Supplementary Information

An antibacterial biomimetic adhesive with strong adhesion in both dry and underwater situations

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Content:

Table S1. The compositions of adhesives

Adhesives codes	DP (mL)	10 w/v% Gel solution (mL)	20 w/v% TA solution (mL)
DP0@TA-Gel	0	2	8
DP1@TA-Gel	1	2	8
DP2@TA-Gel	2	2	8
DP3@TA-Gel	3	2	8
DP4@TA-Gel	4	2	8

Table S2. The compositions of simulated seawater

Reagent	Concentration (g/L)
NaCl	25.5
KCl	0.67
$MgCl_2•6H_2O$	4.7
$MgSO_4$	6.3
$CaCl_2$	1.35
$NaHCO_3$	0.18

Table S3. The atom percent of element on the adhesive surface obtained form EDS analysis after immersing different time

Element	0 h	0.5 h	12 h
C	57.56%	56.87%	56.03%
N	1.64%	3.37%	8.17%
O	40.79%	39.76%	35.80%

Table S4. The proportion of C−OH and C=O on the adhesive surface after immersing in water for different time

Group	0 h	0.5 h	12 h
C−OH	51.78%	48.49%	36.28%
C=O	9.54%	16.43%	20.26%

The calculations to assess the proportion of C−OH and C=O on the adhesive surface were performed according to the values from the peak fits of high-resolution XPS C1s spectra below.

C−OH:

0h: 6639.18/(4959.17+6639.18+1223.09)=51.78%

0.5h: 11213.11/(8114.52+11213.11+3798.61)=48.49%

12h: 11481.38/(13754.73+11481.38+6412.03)=36.28%

C=O:

0h: 1223.09/(4959.17+6639.18+1223.09)=9.54%

0.5h: 3798.61/(8114.52+11213.11+3798.61)=16.43%

12h: 6412.03/(13754.73+11481.38+6412.03)=20.26%

Figure S1. Appearance of DP.

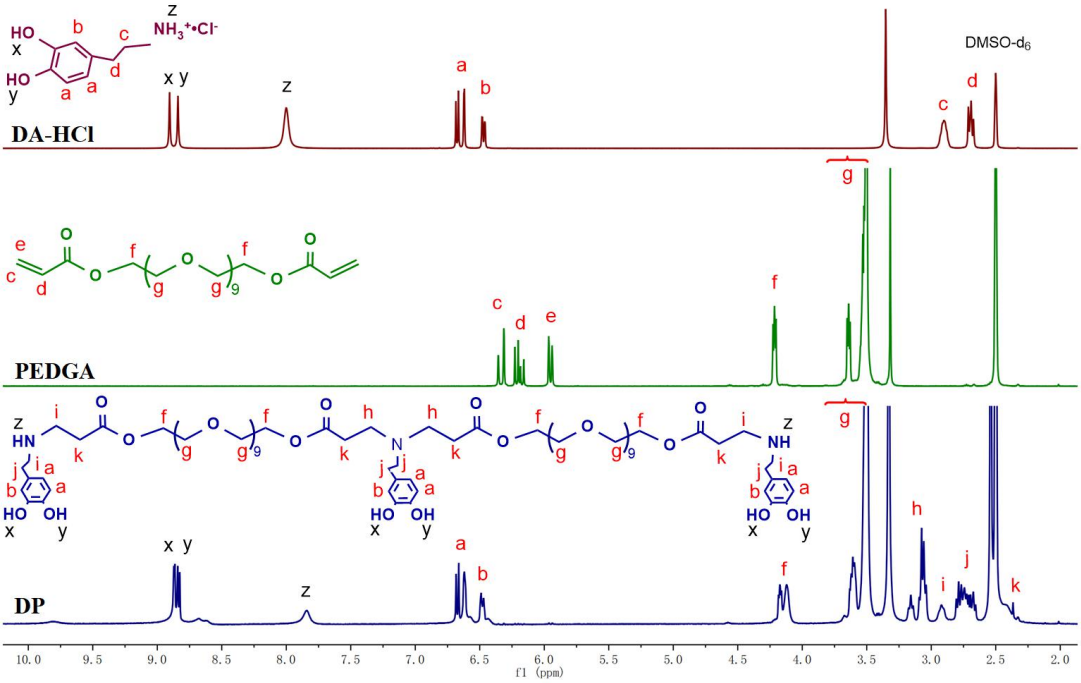

Figure S2. ^{1}H NMR spectra of DA-HCl, PEGDA and DP in DMSO-d6.

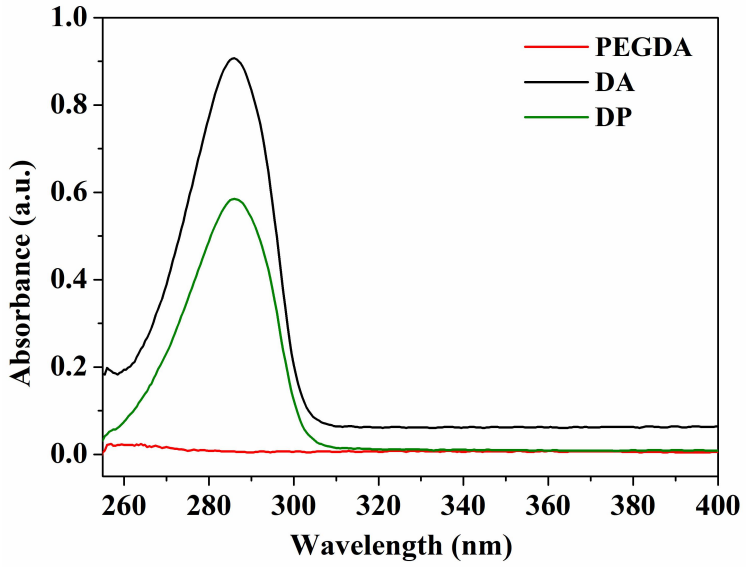

Figure S3. The UV-Vis absorption spectra of PEGDA, DA, and DP.

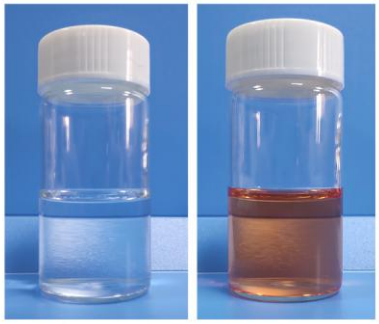

Figure S4. The DP solution (0.1 v/v%) without (left)/with (right) addition of $NaIO_4$.

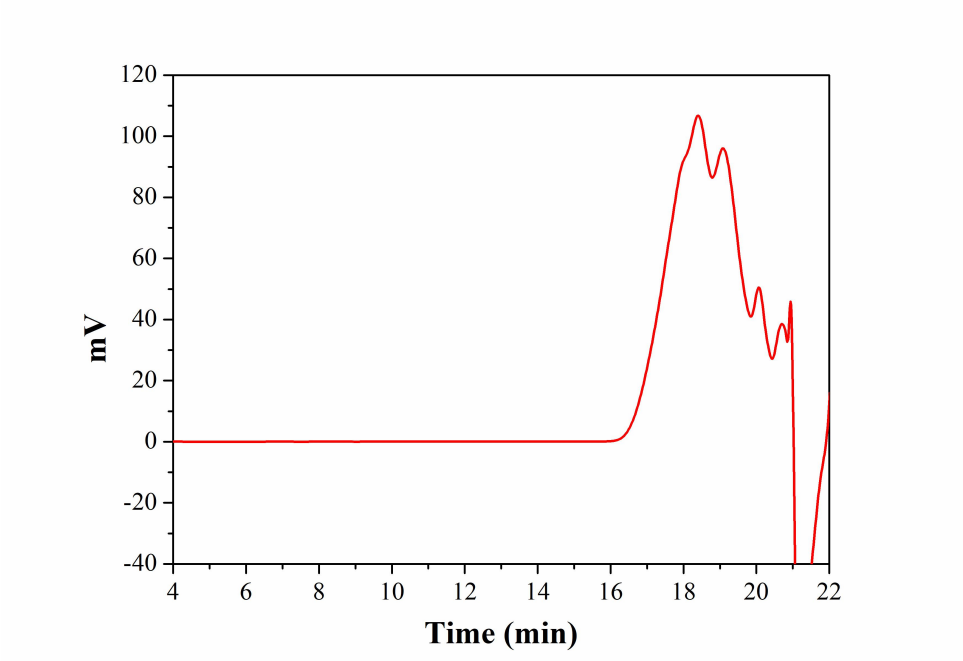

Figure S5. The representative GPC traces of DP.

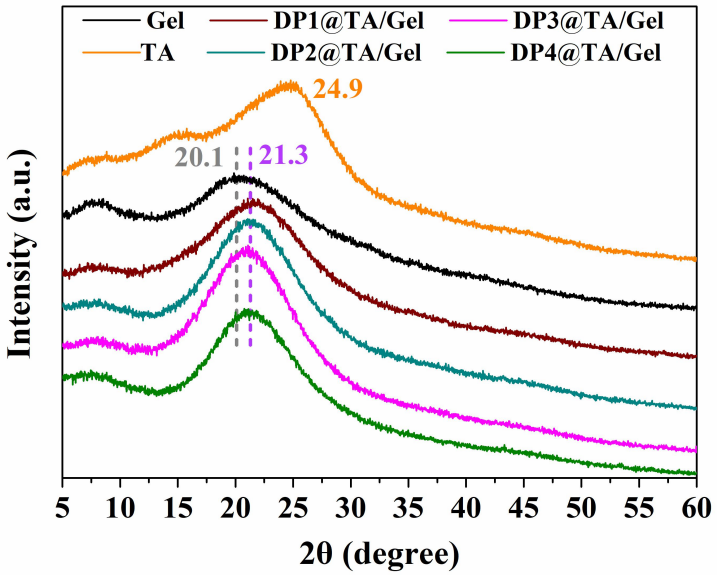

Figure S6. The XRD patterns of Gel, TA and DP@TA/Gel adhesives.

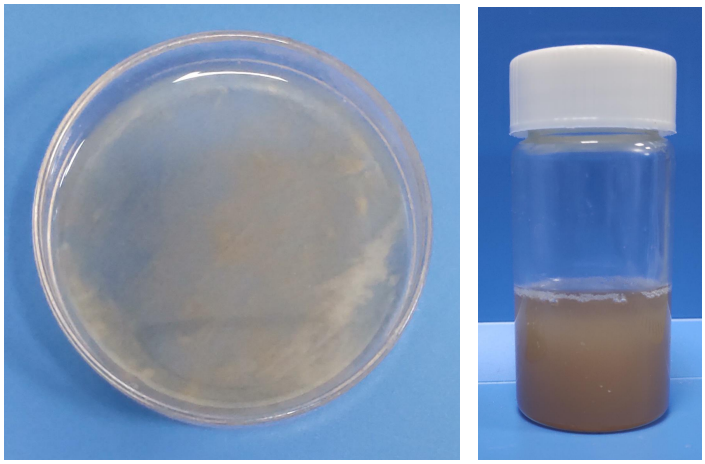

Figure S7. DP@TA/Gel adhesives formation was disturbed at the presence of urea.

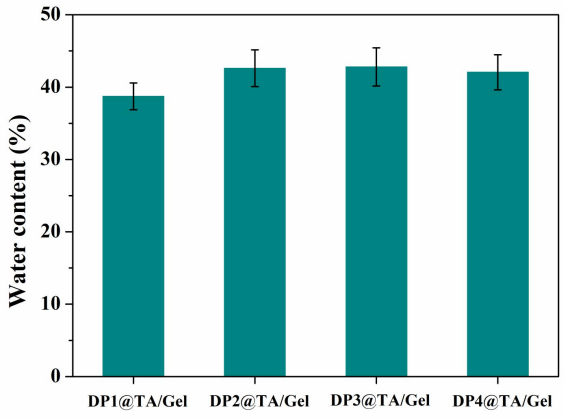

Figure S8. Water content of the DP@TA/Gel adhesives.

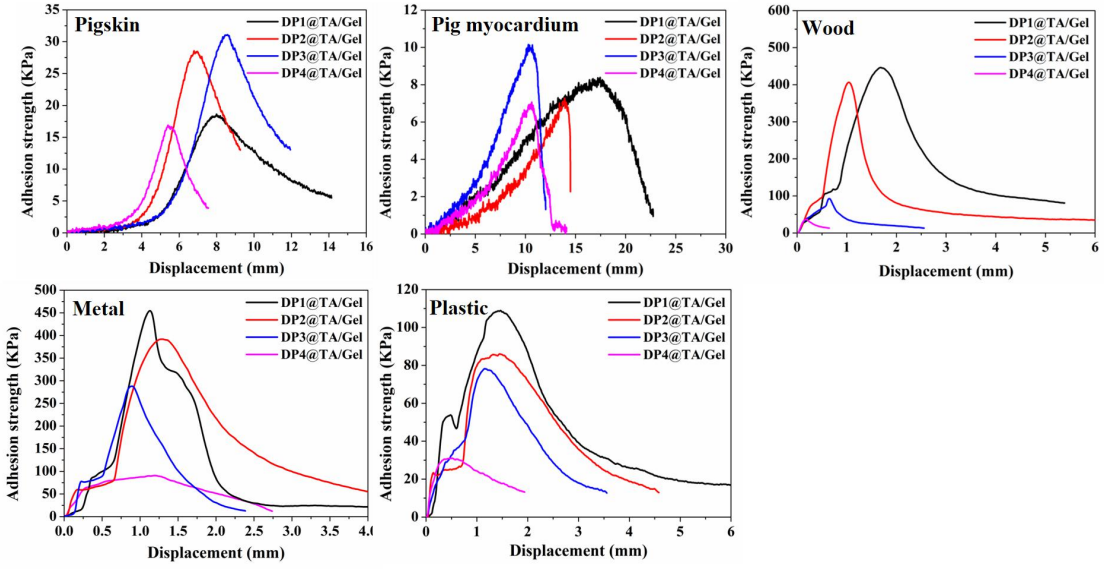

Figure S9. The representative adhesion curves of the adhesives on different substrates.

Figure S10. The bonded metal sheets with the bonding area of 10 × 8 cm^2 can lift the author (60 kg) and even support pull-ups.

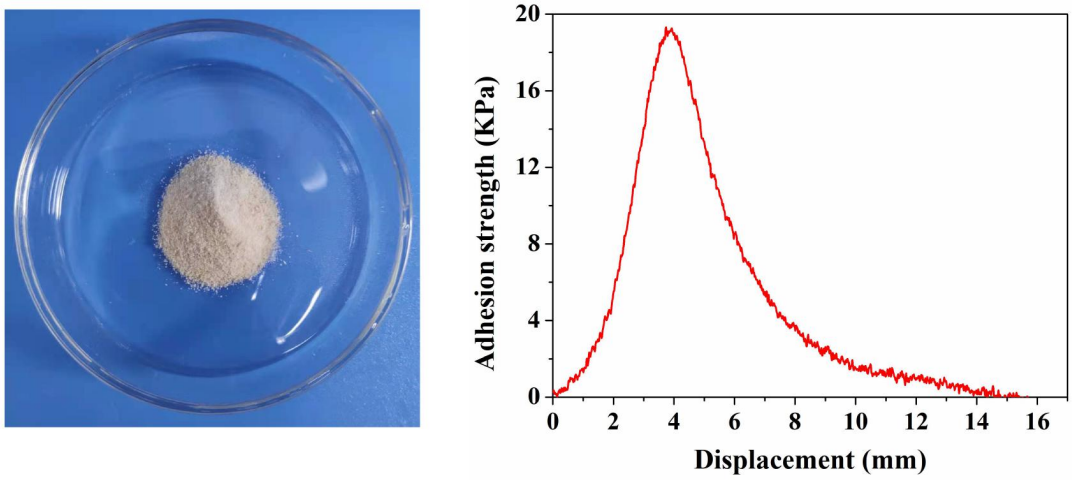

Figure S11. Photograph of the powder of the lyophilized adhesive (left) and the representative adhesion curve of the recovered adhesive on pigskin (right). The adhesion strength on pigskin was 18.19 ± 1.9 kPa.

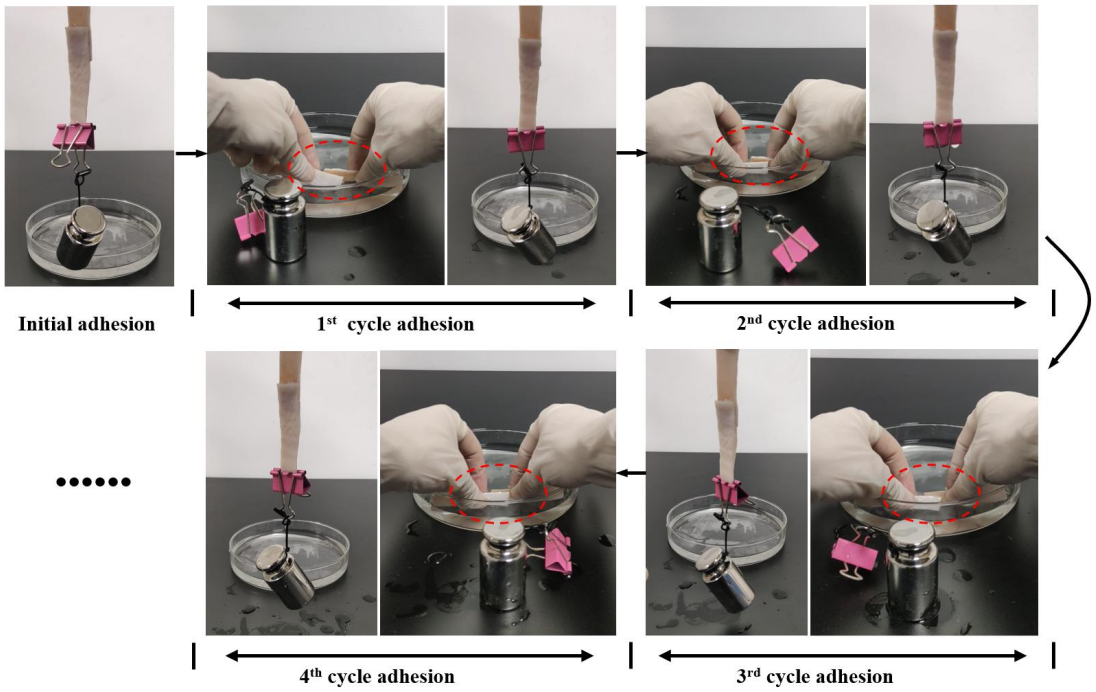

Figure S12. The repeatable adhesion performance of the DP@TA/Gel adhesive on pigskin underwater.

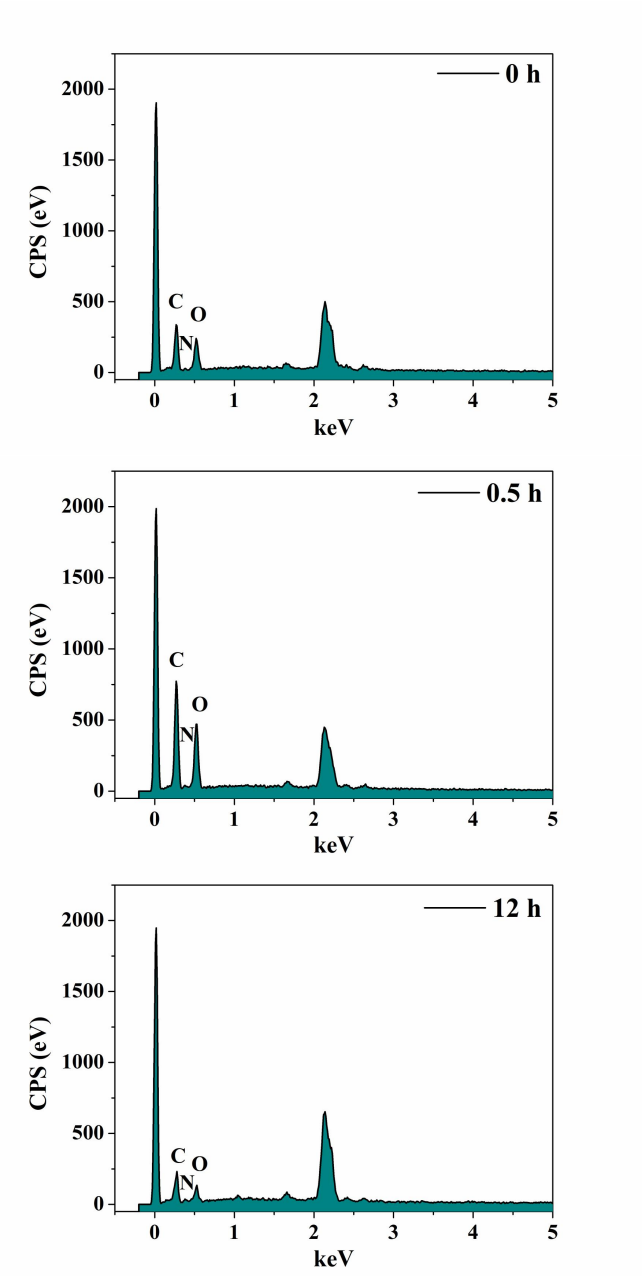

Figure S13. The EDS of the adhesive after immersing underwater for different time.

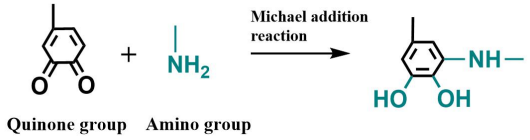

Figure S14. The Michael addition reaction between the quinone and amino groups.

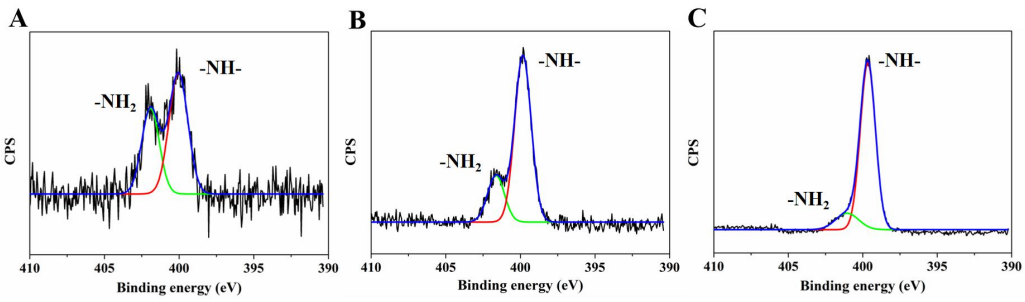

Figure S15. Peak-fitting XPS spectra in the N1s regions of the adhesive after immersing in water for (A) 0 min, (B) 30 min and (C) 12 h.

The calculations to assess the proportion of $-NH_2$ of the adhesive were performed according to the values from the peak fits of high-resolution XPS N1s spectra below.

immersing in water for 0 min: 285.71/(285.71+430.43) = 39.90%

immersing in water for 30 min: 562.53/(562.53+1964.85) = 22.26%

immersing in water for12 h: 931.28/(931.28+6231.39) = 13.00%

The degree of the cross-linking of the DP@TA/Gel adhesive:

$D_{(0.5)}$ = (39.90% − 22.26%) / 39.90% = 44.21%

$D_{(12)}$ = (39.90% − 13.00%) / 39.90% = 67.42%

Where the $D_{(0.5)}$ and $D_{(12)}$ represented the degree of the cross-linking of the DP@TA/Gel adhesive after immersing in water for 30 min and 12 h.

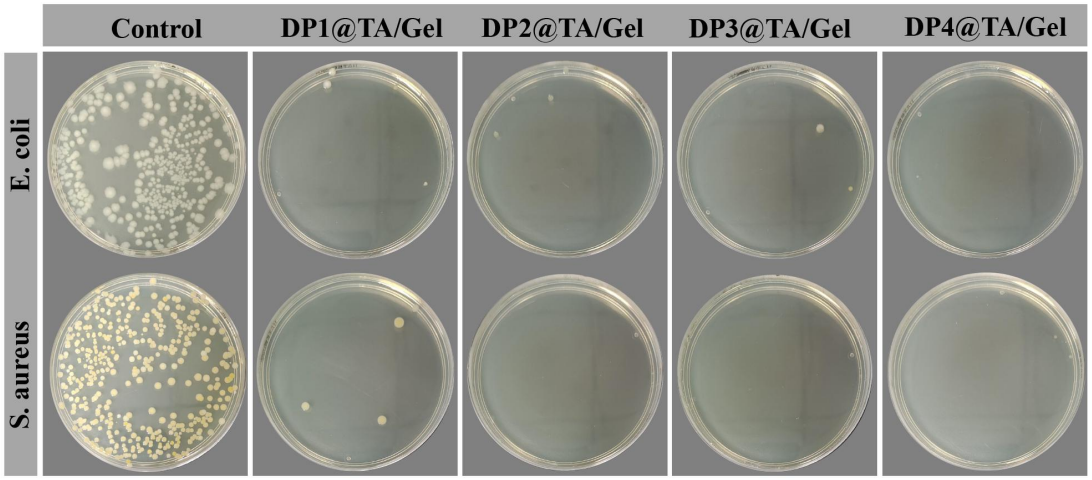

Figure S16. Photographs of the bacterial colonies on agar after incubation for 48 h.

Supplementary Videos:

Video S1. The sticky DP@TA/Gel adhesive formation after addition DP.

Video S2. A non-viscous white flocculent gel was formed when without addition DP.

Video S3. The DP@TA/Gel adhesive exhibited soft structure and high extensibility.

Video S4. The detachment of the bonded fingers by the DP@TA/Gel adhesive.

Video S5. The DP@TA/Gel adhesive became into a white sticky adhesive immediately on contacting with water.

Video S6. The bonded mental sheets with the bonding area of 10 × 8 cm^2 can lift the author (about 60 kg) and even support pull-ups.

Video S7. The adhesive can glue the pigskin immediately underwater without any stimulus.