Supplementary Information (SI) for Analytical Methods.

Nitrogen doped carbon dots with antibacterial activity for dual mode fluorescence and smartphone-assisted colorimetry detection of epirubicin

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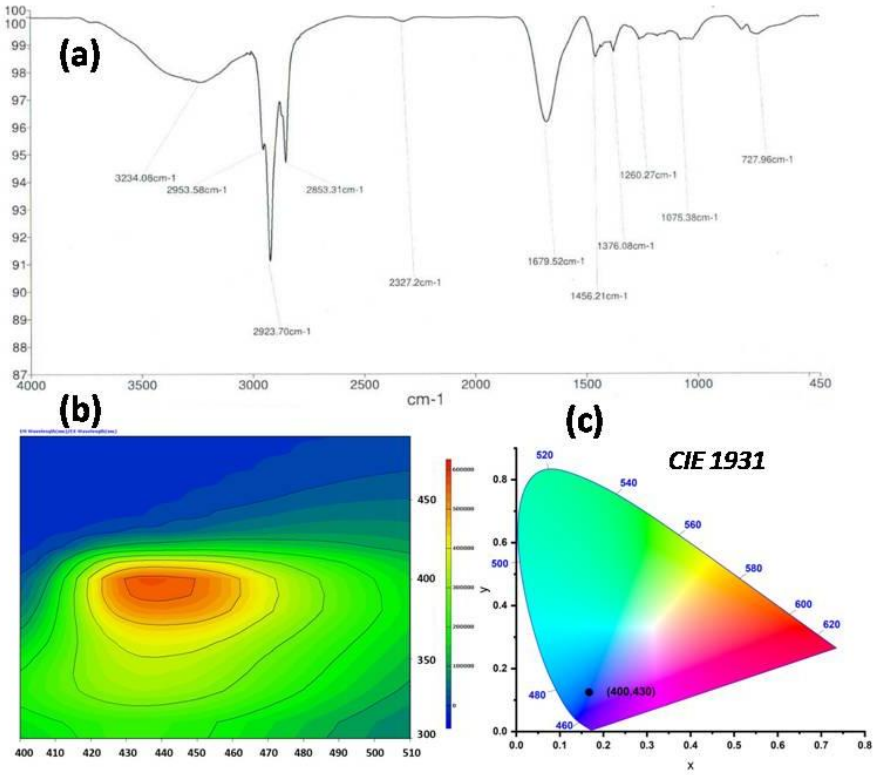

Fig. S1 (a) FT-IR, (b) 3D Image and (c) CIE diagram of N-CDs

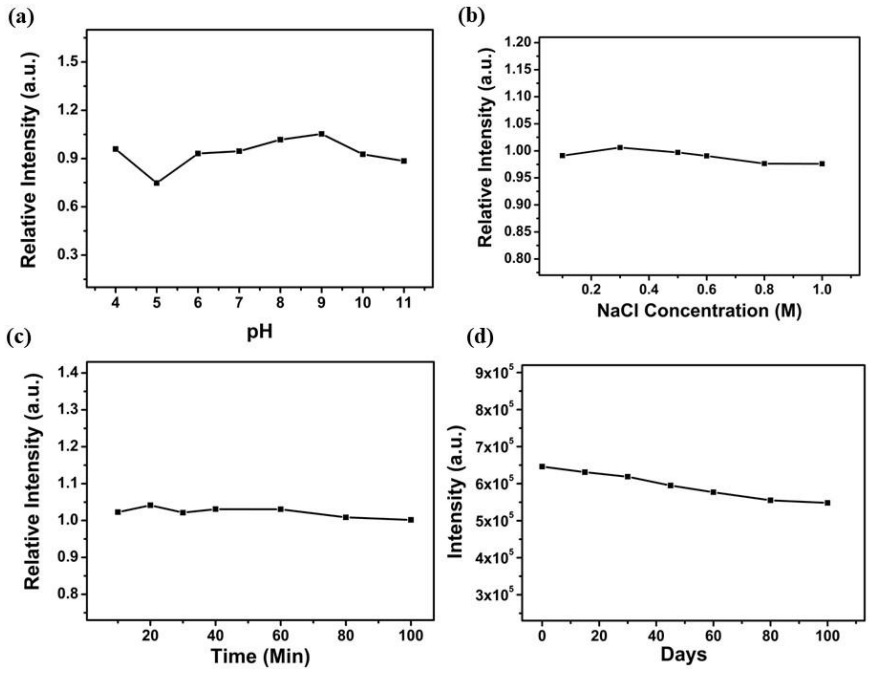

Fig. S2 The stability of N-CDs in different conditions: (a) pH, (b) ionic strength, (c) UV irradiation and (d) number of days

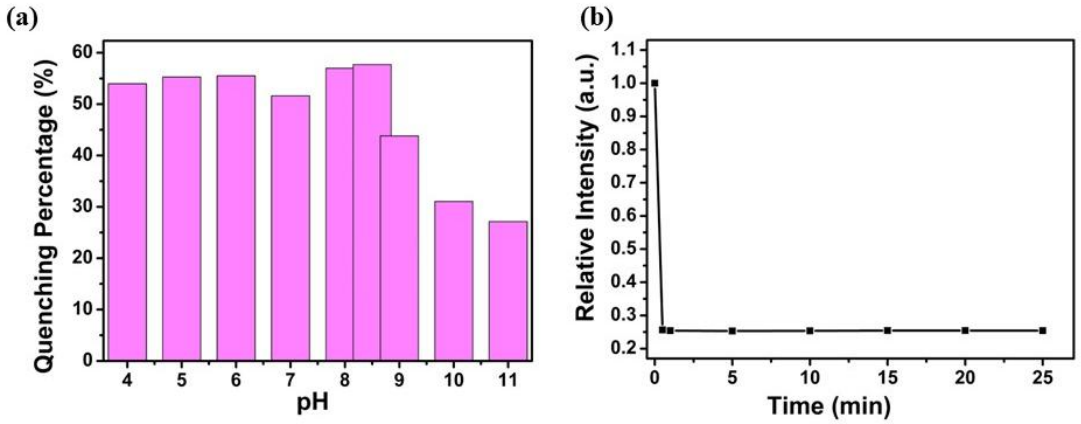

Fig. S3 (a) pH optimisation and (b) response time of EPR quenching

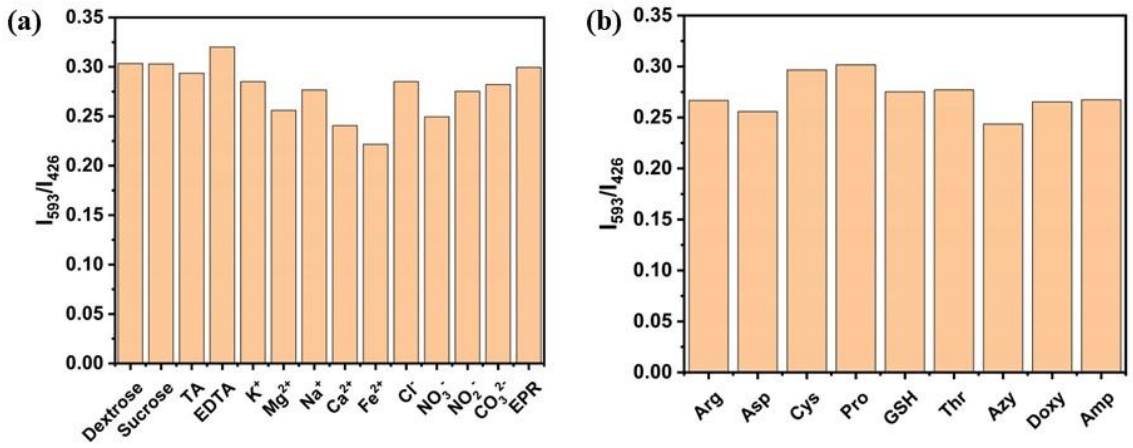

Fig. S4 Interference of the N-CDs in presence of EPR and other interfering molecules: (a) ions, molecules and (b) antibiotics, amino acids in fluorescence

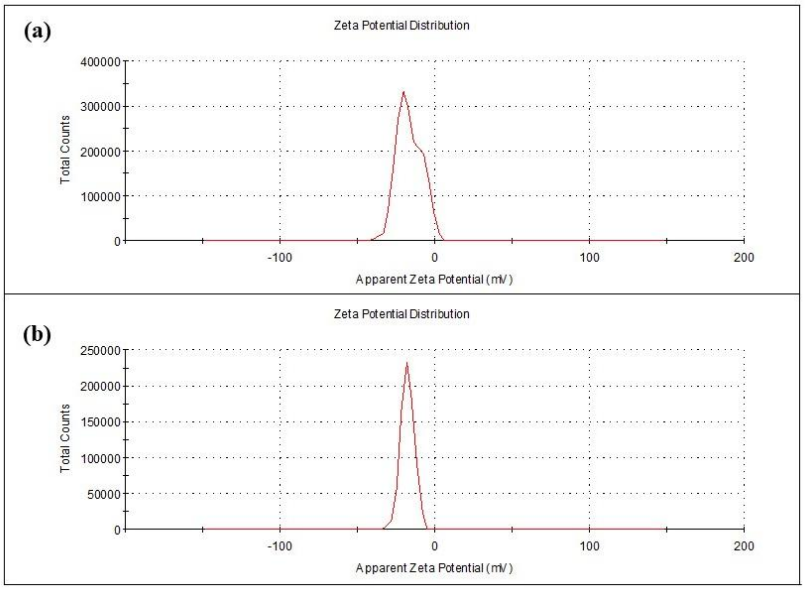

Fig. S5 Zeta potential of (a) N-CDs and (b) EPR

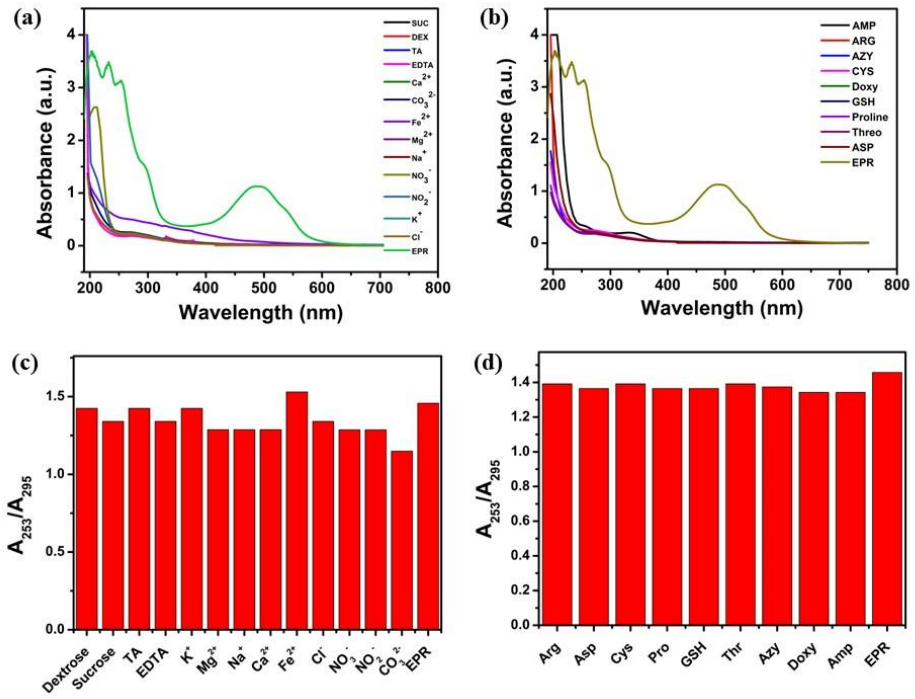

Fig. S6 The UV-Vis colorimetric response of N-CDs to EPR and other interfering substances (a) ions, molecules and (b) antibiotics, amino acids, The UV-Vis colorimetric response of N-CDs to EPR in presence of other co-existing interfering substances (c) ions and molecules and (d) antibiotics and amino acids.

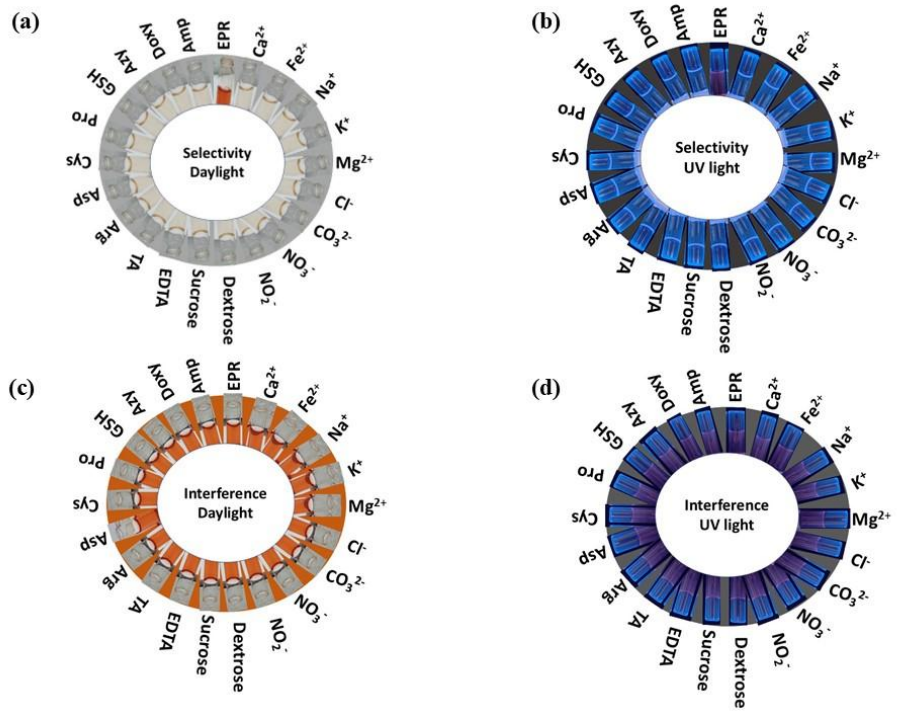

Fig. S7 Smartphone based colorimetric response of N-CDs to EPR and other interfering substances (a) ions, molecules and (b) antibiotics, amino acids, Smartphone based response of N-CDs to EPR in presence of other co-existing interfering substances (c) ions and molecules and (d) antibiotics and amino acids.

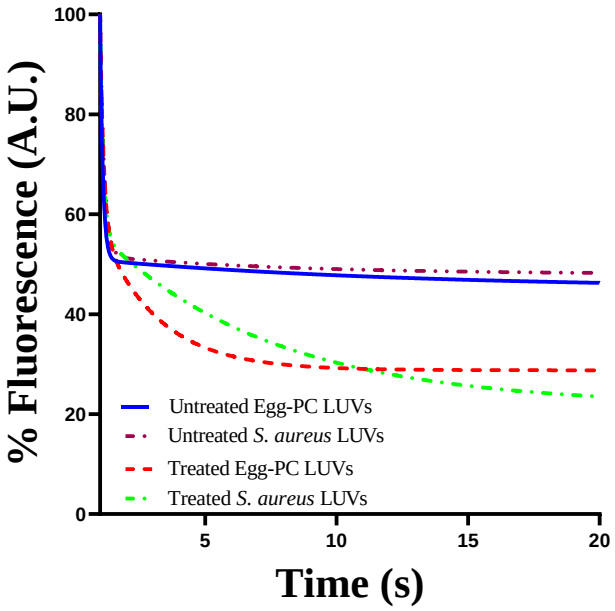

Fig. S8 Flippase activity by N-CDs in reconstituted model membrane (LUVs).

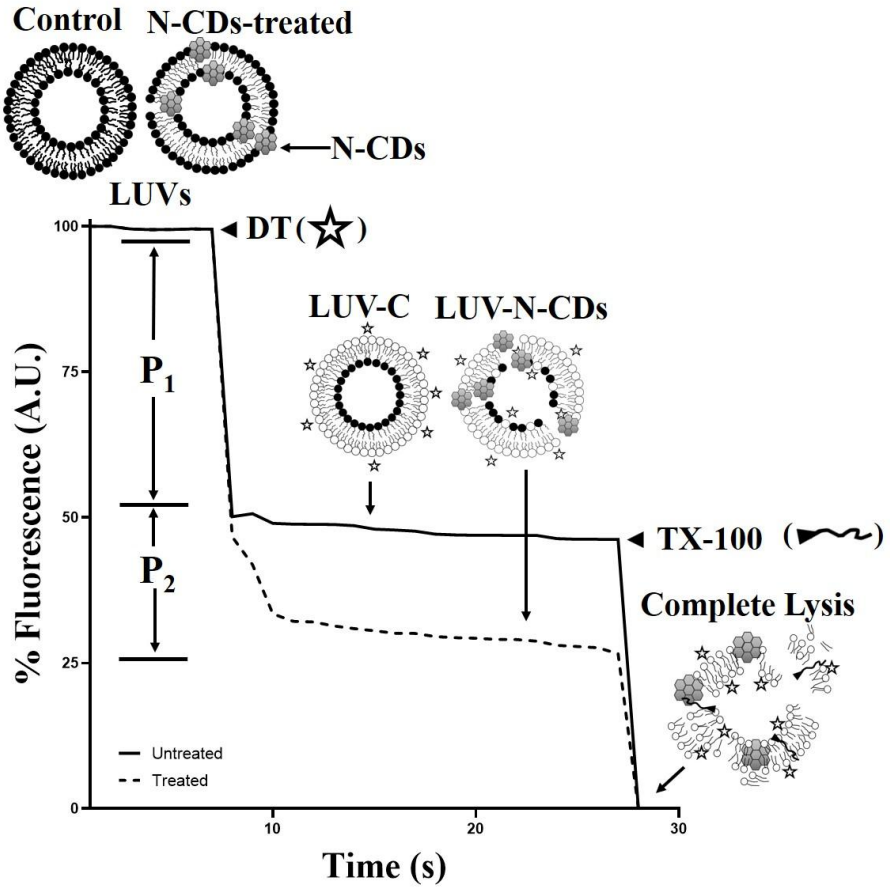

Fig. S9 Lipid flipping activity of N-CDs.

A Schematic diagram (Fig. S9) showing lipid flipping activity of N-CDs. Initial fluorescence of both control LUVs (LUV-C) as well as LUVs incubated with N-CDs (LUV-N-CDs)

exhibit 100% steady state initial fluorescence (F_0) as indicated by their dark head groups. Addition of dithionite (DT) at 1 min decreased the fluorescence in both LUVs and LUVs-N-CDs due to quenching of NBD fluorescence. While control LUV-C show quenching of NBD fluorescence of lipid located on outer leaflet only, leading to fluorescence drop by ~50% of the initial fluorescence, LUV-N-CDs-observed a larger (> 50%) fluorescence quenching due to flipping of NBD-lipids from inner leaflet to the outer leaflet. Total fluorescence quenching is the combination of a fast (P_1) and a slow (P_2) phases. Addition of 1% triton X-100 leads to complete lyses of LUV membrane resulting in ~100% NBD-fluorescence quenching for both LUV-C and LUV-N-CDs.

Table S1 Real sample analysis in blood serum

Real Sample	EPR (μM)	Fluorescence result (μM)	Recovery (%)	Colorimetric result (μM)	Recovery (%)	Smartphone result (μM)	Recovery (%)
Serum	20	22.04	109.11	20.63	103.17	19.42	97.12
	25	26.74	106.99	23.68	94.75	25.03	100.11
	30	30.80	102.67	29.90	99.70	31.09	103.66
Urine	20	20.78	103.9	21.34	106.7	20.35	101.75
	25	26.73	106.92	25.97	103.88	25.29	101.16
	30	31.52	105.06	28.64	95.46	28.77	95.9
Tap water	20	19.13	95.65	21.29	106.45	20.94	104.7
	25	25.49	101.96	24.49	97.96	26.16	104.64
	30	30.78	102.6	31.23	104.1	29.20	97.33

Table S2 Zone size (cm) for the antimicrobial assay for N-CDs

Strains	Ampicilin	N-CDs
S. flexneri	3.5	1.3
S. aureus	1.4	0.8
K. Pneumoniae	1.0	0.9

Table S3 IC_{50} determination using N-CDs

STRAINS	N-CDs ($\mu g mL^{-1}$)	
	IC_{50}	R^2
S. flexneri	296.5	0.97
S. aureus	619.6	0.95
K. Pneumoniae	699.2	0.94