CLECELL

TPC

3D BIO PRINTER

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.

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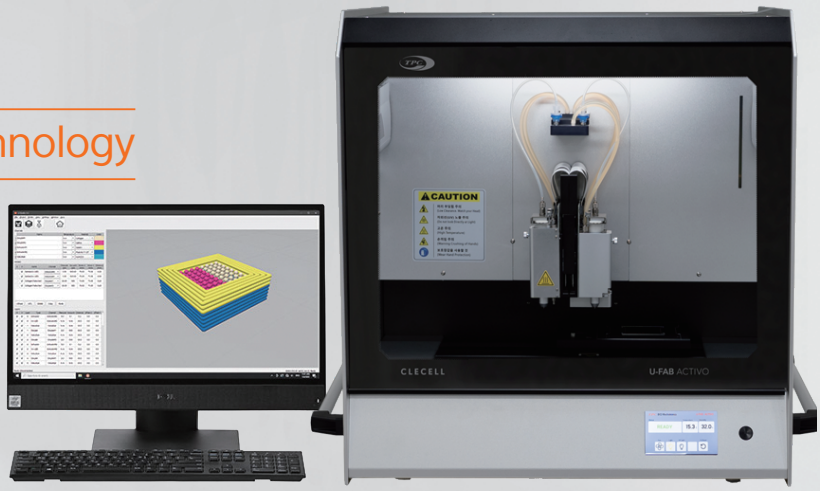
Differentiated Technology

U-FAB ACTIVO

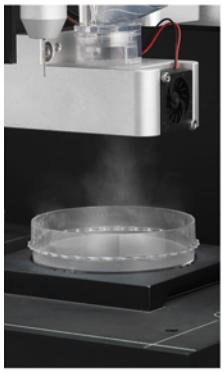
Made in Korea with Korean Technology

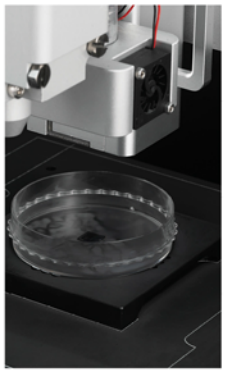


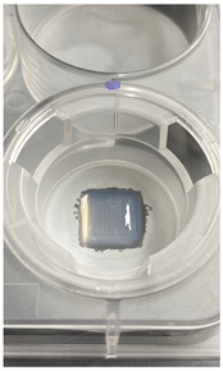
3D BIO PRINTER enabling
3D structure formulation with
both low and high viscosity biomaterials.

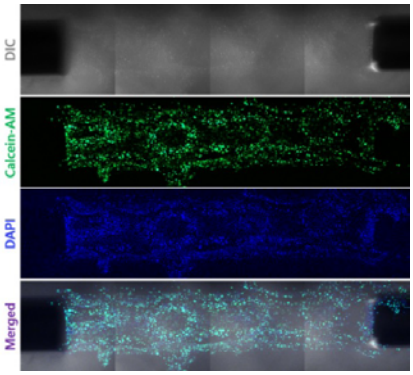
3D Printing with Low Viscosity Biomaterials

Via droplet-based additive 3D printing technologies, U-FAB ACTIVO realizes 3D structure with low viscosity biomaterials which are components of human organs.







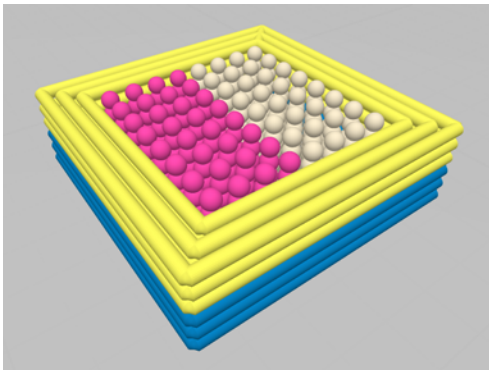


Provision of Multiple Crosslinking Methods Artificial Skin, 3D Cancer Organoid Formulation

The printer provides multiple crosslinking methods, i. e. chemical, enzymatic, and pH in addition to UV and heat offered by ordinary 3D bioprinters. This allows utilization of wide range of bioinks.

3D Structure Formulation with Composite Materials Using Polymers(PCL, PLGA)

U-FAB ACTIVO accurately locates composite materials and simply design 3D structure by proprietary software and realizes designed 3D structure through independent pressure and temperature control of 4 nozzles containing different materials.



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

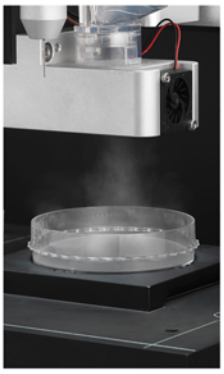
11 **X/Y offset calibration camera:** Camera used to fine-tune the nozzle tip of each channel to the X and Y-axis

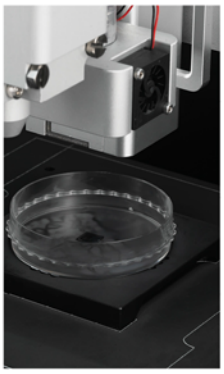
12 **Power Button:** Power on / off switch

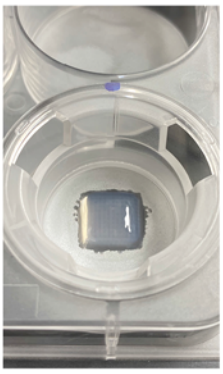
13 **LCD Touch Screen:** LCD panel that allows basic operation of the current state of U-FAB ACTIVO and its equipment

Product Features

1. 3D Accumulation of Low Viscosity Biomaterials
(Droplet dispenser + Nebulizer)







Step 1

Nebulize crosslinking materials to spread on the surface of petri dish

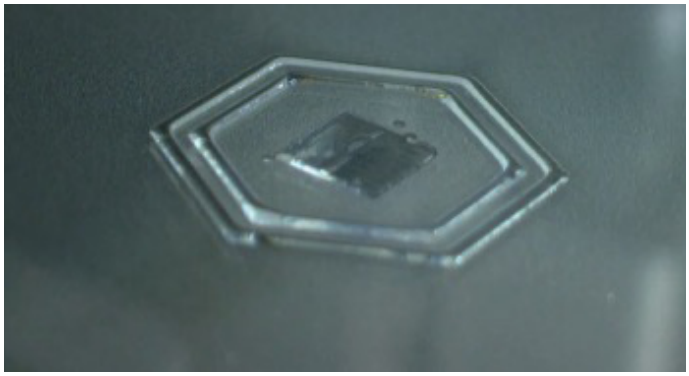
Step 2

Dispense biomaterials and cells onto the crosslinking materials via the droplet method

Result

Repeat Steps 1 and 2 to create a complicated 3D artificial tissue containing cells and biomaterials

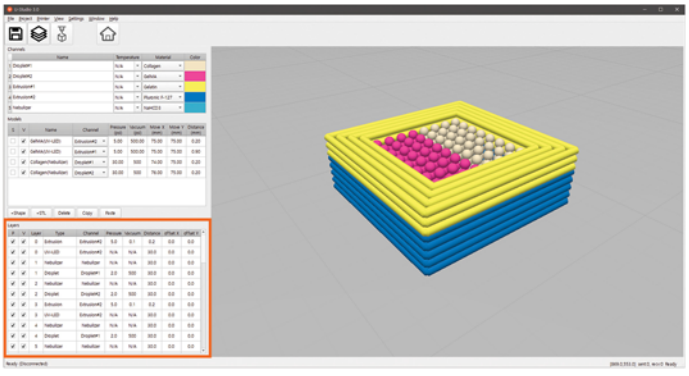
- The U-Biolet dispenser sprays low viscosity biomaterials via the droplet method.
- The built-in Nebulizer controls air pressure to facilitate crosslinking via neutralization, chemical or enzymatic reaction, and creates polymers in the form of microparticles. (size: 4μm)
- Crosslinking at each separate layer initiates gelation successively, Allowing for easy layer-by-layer printing of low viscosity biomaterials.



3D Bioprinting by Droplet Method

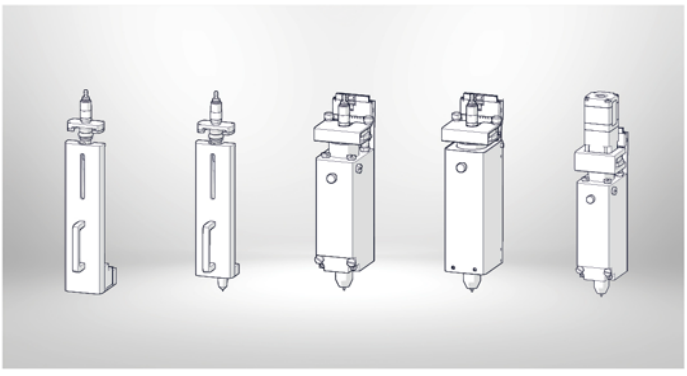
- As pictured above, the U-FAB ACTIVO uses the droplet method (analogous to shedding water droplet) to create a 3D structure.
- The crosslinker, a material used as a sort of adhesive, is dispensed by the Nebulizer for gelation and then biomaterials and cells are laid in droplet form on top of that.
- This allows the low viscosity biomaterial to be accumulated in 3-dimensional form, which is not executable by ordinary 3D bioprinters without scaffold.

2. Independent 3D modeling on each layer



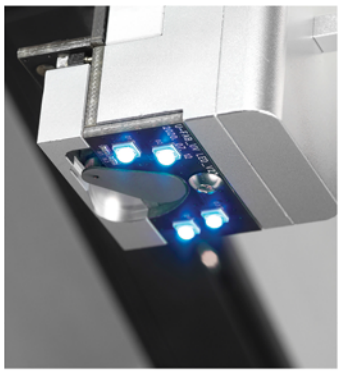
- Using the proprietary U-Studio software for U-FAB ACTIVO, it is possible to adjust and edit each layer's injected material and structure. This allows for a wide variety of 3D models.

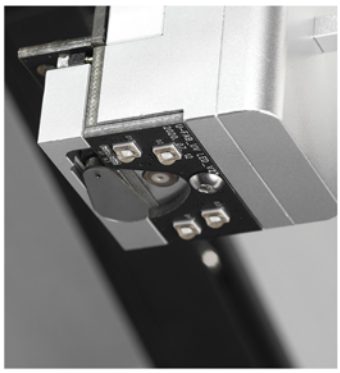
3. Usability of Composite Materials



- It is allowed to use different bio-inks and set up temperature and air pressure independently for operation of 4 nozzles.
- It is capable of applying unique design and constitution of materials for each layer by 3D structure modeling.
- Biocompatible polymers, i.e. PCL and PLGA are usable to constitute a part of 3D structure along with cells and biomaterials.

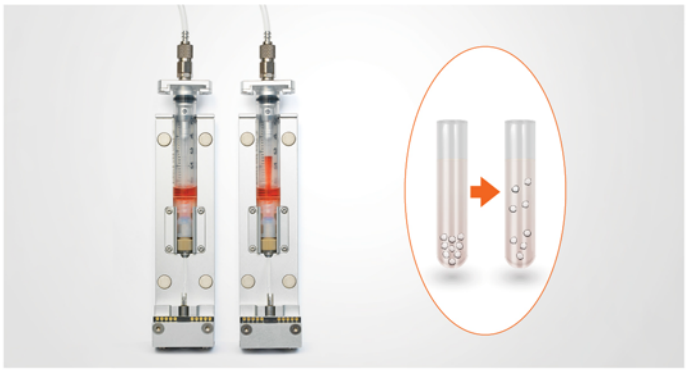
4. UV-LED shutter





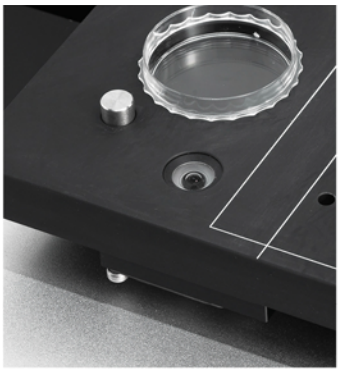
- The shutter blocks material curing at the nozzle end which may occur due to UV LED exposure during photocuring.
- The shutter function allows you to perform more efficient photo-curing 3D printing.

5. Cell homogenization



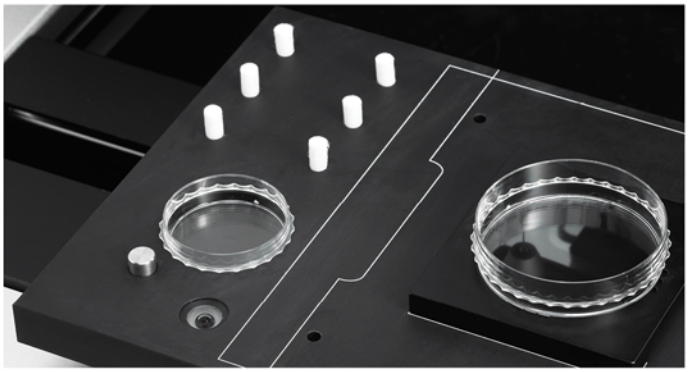
- Circulating the fluid mixture of cells and growth media within the syringe will prevent sedimentation at the bottom of the syringe. It will also maintain a consistent density at the top and bottom of the syringe.
- By keeping the substance in the syringe in a more uniform state during 3D printing, 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 facilitates removal of 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 (0.11 mi/h)
Size	778(W) × 636.5(D) × 708.5(H) mm
Weight	120kg (264.6 lb)
Build Volume	150 × 150 × 50(mm) (5.91 × 5.91 × 1.97 in)

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

Configuration

Sub Module	U-BIOLET dispenser 	U-BIOXT-LV extruder 	U-BIOXT-HV extruder (low temperature) 	U-BIOXT-HV extruder (High temperature) 
Printing Type	Droplet / Non-Contact	Extrusion/ Contact		
Pressure Range	0 ~14 psi		0 ~ 114 psi	
Viscosity	Low	Low/ Intermediate	Intermediate/ High	
Material Type	Sol	Sol / Gel	Gel	Gel / Pellet
Temperature	10~50℃ (50~122℉)	10~50℃ (50~122℉)	10~50℃ (50~122℉)	10~50℃/RT~180℃ (50~122℉/RT~356℉)
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, Hydroxypatite
	Low viscosity stage bioink available	Low ~ medium stage bioink available	High viscosiy stage bioink avaliable *high viscostiy 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-homegenizing function Droplet dispenser with UV shutter function can be used by crossing U-BIOLET and U-BIOXT-LV as required		Mechanical Extruder can crosslink at low and high temperatures.	

U-FAB ACTIVO Biomaterial adaptation

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	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

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