Gelatin Methacryloyl (GelMA)

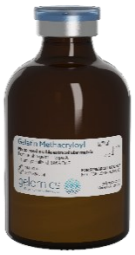
For Research Use Only. Not for use in human or animal therapeutic or diagnostic applications.

Product Description

GelMA is a photocrosslinkable gelatin derivative that forms mechanically tuneable hydrogels when exposed to ultraviolet or visible light in the presence of a photoinitiator such as Irgacure 2959 or lithium phenyl-2,4,6-trimethylbenzoylphosphinate (LAP).

GelMA hydrogels closely resemble native extracellular matrices and contain partially hydrolysed collagens with cell-adhesive and protease-sensitive motifs. Its tuneability and bioactivity make it a versatile biomaterial for tissue engineering, 3D bioprinting and 3D cell culture. Gelomics offers GelMA from porcine skin (SKU0010), bovine bone (SKU0013) and cold-water fish (SKU0014).

At low concentrations (4–8% w/v), GelMA is suitable as an extracellular matrix for 3D cell culture. At higher concentrations, it can be used to generate bioinks for 3D extrusion bioprinting, and can be blended with rheological additives to improve print fidelity.



Product Specification

Format	1 g lyophilised GelMA, sterile, degree of functionalisation (DoF): 80%.
Use	3D cell culture (4–8% w/v); extrusion bioprinting bioinks (higher concentrations).
Compatible Photoinitiators	Irgacure 2959 (0.05–0.25% w/v, crosslinked using 365 nm light) LAP (0.1–0.25% w/v, crosslinked using 405 nm light).
Storage	Store lyophilised GelMA and reconstituted GelMA solutions without photoinitiator at 4–8 °C, protected from light. GelMA solutions containing photoinitiator must be used on the day of preparation.
Expiry	24 months from manufacture.
Manufacturing Standards	ISO 9001:2015 Quality Management System.

Reconstitution & Crosslinking Protocol

Usage Recommendations

- This protocol provides recommended starting conditions. Optimise GelMA concentration, photoinitiator concentration and crosslinking exposure for your application. Perform all steps using aseptic technique in a biological safety cabinet.
- GelMA solutions (SKU0010, SKU0013) will thermally gel below about 30 °C. Keep GelMA at 37 °C to maintain it in a liquid state. Alternatively, use SKU0014, which remains liquid below 30 °C.
- A positive-displacement pipette is recommended for the most accurate results when handling viscous GelMA solutions.
- GelMA can be blended with other biomaterials, such as hyaluronic acid, collagen, laminin and proteoglycans, to tailor the matrix composition and bioactivity of the hydrogel.

Required Equipment and Materials

- LunaX Crosslinker – Visible Light Photocrosslinking Device (SKU0028)
- LAP – Photoinitiator Powder, 5 × 3 mg, sterile (SKU0021)
- 37 °C water bath and incubator
- Sterile pipettes and tips
- Cell culture medium appropriate for the cell type in use
- Sterile centrifuge tubes
- Benchtop centrifuge

Note: *LunaX Crosslinker is validated for use with clear, flat-bottom, plastic plates. Opaque-bottom plates are not compatible and black-walled plates may affect crosslinking efficiency.*

Experimental Procedure

1. **Prepare the GelMA stock solution**
   Allow GelMA to reach room temperature, then add reconstitution buffer, such as PBS or HEPES, to achieve a stock concentration of 8–20% w/v. Prepare the GelMA stock at twice the desired final GelMA concentration. For example, to prepare a final hydrogel containing 5% w/v GelMA, prepare a 10% w/v GelMA stock. To reconstitute, first add buffer and allow the GelMA to swell at room temperature for 30–60 minutes. Then incubate for several hours or overnight at 37 °C with gentle agitation. Sterile GelMA stock solutions without photoinitiator can be stored at 4–8 °C for up to 6 months.

Experimental Procedure

2. **Prepare the photoinitiator stock solution**
   Prepare the photoinitiator stock solution in reconstitution buffer, minimising light exposure. Prepare the photoinitiator stock at twice the desired final photoinitiator concentration. For example, to prepare a final hydrogel containing 0.1% w/v LAP, prepare a 0.2% w/v LAP stock. Photoinitiator stock solutions should be prepared fresh and used on the day of preparation.
3. **Prepare the GelMA/photoinitiator hydrogel precursor solution**
   Warm both stock solutions to 37 °C. Mix equal volumes of the 2× GelMA stock and the 2× photoinitiator stock to achieve the desired final 1× GelMA and photoinitiator concentrations. Mix thoroughly by pipetting, taking care to avoid introducing air bubbles. Prepare the mixed GelMA-photoinitiator solution fresh and use on the day of preparation.
4. **Optional: encapsulate cells**
   Harvest and count cells according to your standard protocol. Quench and remove trypsin/protease to avoid residual activity. Pellet the required number of cells by centrifugation and remove all supernatant. Gently resuspend the cell pellet in the GelMA/photoinitiator hydrogel precursor solution by pipetting until a homogeneous cell suspension is formed.
5. **Dispense the hydrogel precursor solution**
   Dispense the hydrogel precursor solution, with or without cells, into well plates, casting moulds or printing cartridges.
6. **Crosslink the hydrogel**
   Crosslink the hydrogel precursor solution by light exposure at 365 or 405 nm, matched to the photoinitiator selected in Step 2. The LunaX Crosslinker's default wavelength is 405 nm; contact Gelomics for alternative wavelengths.
7. **Add culture medium**
   Add sufficient cell culture medium to fully cover the hydrogel and incubate under standard tissue culture conditions.
8. **Maintain the culture**
   Replace the cell culture medium as required, taking care not to damage or dislodge the hydrogel.

Troubleshooting Guide

Problem	Solution
Air bubbles in GelMA or hydrogel precursor solution.	Centrifuge the solution (with or without cells) at 300 × g for 1 minute and mix by pipetting up and down.
GelMA hydrogel does not crosslink when exposed to light.	Ensure the photoinitiator solution is freshly prepared; extend the crosslinking exposure time.
GelMA hydrogel samples dissolve following cell encapsulation.	Residual trypsin or other proteases may degrade the hydrogel. Ensure complete removal of trypsin before cell encapsulation by washing the cell pellet with medium or buffer.

Recommended Working Concentrations

Application	GelMA Concentration	Photoinitiator
3D cell culture	4–8% w/v	Irgacure 2959: 0.05–0.25% w/v LAP: 0.1–0.25% w/v
Extrusion bioprinting bioink	Higher (blend with rheological additives)	As above; optimise for the printer and nozzle

Related Products

- LunaX Crosslinker – Visible Light Photocrosslinking Device (SKU0028)
- LunaX Cell Recovery (SKU0015)

Available Documents

- Safety Data Sheet
- Certificate of Analysis
- LunaX Crosslinker User Manual

Please contact us at **info@gelomics.com** for questions or more information.