Electronic Supplementary Material (ESI) for Analytical Methods.

Supplementary Information

An inner filter effect-based fluorescent aptasensor for sensitive detection of kanamycin in complex samples using gold nanoparticles and graphene oxide quantum dots

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Materials and reagents

Kanamycin, oxytetracycline, ampicillin, chloramphenicol and bovine serum albumin (BSA) were obtained from Aladdin Industrial Corporation (Shanghai, China). GOQDs were purchased from Nanjing XFNANO materials Tech Co., Ltd. (Nanjing, China). Glucose and L-cystine were purchased from Sangon Biotech Co., Ltd. (Shanghai, China). Chloroauric acid tetrahydrate ($HAuCl_4 \cdot 4H_2O$), trisodium citrate, $CaCl_2$ and other analytical reagents were obtained from Sinopharm Chemical Reagent Co., Ltd (Shanghai, China) and used as received without further purification. Ultrapure water with a resistivity of 18.2 MΩ·cm obtained from a Millipore Milli-Q water purification system was used throughout the experiments. The kanamycin-specific aptamer with the sequence 5'-AGA TGG GGG TTG AGG CTA AGC CGA-3' was synthesized and purified by Sangon Biotech Co., Ltd. (Shanghai, China). Milk and honey samples were purchased from the local supermarket (Guangzhou, China). Human serum samples from healthy volunteers were kindly supplied by a local hospital (Guangzhou, China).

Apparatus

All fluorescence spectra were recorded on a RF-5301 fluorescence spectrophotometer (Shimadzu, Japan), with an excited slit of 5 nm and emission slit of 10 nm, as well as the excitation wavelength at 370 nm. The UV-vis absorption spectra were obtained using a UV-6100 spectrophotometer (Metash, Shanghai). The zeta potential of AuNPs and GOQDs, as well as the diameter distribution of AuNPs were measured by a Zetasizer Nano ZS/Mastersizer 2000E laser diffraction particle size analyzer (Malvern Instruments, UK). The morphology and size of AuNPs and GOQDs were characterized by a JEM-2100F transmission electron microscope (TEM, JEOL, Japan).

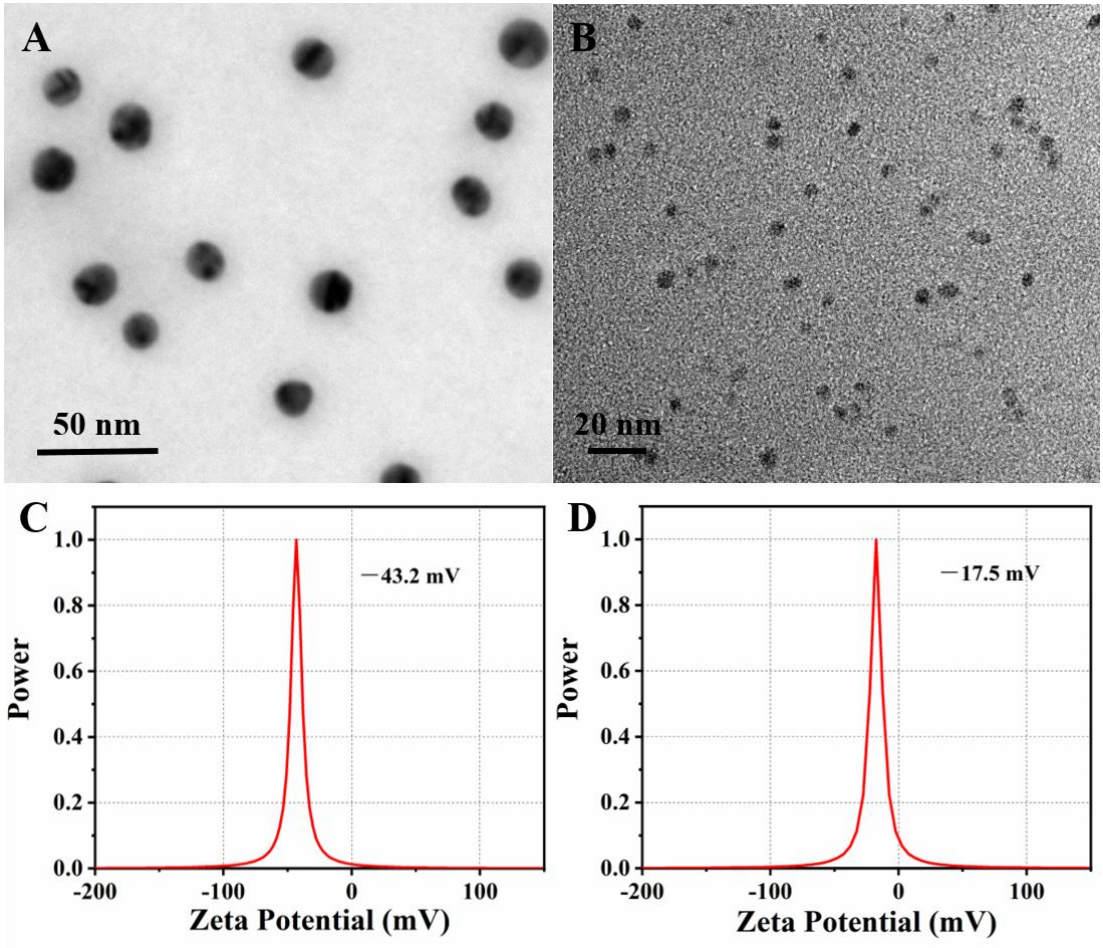

Fig. S1 Transmission electron micrographs of AuNPs (A) and GOQDs (B). Zeta potential measurements of AuNPs (C) and GOQDs (D).

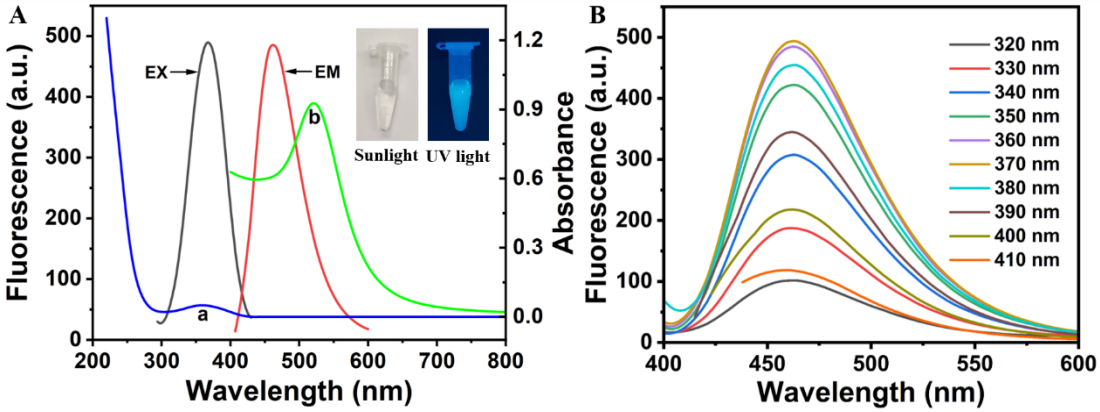

Fig. S2 (A) UV–vis absorption spectra of GOQDs (a) and AuNPs (b). Excitation (EX) and emission (EM) spectra of GOQDs. Inset: photographs of GOQDs solution under visible and UV light. (B) Fluorescence emission spectra of GOQDs recorded at various excitation wavelengths ranging from 320 nm to 410 nm.

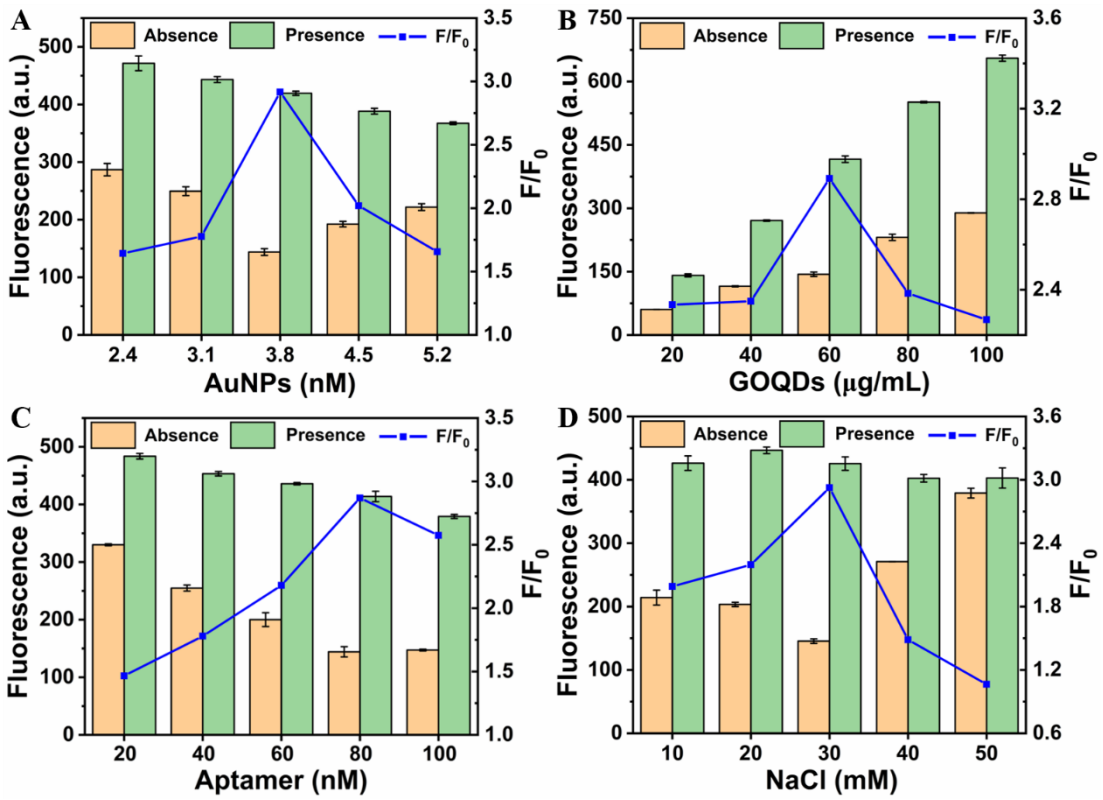

Fig. S3 Optimization of the experimental conditions for kanamycin detection: the concentrations of AuNPs (A), GOQDs (B), Aptamer (C), and the amount of NaCl (D). Here F_0 and F were the fluorescence intensity of the sensing system in the absence and presence of kanamycin, respectively. Error bars represented the standard deviation of three measurements.

Table S1 Comparison of the proposed sensing strategy with previously reported methods for the detection of kanamycin.

Detection method	Strategy	Linear range	LOD	Reference
Colorimetry	AuNPs and HCR	1–40 μM	0.68 μM	1
Colorimetry	AgNPs	0.05–0.6 μg/mL	4.6 nM	2
Colorimetry	CHA and AuNPs-DNA	20–5000 pM	10 pM	3
Electrochemistry	aptamer-functionalised electrode	10–2000 nM	14 pM	4
Electrochemistry	AuNPs	0.1–60 nM	0.06 nM	5
Electrochemistry	MNPs and HCR	1 pM–100 nM	1 pM	6
Fluorescence	dsDNA and CNTs	1–50 nM	0.4 nM	7
Fluorescence	FRET	10–600 nM	13.52 nM	8
Fluorescence	AuNPs and CDs	40–240 nM	18 nM	9
Fluorescence	AuNPs and GOQDs	5–600 nM	3.6 nM	This work

HCR: hybridization chain reaction; AgNPs: silver nanoparticles; CHA: catalytic hairpin assembly; MNPs: magnetic nanoparticles; dsDNA: double-stranded DNA; CNTs: carbon nanotubes; FRET: fluorescence resonance energy transfer; CDs: carbon dots.

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