Biopixlar®

3D SINGLE-CELL BIOPRINTING

fluicell®

Create tissues at will
with single-cell precision

Biopixlar is a completely new type of bioprinter with the unique capability to position cells in three dimensions with high resolution and precision.

Based on innovative Fluicell technology, Biopixlar is capable of generating detailed, multi-cellular biological tissues, directly in native cell culture media.

Using a microfluidic printhead, Biopixlar is designed for handling scarce and valuable cell sources such as stem cells and primary cells.

Biopixlar is all-in-one discovery platform that will help researchers around the globe to build novel tissue models for drug development, disease understanding and regenerative medicine research.

Single-cell resolution

High precision and reproducibility

Multi-cellular models

>95 % cell viability

AN ALL-IN-ONE DISCOVERY PLATFORM...

Bioprinter

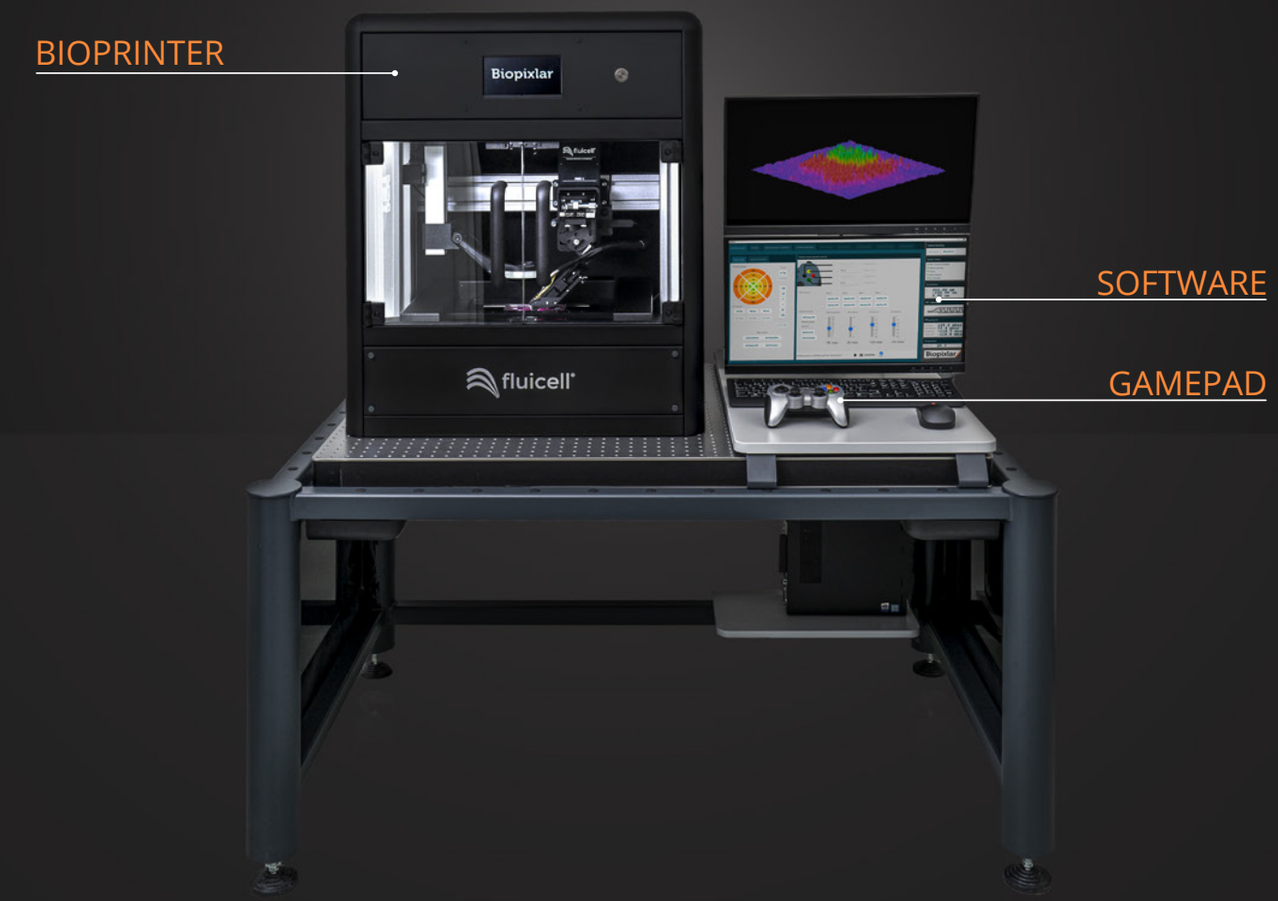
Biopixlar is capable of printing multiple different cell types in one run with high precision and resolution. The bioprinter includes a micromanipulator arm and a motorized stage that let you precisely position the printhead and sample. The onboard multi-color fluorescence imaging setup allows real-time monitoring of your printing process and post-print analysis.

Software

The cross-platform Biopixlar software enables easy configuration of the bioprinting process. Through the software, you can control positioning of the printhead, cell type selection as well as the printing rate, fluorescence configuration and heating. A graphical user interface is included for design of 2D structures.

Gamepad

The gamepad interface brings an entirely new way to experience bioprinting by putting full control of the process in the palm of your hand. With the gamepad, you have the ability to position the printhead and deposit cells with the press of a button.



...EMBEDDED WITH USER-FRIENDLY FEATURES

TOP LIGHTING

LED LIGHT

DISH HOLDER

MICROSCOPE

MICROMANIPULATOR ARM

PRINTHEAD HOLDER

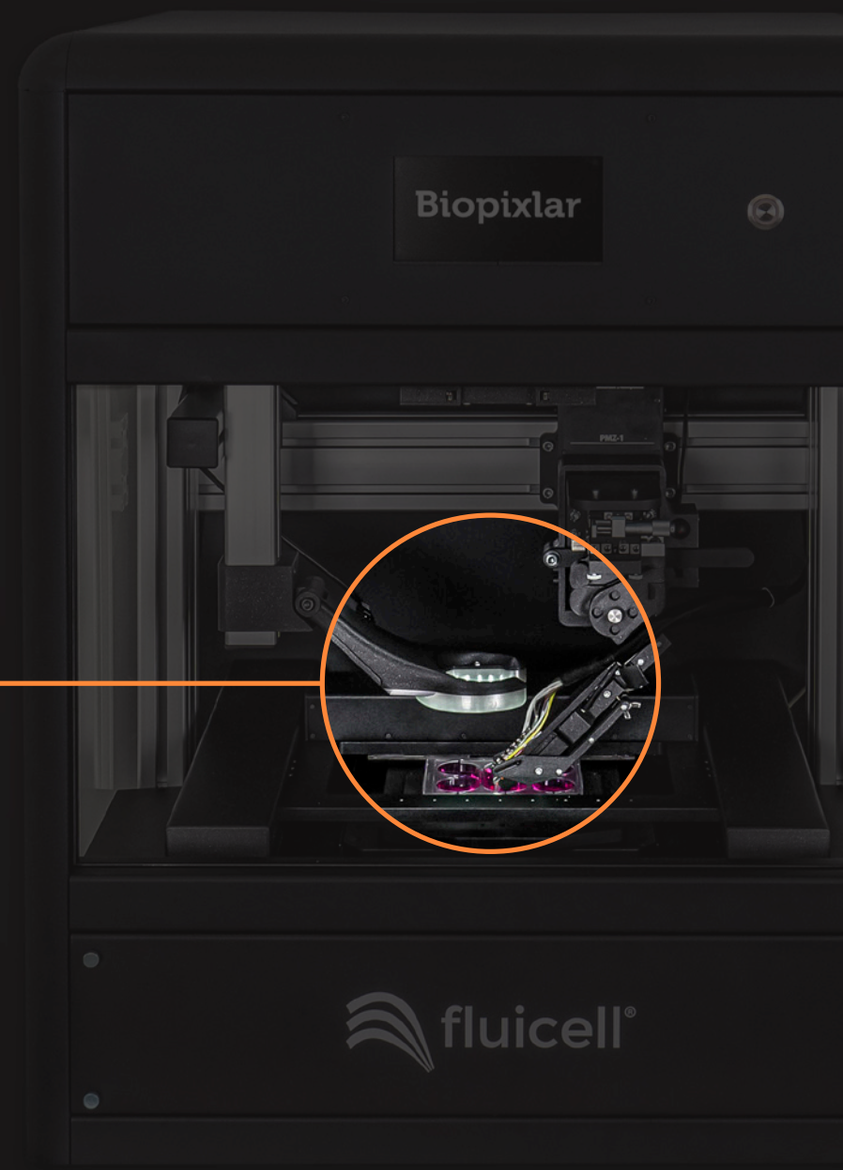
STAGE

OBJECTIVE

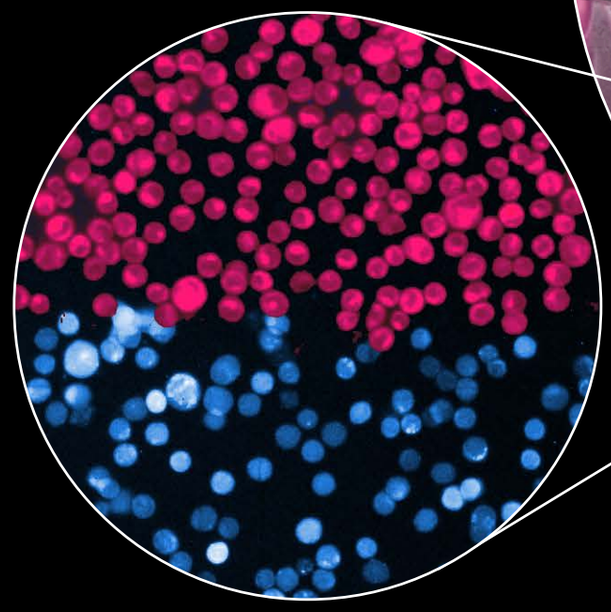
TAKE A CLOSER LOOK

The printhead, based on innovative Fluicell microfluidic technology, is capable of printing several different cell types.

MICROFLUIDIC PRINTHEAD



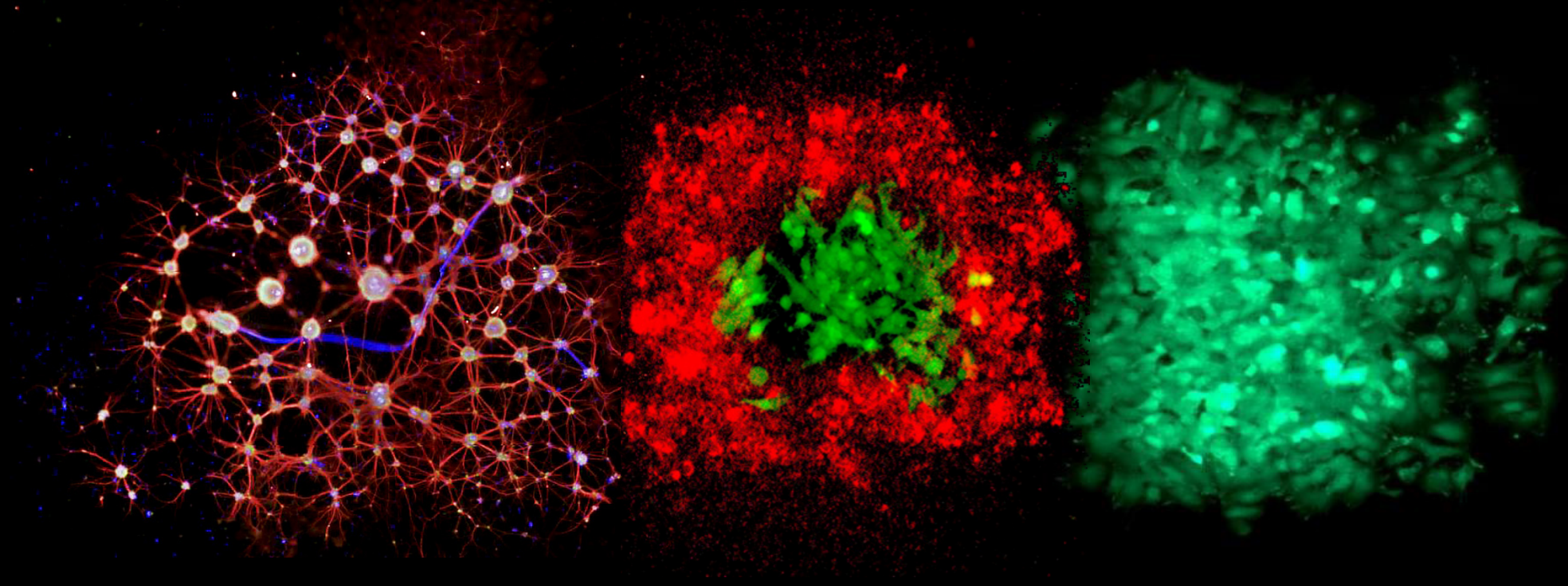
High precision



High resolution

CREATE MULTICELLULAR TISSUES

Tailored for therapeutics and drug development



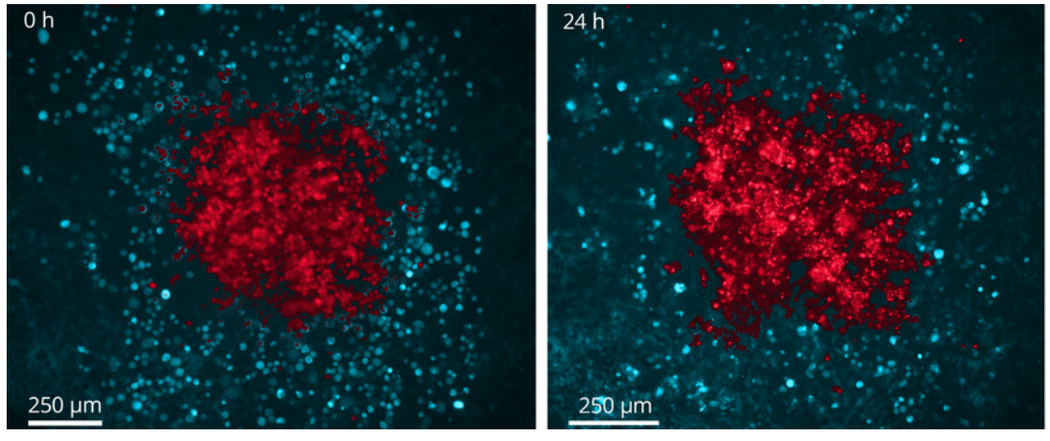
2D Primary Neurons

3D Skin melanoma model

MSC Stem cells

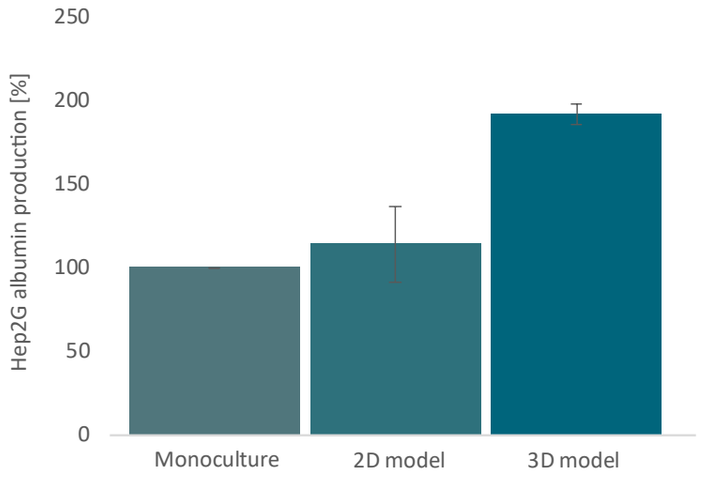
BIOPIXLAR 3D LIVER MODEL

A bioprinted multicellular, multilayer liver model



Resulting tissue

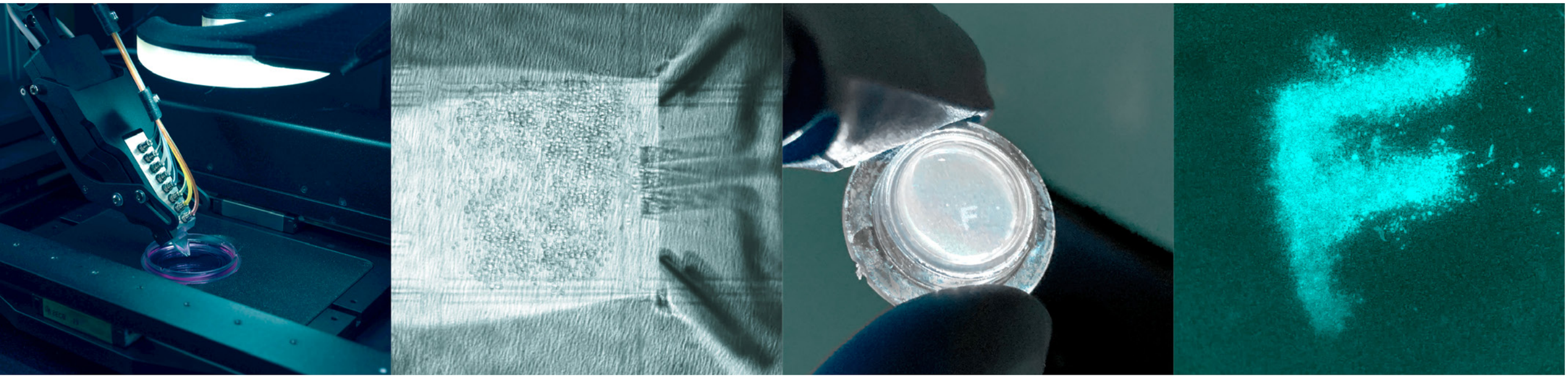
The fluorescence image shows the structure of the liver model top layer right after printing and after incubation for 24 hours. The HepG2 hepatocytes are appear in red and the surrounding layer of 3T3-J2 fibroblasts in blue.



Albumin production

The bioprinted 3D liver model with a protective fibroblast layer surrounding the hepatocytes shows significant increase in albumin production compared to both bioprinted 2D and monoculture tissues, measured after 7 days.

Further details about the Biopixlar liver model is available on our **website.**



BIOPIXLAR TRANSPLANTABLE MEMBRANE BIOPRINTING

Release your tissues from the petri dish

Biopixlar can be used to bioprint tissues onto tranplantable porous membranes. This lets you excise the printed tissues and transfer them for later use. This greatly increases the flexibility and the potential usage of the bioprinted tissues in research, whether it be for drug development, fundamental biological research, or even in clinical studies.

Biopixlar can be used to create a wide variety of shapes and structures and can be combined with many different membrane materials, providing an array of design and application possibilities. Here, we provide examples of microtissues, bioprinted on a semipermeable membrane, a type of porous scaffold that has been used in both in vivo and clinical studies.

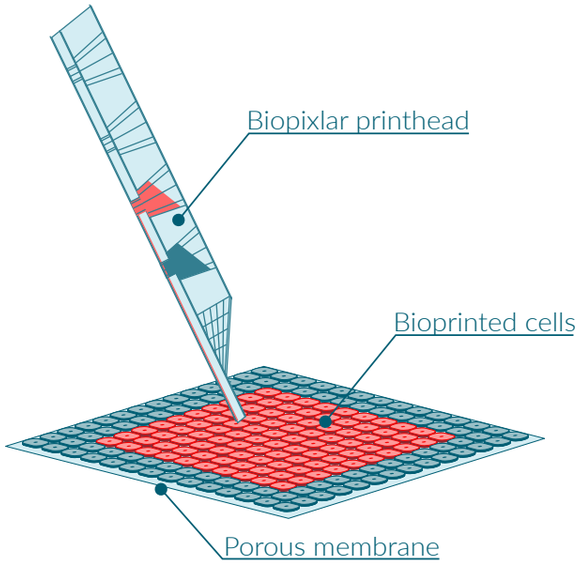
Biopixlar has also been used for bioprinting tissues on several other types of membrane materials, including cross linked ECM-like gels and human amniotic membranes.

Learn more about Biopixlar membrane bioprinting on our **website.**

Membrane bioprinting features

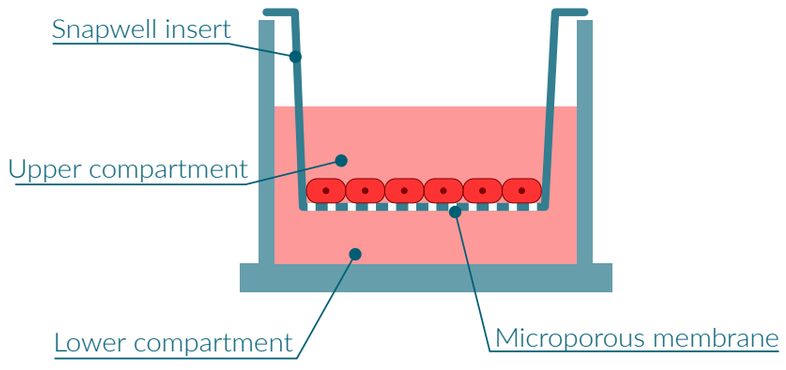
- Increased access to nutrients. Improved cell and tissue viability.
- Transfer bioprinted tissues for use in research and therapeutic development.
- Print on multiple therapeutically relevant materials such as, polytetrafluoroethylene (PTFE), cross linked ECM-like gels and human amniotic membranes.

1



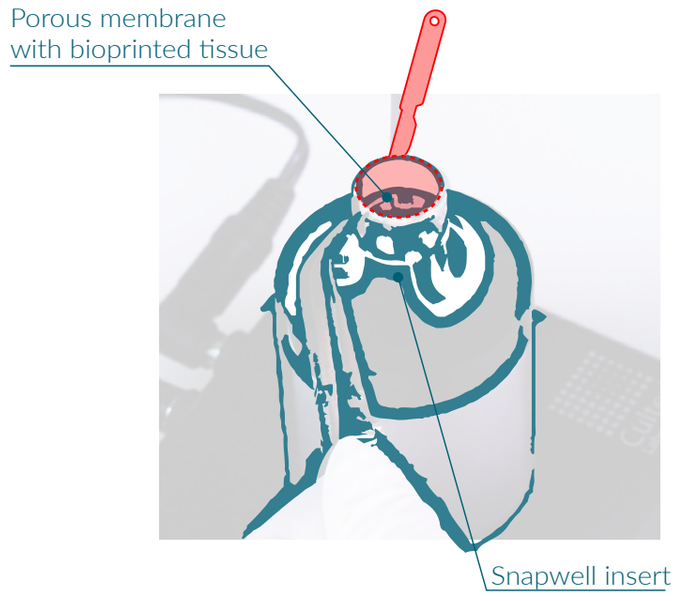
Bioprint detailed cellular structure onto porous membrane

2



Culture and develop tissue

3

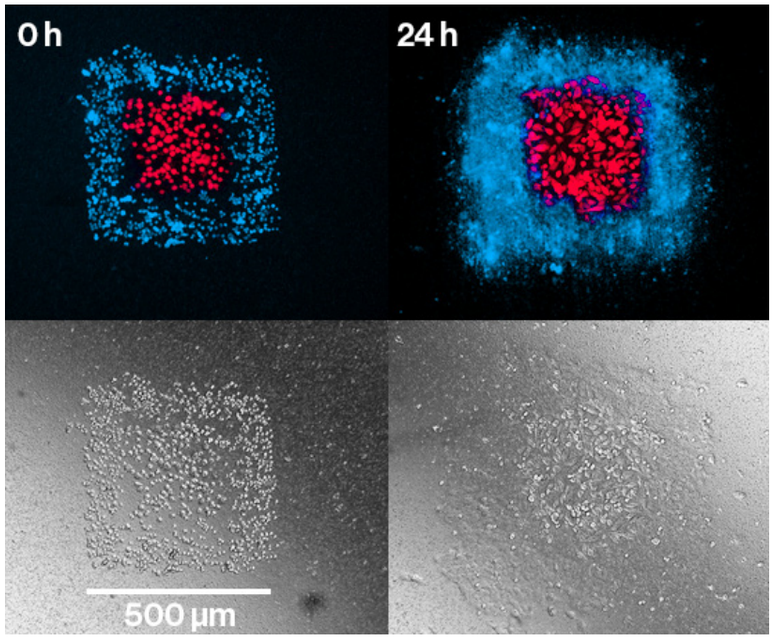


Excise membrane for research or therapeutic use

Biopixlar membrane bioprinting step by step

1. Bioprint cells into the desired tissue architecture on the appropriate porous membrane. The source of the cells can either be from culture, or obtained directly from a patient.Transfer bioprinted tissues for use in research and therapeutic development.
2. Incubate the bioprinted cells to allow for the tissue to develop. Here, the microporous structure of the membrane enables nutrient access from both sides of the tissue.
3. Excise the matured tissue for use in research or for therapeutic use.

MEMBRANE BIOPRINTING TISSUE EXAMPLES

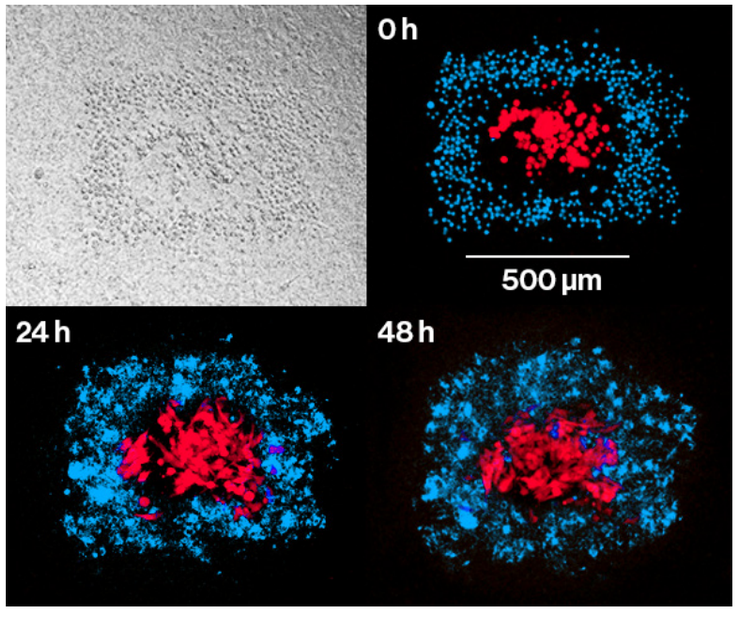


Single layer pattern

Two different cell types (HaCaT in blue and SK-MEL-28 in red) printed in a square shape single layer on a PET (Polyethylene Terephthalate) membrane. The cells are fluorescently labeled to enable easy identification. The images show the tissue composition right after printing and after 24 hours of incubation.

Membrane type: PET (Polyethylene Terephthalate)

Cell types: HaCaT / SK-MEL-28

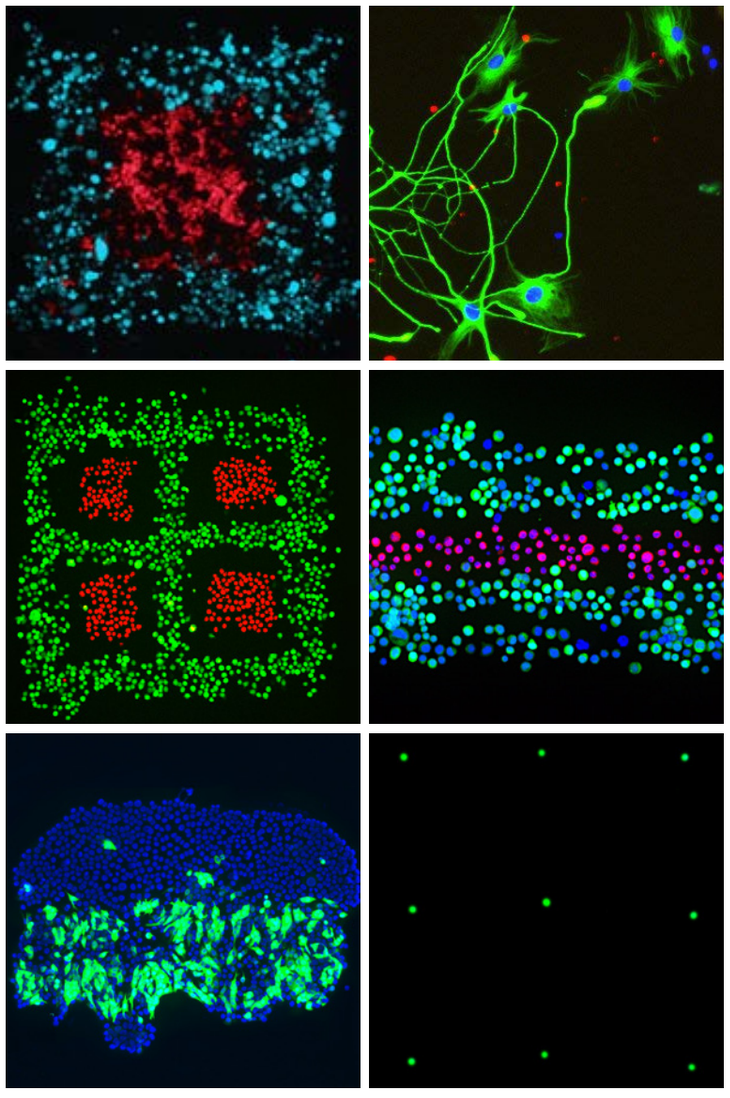


Multilayer pattern

A multilayer construct built using a bottom cell layer consisting of 3T3-J2 fibroblasts and a top layer consisting of the two different cell types HaCaT (blue) and SK-MEL-28 (red), printed in a square shape. The entire structure is created on a porous PET (Polyethylene Terephthalate) membrane. The upper layer of cells is fluorescently labeled to enable easy identification. The images show the tissue composition right after printing and after 24 and 48 hours of incubation.

Membrane: PET (Polyethylene Terephthalate)

Cell types: 3T3-J2 (bottom layer), HaCaT / SK-MEL-28 (top layer)



CURRENTLY PRINTED CELLS*

SH-SY5Y	Neuroblastoma, bone marrow
A-431	Epidermoid carcinoma, epithelial
HaCaT	Keratinocytes, skin
nHEK	Epidermal keratinocytes
SK-MEL-28	Melanoma, skin
HUV-EC-C	Endothelial, skin
3T3-J2	Fibroblasts, mouse
HepG2	Epithelial, liver
Fibroblasts	Primary, human
MCF10A	Fibrocystic, breast
MDA-MB-231	Adenocarcinoma, epithelial
CD8+ T cell	Primary, human
Neuronal tissue digest	Primary, rat
iPSC	Induced pluripotent stem cells. iPSC cardiomyocytes
MSC	Human bone marrow-derived mesenchymal stem cells
iPSC-CM	Human iPSC-derived ventricular cardiomyocytes
MIN6	Pancreatic beta cell line, mouse

*This is not a restrictive nor exhaustive list of Biopixlar compatible cell types, but cells that have been sucessfully printed by Fluicell so far.

BIOPRINTING PERFORMANCE

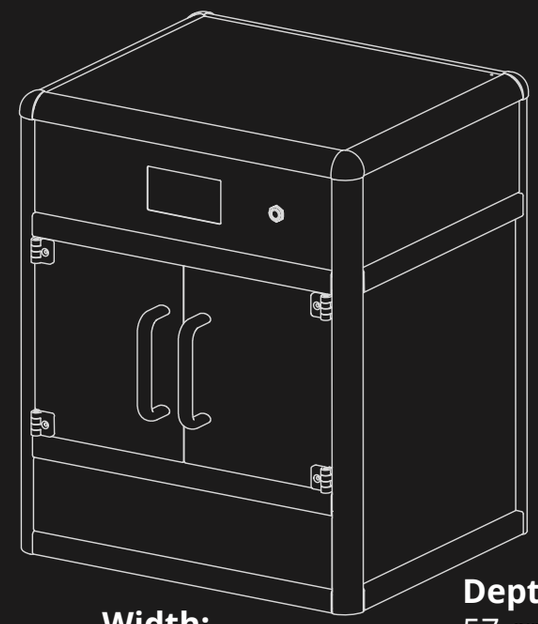
PRINTING TECHNOLOGY	Microfluidic hydrodynamic confined flow technology
PRINTING DIMENSION	2D and 3D
PRINTING MODE	Direct printing of cell suspension without the need for gel matrix
PRINTING SURFACE	Cell culture dish with culture medium or buffer
DEPOSITION MODE	From individual cells to thousands of cells
PRINTHEAD	Exchangeable single-use printhead made from medical grade elastomer with the capacity to hold up to 3 different cell types

MICROSCOPE SPECIFICATIONS

ILLUMINATION	LED fluorescence illumination and bright-field
FLUORESCENCE FILTERS	Blue: Excitation 370-410 nm; Emission 429-462 nm Green: Excitation 473-491 nm; Emission 502-561 nm Red: Excitation 580-598 nm; Emission 612-680 nm
OBJECTIVE	Air 10x (Olympus Plan Fluorite Objective, 0.3 NA, 10 mm WD)
CAMERA	6 Mpx High sensitivity

ADDITIONAL SPECIFICATIONS

STAGE TRAVEL RANGE	16 × 16 cm
MOVEMENT PRECISION	2 µm
DISH HOLDERS	For 35 mm cell culture dish For 50 mm cell culture dish For Microtiter plate (6 wells)
SOFTWARE	Java – cross-platform compatible
CONTROL INTERFACE	Gamepad
AIR FLOW	Filtered air enclosure



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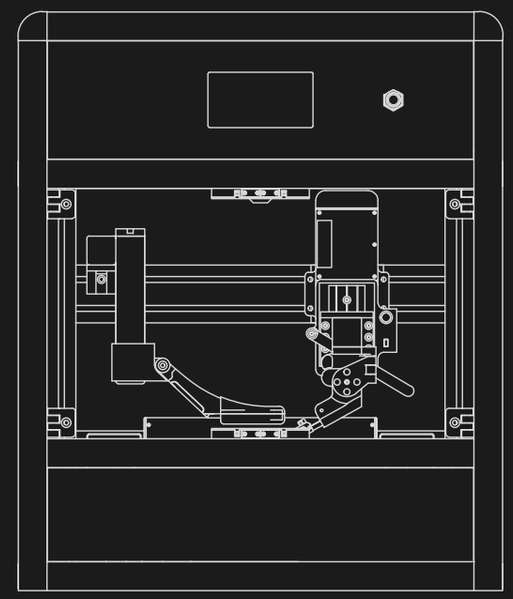

Height:
80 cm

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