Supporting information

In situ synthesis of fluorescent polydopamine polymer dots based on Fenton reaction for multi-sensing platform

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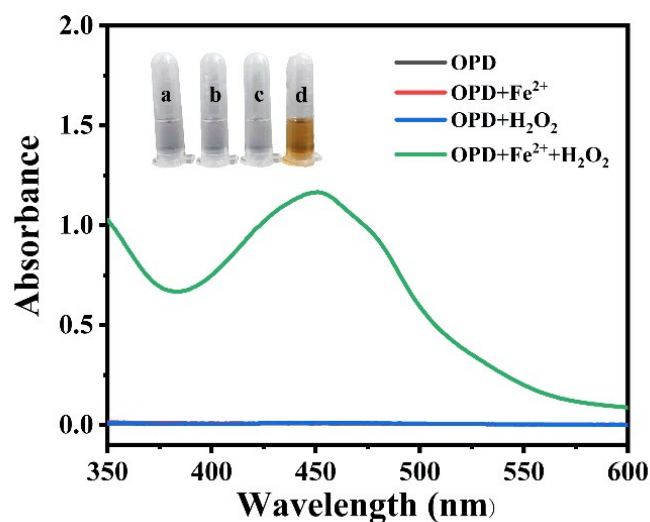*Corresponding authors. Yun Wei, E-mail: weiyun@mail.buct.edu.cn

Fig. S1 Absorption spectra of (a) OPD solution, (b) OPD-Fe^{2+} solution, (c) OPD-H_2O_2 solution, (d) OPD-Fe^{2+}-H_2O_2 solution (insert: the corresponding photograph under natural light). The concentrations of Fe^{2+}, OPD, and H_2O_2 are 100 μM, 200 μM, and 2 mM, respectively, and pH 4.0.
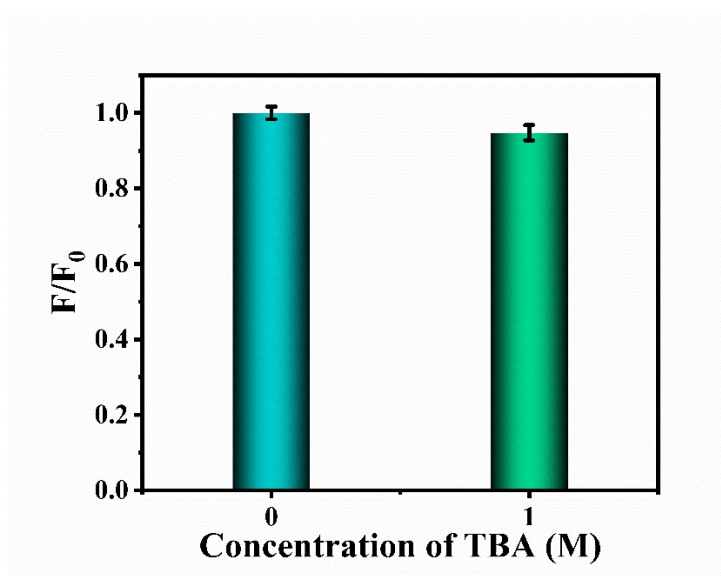

Fig. S2 The fluorescence response of the obtained PDA-PDs with TBA, where F_0 and F are fluorescence intensity of the PDA-PDs in the absence and presence of TBA, respectively.
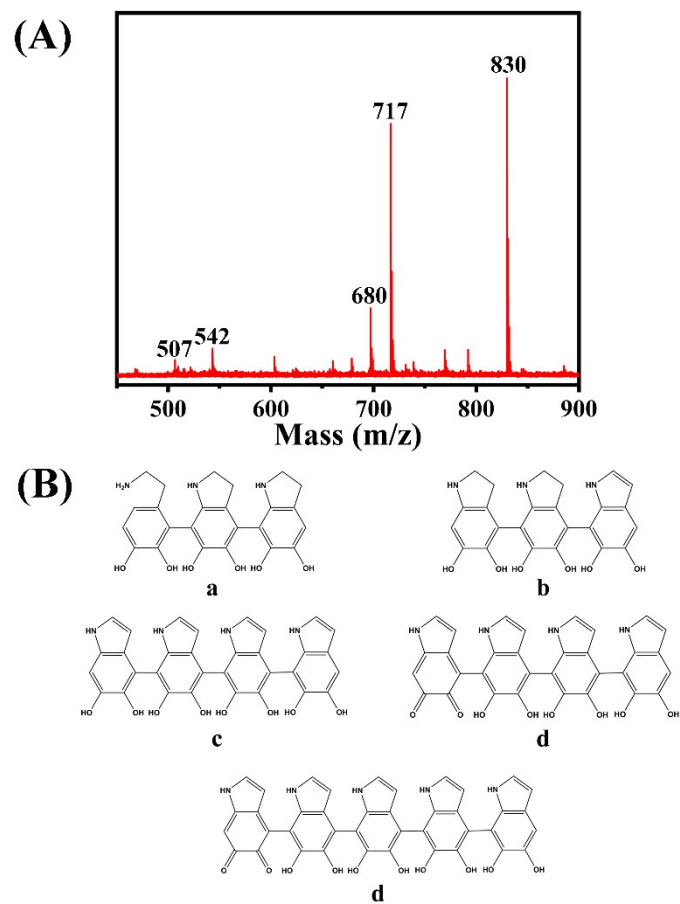
Fig. S3 (A) MALDI-TOF mass spectrometry of the as-synthesized PDA-PDs. (B) Possible chemical structures of the fragments of PDA-PDs.
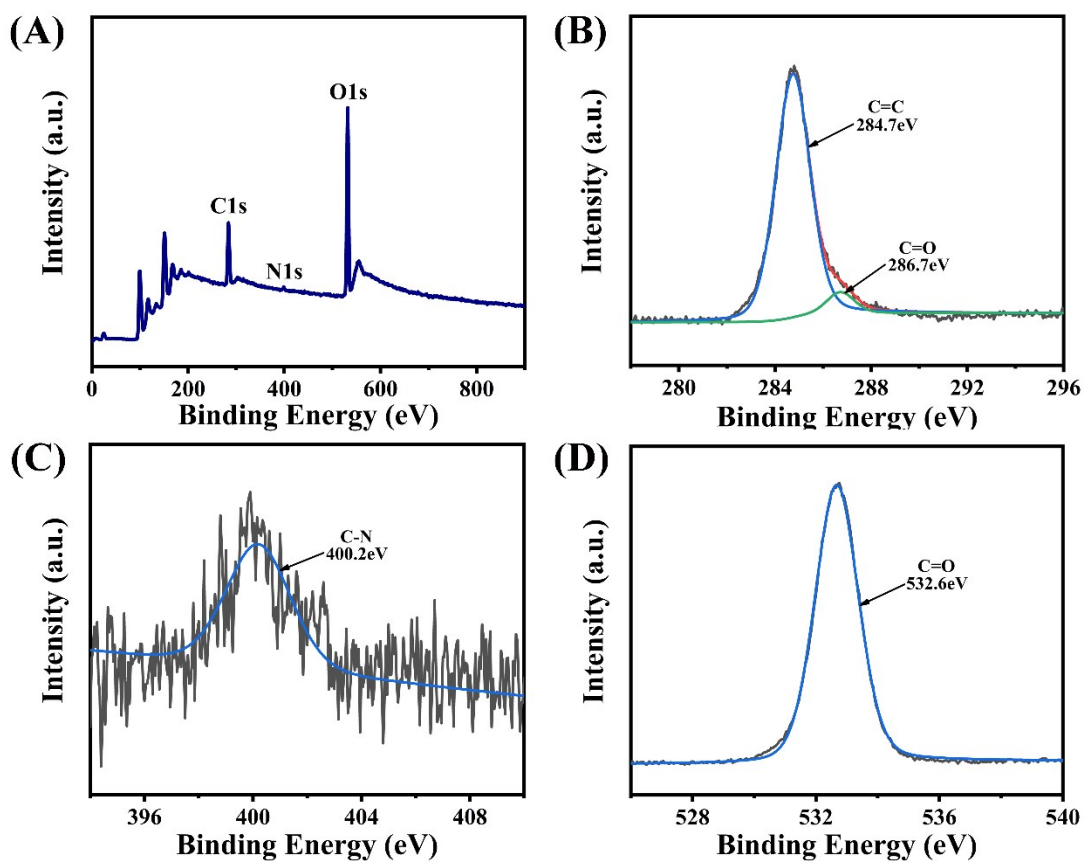
Fig. S4 (A) XPS spectra of the PDA-PDs. High resolution (B) C1s, (C) N1s, and (D) O1s peaks of the PDA-PDs.
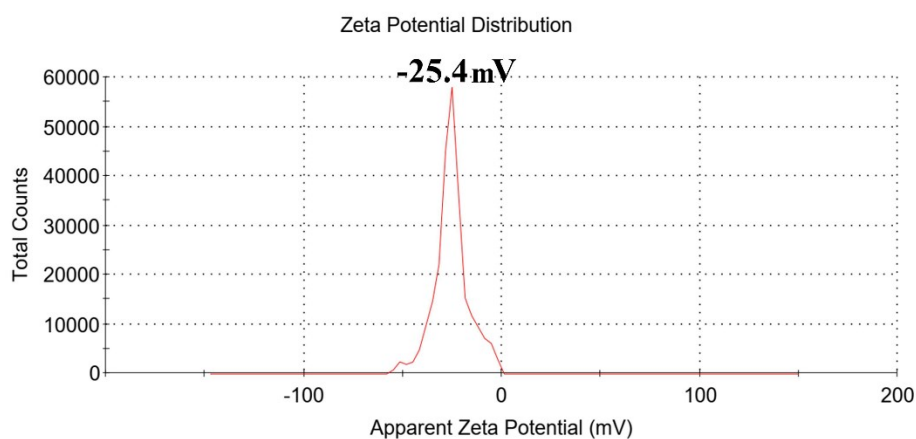

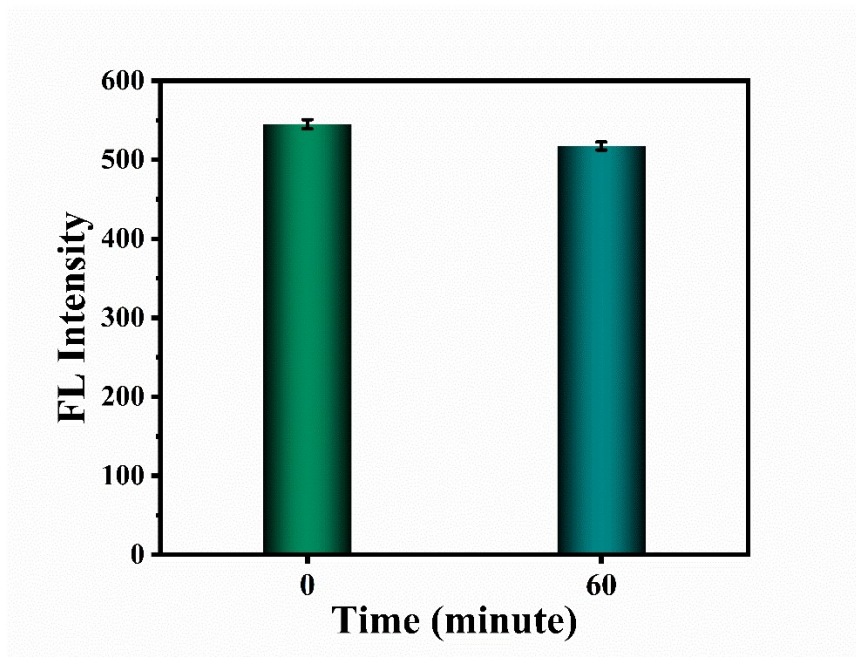**Fig. S5** The zeta potential of the PDA-PDs.

Fig. S6 The fluorescence intensity of the PDA-PDs under 365 nm excitation for 60 min.
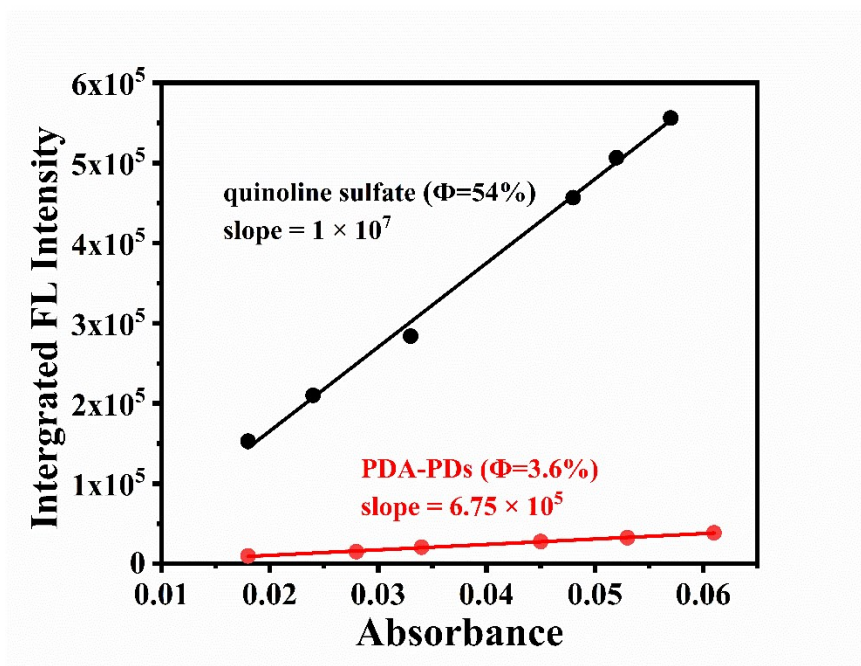
Fig. S7 The relationship of the integrated fluorescence intensity with absorbance at 380 nm for quinoline sulfate and fluorescent PDA-PDs.

Fig. S8 Effects of (A) DA concentration, (B) H_2O_2 concentration, (C) pH, and (D) incubation time on the detection of Fe^{2+}.
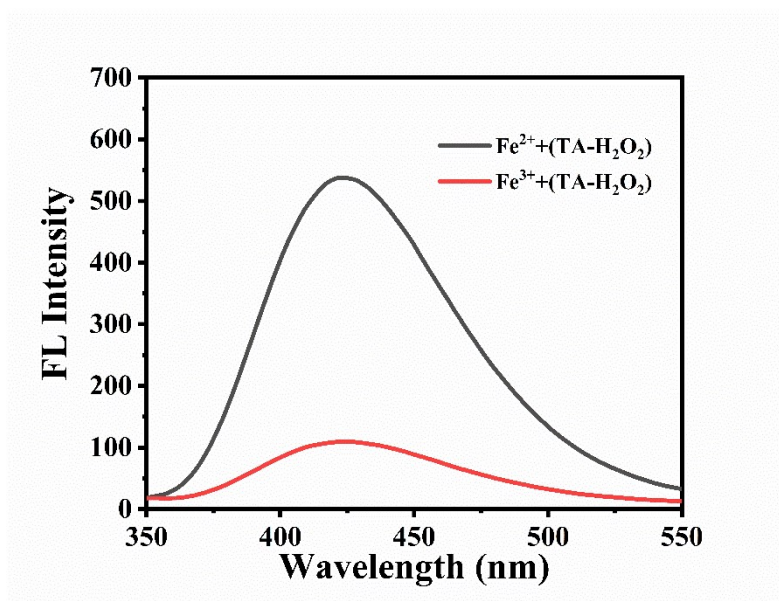
Fig. S9 The fluorescence spectra of the TA-H_2O_2 system catalyzed by Fe^{2+} and Fe^{3+}. TA concentration: 1 mM; H_2O_2 concentration: 2 mM; Fe^{2+} concentration: 50 μM; Fe^{3+} concentration: 50 μM; pH: 4.0; Reaction time: 30 min.

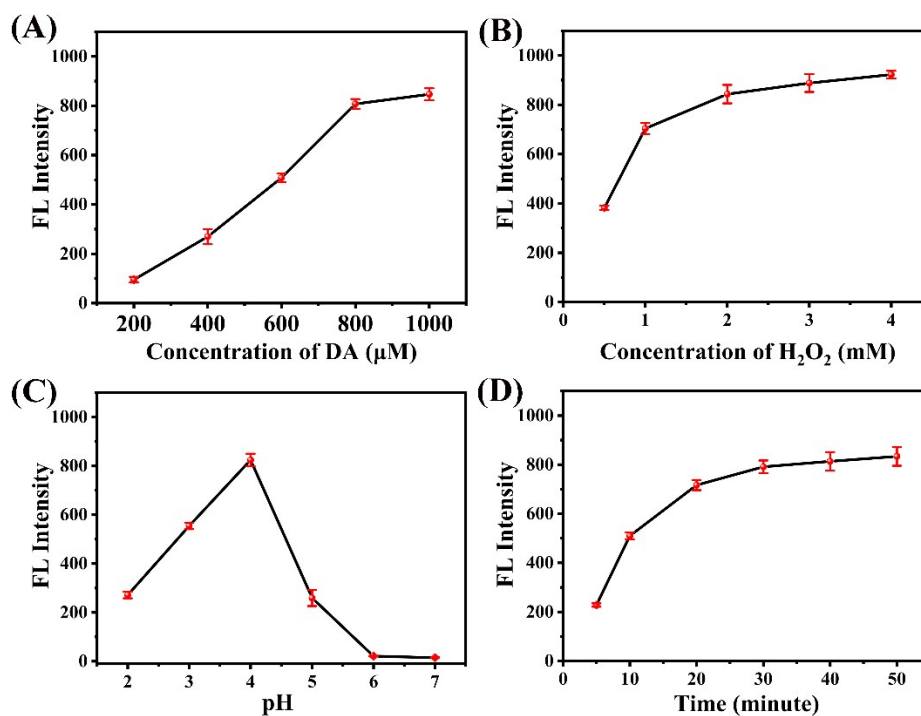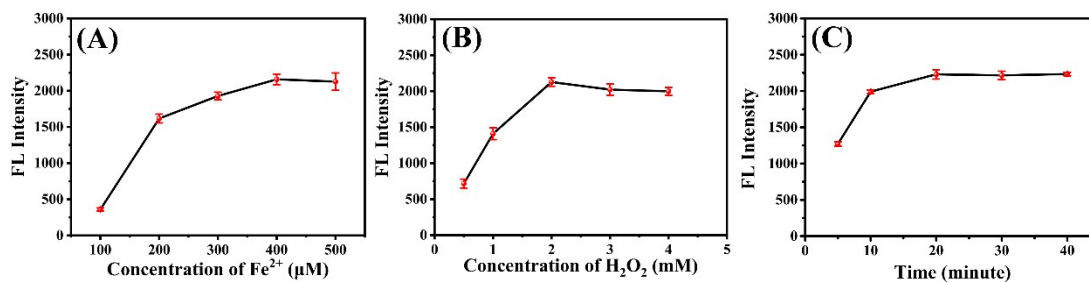**Fig. S10** Effects of (A) Fe^{2+} concentration, (B) H_2O_2 concentration, and (C) incubation time on the detection of DA at pH 4.0.

Fig. S11 The fluorescence intensities of Fe^{2+}-H_2O_2 system by adding different substrates with similar molecular structure to DA.

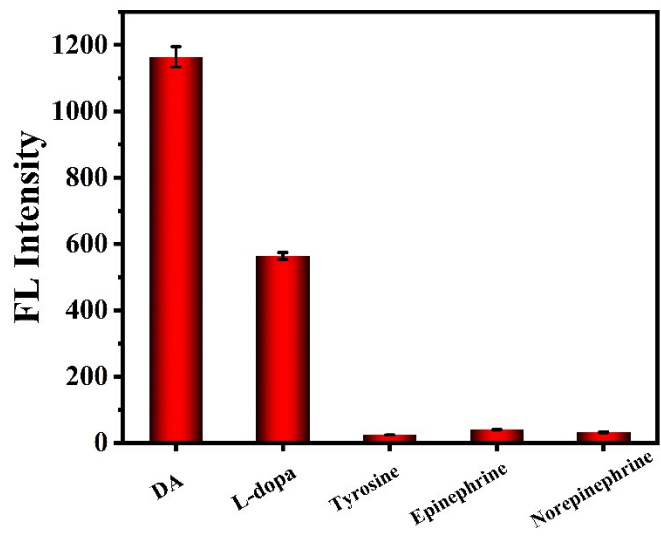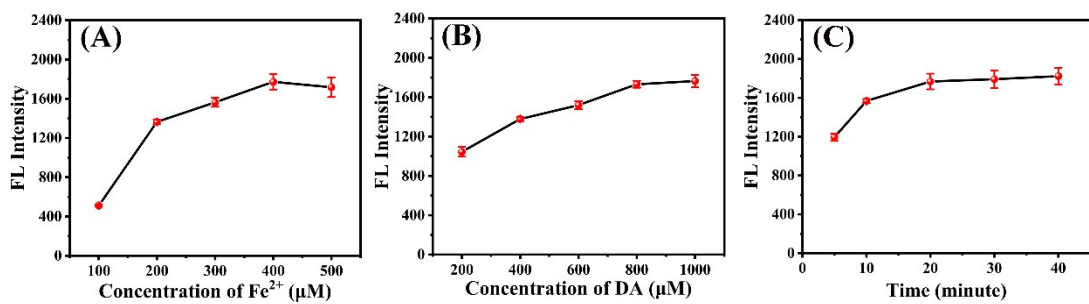**Fig. S12** Effects of (A) Fe^{2+} concentration, (B) DA concentration, and (C) incubation time on the detection of H_2O_2 at pH 4.0.
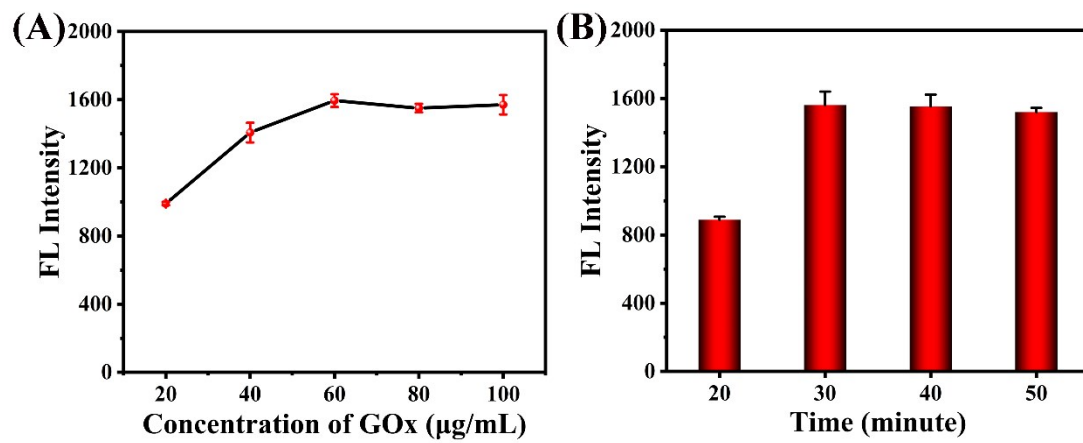
Fig. S13 Effects of (A) GOx concentration, (B) incubation time on the detection of glucose at 37℃.

Table S1 Comparison of different analytical methods for Fe^{2+} sensing.

Methods	Sensing Probe	LOD (μM)	Reference
Electrochemistry	SMS-1 modified SPE	0.54	1
Colorimetry	Chelate-type Schiff base	0.19	2
Colorimetry	Agar-stabilized AgNPs	0.54	3
Colorimetry	Triazole-Azo dye	0.11	4
Fluorometry	Carbon dots	0.051	5
Fluorometry	MPA-CdZnTe QDs	0.2	6
Fluorometry	PDA-PDs	0.09	This work

Table S2 Comparison of different analytical methods for DA sensing.

Methods	Sensing Probe	LOD (μM)	Reference
Electrochemistry	3D pGO-GNP-ITO	6	7
Electrochemistry	Pt-Au nanoparticles	0.075	8
Colorimetry	$CoFe_2O4/CoS$	0.58	9
Colorimetry	$Pt/CoFe_2O_4$	0.42	10
Fluorometry	$F-CuInS_2$	0.2	11
Fluorometry	GQDs	0.09	12
Fluorometry	PDA-PDs	0.07	This work

Table S3 Comparison of different analytical methods for glucose sensing.

Methods	Sensing Probe	LOD (μM)	Reference
Chromatography	3-OMG	0.39	13
Colorimetry	Fe-doped CeO_2 NRs	3.41	14
Colorimetry	$H_2TCPP-Co(OH)_2-GO$	9.5	15
Fluorometry	C-dots/AgNPs	1.39	16
Fluorometry	Nanoceria	8.9	17
Fluorometry	$MnO_2-UCNPs$	3.7	18
Fluorometry	PDA-PDs	1.61	This work

Table S4 Determination of Fe^{2+} in serum samples (n = 3).

Samples	Added (μM)	Measured (μM)	Recovery (%)	RSD (%)
1	0.00	ND	/	/
	2.00	1.85	92.5	3.79
	4.00	4.13	103.3	2.86
2	0.00	ND	/	/
	2.00	2.12	106.0	3.67
	4.00	3.73	93.3	4.63

The final serum samples were diluted 100-fold for detection.

Table S5 Determination of dopamine in serum samples (n = 3).

Samples	Added (μM)	Measured (μM)	Recovery (%)	RSD (%)
1	0.00	ND	/	/
	5.00	5.59	111.8	4.00
	10.00	11.60	116.0	2.71
2	0.00	ND	/	/
	5.00	5.24	104.8	3.08
	10.00	9.51	95.1	4.63

The final serum samples were diluted 100-fold for detection.

Table S6 Determination of glucose in serum samples (n = 3).

Samples	Added (μM)	Measured (μM)	Recovery (%)	RSD (%)
1	0.00	48.52	/	/
	10.00	58.99	100.8	4.36
	20.00	67.02	97.8	2.43
2	0.00	44.68	/	/
	10.00	53.2	97.3	3.14
	20.00	68.73	106.3	2.57

The final serum samples were diluted 100-fold for detection.

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