INTRODUCING BIO X™

THE FUTURE OF MEDICINE IS HERE

TABLE OF CONTENTS

MEET THE BIO X

BIO X is equipped with features scientist have been waiting for

BIO X is the most user friendly yet flexible bioprinter 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 yet closer and faster to a desired future of medicine.

WIDE MATERIAL RANGE

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

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.

INTELLIGENT PRINTHEADS

User exchangeable, intelligent printheads with a wide range of features, making it possible to bioprint a wide range of bioinks and cells with minimal effort.

STAND ALONE UNIT

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

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 control your sterility remains uncompromised.

DESIGNED WITH THE SCIENTIST IN MIND

YOU TALKED AND WE LISTENED!

When developing the BIO X, we at CELLINK reached out to you, our fellow scientists, 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"

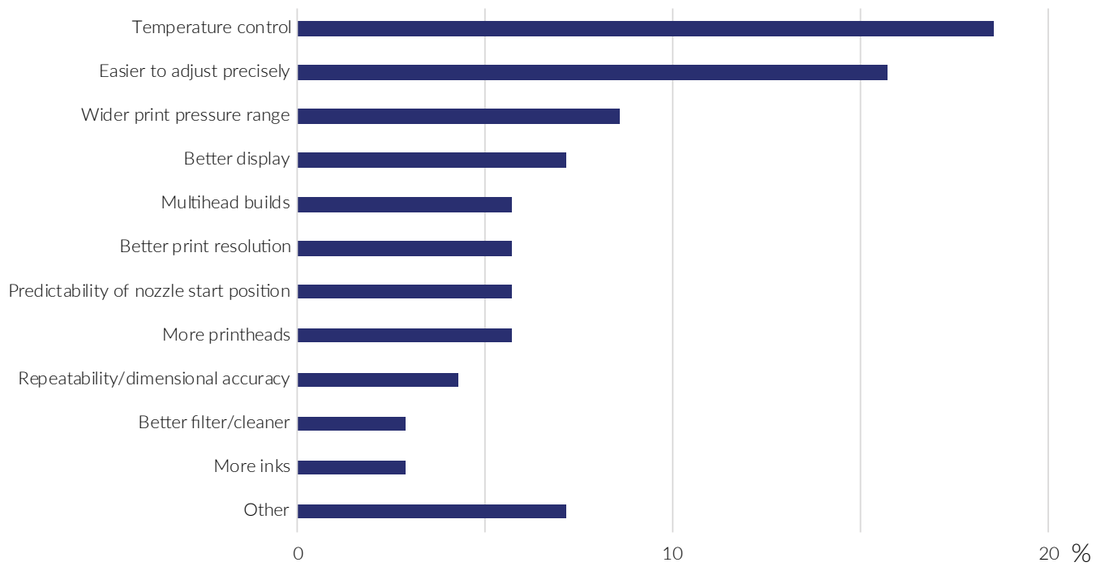
"I would like a cooling and heating system for the print bed"

"I'd like the ability to print at pressures higher than 400 kPa"

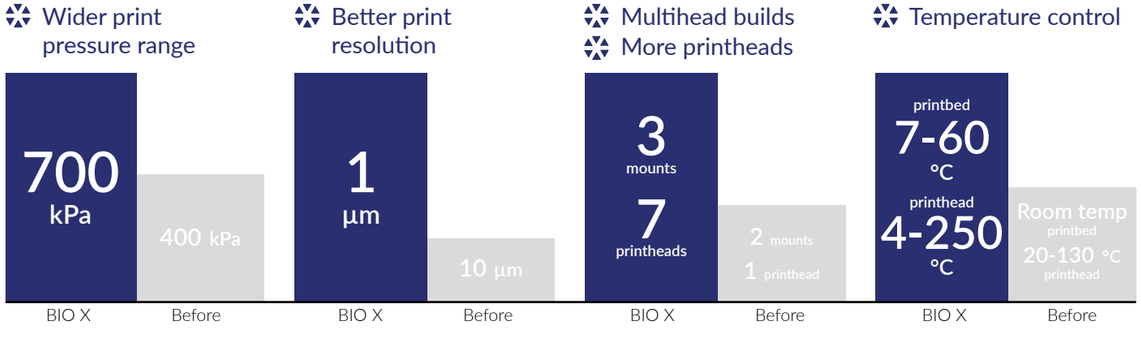
"Different print heads, heated print heads"

We asked what current features you'd want to improve, and what non-existing features you'd like to see in the next generation bioprinter.

The diagram below shows what categories your answers concerned



YOU AFFECTED BIO X

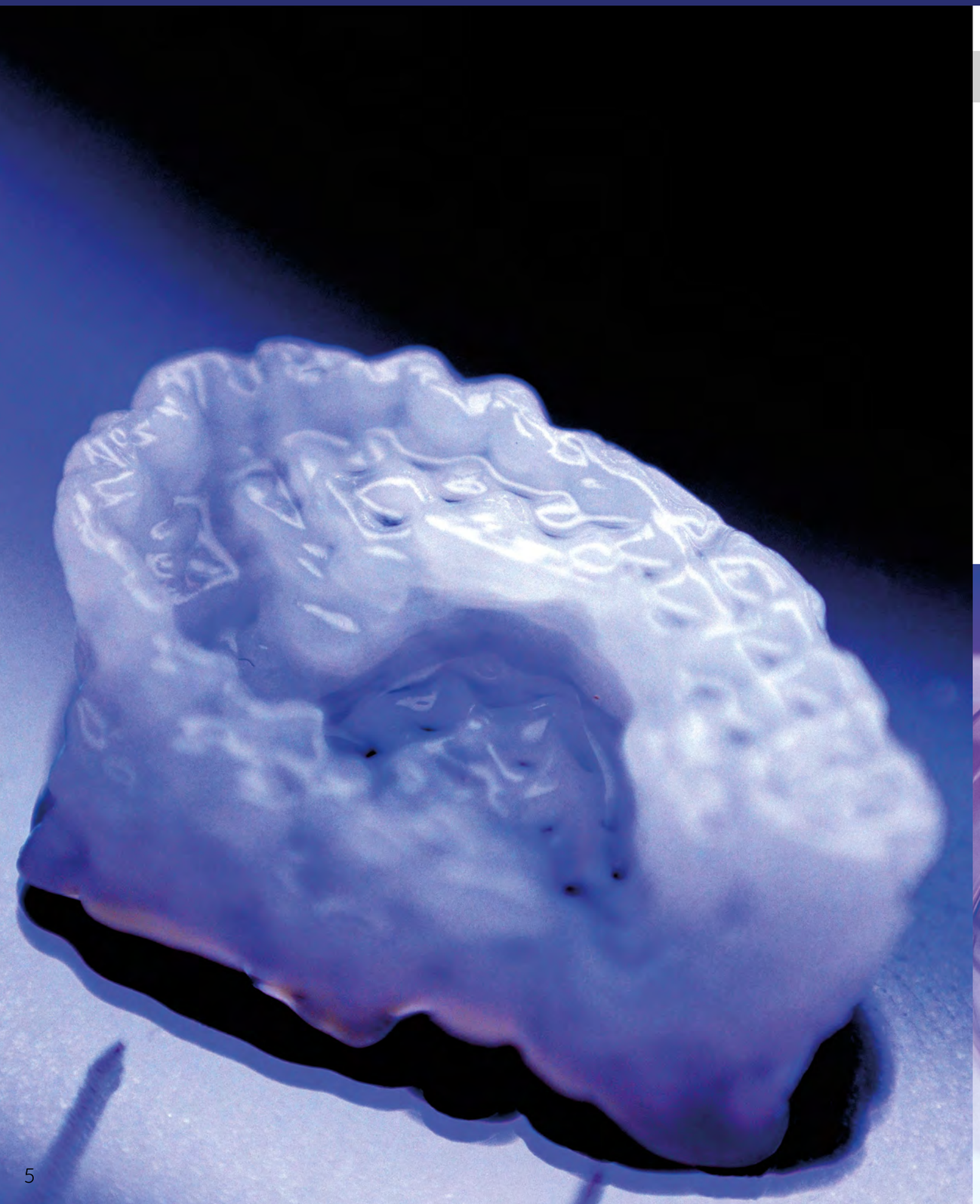


ADDITIONAL IMPROVEMENTS

More inks	Now: The temperature control and the printhead system allows for any biomaterial to be printed.
Predictability of nozzle	Now: Neocortex M1 processor allows for better performance and comprehensive feedback.
Better filter/cleaner	Now: H14 Dual HEPA filtration, included in Clean Chamber Technology.
Easier to adjust precisely Better display	Now: Integrated, easy to use BIO X software with digital control instead of analog.

BIOPRINTING

THE FUTURE OF MEDICINE



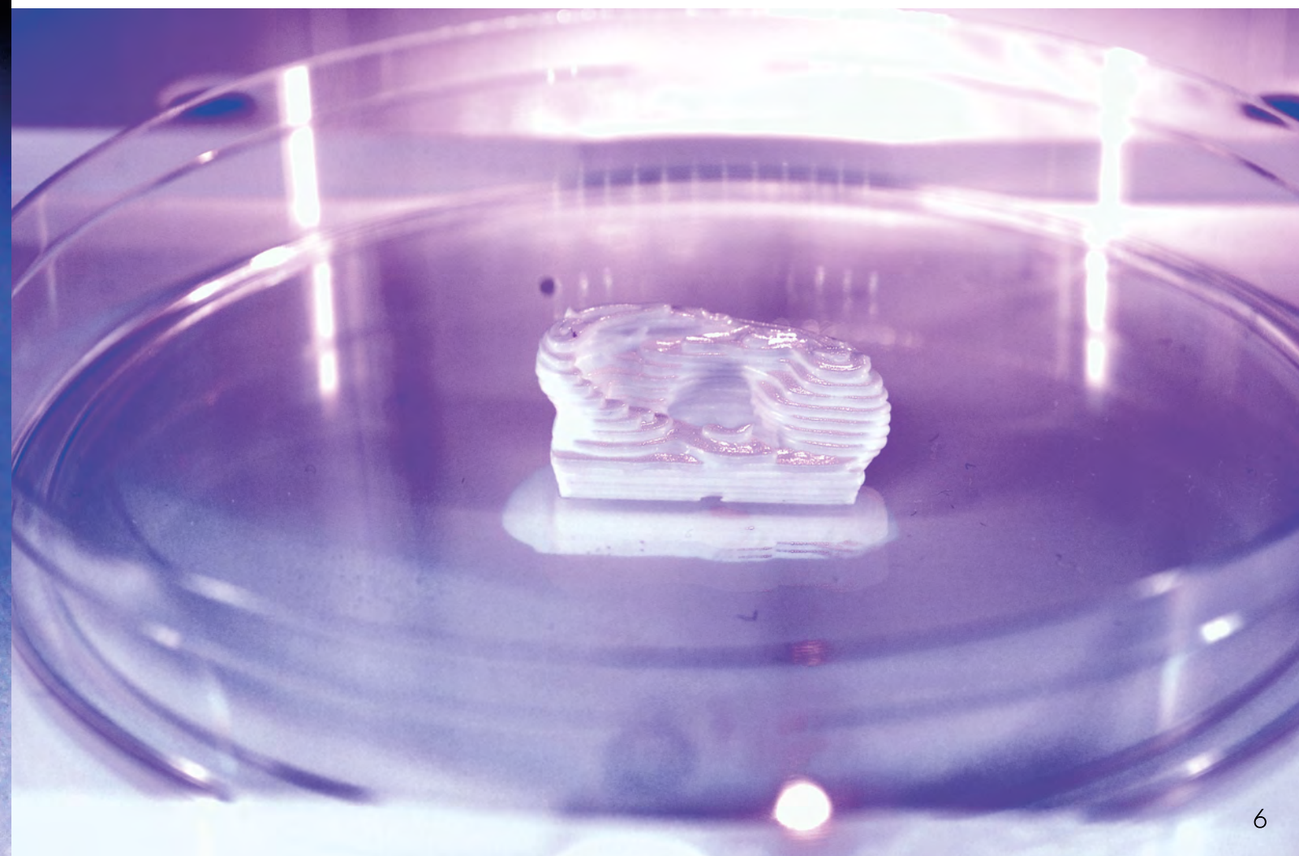
WHAT IS BIOINK?

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 with biologically relevant chemical and physical signals, mimicking the natural extracellular matrix environment. 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?

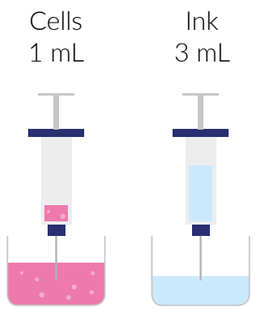
The innovative methods for engineering human tissues and organs can have a profound effect on the future of medicine. 3D Bioprinting is considered a revolutionizing technology for advancing and accelerating progress in the field of tissue engineering and regenerative medicine, and thus, the future of 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.

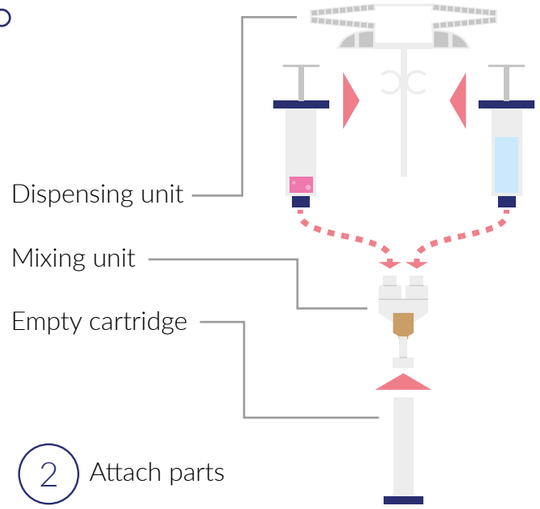


THE PRINTING PROCESS

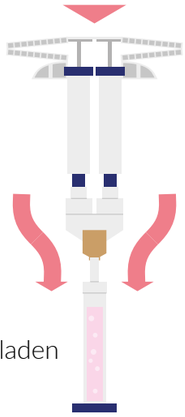
PREPARATION STEPS



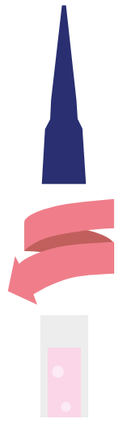
1 Fill syringes



2 Attach parts

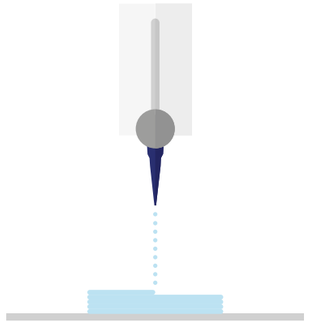


3 Mix and fill cartridge



4 Screw nozzle on

5 Place in printhead



6 Select settings and start printing!

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.

USER-CENTERED INTERFACE

ERGONOMICALLY DESIGNED FOR YOUR CONVENIENCE

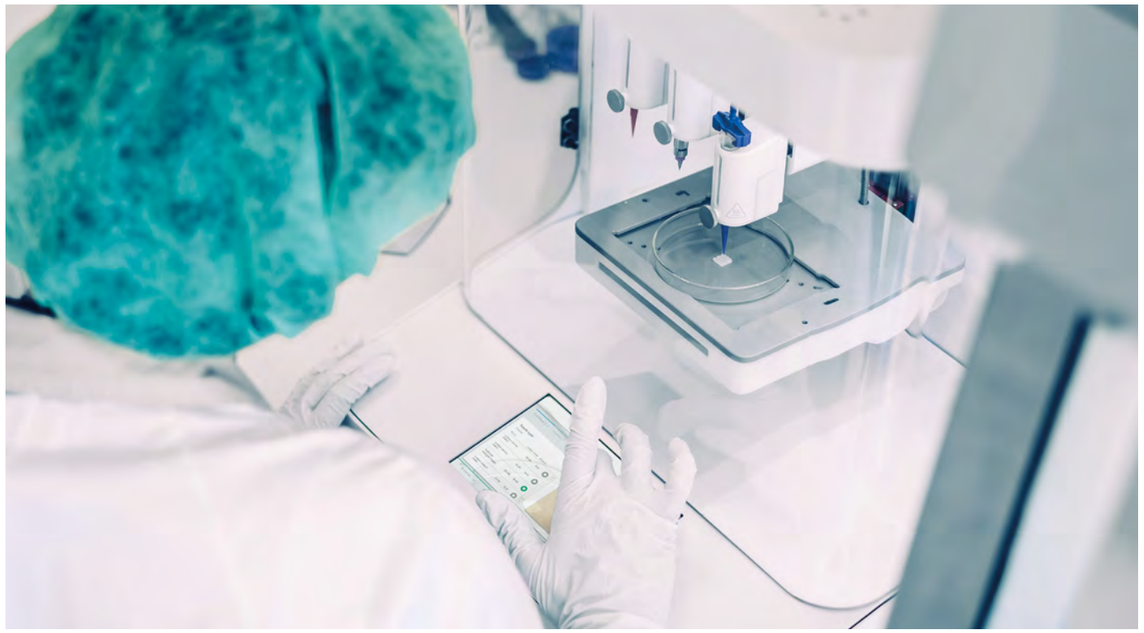
EASILY EXCHANGEABLE PRINTHEADS

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.

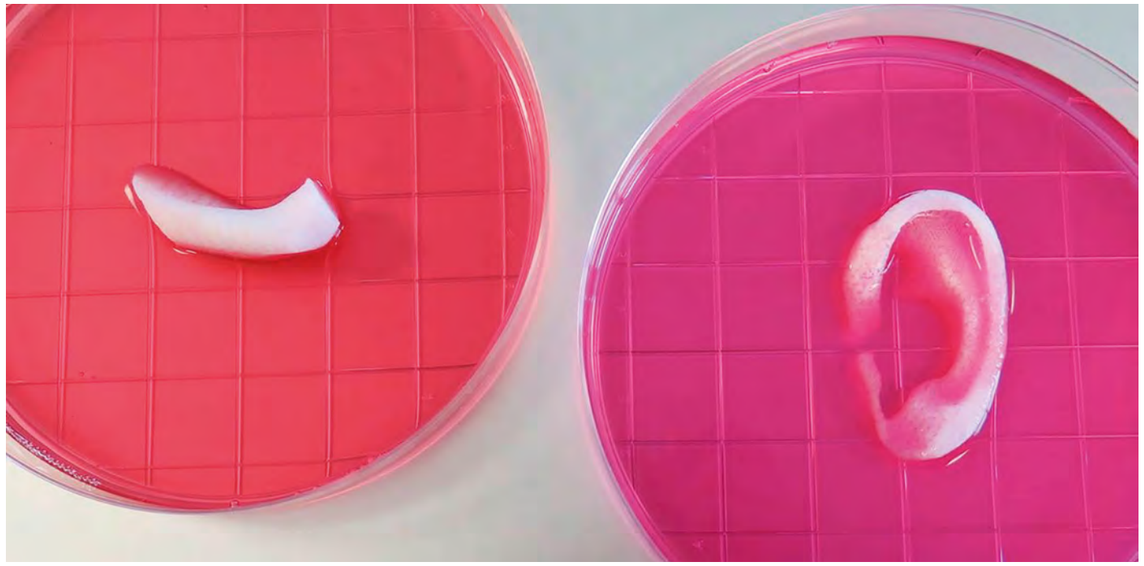
BIO X is equipped with a high precision, 7” illuminated touch display that is suitable even with the gloves on. The new, revolutionary integrated software provides you with constant feedback and is designed to guide the user in every step to facilitate the bioprinting process. Its user-friendly, graphical 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 working environment.

GUIDES THE USER IN EVERY STEP



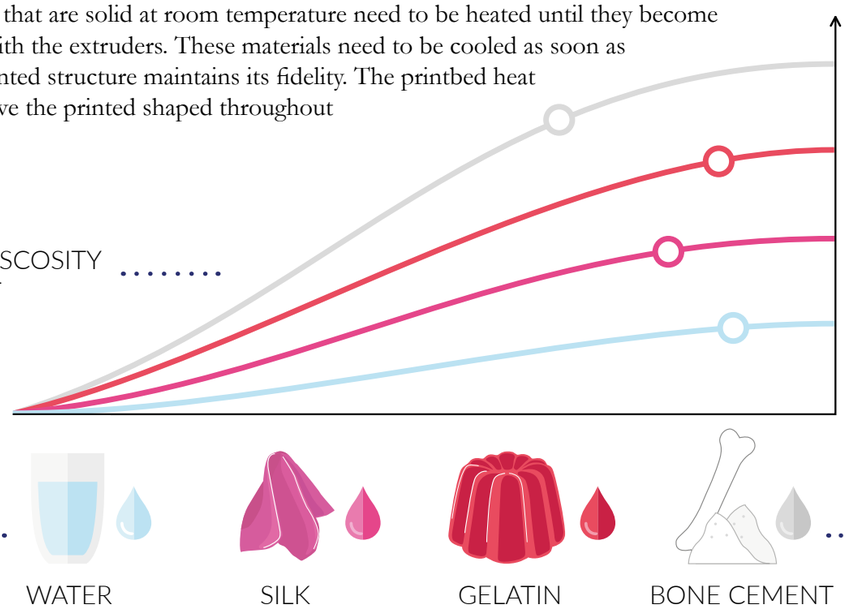
WIDE MATERIAL RANGE



Non-suitable materials? Not with the BIO X print bed

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.

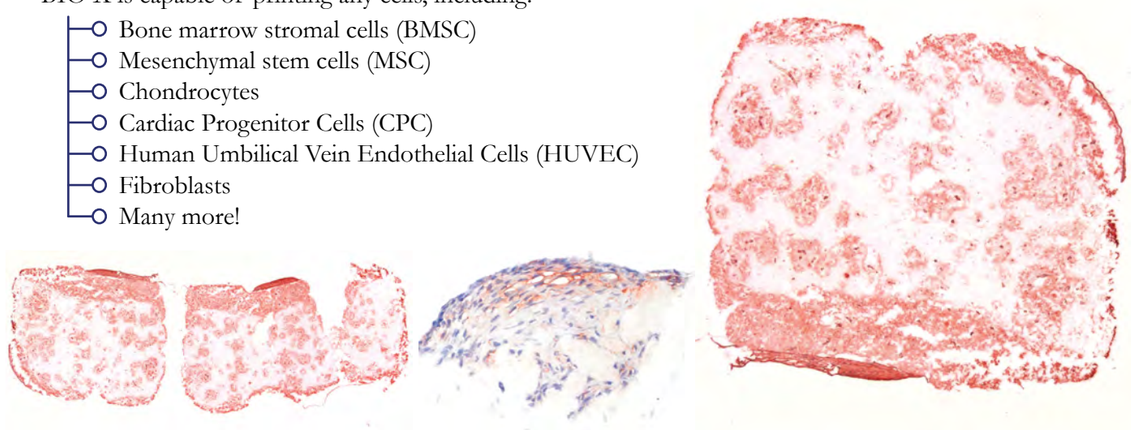
NO MATTER THE VISCOSITY
BIO X CAN PRINT IT



Available materials and their printing methods

BIO X is capable of printing any cells, including:

- Bone marrow stromal cells (BMSC)
- Mesenchymal stem cells (MSC)
- Chondrocytes
- Cardiac Progenitor Cells (CPC)
- Human Umbilical Vein Endothelial Cells (HUVEC)
- Fibroblasts
- Many more!

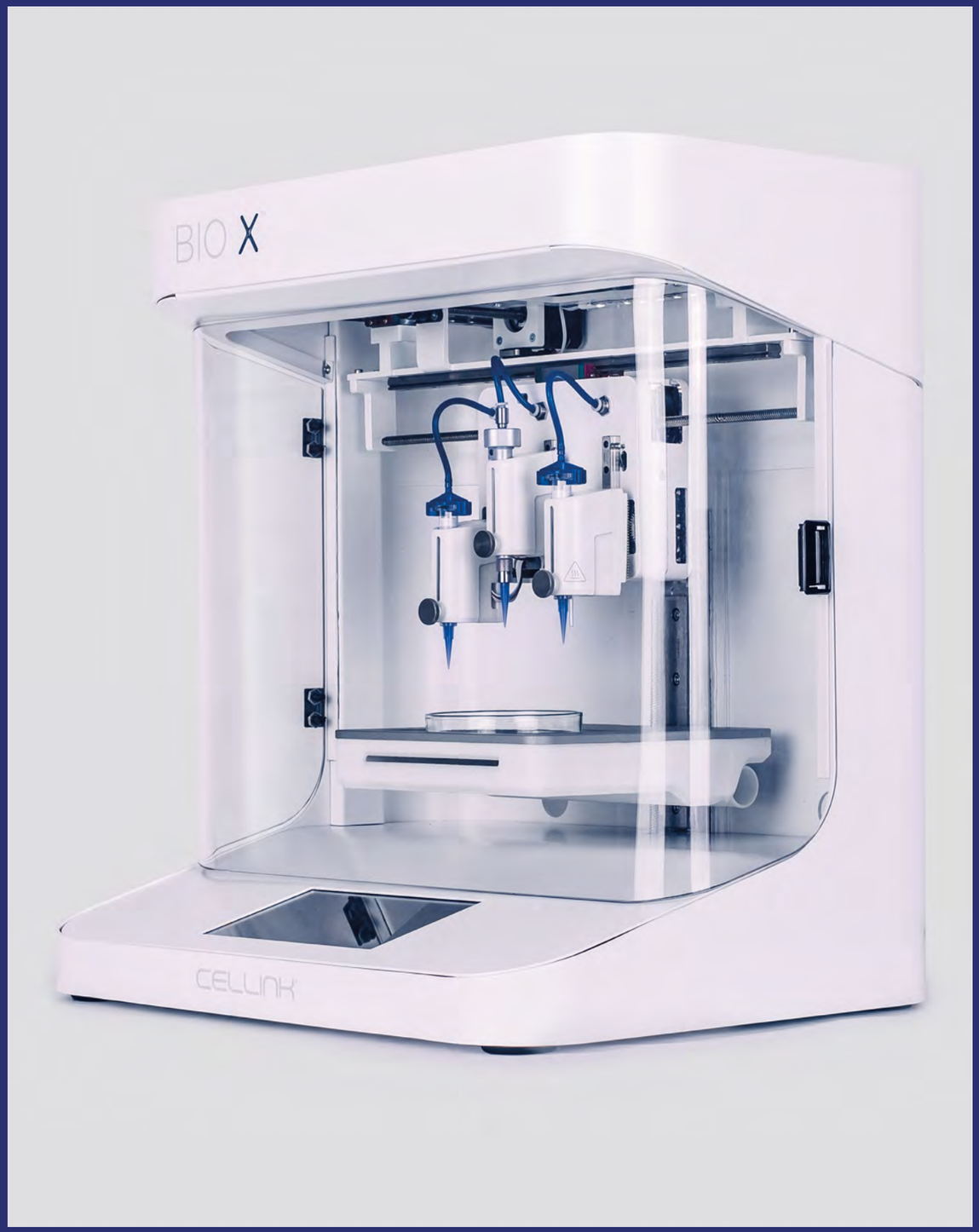


LIST OF BIOINKS AND THEIR PRINTING EXTRUSION METHODS

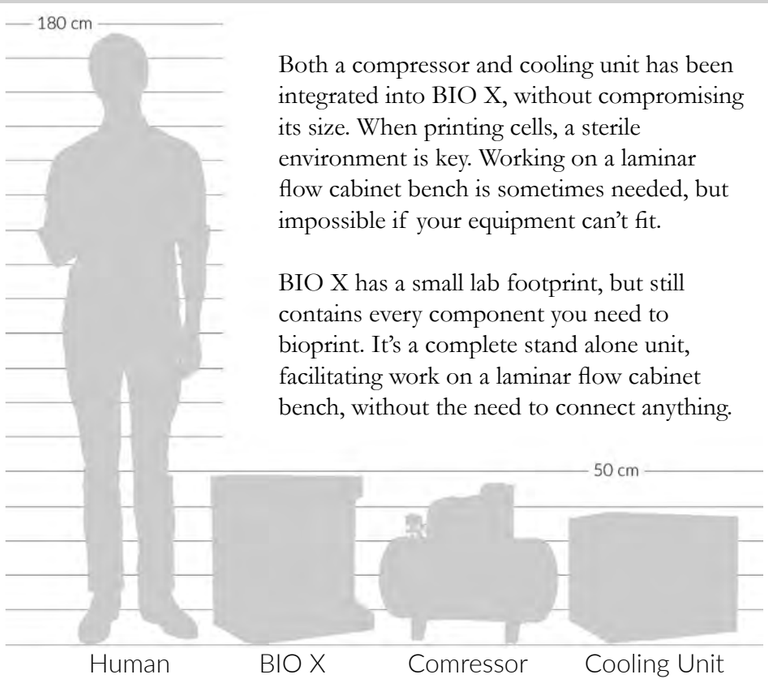
	Pneumatic-driven Extrusion	Piston-driven Extrusion (syringe)	Inkjet	Thermoplastic Extrusion
Gelatin Methacryloyl	✓	✓	✓	
Collagen methacryloyl (Collagen solution and precipitated)	✓	✓	✓	
Hyaluronan	✓	✓	✓	
Alginate	✓	✓	✓	
Chitosan	✓	✓	✓	
Silk	✓	✓		
Nanocellulose	✓	✓	✓	
PEG/PEGDA	✓	✓	✓	
Fibrinogen/thrombin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

STAND ALONE UNIT

A COMPLETE SYSTEM MOVEABLE IN ONE PIECE



SMALL LAB FOOTPRINT



Both a compressor and cooling unit has been integrated into BIO X, without compromising its size. When printing cells, a sterile environment is key. Working on a laminar flow cabinet bench is sometimes needed, but impossible if your equipment can't fit.

BIO X has a small lab footprint, but still contains every component you need to bioprint. It's a complete stand alone unit, facilitating work on a laminar flow cabinet bench, without the need to connect anything.

INDEPENDENT, BUT STILL COMPATIBLE

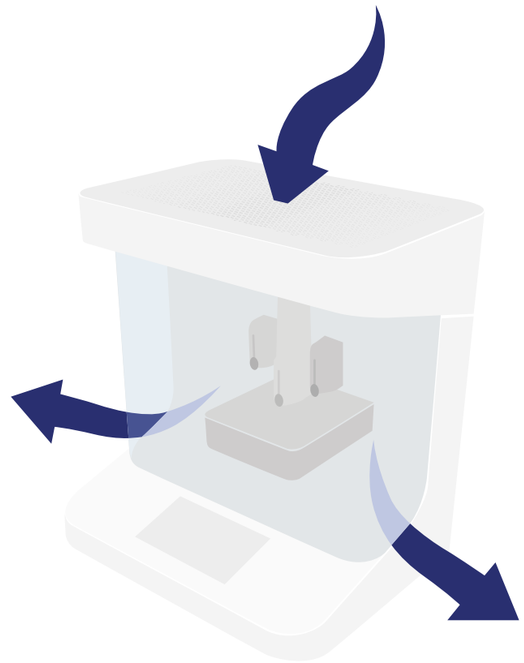
Even though BIO X works perfectly on its own, you might sometimes want to increase performance of different functions. There's a plug in the back of the BIO X where you can connect to your laboratory air supply if so be needed. Connecting the it allows you to print with higher pressure than usual, which is sometimes necessary for high viscosity inks. You may also connect whatever other utilities you may need. BIO X is the most diverse bioprinter yet.

CLEAN. REINVENTED

Dual power fans and a positive air pressure

BIO X is equipped with dual, high-power fans that create a powerful airflow through its dual filtration top, creating a positive 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 organisms. The Dual power fans fills the chamber with filtered air, at a positive pressure, keeping the flow going.

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

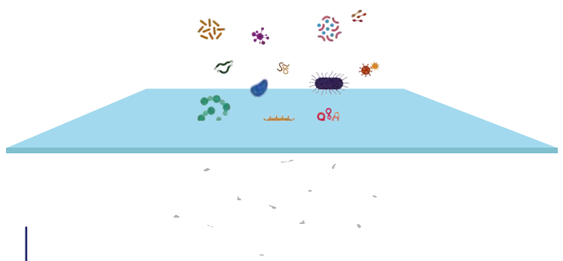


HEPA Filter

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.

H14 retension rate (total):

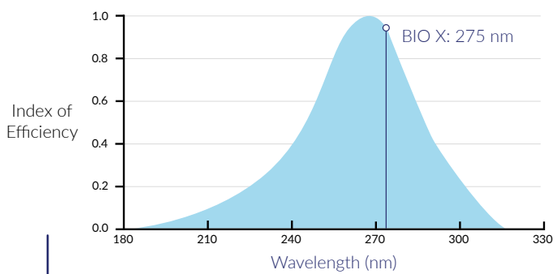
99.995%



UV Lights

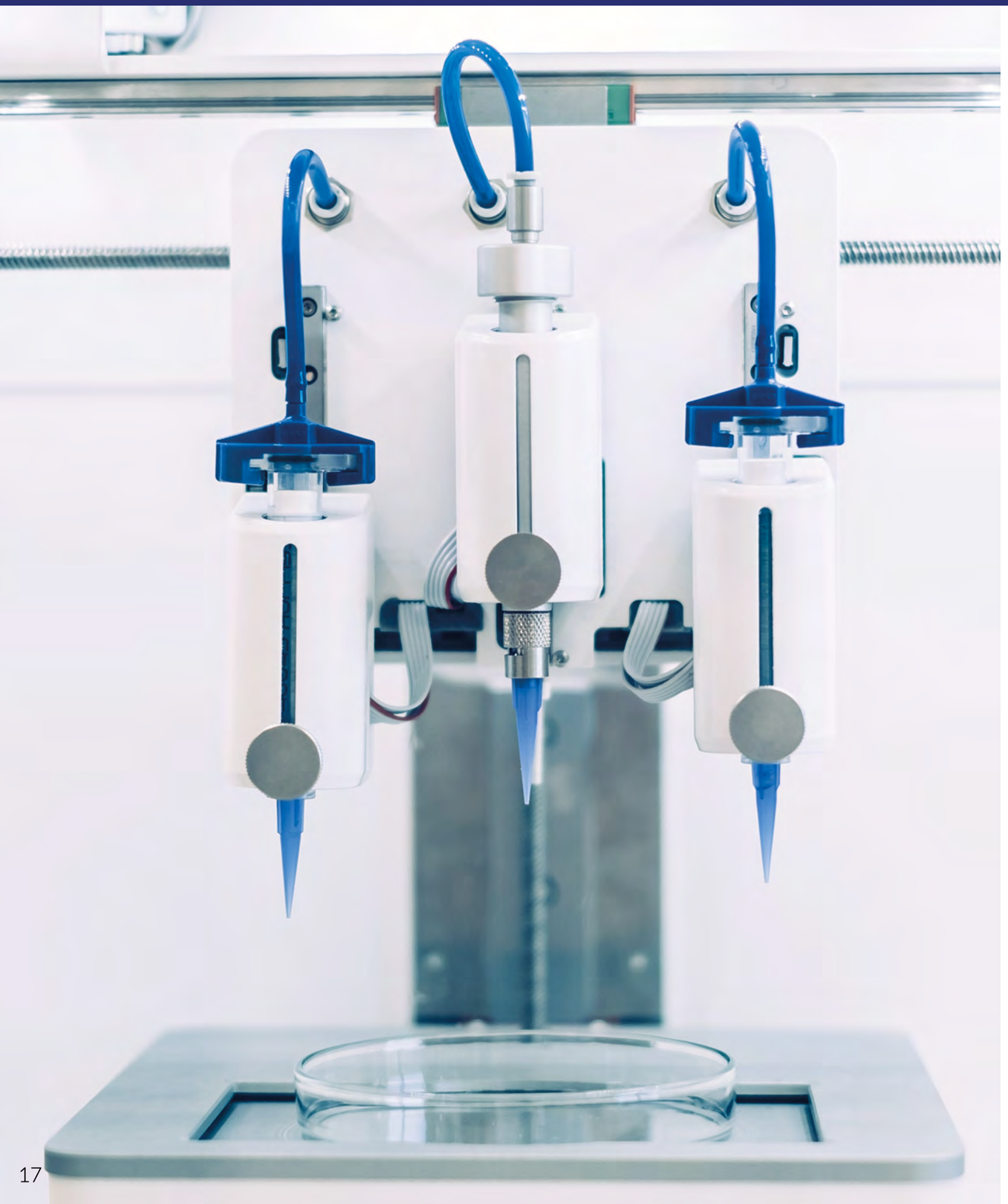
To further sterilise the printing environment, BIO X uses UV-C germicidal lamps to kill or inactivate microorganisms by disrupting their DNA and destroying their nucleic acids. This causes the micro-organisms to be inactivated, making their presence insignificant. With a wavelength of 275 nm, BIO X works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

Germicidal output of UV radiation



PRINTHEADS

INTELLIGENT AND EXCHANGEABLE

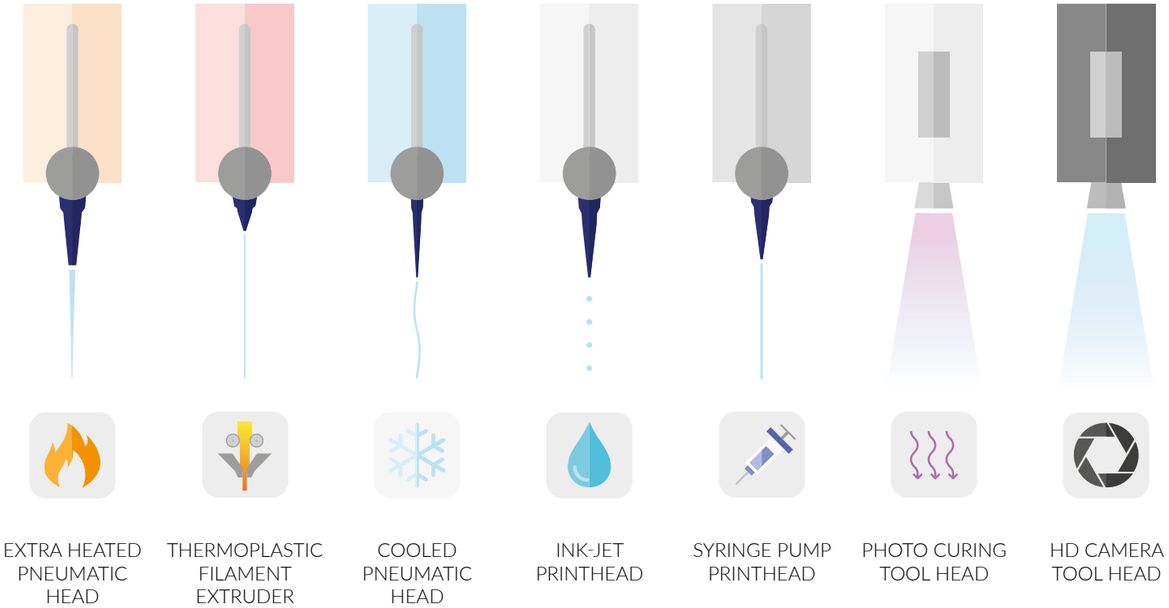


BIO X is equipped with a total of three printhead mounts. This allow you to change between printing techniques or to use multiple materials. These features make it possible to print a wide range of different bioinks and cells with minimal effort, allowing you a greater freedom of design. You can also attach several other tools to the same mounts in order to facilitate and optimize certain parts of the printing process.

With its exchangeable print head system, BIO X offers an unparalleled flexibility. The snap-on feature offers fast exchange for a wide range of printheads including chilled printheads, heated printheads, HD cameras, and many more.

BIO X comes with 365 and 405 nm wavelength UV light sources, which provides you with instant and automated crosslinking. They can be replaced at any time with other wavelengths if so be needed. All by simply clicking it 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. The BIO X print heads 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 possbilities are endless, giving you full freedom in your lab work.

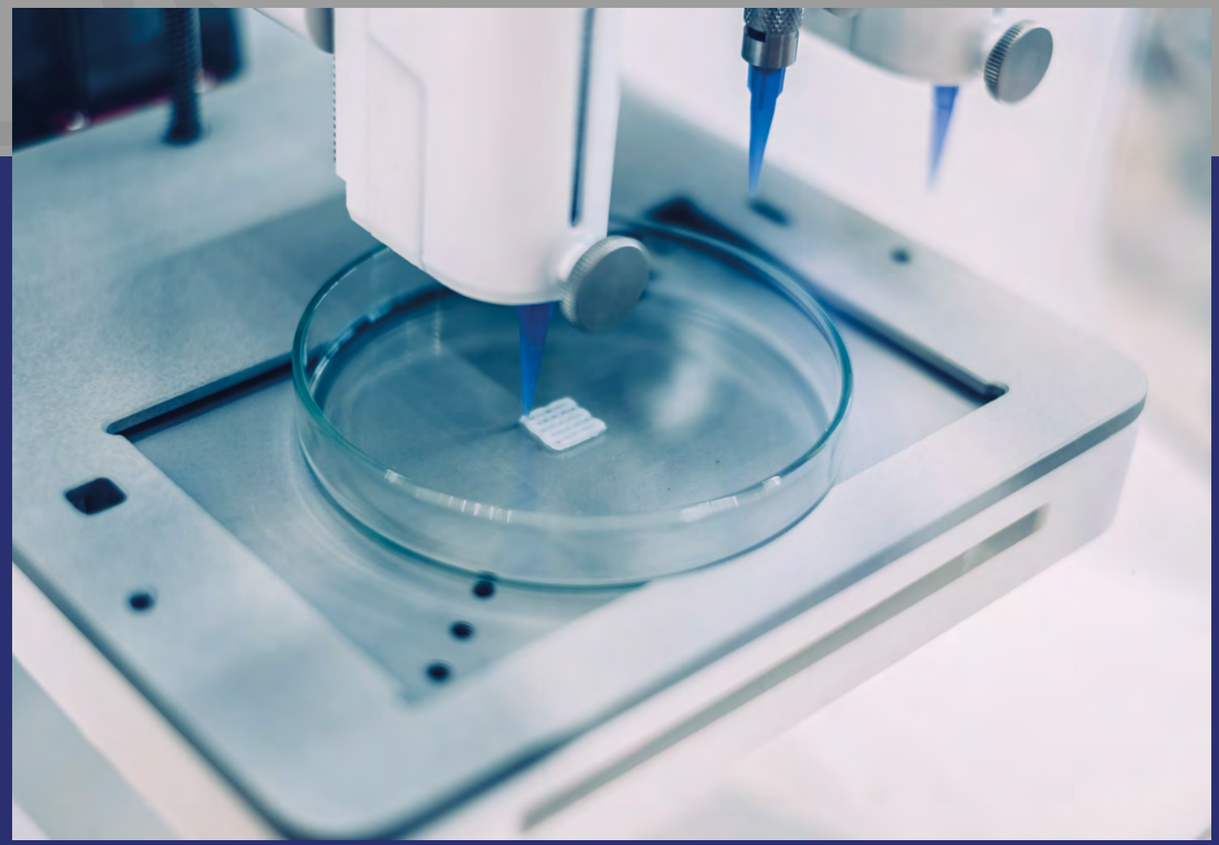


OUR PRINTHEADS

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

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

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



HEATED PNEUMATIC HEAD, TEMP: 85 °C
The default printhead that comes with BIO X.

EXTRA HEATED PNEUMATIC HEAD TEMP: 130 °C
The hightened maximum temperature allows for a wider range of thermoplastics to be printed effortlessly.

THERMOPLASTIC FILAMENT EXTRUDER TEMP: 250 °C
Allow for the use of thermoplastics in the bioprinting process to reinforce the bioinks, creating a stronger construct.

COOLED PNEUMATIC HEAD, TEMP: 4 °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: 85 °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 and deposited 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 documenting 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.

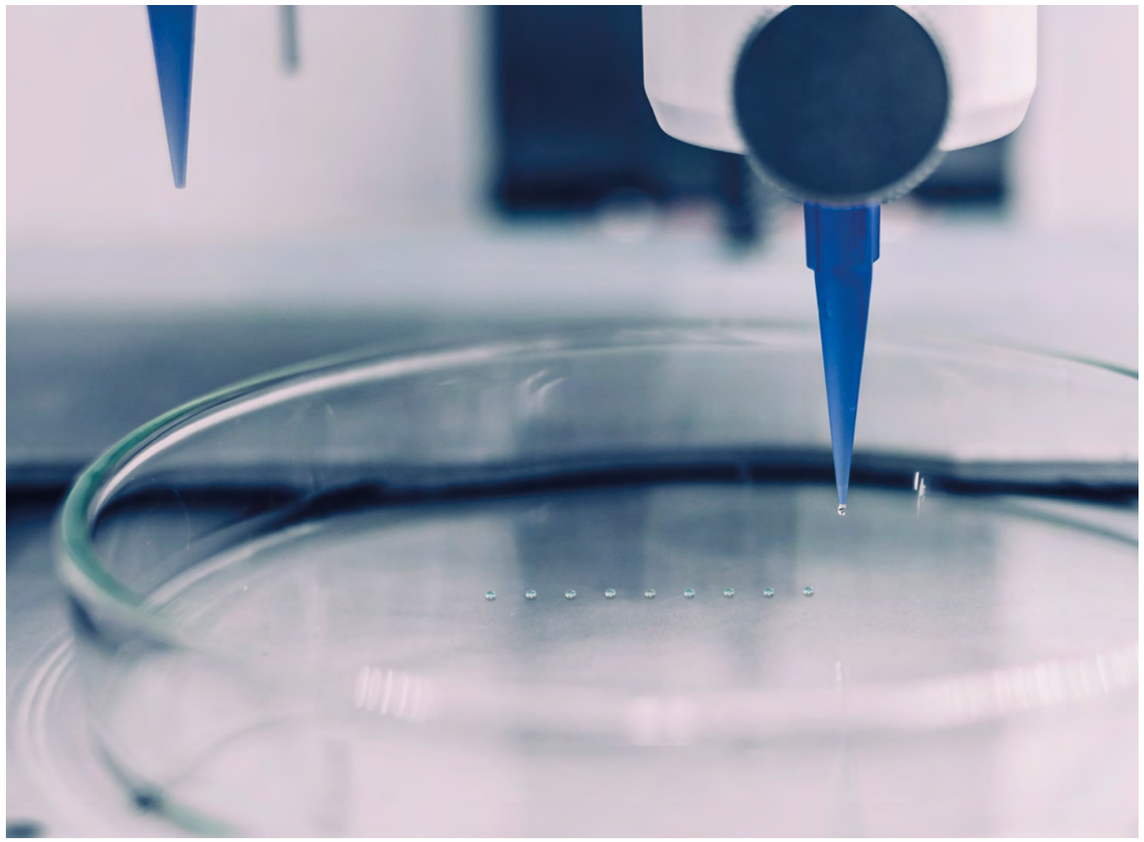
OUR INKS

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 biologist 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.

DID YOU KNOW?

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.



APPLICATIONS

	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
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 mixed with high concentration 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 mixed with high concentration 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 monomer. 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.

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 axis.

SPECIFICATIONS: PERFORMANCE AND TECHNICAL DATA

PRINT AND TOOL HEADS

Print heads	Heated pneumatic print head Ink-jet print head Thermoplastic filament extruder Cooled pneumatic print head Extra heated pneumatic print head Syringe pump print head
Tool heads	Photo curing tool head HD camera tool head
Print heads included	(2x) Heated pneumatic print head (1x) Syringe pump print head

HARDWARE

Filters included	HEPA H14, retention rate 99.995% Prefilter (larger particles)
Software	Integrated
Supported file types	.STL
Connectivity	Ethernet, Wi-Fi, USB
Machine size (H/W/D)	500x360x450mm
Machine weight	17kg
Shipping weight	21kg
Power input	100-240V, 50-60Hz, 600W
Fuse	250V T8A
Structure	Powder coated, aluminum frame

PRINTING

Build volume	130x90x70 mm
Layer resolution	1 µm
Positioning resolution	1 µm
Calibration	Automatic
Printbed temperature control	4-60 °C
Printhead temperature control	Cooling/heating printheads available
Pressure	0-700 kPa
Printing speed	TBD mm/s
Dedicated materials	see Wide material range, p.12
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

ADDITIONAL FEATURES

- Integrated air supply
- Integrated compressor
- Dual power fans
- Positive chamber pressure
- UV-C germicidal lamps, 275 nm, 2 Watt
- Modular system of triple printing nozzles
- 7” LCD touch screen, usable while wearing gloves

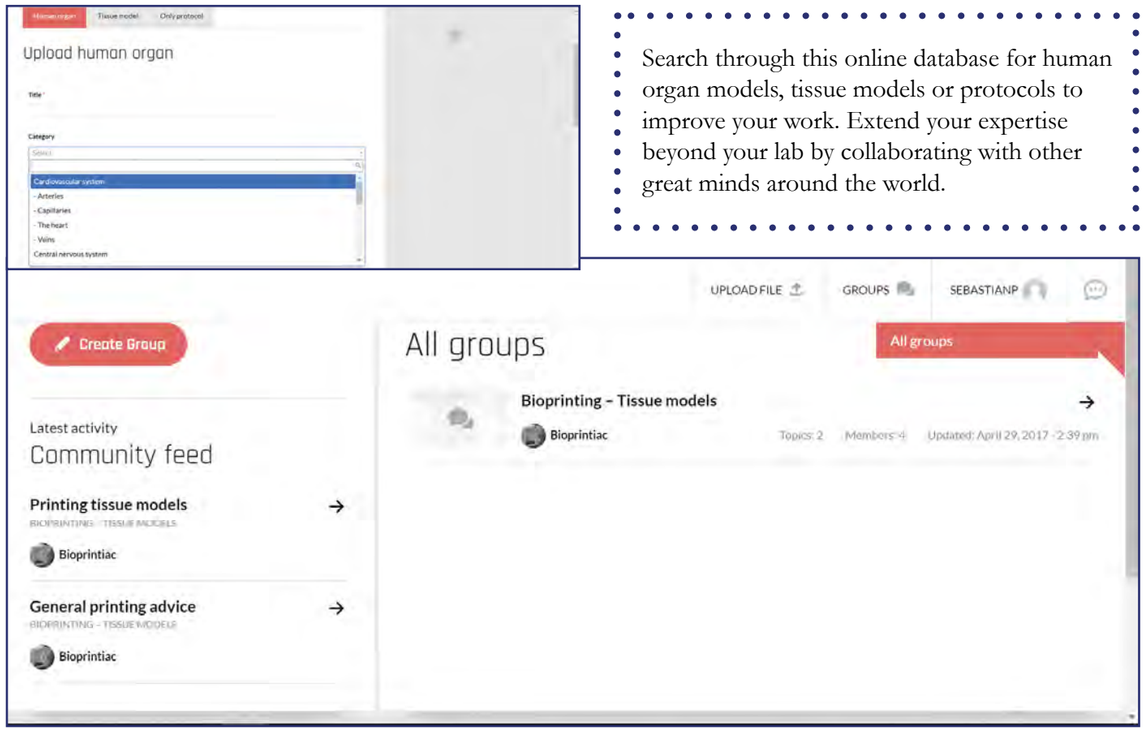
BIOVERSE.CO

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.

DOWNLOAD MODEL

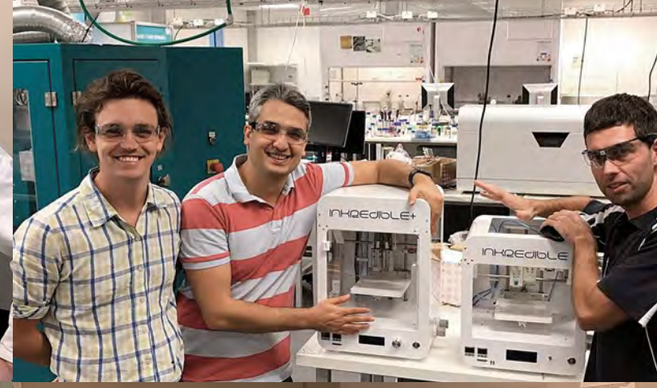
Collaborate to accelerate progress

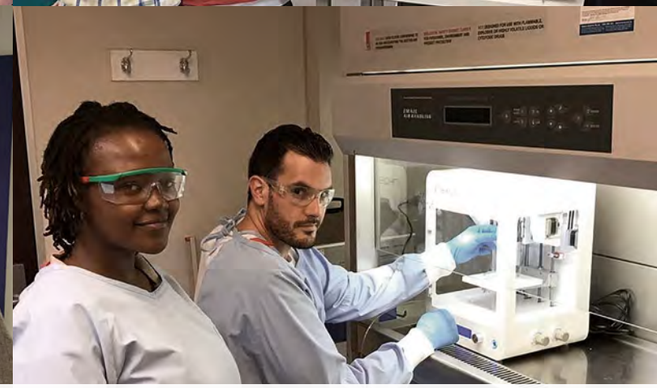


Search through this online database for human organ models, tissue models or protocols to improve your work. Extend your expertise beyond your lab by collaborating with other great minds around the world.

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 warrenties 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.





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

With our 3D Bioprinters we hope to open the possibility for more extensive medical research. Together with our collaborators, in hundreds of labs in over 30 countries, we work side by side to ensure quality and support.

"CELLINK also provides great customer sverice with timely responses and has been fantastic to work with"

- University of Oklahoma

"CELLINK has taken our feedback and adapted their system while being actively engaged in the process"

- Dr. Grande, The Feinstein Institute for Medical Research

CELLINK®

info@cellink.com

Sweden

Arvid Wallgrens Backe 20,
Gothenburg, 41346

Virginia, USA

2000 Kraft Dr, Suite 2125
Blacksburg, VA 24060

Massachusetts, USA

675 W Kendall St,
Cambridge, MA 02142

California, USA

470 Ramona St.
Palo Alto, CA 94301