

## **A naringin-derived bioink enhances shape fidelity of 3D bioprinting and efficiency of cartilage defects repair**

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## Supplementary Figures

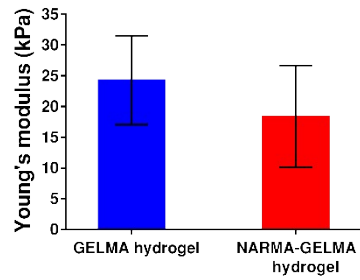


Figure S1. Young's modulus of NARMA-GELMA hydrogel and GELMA hydrogel.

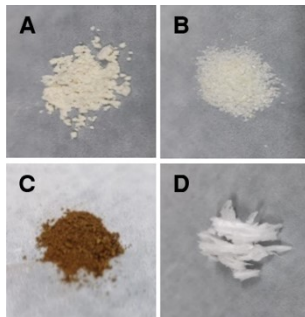


Figure S2. Observation of raw materials and modified products. (A) NAR, (B) GEL, (C) NARMA, (D) GELMA.

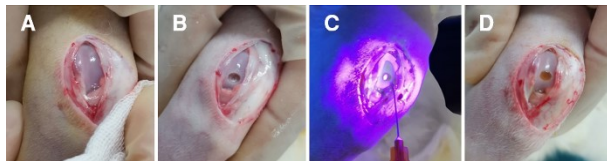


Figure S3. The injection and photocuring process of NAR derived medical bioink for cartilage repair in the rabbit articular cartilage defect model. (A) Joint exposure. (B) Cartilage defect creating. (C) Bioink implantation. (D) Observation of the fixed sample.

## Supplementary Tables

Table S1. 3D printing parameters of NAR derived bioink and GELMA bioink.

Model (100 $\mu\text{m}/\text{layer}$ )	NAR derived bioink		GELMA bioink	
	One sixth of a sphere	Cylindrical channel structure	One sixth of a sphere	Cylindrical channel structure
Size (mm)	6 (Diameter)	0.5 (Hole diameter)	6 (Diameter)	0.5 (Hole diameter)
Section numbers	15	15	15	15
Exposure intensity ( $\text{mW}/\text{cm}^2$ )	20	20	6	6
Exposure time (s)	8	8	8	8

Table S2. The sequence of primers used for RT-qPCR.

<i>RNA</i>	<i>The full name of each RNA</i>	<i>5' -3'</i>	<i>Primer</i>
<i>GAPDH</i>	<i>Glyceraldehyde-3-phosphate dehydrogenase</i>	forward	TTGTCGCCATCAATGATCCAT
		reverse	GATGACCAGCTTCCCGTTCTC
<i>SOX9</i>	<i>SRY-box transcription factor 9</i>	forward	GCGTCAACGGCTCCAGCAAGA
		reverse	GCGTTGTGCAGGTGCGGGTAC
<i>COL II</i>	<i>Collagen type II</i>	forward	GAGAGCCTGGGACCCCTGGAA
		reverse	CGCCTCCAGCCTTCTCGTCAA
<i>COL I</i>	<i>Collagen type I</i>	forward	CTAGCCACCTGCCAGTCTTTA
		reverse	GGACCATCATCACCATCTCTG
<i>RUNX2</i>	<i>Runt-related transcription factor 2</i>	forward	CGGCAGCGTAGGTCTTGGTGA
		reverse	CGGCAGCGTAGGTCTTGGTGA
<i>COL X</i>	<i>Collagen type X</i>	forward	GCAGCAGCATTATGACCCAACAAC
		reverse	ACAGGCGTGCCATTCTTATACAGG
<i>SOD1</i>	<i>Superoxide Dismutase 2</i>	forward	GCACGGATTCCATGTCCACCA
		reverse	TCACATTACCCAGGTCGCCCA
<i>SOD2</i>	<i>Superoxide Dismutase 1</i>	forward	CAGAAGCACAGCCTCCCCGAC
		reverse	CCGTGGCGTTCAGGTTGTTCA
<i>BCL-2</i>	<i>B-Cell Leukemia/Lymphoma 2</i>	forward	CGGAAGGGACTGGACCAGAGA
		reverse	GCTGTCATGGGGATCACCTCC
<i>CASP10</i>	<i>Caspase 10</i>	forward	GCTCTACGAACTGGCAGAAGC
		reverse	CAGATGTTCCAGCAAATGCAG