Supplementary Information (SI) for Journal of Materials Chemistry B.
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Supporting Information

Dissolving Microneedles Loaded with Chitosan Oligosaccharides and Gallic Acid-Modified ε-Poly-L-lysine for the combined Antibacterial and Anti-inflammatory Therapy of Acne Vulgaris

Supporting Information 1

Calculation mothed. Elemental analyses (EA, Vario EL Cube, Elementar) were used to determine the degree of substitution (DS) of GA onto EPL [1, 2]. Carbon, hydrogen and nitrogen contents were measured for EPL and EPL-GA. The degree of substitution (DS) was calculated according to the following equation:

$$DS\ (\%) = \left| \frac{M_C - \%C \times M_{unit}}{M_{grafted} \times \%C - M_{C,\ grafted}} \right| \times 100\% \quad (1)$$

$$DS\ (mmol/g) = \frac{\%DS \times \%C}{M_C + M_{C,grafted}} \times 1000 \quad (2)$$

where %C is the relative carbon content in the sample. M_C, M_{unit}, $M_{grafted}$ and $M_{C,grafted}$ correspond to the carbon mass of EPL unit, the molecular mass of EPL unit, the molecular mass of GA residue and the carbon mass of GA residue, respectively.

Supporting Information 2

Table 1 Detailed compositions of CEGP MNs in 5 mL deionized water

Sample	PVA (15%, w/v)	COS	EPL-GA
PVA MNs	750 mg	0 mg	0 mg
COS/PVA MNs	750 mg	100 mg	0 mg
EPL-GA/PVA NMs	750 mg	0 mg	100 mg
CEGP MNs	750 mg	100 mg	100 mg

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Table 2 qRT-PCR primers

Primer	Primers sequence (5' to 3')
TNF-a F	GATCGGTCCCCAAAGGGATG
TNF-a R	TTTGCTACGACGTGGGCTAC
IL-6 F	AGCCAGAGTCCTTCAGAGAGAT
IL-6 R	AGGAGAGCATTGGAAATTGGGG
VEGF F	GCAGGCTGCTGTAACGATGA
VEGF R	GCTCACAGTGATTTTCTGGCTT
IL-1β F	ATGCCACCTTTTGACAGTGATG
IL-1β R	TGTGCTGCTGCGAGATTTGA
IL-10 F	CCTGGGTGAGAAGCTGAAGAC
IL-10 R	CTTGTAGACACCTTGGTCTTGG
GAPDH F	GGAGAGTGTTTCCTCGTCCC
GAPDH R	ATGAAGGGGTCGTTGATGGC

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Table 3 Calculation of the degree of substitution based on elemental analyses (%w/w) data of EPL and EPL-GA

Sample	N (%)	C (%)	H (%)	DS (%)	DS (mmol/g)
EPL1	14.967	38.684	8.531	/	/
EPL2	15.035	38.827	8.361	/	/
EPL3	15.054	38.768	8.095	/	/
EPL-GA1	13.567	39.899	7.782	39.48286	
EPL-GA2	13.064	39.022	7.830	44.32851	1.027±0.061
EPL-GA3	13.482	40.252	7.769	37.26953	

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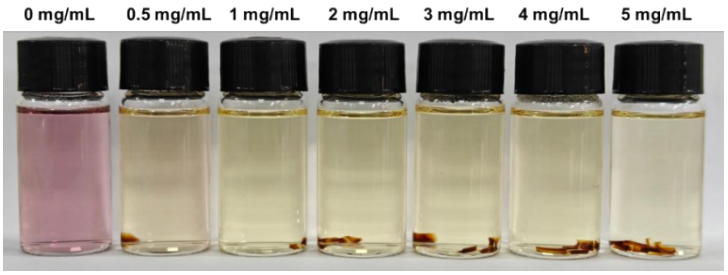

Figure S1. Photos showing the DPPH scavenging effects of CEGP MNs.

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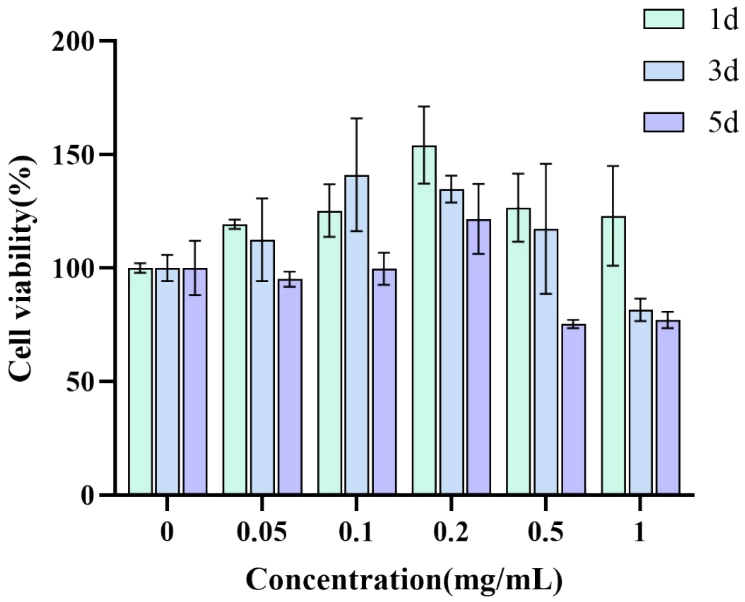

Figure S2. Cell viability of L929 cells after co-culture with different CEGP extraction concentrations.

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A 50 μL of *P. acnes* suspension (~10^8 CFU/mL) was administered via intradermal injection into the dermis of mice (Figure S3). After 24 h post-injection, localized swelling and erythema developed at the injection site. At this time point, a second intradermal injection of 50 μL *P. acnes* suspension (~10^8 CFU) was administered; after another 24 h, distinct acneiform pustules had formed (Figure 6c). The mice were then

randomly assigned to different treatment groups.

Figure S3. Photo shows wheals induced by injecting *P. acnes* suspension into the epidermis of mice.

References

[1] M. Krouit, J. Bras, M.N. Belgacem, Cellulose surface grafting with polycaprolactone by heterogeneous click-chemistry, European Polymer Journal 44(12) (2008) 4074-4081.

[2] K. Missoum, M.N. Belgacem, J.P. Barnes, et al., Nanofibrillated cellulose surface grafting in ionic liquid, Soft Matter 8(32) (2012) 8338-8349.