Quaternization carbon dots with enhanced antimicrobial ability to Gram-negative bacteria for the treatment of acute peritonitis caused by *E. coli*

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1. Experimental section

Identifying bacteria using mass spectrometry

Preparation of matrix solution: Take 100 μL of lysis solution 2 and buffer solution respectively, add them to the matrix, shake and mix well to fully dissolve the matrix, and set aside. The prepared matrix solution is sealed and stored at 2℃-8℃ and can be used for 30 days.

Experimental operation: add 300μL of deionized water to a 1.5mL centrifuge tube, take a sample (choose 1~2 single colonies from a medium-sized colony) in a centrifuge tube, and shake and mix well. Add 900μL of absolute ethanol, mix well, centrifuge at room temperature for 2 to 4 minutes (8000rpm to 14800rpm), discard the supernatant, and centrifuge again to completely remove the supernatant. Dry the precipitate at 37℃ to 40℃ for 2 minutes to 5 minutes, until there is no obvious water mark on the surface of the precipitate. Add 10μL of lysis solution 1, mix well, then add 10μL equal volume of lysis solution 2, mix well, and centrifuge at room temperature for 2 to 4 minutes (8000rpm-14800rpm). Aspirate 1μL of the supernatant, drop it on the sample target, and air dry until there is no obvious water trace on the sample point. Take 1μL of matrix solution to cover the above-mentioned sample point, and air-dry until there is no

obvious water mark on the sample point. The sample target is placed into the mass spectrometer for identification.

Table S1. Pretreatment reagents for mass spectrometry samples

number	Solution name	100 tests/box
1	Lysate 1 (formic acid-containing solution)	1.0ml
2	Lysate 2 (acetonitrile-containing solution)	1.1ml
3	Buffer (solution containing trifluoroacetic acid)	0.3ml
4	Matrix (with alpha-cyano-4-hydroxycinnamic acid)	2.0mg

2. Figures and Figure captions

Table S2. MICs of QCDs against five samples of clinical drug-resistant bacteria.

Bacterial Strains	G^+/ G^-	MIC(μg/mL)
Resistant *E. coli*-1	G^-	30
Resistant *E. coli*-2	G^-	30
Resistant *E. coli*-3	G^-	30
Resistant *E. coli*-4	G^-	30
Resistant *E. coli*-5	G^-	30

Table S3. The MIC of recent several carbon dots to *E. coli.*

Kinds of Materials	MIC value	Ref.
PC-CQDs	120 μg/mL	1
QCQD	640 μg/mL	2
qCQDs	50 μg/mL	3
FA-CD	＞2 mg/mL	4
P-doped CQDs	1.23 mg/mL	5
GCD	50 μg/mL	6
CNDs	192 μg/mL	7
F-CDs	64 μg/mL	8
QCDs	30 μg/mL	This study

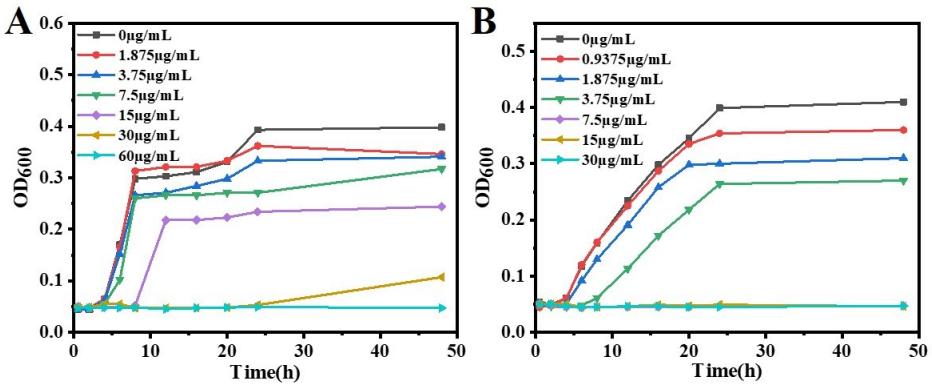

Figure S1. Bacterial inhibition curves by QCDs. (A) *E. coli.* (B) *S. aureus.*

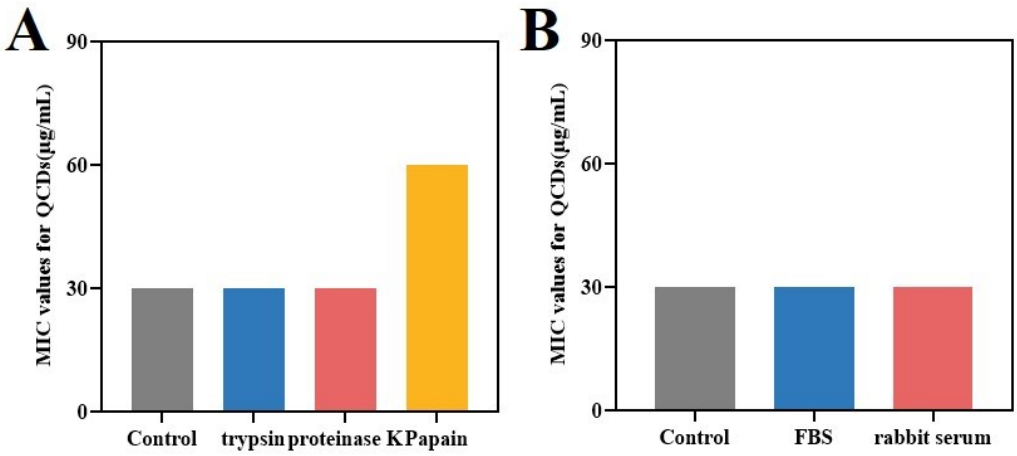

Figure S2. Stability of antimicrobial activity of QCDs in different conditions against *E. coli*. (A) Various protein. (B) Various serum.

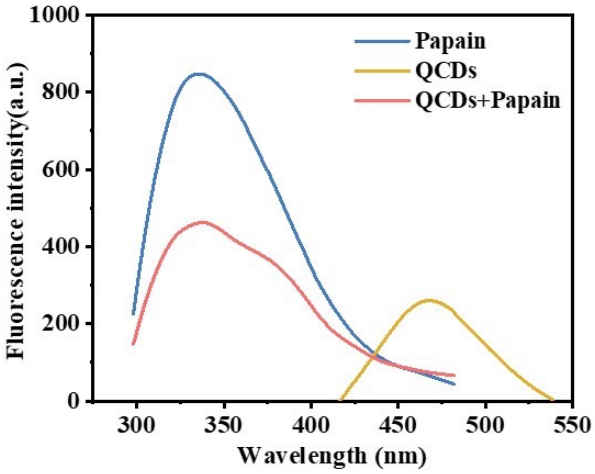

Figure S3. Fluorescence spectra of papain, QCDs and the interaction of QCDs and papain.

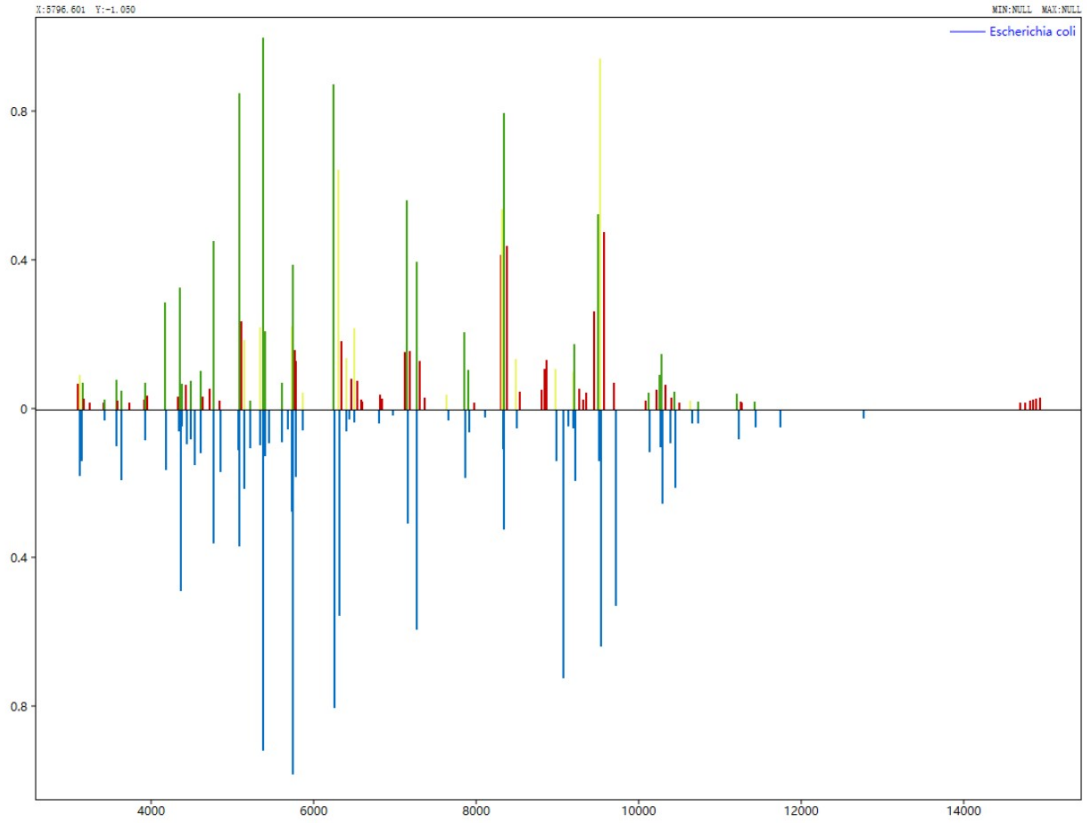

Figure S4. The MS identification result of the colonies on the petri dish of the rat in the negative control group.

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