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Supporting Information

Title: Fibrillized Collagen Microspheres Possessing Resembling Microstructure of the Extracellular Matrix

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Figure S1. Photographs of CMS [(a) and (c)] and fCMS [(b) and (d)] suspended in PBS for 30 min [(a) and (b)] and for 1 month at room temperature [(c) and (d)]. Both microspheres seen in these photographs were prepared by surfactants with HLB values of 4.3, 8.6, 9.0, and 16.7, from left to right.



Figure S2. Optical images of fCMS before (a) and after (b) the extrusion through 27G needle extruded at the rate of 50mL/min.

HLB value	Collagen concentration (in saline, %)	Surfactant concentration (%)	Rotor speed (rpm)	Temperature	Batch No.	Size range (µm)	Average diameter (µm)	Variation coefficient
9	0.5	1.0	600	30	1	31.8-96.5	56.9 ± 12.1	0.2
					2	28.1-83.7	50.1 ± 10.2	0.2
					3	17.9-93.2	47.4±12.2	0.3



Figure S3. Batch-to-batch reliability of fCMS prepared in HLB value 9.0.



Figure S4. Optical images (above) and deflection AFM image (below) of fCMS prepared at (a) 25°C, (b) 30°C, and (c) 37°C.



Figure S5. Deflection AFM image of CMS prepared using surfactants with HLB values of (a) 4.3 (b) 8.6, (c) 9.0, and (d) 16.7.



Figure S6. Topographic AFM images of fCMS prepared by surfactants with various HLB values (upper), rotor speeds (middle), and surfactant concentrations (below). HLB control: (a) 4.3, (b) 8.6, (c) 9.0, and (d) 16.7. Rotor speed control: (e) 300, (f) 600, (g) 900, and (h) 1,200 rpm. Surfactant concentration control: (i) 0.5%, (j) 1%, and (k) 2%. Notice the thin fibrils in (h).



Figure S7. Optical images of CMS and fCMS in 37°C in PBS. Preparation condition for CMS; HLB value:9.0,

rotor speed:300rpm, Temp.:25°C, and fCMS; HLB value:9.0, rotor speed:600 rpm, Temp.:30°C.

Table S1. Effect of surfactant concentration and rotor speed on the diameter and the dispersity of the CMS. Bold italic numbers represents the altered variation.

HLB value	Collagen concentration (in saline, %)	Surfactant concentration (%)	Rotor speed (rpm)	Size range (µm)	Average diameter (µm)	Variation coefficient	Yield (%)
9.0	0.5	0.5	600	11.7-52.8	26.0±7.6	0.29	60
9.0	0.5	1.0	600	15-306.9	41.9±22.6	0.5	70
9.0	0.5	2.0	600	2.6-35.9	12.8±5.3	0.41	50
9.0	0.5	1.0	300	18.9-366.3	79.7±51.0	0.6	75
9.0	0.5	1.0	900	11.9-104.6	33.8±16.3	0.5	68
9.0	0.5	1.0	1200	8.9-77.7	25.2±9.2	0.4	66

Table S2. CMS/fCMS yield ratio for all the CMS and fCMS used in this study. Bold italic numbers represents the altered variation.

HLB value	Surfactant concentration (%)	Rotor speed (rpm)	CMS/fCMS yield ratio		
4.3	1.0	600	0.5		
8.6	1.0	600	0.67		
9.0	1.0	600	0.57		
16.8	1.0	600	1.14*		
9.0	0.5	600	0.92		
9.0	2.0	600	0.76		
9.0	1.0	300	0.67		
9.0	1.0	900	0.44		
9.0	1.0	1200	0.53		
Average CMS/fCMS yield ratio (excluding those prepared in HLB 16.7*)0.63±					

* Excluded due to the breakdown of the fCMS during the W/O emulsion procedure.