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3D-printed bilayered scleral patches with mechano-biological synergistic activity: A novel strategy for posterior scleral reinforcement in pathological myopia

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Supplementary File

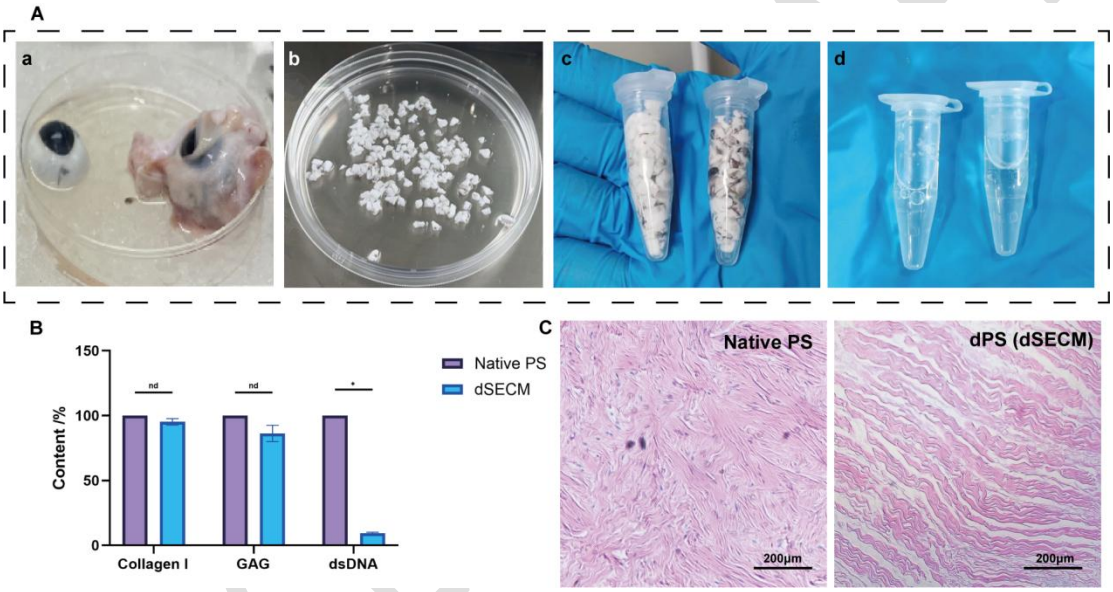

Figure S1. Decellularization efficacy and structural preservation of porcine scleral (dPS) and scleral extracellular matrix (dSECM). (A) Process of dSECM extraction and decellularization. (B) Quantification of dsDNA, GAG, and collagen type I content in native and decellularized PS. (C) H&E staining of native and decellularized porcine sclera, showing complete nuclear removal. Statistical significance was determined using a t-test. Statistical significance is indicated by asterisks: *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

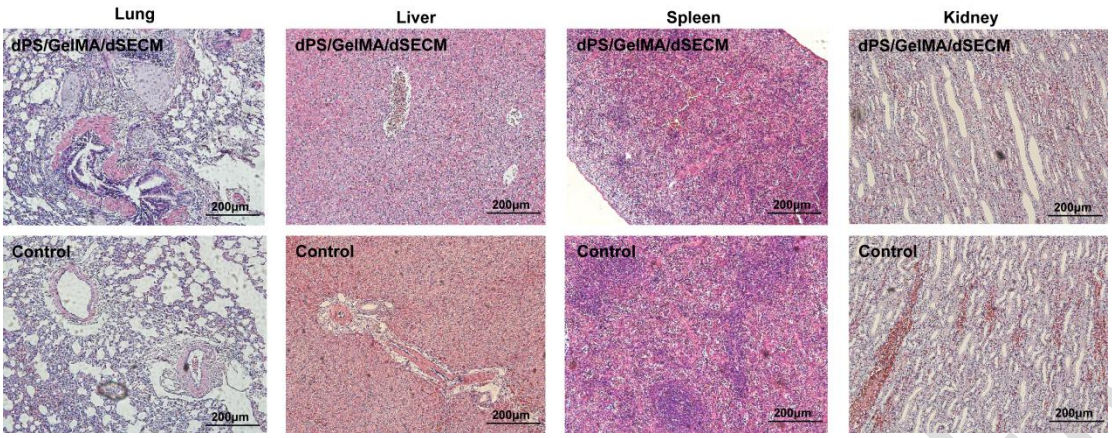

Figure S2. HE-stained sections of major organs (liver, spleen, lung, and kidney) showed no abnormal inflammatory response at 8 weeks after subcutaneous implantation of dPS/GelMA/dSECM in guinea pigs.

Table S1. Mass Loss (%)of different material in 14 days.

Group	Condition	d0	d1	d3	d5	d7	d14
dPS	PBS	0.0±0.0	0.0±0.0	0.8±0.0	0.0±0.0	0.5±0.4	1.3±0.5
	Col XIV	0.0±0.0	7.3±0.7	19.7±3.3	37.6±4.8	45.3±5.2	58.5±5.2
GelMA	PBS	0.0±0.0	12.6±0.9	20.3±0.5	38.3±0.9	52.3±2.4	73.5±1.8
	Col XIV	0.0±0.0	22.1±0.8	49.9±2.2	83.3±2.1	94.7±2.9	100.0±0.0
GelMA/dSECM	PBS	0.0±0.0	12.9±0.5	26.9±1.1	36.3±2.2	46.1±1.7	75.9±2.3
	Col XIV	0.0±0.0	23.1±0.9	57.9±1.6	74.9±0.7	87.0±0.7	98.3±1.1
dPS/GelMA/dSECM	PBS	0.0±0.0	0.2±0.2	9.6±0.6	14.5±1.9	22.8±2.1	33.0±6.9
	Col XIV	0.0±0.0	16.1±1.6	27.5±1.1	39.8±1.5	42.0±0.9	46.4±1.9

Table S2. Two-way ANOVA (Group x Time) results in different treatment groups and time point.

Parameter	Effect	Sum Sq	df	F-value	p-value	Sig.
Diopter (D) $R^2 = 0.946$	Group	139.534	4, 600	1.751×10^2	<0.001	***
	Time	204.405	2, 600	5.133×10^2	<0.001	***
	Group × Time	84.586	8, 600	5.313×10^1	<0.001	***
ACD (mm) $R^2 = 0.736$	Group	0.054	4, 600	6.04	<0.001	***
	Time	0.556	2, 600	1.254×10^2	<0.001	***
	Group × Time	0.104	8, 600	5.85	<0.001	***
LT (mm) $R^2 = 0.649$	Group	0.037	4, 600	0.86	0.490	ns
	Time	1.801	2, 600	8.31×10^1	<0.001	***
	Group × Time	0.230	8, 600	2.65	0.010	*
VCD (mm) $R^2 = 0.894$	Group	1.240	4, 600	3.23×10^1	<0.001	***
	Time	5.456	2, 600	7.11×10^2	<0.001	***
	Group × Time	1.093	8, 600	2.97×10^1	<0.001	***
AL (mm) $R^2 = 0.885$	Group	3.994	4, 600	9.56	<0.001	***
	Time	28.853	2, 600	1.73×10^2	<0.001	***
	Group × Time	5.746	8, 600	1.72×10^1	<0.001	***

***P<0.001，**P<0.01，*P<0.05，ns=no significant. **Sum Sq**, Sum of Squares;df, Degrees of Freedom; Sig, Significance; ACD, Anterior Chamber Depth; LT, Lens Thickness; VCD, Vitreous Chamber Depth; AL, Axial Length.

Table S3. Tukey HSD Post-Hoc: 4-week group comparisons in different treatment groups.

Parameter	Comparison	Mean Diff	p-adj	Sig.
Diopter (D)	Control vs FDM Control	6.339	<0.001	***
	dPS/GelMA vs FDM Control	2.314	<0.001	***
	dPS vs FDM Control	2.381	<0.001	***
	HDM vs FDM Control	2.214	<0.001	***
	dPS/GelMA vs HDM	0.100	0.996	ns
	dPS/GelMA vs dPS	-0.067	0.999	ns
	dPS vs HDM	0.167	0.965	ns
AL (mm)	Control vs FDM Control	1.344	<0.001	***
	dPS/GelMA vs FDM Control	0.654	<0.001	***
	dPS vs FDM Control	0.544	<0.001	***
	HDM vs FDM Control	0.143	0.624	ns
	dPS/GelMA vs HDM	-0.512	<0.001	***
	dPS/GelMA vs dPS	-0.110	0.852	ns
	dPS vs HDM	-0.402	0.006	**
VCD (mm)	Control vs FDM Control	0.619	<0.001	***
	dPS/GelMA vs FDM Control	0.352	<0.001	***
	dPS vs FDM Control	0.297	<0.001	***
	HDM vs FDM Control	0.107	0.211	ns
	dPS/GelMA vs HDM	-0.245	<0.001	***
	dPS/GelMA vs dPS	-0.055	0.831	ns

***P<0.001，**P<0.01，*P<0.05，ns=no significant. ACD, Anterior Chamber Depth; LT, Lens Thickness; VCD, Vitreous Chamber Depth; AL, Axial Length.