

Supplementary Information

Synthesis of photothermal antimicrobial cotton gauze using AuNPs as photothermal transduction agents

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1. Experimental procedure

1.1 Contact angle

For contact angle test, the original, Au-1 and Au-2 cotton gauzes were cut into 0.7 cm × 0.7 cm pieces, then each sample was put in a contact angle meter (OCA25, Germany), and the water dosing volume was set as 3 μL. The photos of samples before and after water contact were snapped.

1.2 Water absorbency

Water absorbency test was carried out according to BS EN 13726. Firstly, the original, Au-1 and Au-2 cotton gauzes in 6 cm × 6 cm pieces were weighed (W_1). And test solution with 142 mM Na⁺ ions and 2.5 mM Ca²⁺ ions was prepared and pre-warmed to 37 °C. Then each cotton gauze sample was placed in a 6 cm Petri dish and incubated in 15 mL test solution at 37 °C. After incubation for 30 min, each cotton gauze sample was taken out using forceps by one corner, suspended for 30 s, and weighed (W_2). The water absorbency was calculated in terms of percentage ($[(W_2 - W_1) \times 100 / W_1]$).

1.3 Gold release from the AuNPs modified cotton gauzes

To study the gold release from the AuNPs modified cotton gauzes, 6 cm × 6 cm Au-1 and Au-2 cotton gauzes were weighed, then soaked in 20 mL distilled water. After soaked for 24 h, 8 mL solution was sucked. Then the Au-1 and Au-2 cotton gauze samples were further soaked for 48 h, and another 8 mL solution was sucked. Finally, 0.25 mL aqua regia was added to each sucked solution to digest the Au atoms, and the digested solutions were analyzed using an inductively coupled plasma-mass spectrometry (ICP-MS) (ICAP6300, USA).

1.4 Microbial cell adhesion morphology

The original, Au-1 and Au-2 cotton gauzes were cut into 0.7 cm × 0.7 cm pieces and sterilized. Then 30 μL microbial solution ($OD_{600\text{ nm}}=0.1$) was dropped onto each cotton gauze sample placed in a 5 mL transparent glass bottle, and further cultured for 6 h. Then the cotton gauze samples were washed with water twice, fixed with 5% formaldehyde for 30 min, dehydrated using gradient ethanol solutions, air dried and observed by a scanning electron microscope (Sigma 300, Germany).

2. Results and discussion

Contact angle test was conducted to evaluate the surface wettability of cotton gauzes. As shown in **Fig.S1**, when contacted with water, the original, Au-1 and Au-2 cotton gauzes could rapidly adsorb water, and there were no water-drops snapped on

the surfaces, showing that both the original and AuNPs modified cotton gauzes were super-hydrophilic. This agreed with water absorbency results (**Table.S1**) that the original, Au-1 and Au-2 cotton gauzes could absorb over 400% water and were hydrophilic.

Cotton gauze is a kind of biomaterial widely used in clinic. To evaluate the biocompatibility of the AuNPs modified cotton gauzes, the cell adhesion behaviours of *Candida albicans* and *Escherichia coli* were studied. As showing in **Fig.S2**, both *Candida albicans* and *Escherichia coli* cells could adhere well on the Au-1 and Au-2 cotton gauzes, and the cell morphologies were the same as that on the original cotton gauze, demonstrating that the AuNPs modified cotton gauzes were biocompatible to *Candida albicans* and *Escherichia coli* cells.

Tables & Figures

Table.S1 Water absorbency and gold release of the original and AuNPs modified cotton gauzes

| Samples | Water absorbency (%) | Gold release (%) | |
|-----------------|----------------------|------------------|------|
| | | 24 h | 72 h |
| Original | 473.4 ± 8.3 | -- | -- |
| Au-1 | 473.4 ± 6.6 | 0.00 | 0.00 |
| Au-2 | 493.4 ± 3.1 | 1.48 | 1.65 |

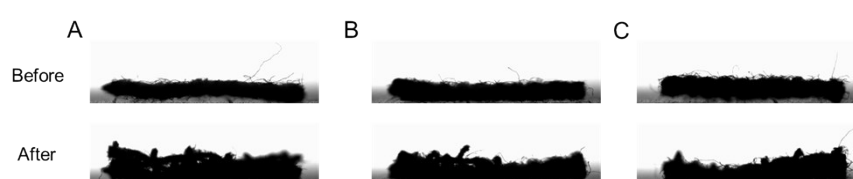


Fig.S1 Photos of the (A) original, (B) Au-1 and (C) Au-2 cotton gauzes before and after contact with water.

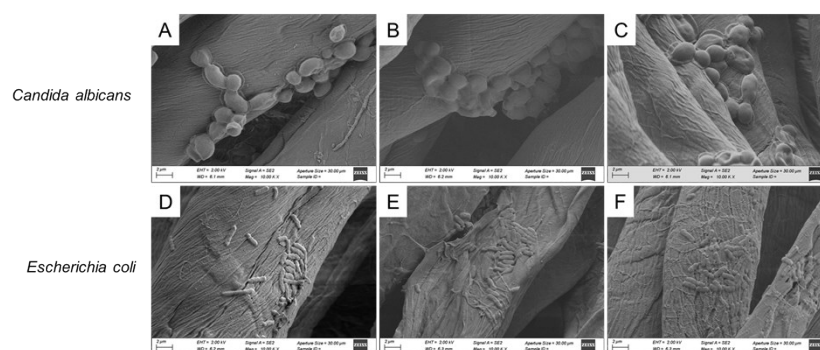


Fig.S2 SEM images of (A-C) *Candida albicans* and (D-F) *Escherichia coli* cells adhesion on the (A and D) original, (B and E) Au-1 and (C and F) Au-2 cotton gauzes after culture for 6 h.