

# Crosslinked liposome hydrogels

Stanford researchers have developed crosslinked liposome hydrogels that combine stiffness, injectability, self-healing behavior, and tunable drug release. The platform uses liposomes as dynamic structural elements within a polymer hydrogel, allowing the material to flow during injection or extrusion and then rapidly reform afterward. The hydrogels can support 3D mammalian cell culture, present cell-interactive signals, and release therapeutic molecules such as proteins or antibodies. Many hydrogels used for biomedical applications are either soft enough to inject but too weak for tissue-like support, or stiff enough for cell culture and delivery but difficult to push through small needles or catheters. Existing materials may also rely on animal-derived components, restrictive crosslinking conditions, or formulations that are hard to reproduce. This technology could support injectable therapies, controlled drug delivery, 3D bioprinting, and reproducible cell culture materials.

**Stage of Development:** in vivo studies

## Applications

- Injectable and catheter-delivered biomaterials
- 3D bioprinting inks and scaffolds
- Three-dimensional cell culture and organoid models
- Controlled release of therapeutics and biologics
- Cell and drug delivery for tissue repair

## Advantages

- Combines high stiffness with shear-thinning injectability
- Self-healing after extrusion through fine needles or catheters
- Tunable stress relaxation across multiple length scales
- Not animal-derived, unlike Matrigel-based matrices

- Modular polymer and lipid chemistry adaptable to many applications

## **Innovators**

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