ImageXpress HCS.ai
WIDEFIELD

ImageXpress HCS.ai
CONFOCAL

ImageXpress HCS.ai
ADVANCED



Widefield capability



2X–60X high NA and 20X–60X ELWD objective options plus a magnification changer option (1X and 1.5X)



LED illumination, 5 color LED
(up to 220 mW per channel)

Laser illumination, 7 color laser
(up to 800 mW per channel)



DAPI, FITC, TRITC, TxRed, Cy5 (+ CFP, YFP as optional)

DAPI, CFP, FITC, YFP, TRITC,
TxRed, Cy5, Cy7



Standard spinning disk confocal
60 μ m pinhole (single), 60 μ m pinhole + 50 μ m slit (dual)



Deep tissue spinning disk
50 μ m pinhole high resolution and
high-sensitivity disk (dual)



Water immersion option (20X–60X)



Environmental control option (temperature, humidity, CO₂, O₂)



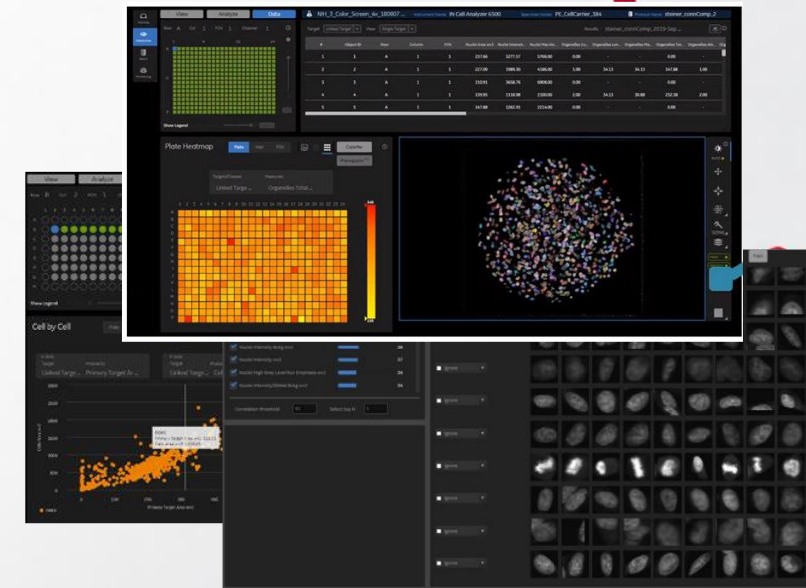
Upgradable modular design

ImageXpress HCS.ai

High Content Imaging System

New MetaXpress Acquire Intelligent Acquisition

IN Carta Ai-powered
Image Analysis



SINAP – segmentation

Phenoglyphs – phenotyping of cells



Imaging analysis of 3D cell lines

Sh

Count Spheroid

But I h

Z-stack

Colorectal Cancer Patient Derived Organoids (PDO)

Zebrafish

heroid?

nge?

HCT116 spheroid
(cleared)

spheroid + IN Carta 3D
viewer

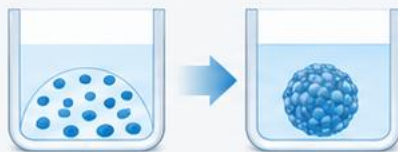
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Cell Total Intensity	5.8293e+05
Total Area	18999

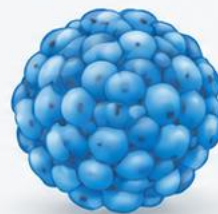
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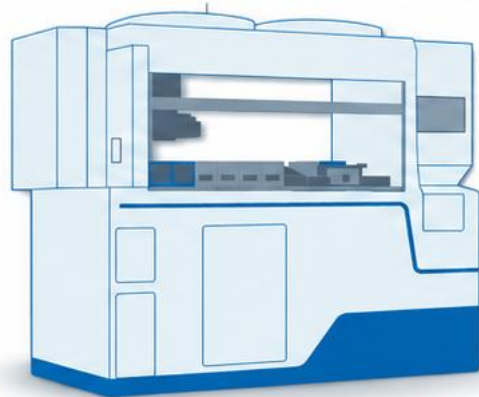
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Maestro Z



Maestro Pro





Functional Analysis



Maestro Z



Maestro Pro

Maestro electrophysiology instruments



- ❌ Impedance-based measurement
- ❌ Label-free; real-time dynamic changes
- ❌ CO₂, O₂ and temperature control
- ❌ Morphology, cell adhesion, cell spreading, cell shape, cell-cell interactions
- ❌ Tumor spheroids
- ❌ Glioblastoma organoids
- ❌ Intestinal and other epithelial organoids

- ❌ MEA-technology
- ❌ Label-free; real-time dynamic changes
- ❌ CO₂, O₂ and temperature control
- ❌ Neuronal and Cardiomyocytes parameters
- ❌ Brain organoids
- ❌ Cardiac spheroids
- ❌ iPSCs



Maestro Edge – Detecting Electrical activity in 3D

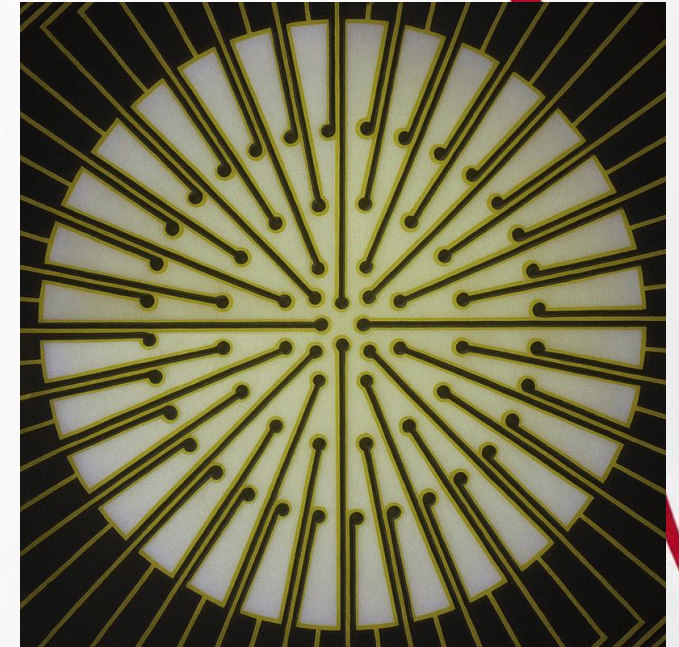


SpheroGuide

- ✂ Integrated placement funnel
- ✂ 48-well format - 16 electrodes per well
- ✂ Transparent bottom

SpheroHD

- ✂ Single well for 4 individual organoids
- ✂ 16 electrodes for each organoid



3DMap

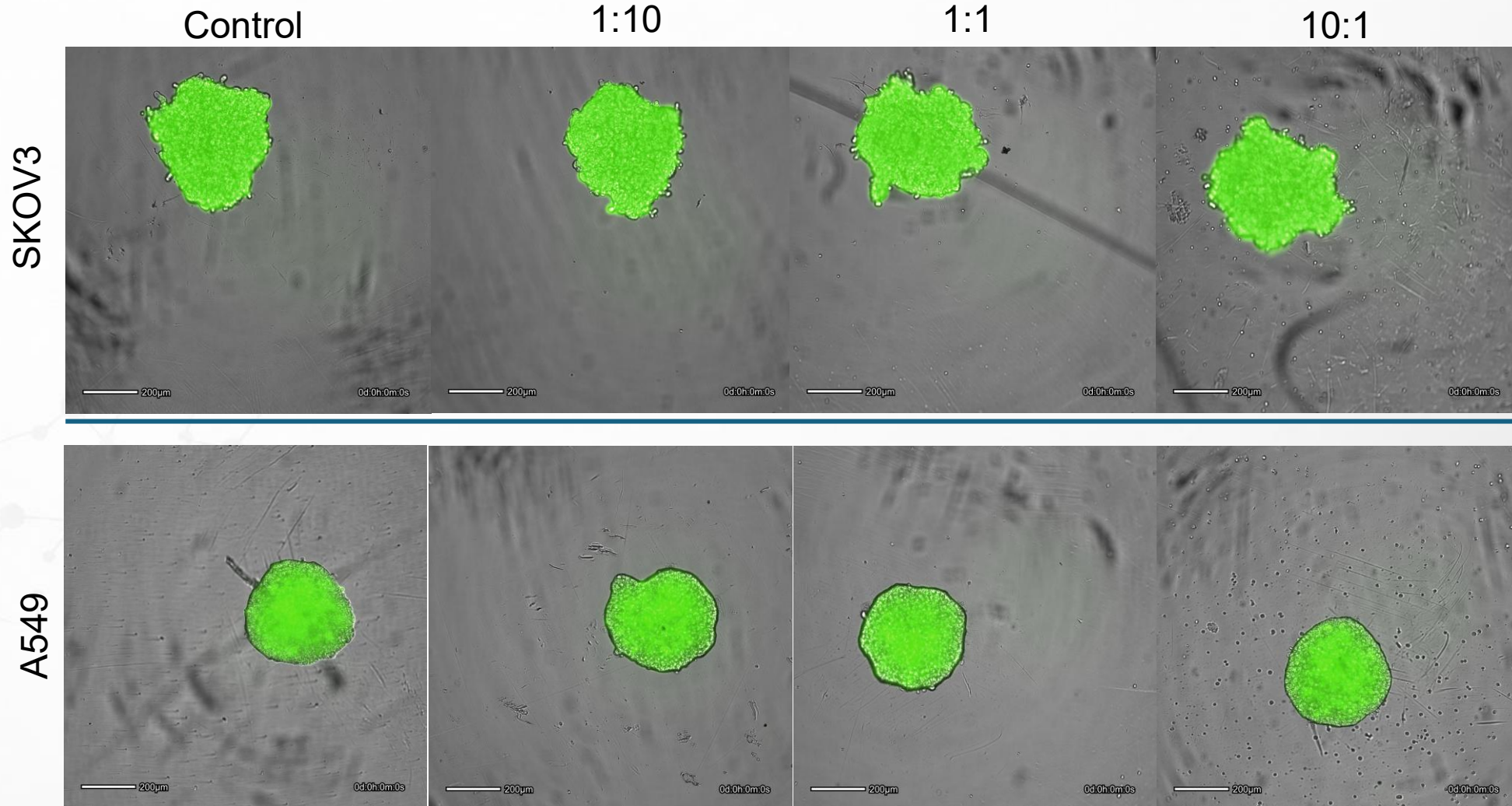
- ✂ Single-organoid placement
- ✂ Flexible electrode design to detect electrical activity from bigger surface area of neural organoids

Thank you for your attention



OMNI Live-Cell Imaging Microscope

- ✂ Killing of SKOV3 and A549 spheroids by HER2 CAR T-cells
- ✂ SKOV3 spheroids are killed at lower E:T ratios compared to A549 cells due to higher HER2 levels



Example 3D Applications

Organoid (PDO)

Zebrafish

Organoid (PDO)

spheroid + IN Carta 3D
viewer

