Supporting information

Table S1 Amino group content and net charge of BLG and CBLG*

Sample name	EDA mol/L	TBNS reactive $-NH_2$ per molecule**	Total $-NH_2$ per molecule**	Total –COOH per molecule**	Net charge per molecule
BLG	0	16.3 ± 0.2^{d}	19.3	25.7	-7
C-0.6M	0.6	21.4 ± 0.4^{c}	24.4	20.6	+3
C-0.9M	0.9	24.4 ± 0.3^{b}	27.4	17.6	+9
C-1.2M	1.2	26.6 ± 0.2^{a}	31.6	13.4	+17
C-1.5M	1.5	27.3 ± 0.5^{a}	31.3	13.7	+17

* Data with different letters showed significant difference (n=3, $P<0.05$).

** Reactive amino groups included the ones in the lysine residues and those introduced by cationization. Total amino groups were reactive amino groups plus the ones in the arginine residues. Total carboxyl groups represented the ones in the aspartic acid and glutamic acid residue. This number was deducted by one upon the addition of each amino group. The net charge (rounded up) was calculated by summing up the electric charges of all residues on BLG or CBLG.

Table S2 Zeta potential and hydrophobicity of BLG and CBLG in PBS and HBSS *

Sample	In PBS		In HBSS	
	Zeta potential (mV)	Hydrophobicity (dimensionless)	Zeta potential (mV)	Hydrophobicity (dimensionless)
BLG	-37.0 ± 0.1^{e}	108.5 ± 9.6^{e}	-18.3 ± 0.2^{d}	68.0 ± 7.2^{e}
C-0.6M	18.1 ± 0.3^{d}	740.1 ± 10.2^{d}	6.7 ± 0.1^{c}	305.8 ± 11.4^{d}
C-0.9M	27.2 ± 0.5^{c}	850.2 ± 11.4^{c}	11.4 ± 0.2^{b}	421.5 ± 15.4^{c}
C-1.2M	36.8 ± 0.4^{b}	1022.3 ± 17.6^{b}	16.1 ± 0.3^{ab}	571.0 ± 14.2^{b}
C-1.5M	38.9 ± 0.4^{a}	1269.8 ± 15.4^{a}	17.5 ± 0.3^{a}	628.9 ± 16.3^{a}

* Data with different letters showed significant difference (n=3, $P<0.05$).

Table S3 Assignment and relative band areas of infrared Fourier self-deconvolved BLG and CBLG *

	Native BLG		C-1.5M	
Band assignment	Wavenumber (cm^{-1})	Area%	Wavenumber (cm^{-1})	Area%
Side chain	1610	**	1604	**

β-sheet	1620	14.15	1614	6.28
β-sheet	1630	20.71	1624	15.39
β-sheet	1638	12.72	1634	15.53
Random coil	1648	12.54	1642	17.14
α-helix	1656	9.96	1651	13.33
Turns	1666	10.26	1660	12.82
Turns	1676	7.59	1671	11.48
Turns	1685	6.94	1681	9.58
β-sheet	1695	5.13	1693	6.78
Total α-helix		9.36		13.06
Total β-sheet		52.12		36.94
Total random coil		25.80		33.20
Total turns		12.72		16.80

* The sample C-1.5M was employed for the FSD process.

** The IR intensity due to side chain vibration was excluded in the calculation for secondary structures.

Table S4 Mucoadhesion properties of BLG and CBLGs *

Sample	**PSM adsorption ng/cm^2**	**Protein adsorption ng/cm^2**	**Mass ratio (Pro: PSM)**
BLG	238±12^{c}	85±14^{c}	0.357±0.052^{e}
C-0.6M	359±17^{a}	231±15^{b}	0.643±0.013^{d}
C-0.9M	378±15^{a}	308±20^{ab}	0.815±0.020^{c}
C-1.2M	243±12^{c}	240±15^{b}	0.988±0.044^{b}
C-1.5M	294±10^{b}	370±14^{a}	1.259±0.071^{a}

* Data with different letters showed significant difference (n=3, P<0.05).

Table S5 Characters of BLG and CBLG nanoparticles*

Sample	**Acetone %**	**Particle size nm**	**Count rate kcps**	**Polydispersity index**
BLG	80	139.1±5.7^{b}	47.4±5.2^{d}	0.255±0.003^{b}
BLG	90	136.3±11.2^{b}	386.2±7.8^{a}	0.142±0.002^{d}
C-0.6M	80	172.3±6.2^{a}	402.4±7.1^{a}	0.086±0.002^{e}
C-0.6M**	90	-	-	-
C-0.9M	80	170.4±10.7^{a}	30.8±2.3^{e}	0.293±0.004^{a}
C-0.9M	90	93.5±3.4^{c}	314.6±10.2^{bc}	0.095±0.004^{c}
C-1.2M	80	165.0±5.2^{a}	26.1±1.4^{f}	0.255±0.006^{b}

C-1.2M	90	75.4±6.7[c]	259.4±12.5[c]	0.104±0.003[c]
C-1.5M	80	155.7±10.1[a]	15.8±1.6[g]	0.297±0.005[a]
C-1.5M	90	81.5±4.2[c]	280.4±13.1[c]	0.124±0.002[c]

* Data with different letters showed significant difference (n=3, $P<0.05$). A fixed protein concentration of 2 mg/mL was adopted.

** No data available due to protein precipitation.