

μ CollaFibR™ Additive for Bioinks and Hydrogels

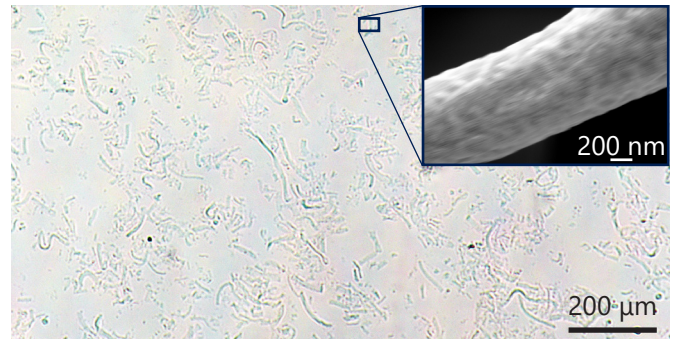
Hydrogel additive for increased durability and biological relevance

3D Bioprinting is the future of personalized tissue engineering. However, bioprinted constructs require improved mechanical durability and biological relevance to have clinical utility.

3D BioFibR's patented dry-spinning technology produces μ CollaFibR™; 50 μ m collagen fibers that increase the shape fidelity and biological relevance of bioprinted constructs. With excellent chemical stability and 1-2 μ m diameters, μ CollaFibR™ is universally compatible with bioprinting materials and modalities.

μ CollaFibR™ Additive:

- Produced using GMP type I collagen, and resembles natural collagen fiber structures
- Can be resuspended in any aqueous environment, including acidic environments ($\text{pH} \geq 2$)
- Increases mechanical strength and modulus of hydrogels in extension and compression
- Improves shape retention/durability for at least 28 days in bioprinted cellular constructs
- Acts as a physiologically relevant site for cell attachment within the constructs
- Improves shape fidelity without compromising bioink viscosity/printability
- Aligns with printhead flow, avoiding clogging



μ CollaFibR™ dispersed at 7.5 mg/mL in PBS

Shape Retention

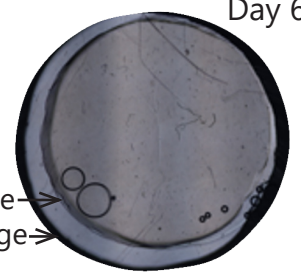
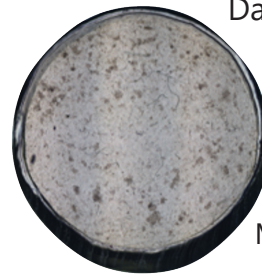
5%_{wt} GelMA constructs with HEK293 kidney cells

μ CollaFibR™ - 1.25 mg/mL

without fibers

Day 28

Day 6



92% shape retention

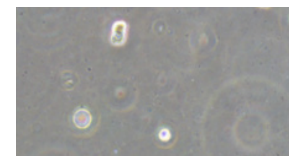
75% shape retention

Cell Functionality

3%_{wt} alginate constructs with fibroblasts (MEFs)

μ CollaFibR™ - 2.5 mg/mL

without fibers



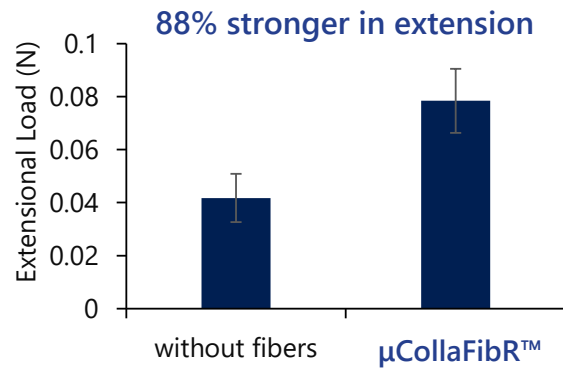
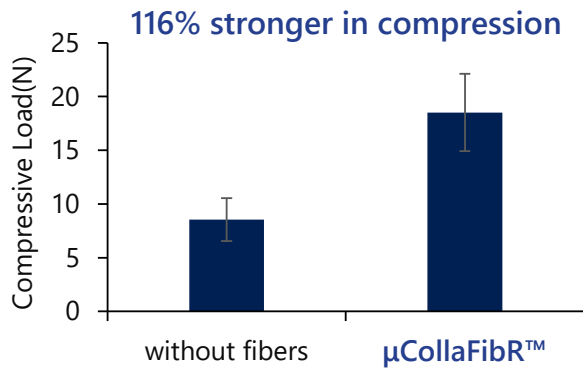
μ CollaFibR™ drives cell attachment and function

μCollaFibR™ for Bioinks and Hydrogels

Mechanical Performance

Compression: 5%_{wt} GelMA with 1.25 mg/mL μCollaFibR™

Extension: 7.5%_{wt} GelMA with 2.5 mg/mL μCollaFibR™



Error bars show standard error of the mean

Product Specifications

Collagen Bovine Type I

Length $44 \pm 13 \mu\text{m}$

Diameter 1 – 2 μm

**Stability in Solution ≥ 3 months at pH 2 – 7.4

Temperature Stability $\leq 60 \text{ }^\circ\text{C}$

Hydrated Young's Modulus $50 \pm 16 \text{ kPa}$

Storage 4 $^\circ\text{C}$ short term
-20 $^\circ\text{C}$ long term

Degrading Enzyme Collagenase I/IV

**Stability testing is ongoing for longer time points