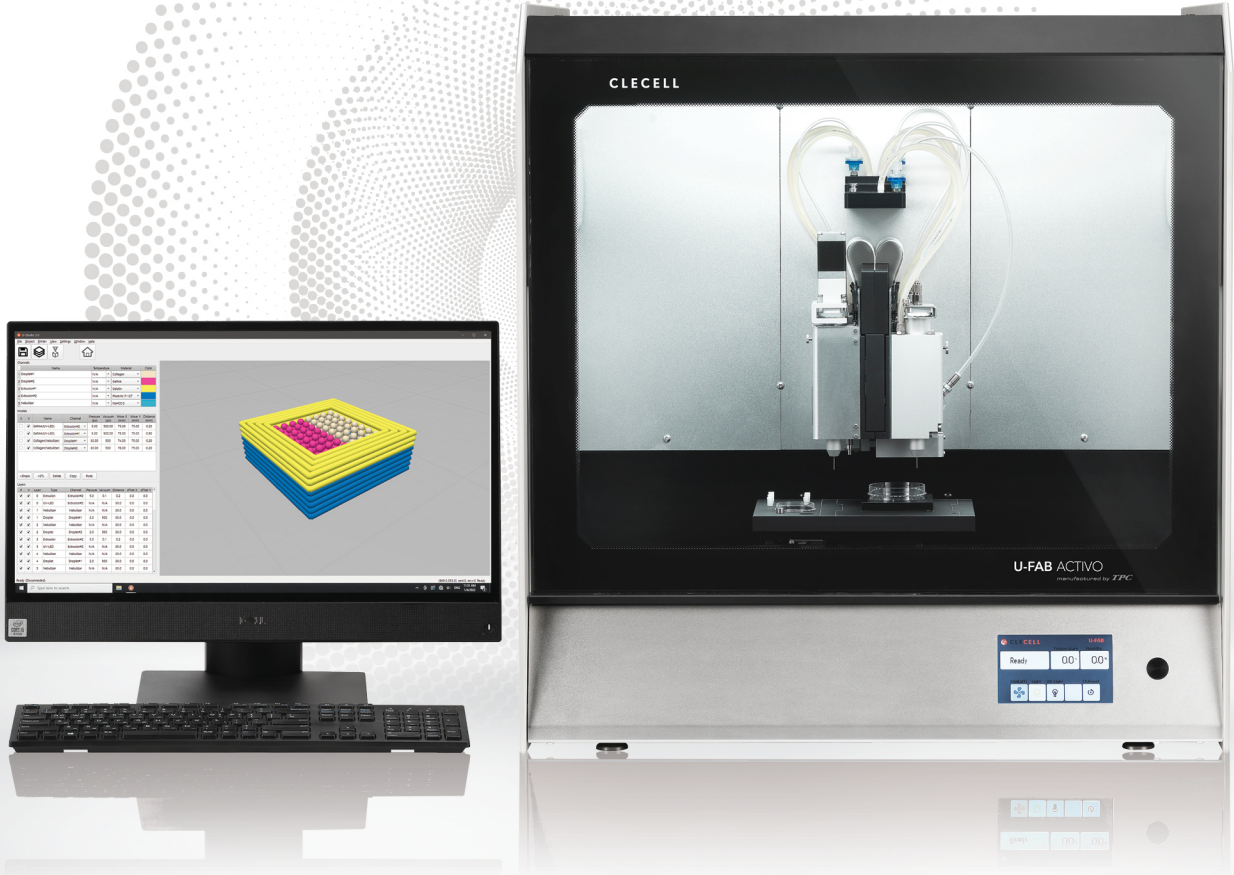
U-FAB ACTIVO

The Most Versatile and Scalable 3D Bioprinting Solutions for Tissue Engineering and Beyond

U-FAB ACTIVO, born from the vast body of research experience from tissue engineers and the cutting-edge 3D printing technology from CLECELL, offers radical solution to the research and development in tissue engineering.



CLECELL

Introduction

CLECELL Co., Ltd. is a bio-platform company, poised to become a leader in the fields of tissue engineering and regenerative medicine through our state-of-the-art 3D bioprinting technology. We strive to create a new future in the field of diagnosis and treatment.

Company History

2016

12
Company Incorporated / CLECELL Corp establishment

2018

01
Transfer of Patent from Harvard Medical School

11
Sponsored Research Agreement with Brigham and Women's Hospital

2020

03
Completion of 3D Bioprinter(U-FAB™) Development

06
Completion of 3D artificial skin (U-Askin™) protocol

08
Joint research for 3D atopic skin model and atopic treatment screening kit

12
3D bioprinting cancer organoid model development (brain cancer, breast cancer, skin cancer)

2021

07
Technical transfer(TT) agreement with TPC Mechatronics for U-FAB ACTIVO

U-FAB ACTIVO

1-1 **U-BIOXT-HV extruder(low temperature):** Channels that can extrude high-viscosity biomaterials

1-2 **U-BIOXT-HV extruder(high temperature):** Channels that can extrude high viscosity biomaterials or polymers

Mechanical Extrude
An extrusion assisting device that can output high-viscosity biological substances, resulting in more stability than before

2-1 **U-BIOXT-LV extruder:** Channels that can extrude low to intermediate viscosity biomaterials

2-2 **U-BIOLET dispenser:** Channel that can inject low-viscosity biomaterials per nanometer units

The U-BIOXT-LV extruder and U-BIOXT-HV extruder are cross-linkable on low viscosity channels

3 **UV-LED:** A device capable of hardening UV-sensitive biomaterials

4 **Z-offset Probe:** A sensor that can automatically adjust the height value of bioware

5 **Clean Bench System:** A device that purifies the outside air through a HEPA filter and supplies it to the inside

6 **UV Lamp:** UV-C type lamp that can disinfect the inside of the device before / after using the device

7 **Monitoring Camera:** Monitoring camera that can monitor the output process

8 **Nebulizer:** A device that can inject and coat biomaterial cross-linking substances

9 **Fabric Nozzle Cleaner:** A small filter that can automatically wipe the nozzle tip.

10 **Flushing Dish:** Injection table that discharges the residue remaining in the series

11 **X/Y offset calibration camera:** Camera used to fine-tune the nozzle tip of each channel to the X and Y-axis

12 **Power Button:** Power on / off switch

13 **LCD Touch Screen:** LCD panel that allows basic operation of the current state of U-FAB ACTIVO and its equipment

Configuration

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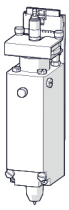
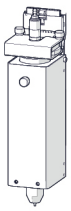
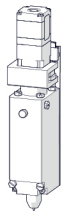
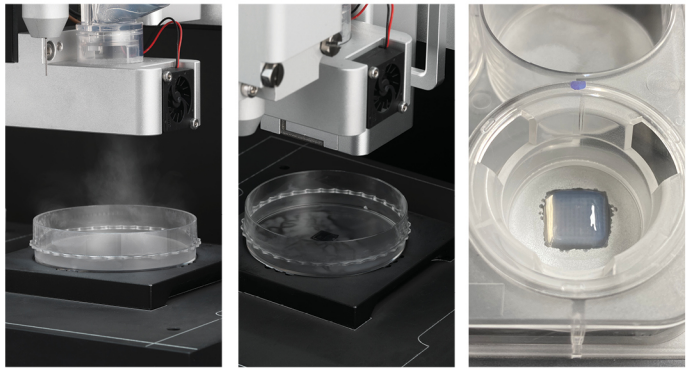
	U-BIOLET dispenser	U-BIOXT-LV extruder	U-BIOXT-HV extruder (low temperature)	U-BIOXT-HV extruder (high temperature)	Mechanical extruder (coming soon)
Sub Module					
Printing Type	Droplet / Non-Contact	Extrusion / Contact			
Pressure Range	0 ~ 14 psi		0 ~ 114 psi		0 ~ 120N
Viscosity	Low	Low / Intermediate	Intermediate / High		High
Material Type	Sol	Sol / Gel	Gel	Gel / Pellet	Gel / Powder / Pastes
Temperature	10 ~ 50°C	10 ~ 50°C	10 ~ 50°C	RT ~ 180°C	10 ~ 50°C /RT ~ 180°C
Polymerization	 Nebulization (pH-sensitive, chemical / enzymatic crosslinking), UV-LED (photo-crosslinking) / Temperature control (thermal-crosslinking)				
Available Biomaterials	Collagen, Alginate, Gelatin, Fibrin, Agarose, Hyaluronic acid(HA), Decellularized extracellular matrix, Matrigel™, PEGDA, etc.		Hydrogel with Cell Mixtures, Hydroxyapatite, Chitosan, Collagen, Gelatin, Fibrin, Hyaluronic Acid, Alginate, etc.		
				PCL, PLGA, PLA, Hydroxyapatite, etc.	
	Low viscosity stage bioink available	Low ~ medium stage bioink available	High viscosiy stage bioink avaliable *High viscosity Gel4Cell / Col4Cell optimized for UFAB-Activo is provided separately.		
Feature	6-well BioWare for simultaneous output of Droplet 2 channels Application of syringe adapter with Cell-homogenizing function Droplet dispenser with UV shutter function can be used by crossing U-BIOLET and U-BIOLETXT-LV as required		Mechanical Extruder can crosslink at low and high temperatures.		

Product Features

1. 3D lamination of low-viscosity biomaterials
(Droplet dispenser + Nebulizer)



Step 1

Spray and coat each material using the Nebulizer

Step 2

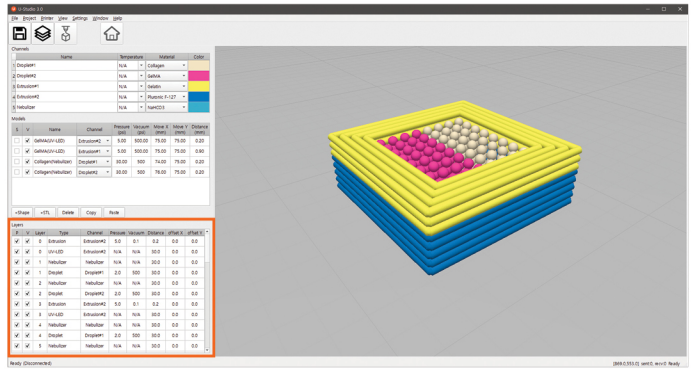
Droplet method sprays biomaterial and cells onto the coated surface

Result

Repeating steps 1 and 2 results in precision-quality artificial tissue that includes cells

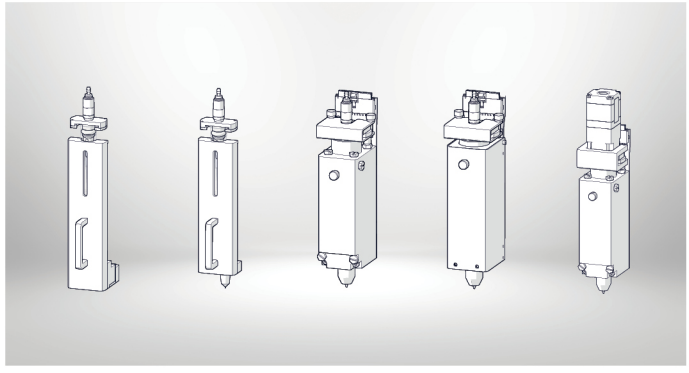
- The U-Biolet dispenser can be used to inject low viscosity biomaterials in spray mode.
- A built-in Nebulizer can be used to form polymers in the form of microparticles (size: 4 μm) via pneumatically controlled pH-sensitive / chemical / enzymatic cross-linking.
- Gradual curing by layered cross-linking facilitates 3D lamination of low viscosity materials.

2. Independent 3D modeling on each layer



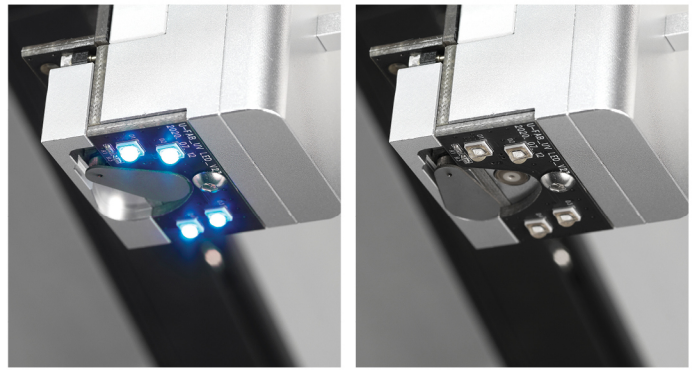
- Using the proprietary U-Studio software for U-FAB ACTIVO, it is possible to adjust and edit each layer's injected material and structure. This allows for a wide variety of 3D models.

3. 4 Independent printing submodules



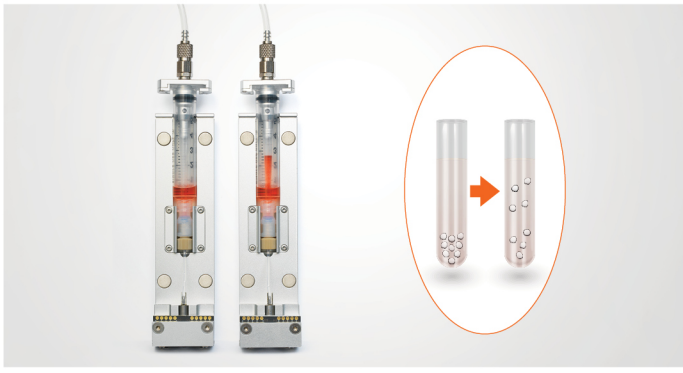
- Different Bioinks can be used for each of the four nozzles, and the temperature and pneumatic conditions can be set to suit each bioink.
- Depending on the 3D modeling settings for each layered injected material and structure, the 4 nozzles can be activated in sequence. This allows the usage of different materials per layer, which can result in the upper and lower layers having different structures from each other.
- It is possible to output composite structures using hydrogel cells and polymer substances (PCL, PLGA, etc.).

4. UV-LED shutter



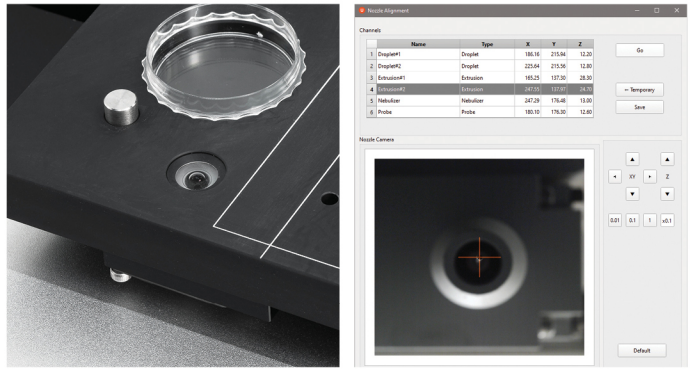
- The shutter can block material curing at the nozzle end, which can occur due to UV LED exposure during photocuring.
- The shutter function allows you to perform more efficient photo-curing 3D printing.

5. Cell homogenization



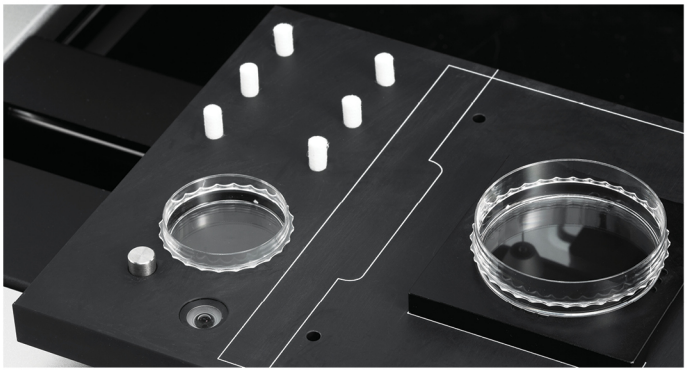
- Circulating the fluid mixture of cells and growth media within the syringe will prevent sedimentation at the bottom of the syringe. It will also maintain a consistent density at the top and bottom of the syringe.
- By keeping the substance in the syringe in a more uniform state during 3D printing, a higher stability of output is realized.

6. Automated nozzle-end sorting system & build-plate leveling



- By automatically recognizing the surface height value of bioware and fine-tuning the X / Y coordinates between the nozzles used for output, highly stable extrusion 3D Printing can be achieved.

7. Nozzle clean system



- Fabric nozzle cleaner makes it easy to remove residual matter and foreign materials in the nozzle.
- The flushing dish (35mm) makes it easy to clean syringes and valves, and maintains optimal output conditions.

U-FAB ACTIVO specification

Max. pneumatic Pressure	8bar
Print Speed	Up to 50mm/s
Size	600(W) × 600(D) × 600(H) mm
Weight	100kg
Build Volume	150 × 150 × 50(mm)
Linear actuation	High precision linear robot (Including ball screw)
Camera	720p HD Camera
Interface	PC
3D Modeling / Editing Type	3D data, Layer-based 2D editing

U-FAB ACTIVO Biomaterial adaptation

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The U-Fab ACTIVO, in conjunction with various Bioinks, can be used for 3D bio printing and can employ both inkjet and extrusion methods.

Subject	Organ	Printing Type	Bioink	Cell Type
Cancer Organoid	Liver	Extrusion Inkjet(droplet)	Collagen Gelatin PCL GelMA / GM-HA: GelMA RGD-coupled sodium Alginate Liver dECM Bioink	HepG2 HUVEC iPSC ADSC
	Pancreas	Extrusion	Pancreas derived ECM	Human islet
Eye Tissues	Cornea	Inkjet(droplet)	Gelatin Alginate Collagen	Human corneal epithelial cells
Vascular Tissues	Skin/ skin tissue	Extrusion Inkjet(droplet)	ECM with fibrinogen Thrombin Gelatin PEG Collagen Agarose Alginate	Human dermal fibroblast Preadipocyte HUVECs Primary human epidermal keratinocytes
	Heart	Extrusion Inkjet(droplet)	GelMA Alginate PDMA ink TPU ink Hyaluronic acid Gelatin	Printing valvular interstitial cells into scaffolds with high speed and good viability (~100 %) over 21 days Printing hydrogel-based valve-shaped structures
	Bone	SLA Extrusion based	Mono-hyaluronic acid Collagen PCL/ PLGA/B-tcp, Fibroblast	hTMSCs
Avascular Tissues	Blood Vessel network	Extrusion Inkjet(droplet)	Gelatin Fibrinogen with transglutaminase Agarose Vascular-derived ECM with Alginate Gelma	Human neonatal dermal fibroblasts, Human bone marrow-derived mesenchymal stem cells HUVEC
Metabolic Tissues	Kidney	Extrusion	Gelatin, fibrinogen with transglutaminase and calcium chloride Kidney-derived ECM Silicone Pluronic F127	Human neonatal dermal fibroblasts Renal tubular epithelial and endothelial cells

The 3D Bioprinter of researchers
Designed by researchers
Innovated for researchers

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