

Product Information

TissueFab™ - GelMA-UV, suitable for 3D bioprinting applications

Protocol for Catalog No. [905429](#)

Introduction

TissueFab™ - GelMA-UV is a ready-to-use bioink which is formulated for high cell viability and printability and is designed for extrusion-based 3D bioprinting and subsequent UV light crosslinking. GelMA-based bioinks can be used with most extrusion-based bioprinters, are biodegradable, and are compatible with most cell types. TissueFab™ - GelMA-UV enables the precise fabrication of 3D cell models and tissue constructs for research in 3D cell biology, tissue engineering, in vitro tissue models, and regenerative medicine.

Disclaimer

TissueFab™ - GelMA-UV bioink is for research use only; not suitable for human, animal, or other use. Please consult the Safety Data Sheet for information regarding hazards and safe handling practices.

Specifications

Storage	Store TissueFab™ - GelMA-UV bioink at 4°C. Protect from light.
Stability	Refer to the expiration date on the batch-specific Certificate of Analysis.

Materials

Materials supplied

The TissueFab™ - GelMA-UV bioink is supplied as follows:

Catalog Number	Quantity
905429	1 × 10 mL bottle (1 unit)

Materials required, but not supplied

- [Cultured cells](#) (visit our website link for an up-to-date list of cell types)
- Appropriate cell culture medium
- Sterile tube for reagent preparation
- Sterile pipette tips for transferring bioink
- Sterile printing cartridge, piston, and nozzle/needle for 3D printing

- Extrusion-based 3D bioprinter
- Water bath or incubator
- Micropipettes
- UV light source

Before you start: Important tips for optimal bioprinting results

Optimize printing conditions. Optimize printing conditions (e.g., nozzle diameter, printing speed, printing pressure, temperature, cell density) for the features of your 3D printer and for your application to ensure successful bioprinting. The suggestions below can guide you.

Reduce bubble formation. If the bioink has air bubbles, the bubbles may hamper bioprinting. Carefully handle the bioink when you mix and transfer it to avoid bubble formation. Do not vortex or shake vigorously.

Aseptic techniques. Follow standard aseptic handling techniques when you prepare and print the bioink, and during cell culture.

Cell density. Resuspend the cell pellet to the appropriate volume for the desired printed structure and cell density. Typical cell density for extrusion-based bioprinting is 1 to 5×10^6 cells/mL. For example, C2C12 myoblasts have been printed with TissueFab™ - GelMA-UV bioink at a concentration of 4×10^6 cells/mL.

Crosslink with UV light. Position the light source directly above the printed structure. Lower intensity light sources will require shorter distances and longer exposure times to complete crosslinking. Recommended conditions: Place an 800 mW/cm^2 365nm wavelength light source 8 cm above the printed structure and expose for 30 s. Lower intensity light sources will require shorter distances and longer exposure times to complete crosslinking. For Cellink™ bioprinters (Bio X™ and INKREDIBLE™), distances of 3 cm or less and exposure times of 60 s or more are recommended.

Note: The number of prints obtained from each 10-mL bottle of bioink (a unit) will vary depending on the structure that is printed. For example, each 10-mL bottle contains enough material to print a 30-μL structure in each well of three 96-well plates or a 100-μL structure in each well of four 24-well plates.

Procedure

Two procedures are provided below: **Procedure 1** to print with cells and **Procedure 2** to print without cells.

Procedure 1 – Print with cells

A. Prepare bioink

1. Warm the 10 mL bottle of TissueFab™ - GelMA-UV bioink in a water bath or incubator set to 37 °C for 30 minutes or until the bioink becomes fluid, so that it is easy to pipette. The bioink is stable for at least 7 heating- cooling cycles.
2. When the bioink has become fluid, gently invert the TissueFab™ - GelMA-UV bioink bottle 5–10 times to make a homogeneous solution. DO NOT vortex or shake vigorously.

B. Prepare bioink-cell solution

1. Resuspend the cell pellet at the desired cell density with the bioink solution by gently and slowly pipetting up and down several times. Ensure the cells are evenly distributed in the bioink solution by gently and slowly pipetting up and down several more times. DO NOT vortex or shake vigorously. Be careful not to dilute the bioink solution with cell culture medium because the medium might interfere with the printability of the bioink.
2. Pipette the bioink-cell solution into the desired printing cartridge. This step creates a filled printing cartridge.

C. Bioprint

1. Cool the filled printing cartridge to below 15–19 °C using a “temperature-controlled printhead”, if available, or place the cartridge in 4 °C refrigerator for 10–15 minutes to induce gelation. If your print bed has a temperature control, set temperature to 15 °C. Do not keep cell laden bioink at low temperature for more than 20-30 minutes as that can be harmful for cell health.
2. Follow the manufacturer’s 3D printer instructions. Load the print cartridge onto the 3D printer and print directly onto a Petri dish or into multi-well plates. Adjust the flow rate according the nozzle diameter, printing speed, printing pressure, and temperature.

Example

Printer: Cellink BIO X™ or Cellink INKREDIBLE™ printer

Temperature: 15 °C

Flow rate (speed): 10 mm/s

Nozzle: 22G TT tapered needle

Pressure: 60–70 kPa

D. Crosslink

Place the UV light source directly above the 3D-bioprinted structure and expose the structure to UV light (wavelength 365 nm). Use the appropriate distance and exposure time based on your light source. For Cellink™ bioprinters (Bio X™ and INKREDIBLE™ printers, as in the above example), distances of 3 cm or less and exposure times of 60 s or more are recommended. The 3D-bioprinted structure is ready for use immediately after crosslinking.

E. Culture cells.

Culture the bioprinted tissue with the appropriate cell culture medium following standard tissue culture procedures.

Procedure 2 – Print without cells

A. Prepare bioink

1. Warm the 10 mL bottle of TissueFab™ - GelMA-UV bioink in a water bath or incubator set to 37 °C for 30 minutes or until the bioink becomes fluid, so that it is easy to pipette. The bioink is stable for at least 7 heating- cooling cycles.
2. When the bioink has become fluid, gently invert the TissueFab™ - GelMA-UV bioink bottle 5–10 times to make a homogeneous solution. DO NOT vortex or shake vigorously.

3. Pipette the bioink solution into the desired printing cartridge. This step creates a filled printing cartridge.

B. Bioprint

1. Cool the filled printing cartridge to below 15–19 °C using a “temperature-controlled printhead”, if available, or place the cartridge in 4 °C refrigerator for 10–15 minutes to induce gelation. If your print bed has a temperature control, set temperature to 15 °C.
3. Follow the manufacturer’s 3D printer instructions. Load the print cartridge onto the 3D printer and print directly onto a Petri dish or into multi-well plates. Adjust the flow rate according the nozzle diameter, printing speed, printing pressure, and temperature.

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If not used immediately, the crosslinked 3D-bioprinted structure should be stored at 2–8 °C. If stored under aqueous conditions, some hydrolytic degradation will occur; shelf life can range from a few weeks to a few months.

Troubleshooting

1. Bioink is incubated at 37°C for 30 minutes, but it is still gel.

Possible reasons – Malfunction of incubator; bioink is crosslinked due to UV exposure.

Solution – Make sure the temperature of incubator / water bath is correct and make sure the bioink bottle is properly and evenly heated in the incubator/water bath. Do not expose the bioink to UV light before printing.

2. Air bubble is trapped in the middle of bioink in the cartridge.

Possible reason – Air bubble was created when the bioink was transferred (and/or was mixed with cells).

Solution - Warm the cartridge at 37°C for 5–10 minutes or until the bioink becomes fluid. Turn the cartridge so that the tip faces up to allow any air bubbles to exit from the tip of the cartridge. Gently tap the cartridge to help the air bubbles pass through the tip.

3. Printed structure spreads and does not hold its shape.

Possible reasons – Bioink was diluted with cell culture medium that remained in the cell pellet; bioink was not cooled sufficiently before printing; or the printing pressure is too high.

Solution – Do not dilute the bioink. Make sure the bioink has been cooled according to the instructions before printing. Adjust printing pressure to achieve sufficient flow of bioink.

4. Interrupted flow or no flow during printing.

Possible reason – Insufficient printing pressure or nozzle is partially or fully clogged.

Solution – Adjust the printing pressure to achieve sufficient flow of bioink. If the problem persists, change the nozzle.

5. Printed structure dissolves in cell culture medium.

Possible reason – Insufficient crosslinking; exposure to incorrect wavelength; malfunction of UV apparatus.

Solution – Make sure that the UV source has sufficient power output and that the printed structure is exposed to UV light according to the instructions.

Related Products

Name	Cat. No.
TissueFab™ - GelAlg-UV bioink	905410
TissueFab™ - GelAlg-Vis bioink	906913
TissueFab™ - GelMA-Vis bioink	906891
TissueFab™ - Sacrificial bioink	906905

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