THE FUTURE OF MEDICINE IS HERE

BIO X™

WELCOME
TO THE WORLD OF
BIOPRINTING

What is Bioink?

A bioink is a biomaterial that is suitable for bioprinting with cells and provides a temporary or permanent support to the cells while they produce their own extracellular matrix. Bioinks based on biopolymers, such as collagen, gelatin, hyaluronan, silk, alginate, and nanocellulose, are known for their favorable biocompatible properties and are attractive biomaterials for cell encapsulation and 3D bioprinting. These bioinks provide an aqueous 3D environment consisting of biologically relevant structural, physical, and chemical signals. Significant advances in 3D bioprinting technology as well as development of new bioinks have made it possible to bioprint complex 3D tissue structures.

Why Bioprinting?

The innovative methods for engineering human tissues and organs can have a profound effect on the future of medicine. 3D Bioprinting is considered a revolutionizing technology for advancing and accelerating progress in the field of tissue engineering and regenerative medicine, and thus, the future of medicine. We believe that we can create this future through a collaborative spirit and by putting our combined expertise to the service of humanity.

The future is created in the present and it belongs to the doers, those who continue moving forward in order to see their vision come to realization. It's not that we see the future and then move towards it. We move in order to see it.

WE ARE CELLINK

We are a team of entrepreneurs, scientists, engineers and pioneers, pushing the limits for what's possible, paving the way for the future of regenerative medicine.

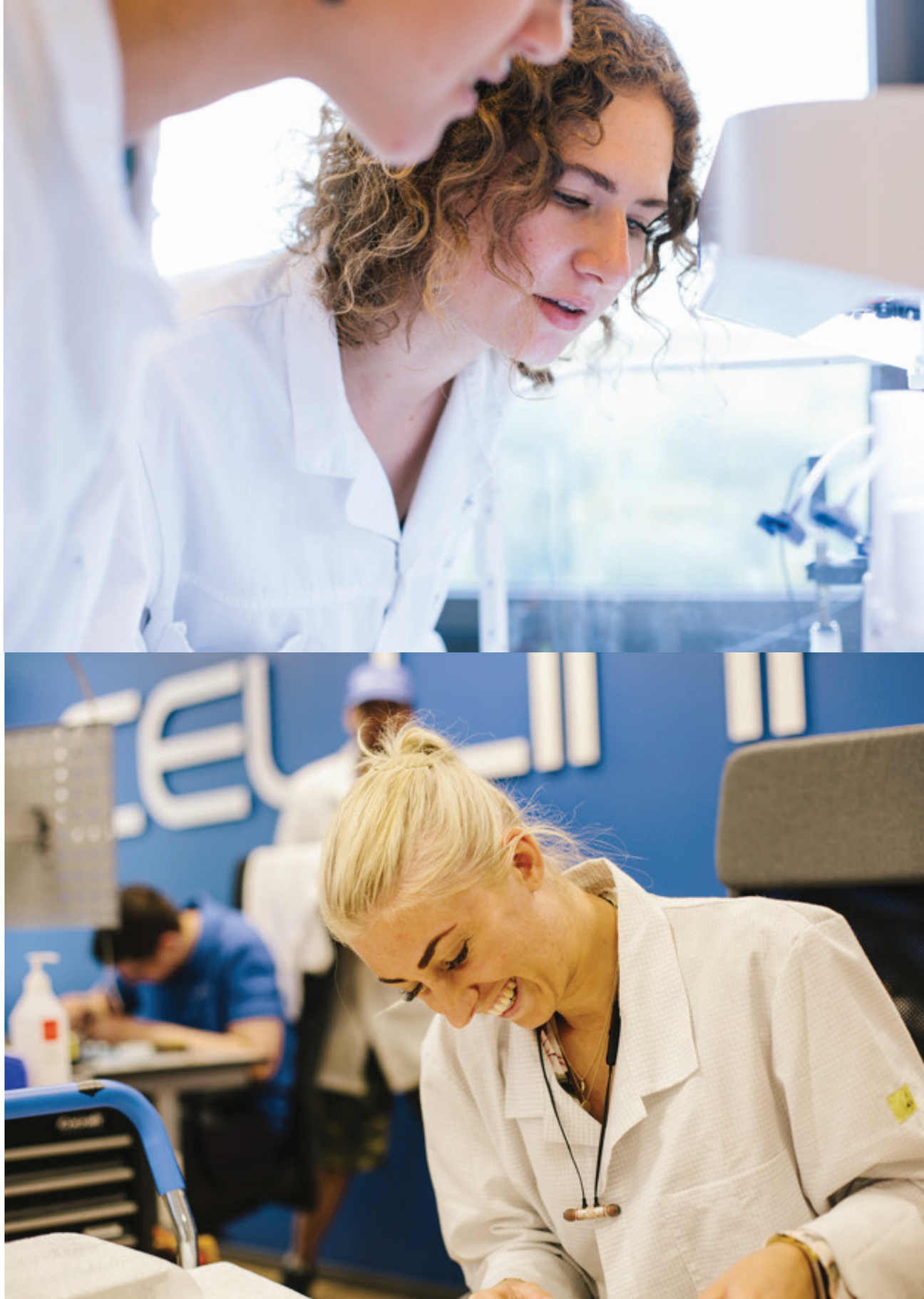
With our 3D bioprinters and Bioinks, we will open the possibility for more extensive medical research. Together with our collaborators, in hundreds of labs in over 45 countries, we work side by side to ensure quality and support.

Our compassion for humans and drive to move an impact will pave the way for continued growth.

"There was a clear difference in CELLINK's customer approach, product robustness, and confidence in their products, all of which made CELLINK stand alone in the market of 3D bioprinting. We trusted the company and now looking back we think it was not a wrong decision to go with CELLINK."
- Dr.Nath, Harvard Medical School

"Thanks CELLINK for engaging the students and holding this successful workshop on bioprinting"
- Ric Levato, UMC Utrecht

"CELLINK has taken our feedback and adapted their system while being actively engaged in the process"
- Dr. Grande, The Feinstein Institute for Medical Research



MEET THE BIO X™

BIO X is the most user friendly yet flexible bio-printer in the world, providing the user with an unparalleled bioprinting experience. The built-in features along with the new BIO X software managed through the large touch screen display minimizes the learning curve, increases effectivity, and ensure you will receive the results you want. BIO X is the new go-to bioprinter for life science companies, researchers and innovators around the world. BIO X is the most user friendly bioprinter on the market and a complete standalone product.

Bioprinted tissue can be used in drug discovery where researchers can test new potential treatments and evaluate efficacy in very early stages. New drugs and treatments will potentially reach clinical trials faster with a decreased number of failures and reduce need of animal testing.

BIO X is the next generation bioprinter, bringing scientists closer to the future of medicine.

reddot award 2018
winner

FEATURES

WIDE MATERIAL RANGE

Whether it's tissues like heart, skin, cartilage or bone, the user has full freedom in the selection of biomaterials for their tissue applications.

INTELLIGENT PRINTHEADS

The unique smart printheads that users can exchange has a wide range of features, makes it possible to bioprint a wide range of bioinks and cells with minimal effort.

USER-CENTERED DESIGN

Navigate the integrated and easy to use BIO X software through its 7" touch screen display, designed to guide the user and facilitate the process.

STAND ALONE UNIT

With its integrated air supply, cooling system, compressor, touch screen and WiFi connectivity, the BIO X is a completely stand-alone unit, working without the need to connect to anything. BIO X maintains a small lab footprint, while still containing everything you need to succeed.

CLEANER THAN EVER BEFORE

Our patented and newly improved Clean Chamber Technology provides you with an aseptic printing area thanks to the dual filtered positive air pressure inside the chamber. With dual power fans, H14 HEPA filters, and UV-C germicidal lights, your sterility remains uncompromised.

PREDICTABILITY OF NOZZLE

Built to meet the needs of today's bio-scientists, BIO X's responsive Neocortex M1 internal computer coupled with HeartOS, the most powerful bioprinting Operating system out there, allows the user to orchestrate the intricate process of building human tissues.

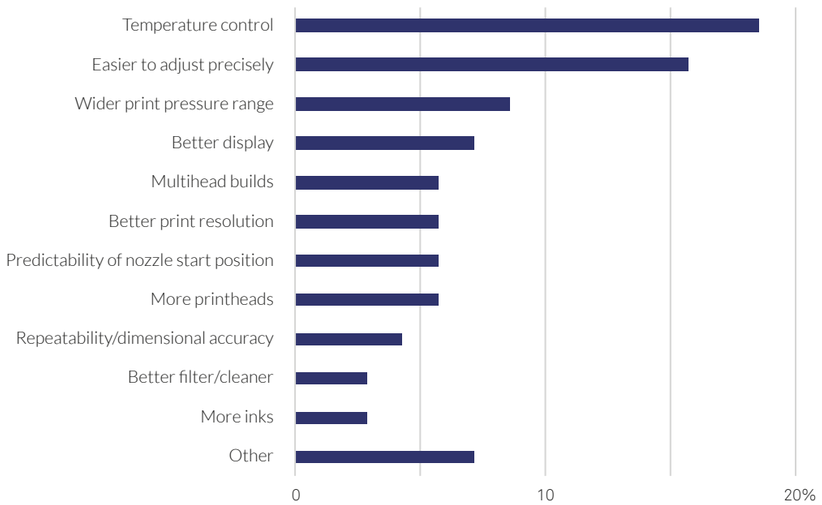
DESIGNED WITH SCIENTISTS IN MIND

YOU SPOKE, WE LISTENED!

When developing the BIO X, we at CELLINK reached out to you, our fellow scientists and users, to get your feedback on the INKREDIBLE and INKREDIBLE+ to understand your needs in 3D bioprinting.

Quotes about INKREDIBLE and INKREDIBLE+ and future features:
“It is quite some effort to get exact values with this knob”
“I would like a cooling and heating system for the print bed”
“I’d like the ability to print at pressures higher than 400 kPa”
“Different print heads, heated print heads”

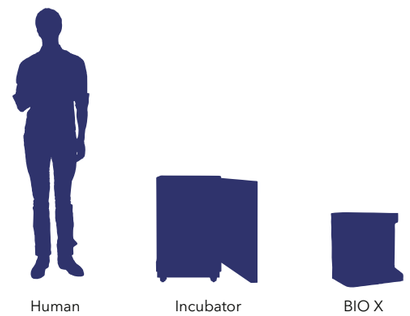
We asked what current features you would want to improve, and what non-existing features you’d like to see in the next generation bioprinter. And you can find the answers which are concerned the most in the diagram below.



INDEPENDENT AND COMPACT LAB FOOTPRINT

Both a compressor and cooling unit have been integrated into the BIO X, without compromising its size. When printing cells, a sterile environment is key. Working in a laminar flow cabinet is sometimes needed, but impossible, if your equipment can’t fit. BIO X has a small enough footprint, but still contains every component you need to bioprint. It’s a complete stand alone unit, facilitating work in a laminar flow cabinet, without the need to connect anything.

Even though the BIO X works perfectly on its own, you might sometimes want to increase performance of different functions. There’s a plug in the back of the BIO X where you can connect to your laboratory air supply, if needed. Connecting the external air supply allows you to print with higher pressure than usual, which is sometimes necessary for higher viscosity bioinks. BIO X is the most flexible bioprinter out there.



EASY TO USE INTERFACE

The BIO X bioprinter provides the user with the most flexible bioprinting platform in the world. With the ability to change the print heads you can utilize a wide range of extrusion methods so that you can ensure that you find a method that truly fits your needs.

BIO X is equipped with a high precision, 7” illuminated touch display that is functional even with gloves on. The new, revolutionary integrated software provides you with constant feedback and is designed to guide the user in every step to facilitate the bioprinting process. Its user- friendly, graphical interface lets the user interact with any setting and provides a comprehensive overview in each step of the way.

The BIO X workspace is well lit with delicately placed soft lights to create a comfortable, ergonomic working environment.

- **ERGONOMICALLY DESIGNED FOR YOUR CONVENIENCE**
- **EASILY EXCHANGEABLE PRINTHEADS**
- **GUIDES THE USER IN EVERY STEP**

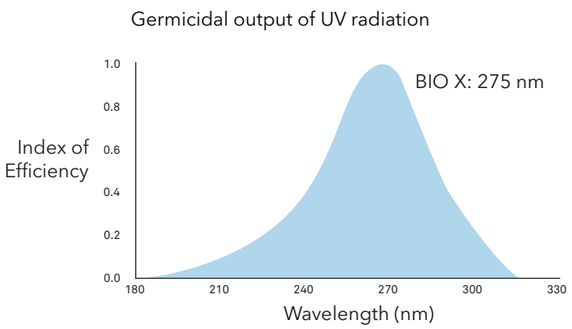
CLEAN. REINVENTED

BIO X is equipped with dual, high-power fans that create a powerful airflow through its dual filtration top, creating a positive air pressure inside the chamber. The air first travels downwards through a prefilter, which retains the bigger particles, and then through a HEPA H14 filter, which sorts out even the smallest of unwanted particles. The dual power fans fill the chamber with filtered air, at a positive pressure, keeping your experiment clear.

The BIO X design is made without sharp corners, only rounded shapes, making sure that no unwanted particles get trapped inside the chamber, but flow out. On top of this, there are UV-C germicidal lights that allow you to run sterilization cycles to sterilize the printing environment. Together, these components create a complete system of uncompromised cleanliness.

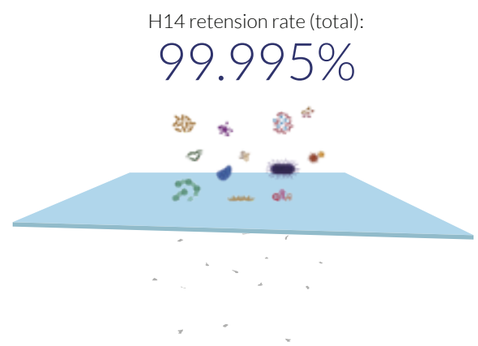
UV LIGHTS

To further sterilise the printing environment, BIO X uses UV-C germicidal lamps to kill or inactivate microorganisms by disrupting their DNA and destroying their nucleic acids. This causes the micro-organisms to be inactivated, making their presence insignificant. With a wavelength of 275 nm, BIO X works within the optimal spectra for killing germs.



HEPA FILTER

BIO X is equipped with our patent pending Clean Chamber Technology through HEPA filtration. The H14 HEPA filter is supported by a pre-filter and together they create a clean printing environment.



PRINTHEADS

BIO X is equipped with a total of three printhead mounts. This allows you to change between printing techniques or to use multiple materials. These features make it possible to print a wide range of different bioinks and cells with minimal effort, providing you a greater freedom to operate. With its exchangeable print head system, BIO X offers unparalleled flexibility. The snap-on feature offers a fast exchange for a wide range of printheads including chilled printheads, heated printheads, HD cameras, inject syringe printhead and many more.

BIO X comes with 365 and 405 nm wavelength UV light sources, which provide you with the ideal crosslinking wavelengths. Other wavelengths can be inserted by simply clicking a new one in place.

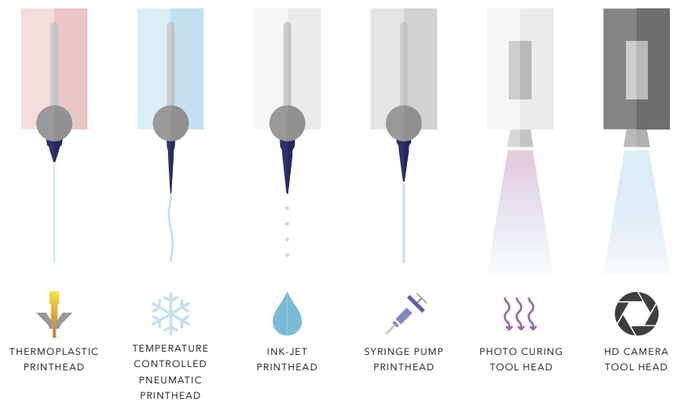
BIO X is the first bioprinter in the world with Intelligent Print Heads (iPH), ensuring your research is always on the cutting edge. BIO X printheads are specifically designed with flexibility, beauty, and simplicity in mind. The best part is that you can design your own dispensing technologies or methods and utilize them with the BIO X system. The possibilities are endless, giving you full freedom in your lab work.

INTELLIGENT AND EXCHANGEABLE

We at CELLINK want to make sure that all necessities for your research are easily available. We, therefore, supply several of the handiest printheads and tool heads you may need when using BIO X.

BIO X is a versatile bioprinter, equipped with intelligent printhead mounts. This means you'll have the opportunity to easily upgrade your system as we develop new printheads to match your evolving bioprinting needs.

The printheads we provide are carefully selected and of the highest quality. By doing so, we ensure to meet your delicate standards, compromising nothing in the act of facilitating your bioprinting projects.



OUR PRINTHEADS

HEATED PNEUMATIC PRINTHEAD
TEMP: 65 °C

The default printhead that comes with BIO X.

THERMOPLASTIC PRINTHEAD
TEMP: 250 °C

Allow for the use of thermoplastics in the bioprinting process to reinforce the bioinks, creating a stronger construct.

TEMPERATURE CONTROLLED PNEUMATIC PRINTHEAD "COOLED PH"
TEMP: 4°C (ΔT=17°C)

This printhead makes it possible to print collagen-based bioinks or any other bioink the requires a cooled temperature for extrusion.

INK-JET PRINTHEAD
TEMP: 65 °C

This technology allows for a high printing speed with precision.

SYRINGE PUMP PRINTHEAD

Enables you to have a better control of the bioink extrusion process by controlling the flow rate andde-posited volume, no matter the viscosity.

PHOTO CURING TOOL HEAD

If the integrated photo curing wavelengths aren't what you seek, an extra photo curing tool head can be attached for UV light in any wavelength.

HD CAMERA TOOL HEAD

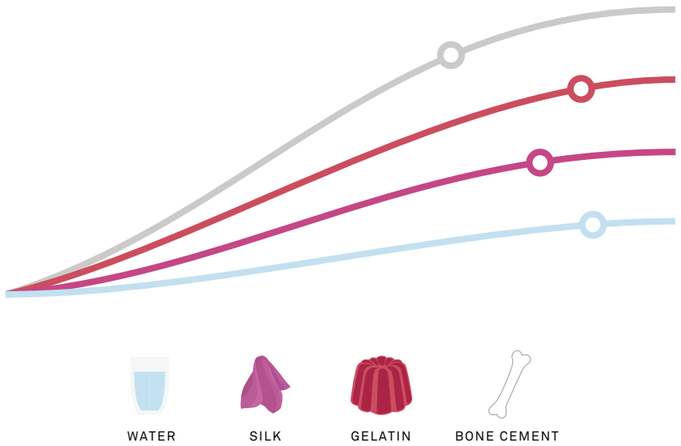
Helps you document your work generally and for reports. It is also a good way of keeping track of the printing process to ensure quality.

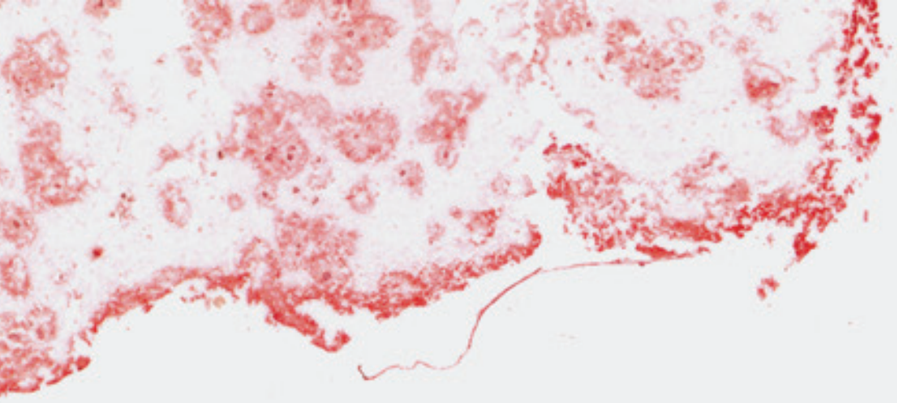
CUSTOM TOOL HEAD

Collaboration is the key to success. If you don't find what you need, just let us know! Contact us at info@cellink.com and we'll be happy to satisfy your needs.

WIDE MATERIAL RANGE

BIO X allows you to delicately control the temperature of the printbed, which enables a new level of printing quality. Being able to control the printbed temperature paves the way for the use of any bioink, no matter its viscosity. Viscosity is temperature dependent and decreases when temperature rises in most cases. Materials that are solid at room temperature need to be heated until they become fluid enough to be printed with the extruders. These materials need to be cooled as soon as they are dispensed so the printed structure maintains its fidelity. The printbed heat control makes sure to preserve the printed shaped throughout the whole process.



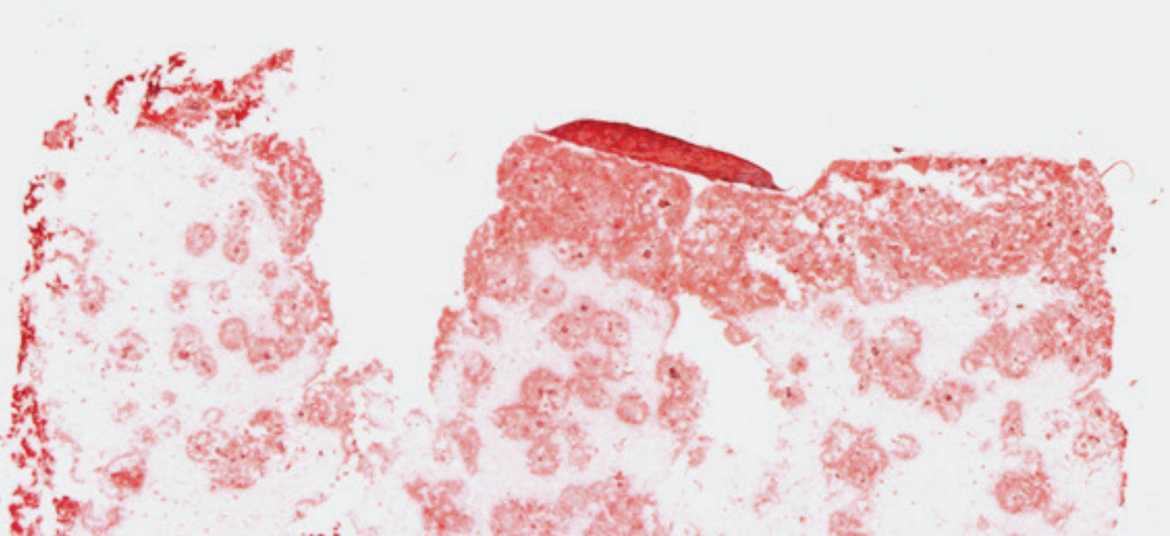


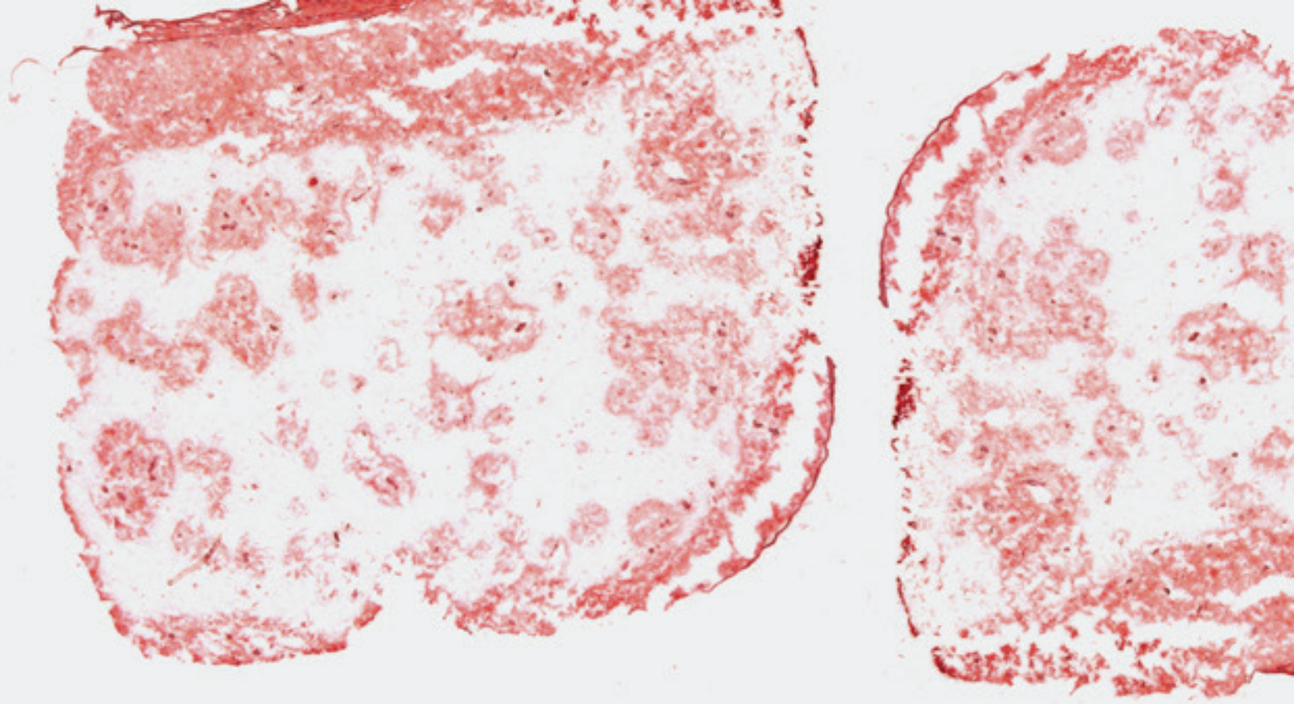
COMPATIBLE MATERIALS

The BIOX is capable of fabricating constructs containing any types of cells, enabling the fabrication of any tissue target found in the body. Fabricate constructs that can be utilized in a wide range of applications through the incorporation of bone marrow stromal cells (BMSCs) or mesenchymal stem cells (MSCs)!

Furthermore, the system can utilize specialized cells such as chondrocytes or fibroblasts for cartilage and dermal applications respectively. Build vascular networks within your constructs utilizing Human Umbilical Vein Endothelial Cells (HUVEC) or construct a cardiac patch using Cardiac Progenitor Cells (CPC)!

Hepatocytes can be bioprinted with the BIOX to rapid create 3D models for drug screening, add some Stellate Cells to quickly make advanced disease models!





LIST OF BIOINKS AND THEIR PRINTING EXTRUSION METHODS

	Pneumatic-driven Extrusion	Piston-driven Extrusion (syringe)	Inkjet	Thermoplastic Printhead
Gelatin Methacryloyl	✓	✓	✓	
Collagen methacryloyl (Collagen solution and precipitated)	✓	✓	✓	
Hyaluronan	✓	✓	✓	
Alginate	✓	✓	✓	
Chitosan	✓	✓	✓	
Silk	✓	✓		
Nanocellulose	✓	✓	✓	
PEG/PEGDA	✓	✓	✓	
Fibrinogen/thrombin	✓	✓	✓	
Decellularized ECM	✓	✓	✓	
Pluronics F127	✓	✓	✓	
Propylene Glycol	✓	✓	✓	
Polycaprolactone				✓
Polylacatic Acid				✓
and more				


BIO X™

OUR BIOINKS

CELLINK is the first universal bioink ever developed. It is currently being used by hundreds of labs in more than 30 countries worldwide. We are working with some of the leading cosmetic companies in the world to eliminate animal testing and replace it with 3D bioprinted human tissue.

At CELLINK we develop new bioinks with good printability and bioactive properties that guide cellular fate processes. Our goal is to support tissue engineers, cell biologists and clinicians to help translate innovative 3D bioprinting technology and bioinks into the clinic.

When you are looking for an ideal solution to all your 3D Bioprinting and 3D cell culturing needs, you can count on CELLINK to deliver the results you are looking for. CELLINK currently provides more than 19 different sterile and ready-to-use bioinks for various applications, with more bioinks in development to broaden the spectra.

APPLICATIONS

Ink	Cartilage	Skin	Bone	Muscle	MSCs	Sacrificial Material
CELLINK	✓	✓			✓	
CELLINK RGD		✓	✓	✓	✓	
CELLINK Bone			✓		✓	
CELLINK A	✓				✓	
CELLINK A-RGD		✓		✓	✓	
CELLINK CollMaGel		✓	✓	✓	✓	
CELLINK GelMa		✓	✓	✓	✓	
CELLINK PCL			✓		✓	✓
CELLINK Pluronics						✓
CELLINK Start						✓
CELLINK GelMA A			✓	✓		
CELLINK GelMA C			✓	✓		
CELLINK Skin		✓				
CELLINK Skin+		✓				
CELLINK Fibrinogen			✓	✓	✓	
CELLINK Fibrin			✓	✓	✓	

CELLINK

The first universal bioink compatible with any 3D bioprinting system. It's a polysaccharide hydrogel, ideal for 3D bioprinting and cell culturing.

CELLINK RGD

Same properties as CELLINK bioink, with an additional biofunctionalization of RGD motifs to improve cell attachment. CELLINK RGD bioink can be mixed with high concentrations of cells.

CELLINK Bone

Same properties as CELLINK bioink, with an additional biofunctionalization of synthetic, osteoconductive particles for bone tissue engineering applications.

CELLINK A

A biodegradable bioink specifically developed for advanced 3D Bioprinting researchers. It's composed of highly purified sodium alginate and crosslinks with divalent cations.

CELLINK A-RGD

Works like CELLINK A bioink with an additional biofunctionalization of RGD motifs to improve cell attachment. CELLINK A-RGD bioink can be mixed with high concentrations of cells.

CELLINK CollMaGel

A type I collagen-based bioink, modified with methacryloyl substitution groups, that provides mammalian cells with a milieu close to their native environment.

CELLINK GelMa

A gelatin-based bioink, modified with methacryloyl substitution groups, that provides mammalian cells with a milieu close to their native environment.

CELLINK PCL

A high molecular weight (Mn 50,000) thermoplastic linear polyester derived from caprolactone monomers. Can be used as a support material when bioprinting load-bearing tissue constructs.

CELLINK Pluronics

A triblock copolymer widely used as a sacrificial material when bioprinting cell-laden constructs with bioinks having poor shape fidelity. Is printed at room temperature and dissolves when cooled.

OUR BIOINKS

CELLINK GelMA A
It is a blend of GelMA and alginate that is the easiest to use gelatin based bioink in the world. Compared to non-modified gelatin, blend retains its shape at physiological temperature and conditions and has unparalleled printability at room temperature. Available with both Irgacure and LAP.

CELLINK GelMA C
It is a blend of GelMA and nanofibrillar cellulose that is a simple to use gelatin based bioink. This blend exhibits unparalleled printability at room temperature and through a wide range of nozzle diameters. It can be extruded at low pressures while forming filaments once deposited. Available with both Irgacure and LAP.

CELLINK Skin
Same properties as CELLINK bioink, with incorporates fibrinogen to recapitulate the native wound healing environment. This is why CELLINK® SKIN is perfectly adapted for printing skin models for research and testing.

CELLINK Skin+
Same properties as CELLINK bioink, with both in situ fibrin and fibrinogen, optimized for the culture of fibroblasts and keratinocytes utilized for the fabrication of skin constructs. This enhancement provides a more physiological environment for the engineering of skin.

CELLINK FIBRINOGEN
Same properties as CELLINK bioink, with incorporates fibrinogen which is a critical protein that is found in the healing of many tissues due to its role in clotting. Perfect for application with cells that are developed to recapitulate the native wound healing environment.

CELLINK FIBRIN
Same properties as CELLINK bioink, it contains both in situ fibrin and fibrinogen and permits the development of a compound network that offers unparalleled stability which is perfect for providing a more physiological wound healing environment.

CELLINK Start
A water soluble gel used as a sacrificial material when bioinks have poor shape fidelity. Also used to prevent sagging of bioink filament and thus, bioprint constructs with porosity along all three axes.

CELLINK GELMA KIT
The CELLINK GelMA Kit consists of sterile CELLINK GelMA powder along with photoinitator necessary to blend your own bioink composition. Easy to use and get started making and customizing your own GelMA based bioinks or for use as a base material for 3D cell culture.

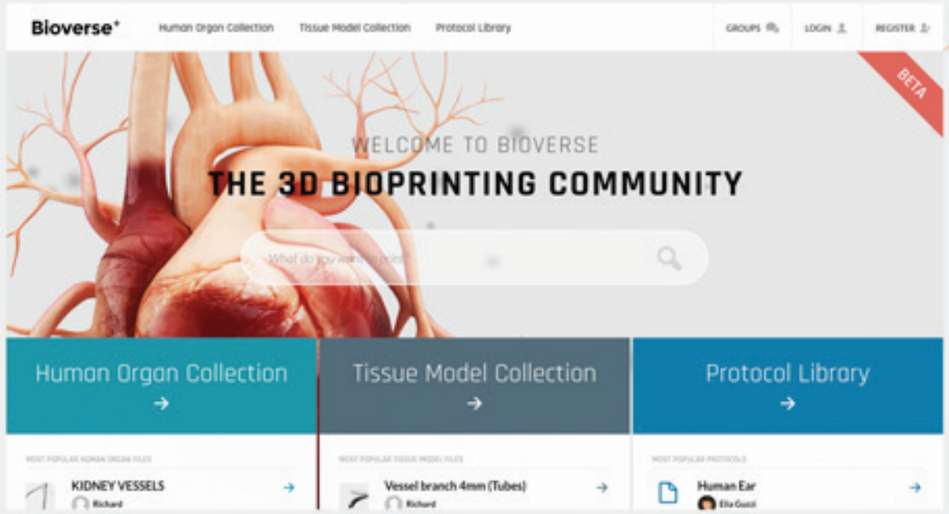
CELLINK SUPPORT KIT
The CELLINK Support Kit contains cartridges of low viscosity bioinks along with support bioinks to enable the fabrication of 3D constructs from otherwise unprintable materials. While specifically optimized for use with the BIO X printer system, the protocol can be adapted for any system.

CELLINK VASKIT
The CELLINK VASKIT is the easiest way to generate vascularized tissue constructs. The kit contains cartridges any CELLINK bioink along with sacrifical pluronics bioinks optimized for the generation of conduits. These ready-t0-print bioinks when combined with our novel vascular network generators will put you well on your way to revolutionizing your research and fabricate larger, more physiologically mimicking constructs.

BIOVERSE.CO

EXTENDING DEVELOPMENT BEYOND YOUR LAB

The future in development lies within the power of sharing and improving together. Bioverse is a global 3D bioprinting online community with CAD-models of human organs and tissue models. The platform is open-source and gives you a place to share, develop and download blueprints and protocols of all types of tissues, organs and tissue analogues. Bioverse is developed and maintained by Cellink AB.



OWNERSHIP HAS NEVER BEEN MORE CONVENIENT

Bioverse.co is not only a forum for sharing, but also for caring. Use your products' serial numbers and register them under your account at Bioverse. You'll get instant notifications when your warranties are about to expire, if maintenance should be done and when there are new software updates for your BIO X. Connect your BIO X to the internet, with or without a wire, and download 3D models from Bioverse straight into your BIO X. If the downloaded project files contain printing protocols, your BIO X will set up automatically according to them and you can start printing with a single click.

COLLABORATE TO ACCELERATE PROGRESS

Search through this online database for human organ models, tissue models or protocols to improve your work. Extend your expertise beyond your lab by collaborating with other great minds around the world.

EASY PRINTING PROCESS

CELL MIXING

Before printing, the cells need to be mixed with the bioink. We have developed the easiest and most homogenous way of doing this using our innovative CELLMIXER. Put the bioink in the 3 mL syringe and your cells in suspension media in the 1 mL syringe. Clip each syringe to the dispensing unit, connect the mixing unit to the tip of each syringe and then connect the filling-cartridge. Screw all connections so there is no leakage. Fill the cartridge by gently injecting the ink and cells through the mixing unit. Your filling-cartridge is now ready for bioprinting and can now be disconnected from the mixing unit.

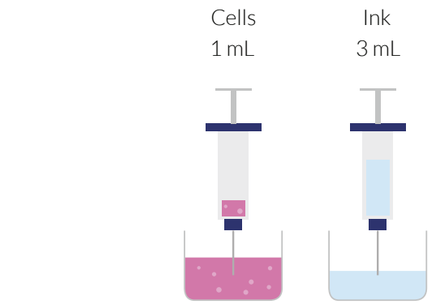
BIOPRINTING

When the cell mixing is done, and your cartridge is filled, you're ready to start pinting. Screw a nozzle on to the cartridge and connect it to the air system. Now place it in the printhead. Continue by choosing the desired printing settings on the touch screen, such as temperatures, printing pressure and printing speed. The parameters and the nozzle's diameter are chosen accordingly to the material of choice. Select the design you want and press print. BIO X will calibrate itself and start printing.

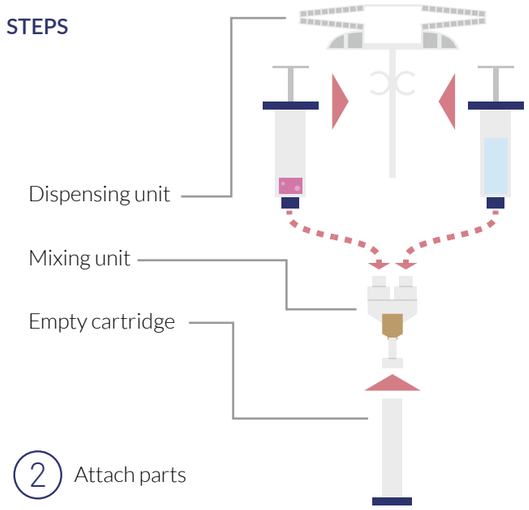
CROSSLINKING

Depending on the material you are printing, you may need to crosslink the printed construct. For UV crosslinking, you can turn on the built in LED and the BIO X will do all the work for you. For other types of crosslinking, you can add the crosslinking agent directly on your construct.

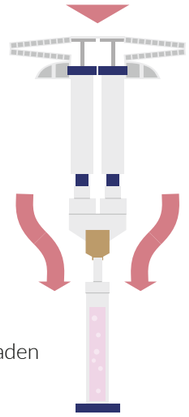
PREPARATION STEPS



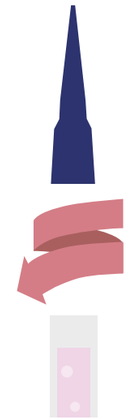
1 Fill syringes



2 Attach parts

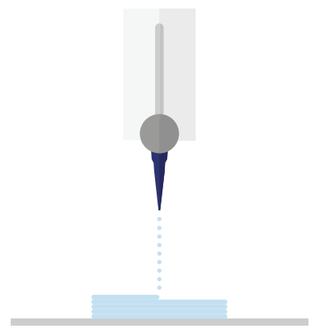


3 Mix and fill cartridge



4 Screw nozzle on

5 Place in printhead



6 Select settings and start printing!

SPECIFICATIONS:

PRINT AND TOOL HEADS

Print heads	Heated pneumatic printhead Ink-jet printhead Thermoplastic filament printhead Temperature controlled pneumatic printhead Syringe pump printhead
Tool heads	Photo curing tool head HD camera tool head
Print heads included	(3x) Heated pneumatic printhead

PRINTING

Build volume	130x90x70 mm
Layer resolution	1 µm
Positioning resolution Calibration	1 µm Automatic
Printbed temperature control	5-60 °C
Printhead temperature control	Cooling/heating printheads available
Pressure	0-700 kPa
Max printing speed	40 mm/s
Dedicated materials	see Wide material range
Materials per scaffold	3, using 3 printheads
Photo curing LED	Default: UV 365 nm and 405 nm Other wavelengths available upon request
Printhead actuation	Mechanical high precision

HARDWARE

Filters included	HEPA H14, retention rate 99.995% Prefilter (larger particles)
Software	Heart OS™ (Integrated)
Supported file types	.STL, Gcode
Connectivity	Ethernet, Wi-Fi, USB
Machine size (H/W/D)	480x440x355mm
Machine weight	17kg
Shipping weight Power	21kg
input	100-240V, 50-60Hz, 600W
Fuse	250V T8A
Structure	Powder coated, aluminum frame

ADDITIONAL FEATURES

Intergrated oil-free air supply, up to 200 kPa
Dual power fans
Positive chamber pressure
UV-C germicidal lamps, 275 nm, 2 Watt
Modular system of triple printing nozzles
7” LCD touch screen, gloves-friendly

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