Electronic Supplementary Information

Noninvasive Rapid Bacteria-Killing and Acceleration of Wound Healing through Photothermal/Photodynamic/Copper Ions Synergistic Action of a Hybrid hydrogel

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Table S1 Primer sequences used in real time Q-RT-PCR.

Gene	Primer sequences	T_m(°C)
VEGF	F:5'TGCGGATCAAACCTCACCA3'	58
	R:5'CAGGGATTTTTCTTGTCTTGCT3'	
bFGF	F:5'ATGGCAGCCGGGAGCATCACC3'	60
	R:5'CACACACTCCTTTGATAGACACAA3'	
HIF-1α	F:5'CCATGTGACCATGAGGAAAT3'	60
	R:5'CGGCTAGTTAGGGTACACTT3'	
GAPDH	F:5'GATTTGGTCGTATTGGGCG3'	60
	R:5'CTGGAAGATGGTGATGG3'	

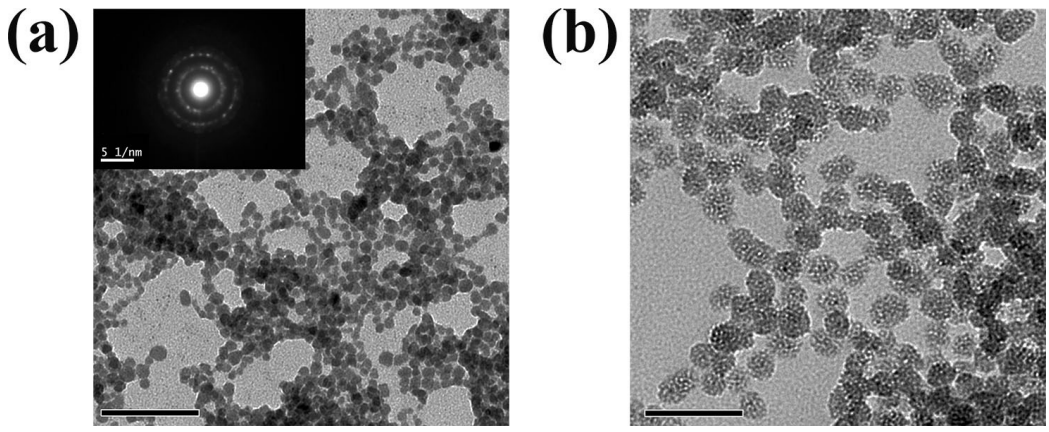


Fig. S1 Morphological characterization of the CuS and CuS/mSiO_2 NPs. TEM images of: (a) CuS NPs and (b) CuS/mSiO_2 NPs (Scale bar = 100 nm).

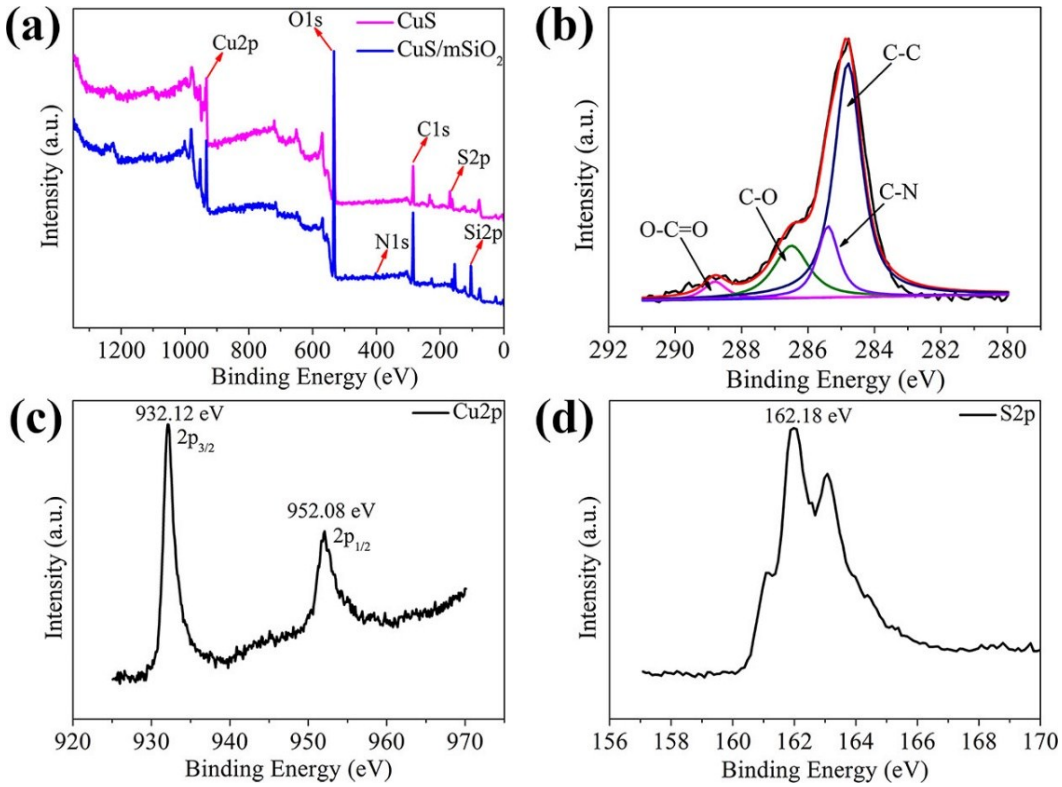


Fig. S2 XPS analysis: (a) Survey spectra of the CuS and CuS/mSiO_2 NPs, (b) C 1s peak of the CuS/mSiO_2 NPs, (c) Cu $2p_{3/2}$ and $2p_{1/2}$ and (d) S 2p of the CuS/mSiO_2 NPs.

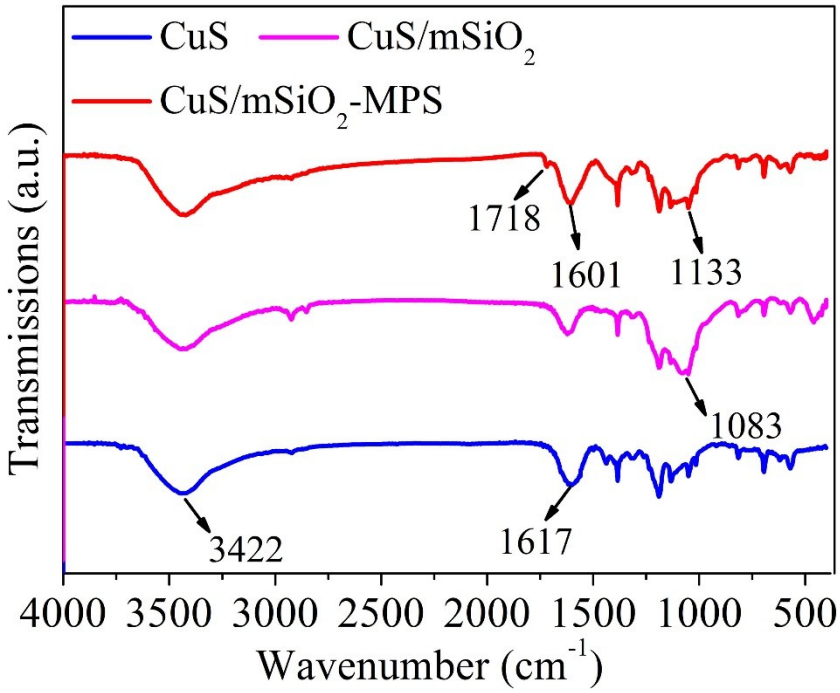


Fig. S3 FTIR spectra of the CuS, CuS/mSiO$_2$, and CuS/mSiO$_2$-MPS NPs.

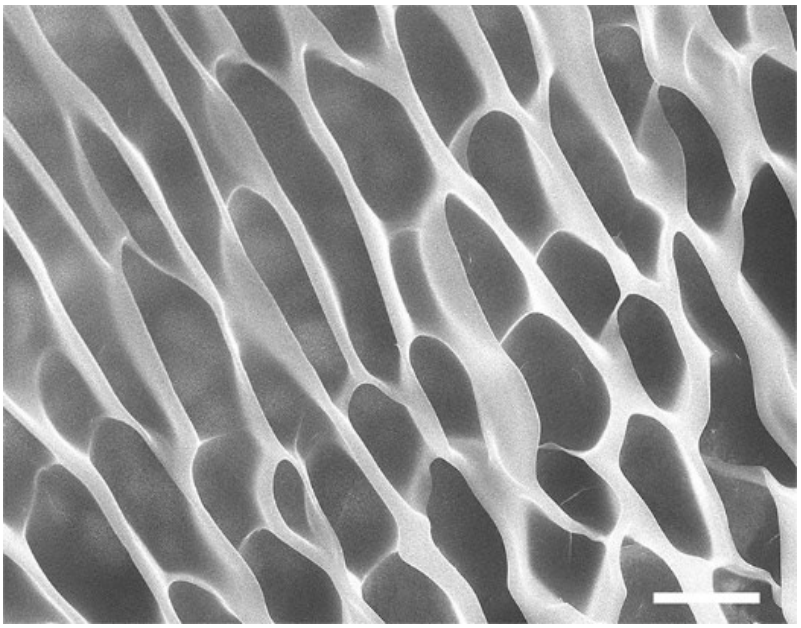
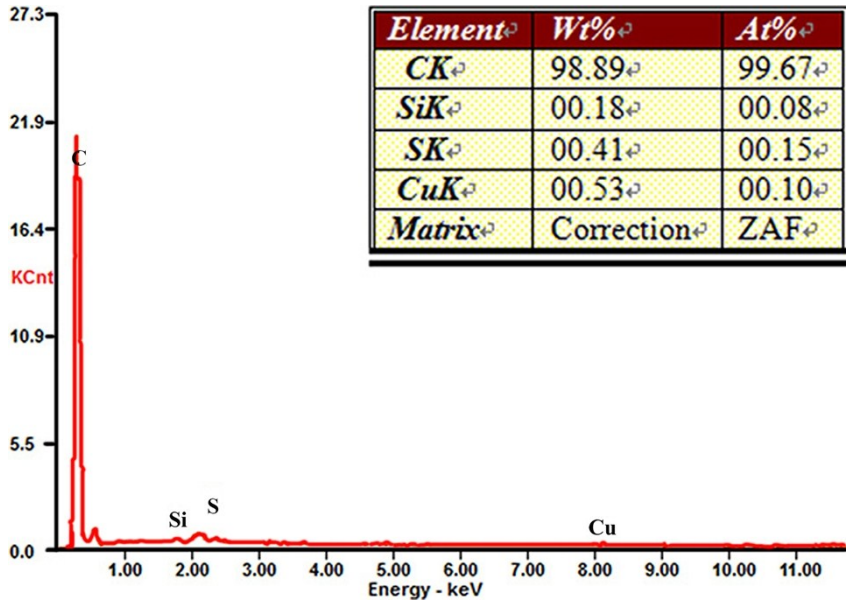


Fig. S4 SEM image of the representative network in the pure hydrogel. Scale bar, 5 μm.



Element	Wt%	At%
CK	98.89	99.67
SiK	00.18	00.08
SK	00.41	00.15
CuK	00.53	00.10
Matrix	Correction	ZAF

Fig. S5 EDS analysis of the NPs-Hydrogel.

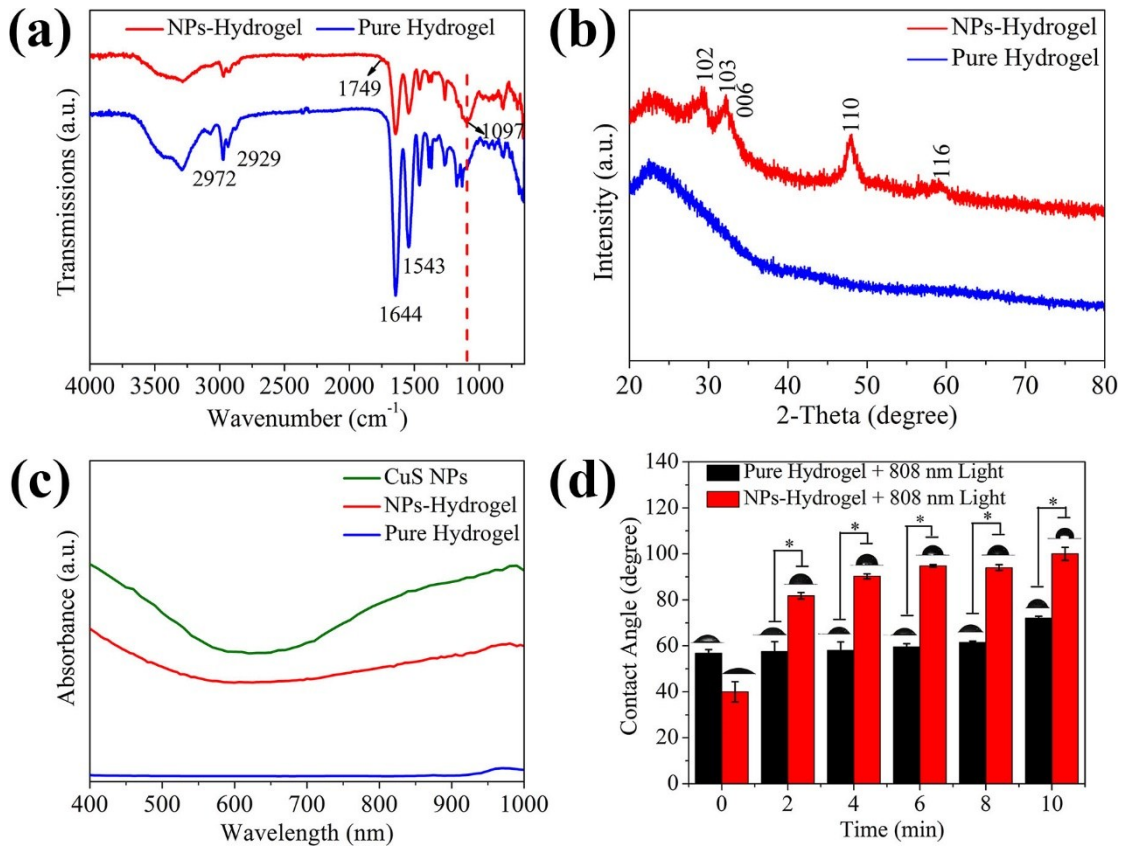


Fig. S6 (a) FTIR spectra of pure hydrogel and NPs-Hydrogel. (b) XRD patterns of pure hydrogel and NPs-Hydrogel. (c) UV-Vis-NIR absorbance spectra of the as-prepared CuS NPs, NPs-Hydrogel, and pure hydrogel. (d) Water contact angle (WCA) on pure hydrogel and NPs-Hydrogel under NIR light irradiation. The error bars indicate means ± standard deviations: $*P < 0.05$, $**P < 0.01$, and $***P < 0.001$.

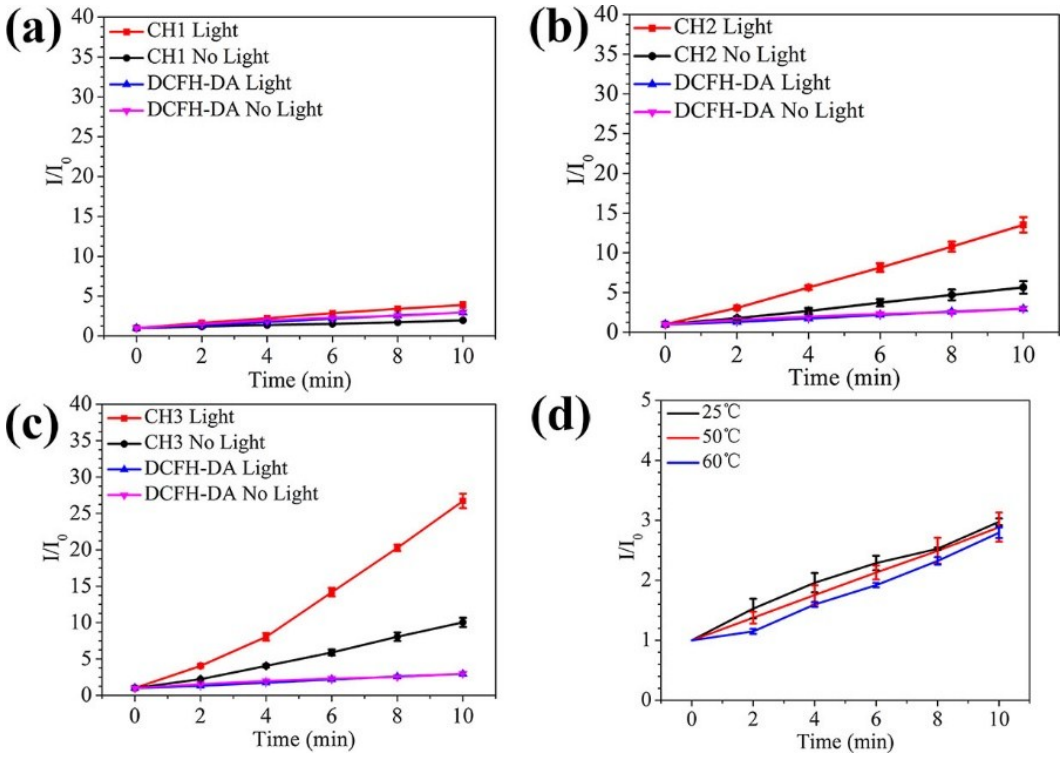


Fig. S7 Fluorescence intensity (FI) of DCF at 525 nm: (a) CH1, (b) CH2, and (c) CH3 with and without light; (d) FI of DCFH-DA dyes at different temperature.

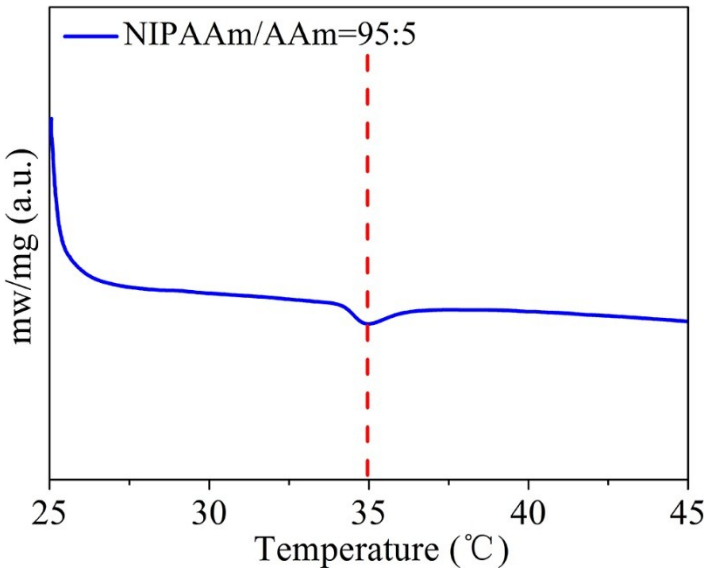


Fig. S8 DSC curves of NIPAAm and AAm with a molar ratio at 95:5.

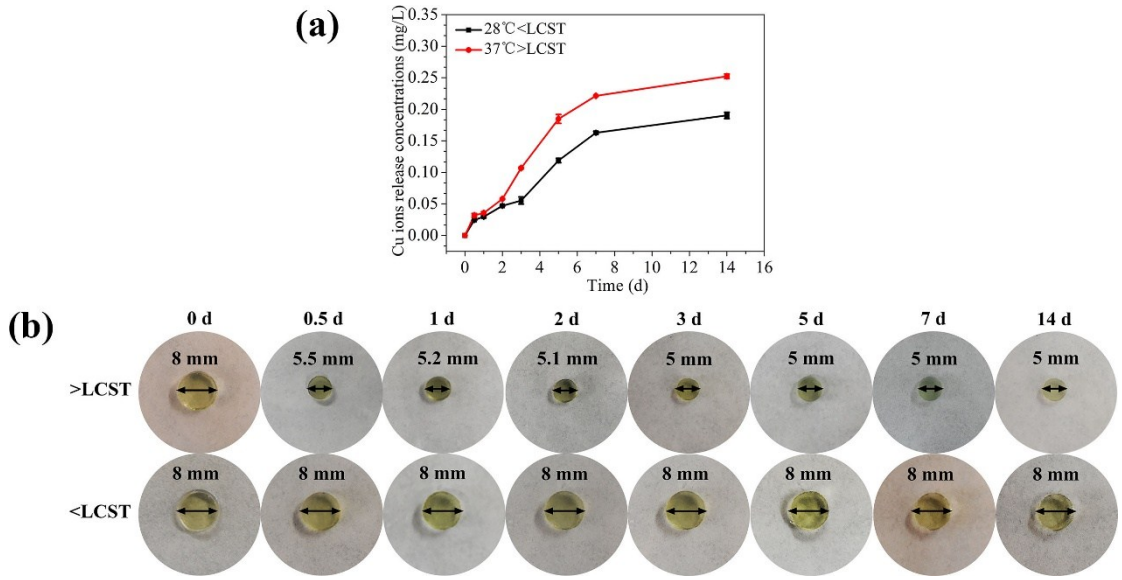


Fig. S9 (a) Cumulative Cu ion release profiles from the hydrogel CH3 at 28 °C (<LCST) and 37 °C (>LCST), respectively. (b) Optical images corresponding to the temperature-stimulated volume transitions of the hydrogel at different temperature, 28 °C (<LCST) and 37 °C (>LCST).

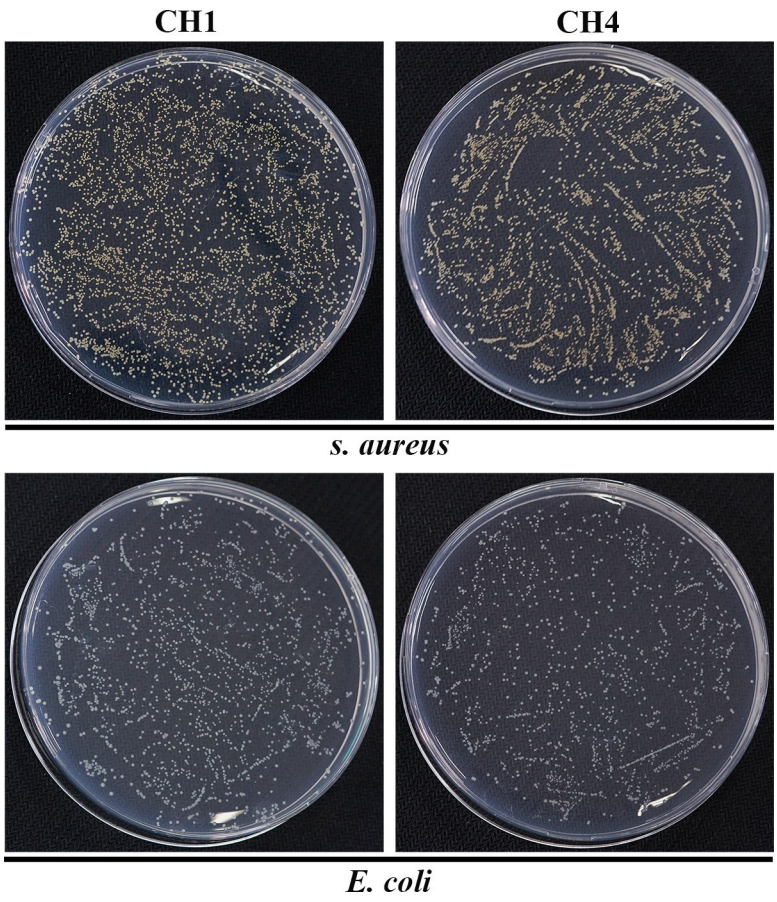


Fig S10 Spread plate results of *S. aureus* and *E. coli*, with the antibacterial experiments of samples CH1 and CH4 were done in an ice bath.

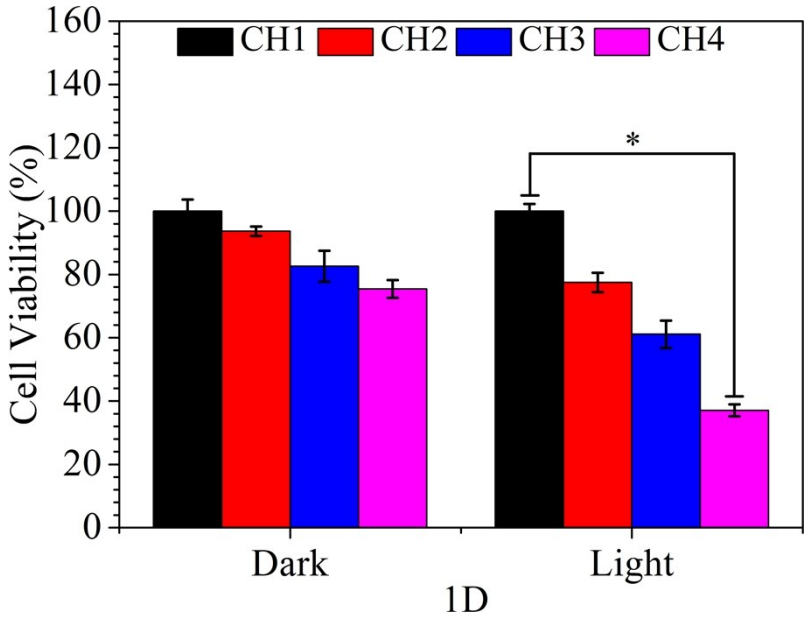


Fig. S11 Cell viability of NIH-3T3 treated with hydrogels CH1, CH2, CH3, and CH4 at day 1, after irradiated for 10 min with 808 nm light or cultured without light irradiation, respectively. The error bars indicate means ± standard deviations: *P < 0.05, **P < 0.01, and ***P < 0.001.

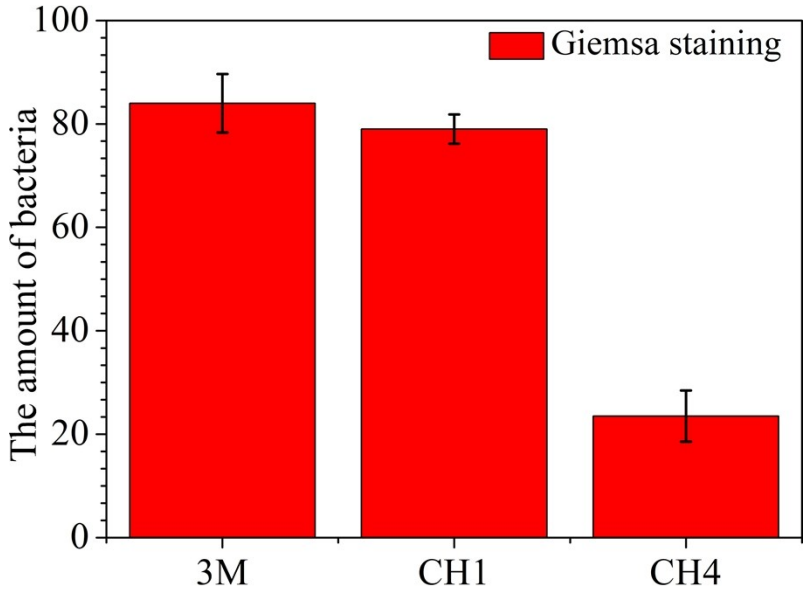


Fig. S12 The amount of bacteria stained by Giemsa. The experiments are performed in triplicate and independently.

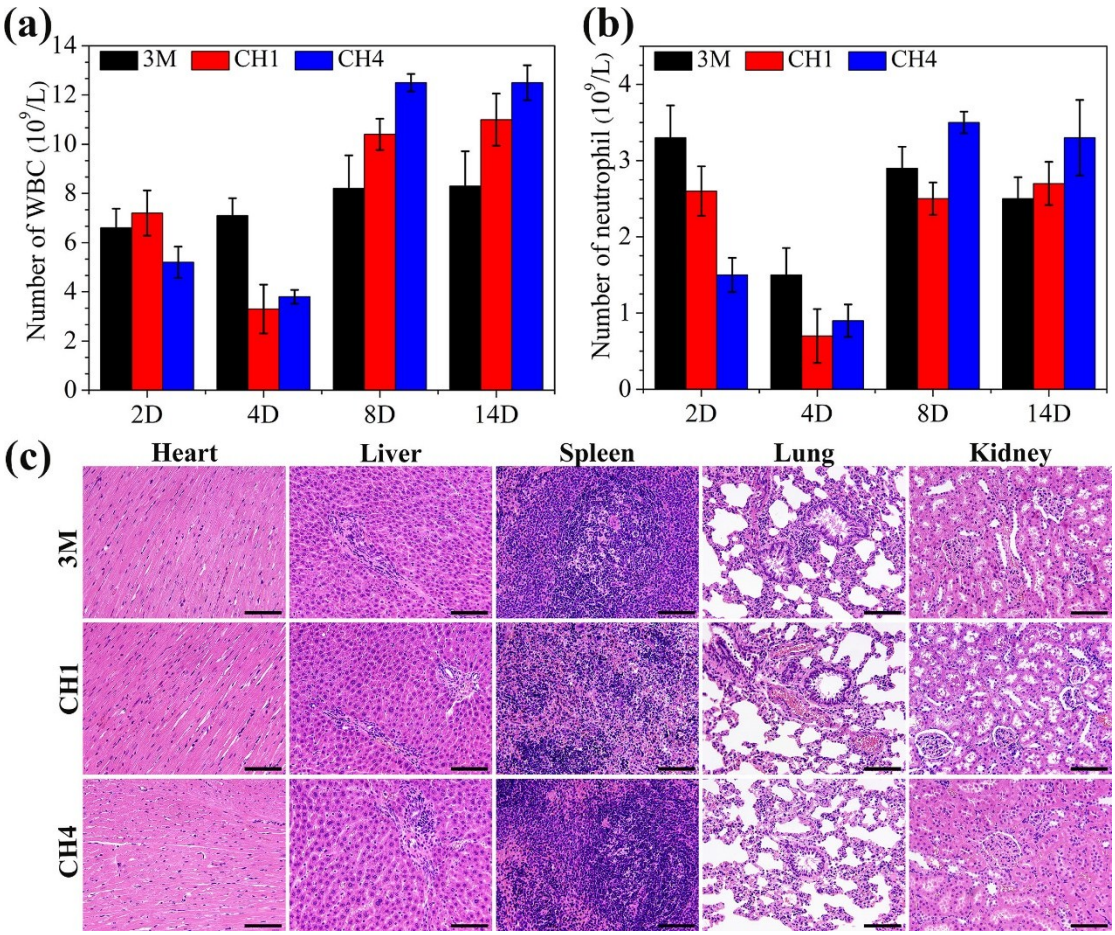


Fig. S13 *In vivo* blood routine analysis of (a) WBCs and (b) neutrophils in the whole blood extracted from the rats after treating with different dressings (3M, CH1, and CH4) for 2, 4, 8, and 14 days. (c) H&E staining of the heart, liver, spleen, lung, and kidney tissue slices after 14-day treatment for the different groups. Scale bars are 100 μm and the experiments are performed in triplicate and independently.