Supporting Information

Highly-selective Lanthanide-containing Probe for Ratiometric Luminescence Detection of an Anthrax Biomarker

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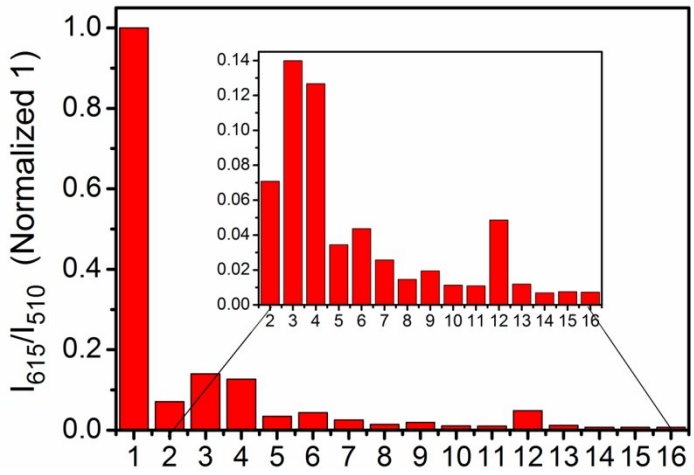

Fig. S1. Luminescence response of probe with molar ratio of ASAP: $EuCl_3$: pyranine = 4000: 4000: 1 in the presence of different interfering aromatic ligands. Effect of various interfering aromatic ligands at I_{615}/I_{510} in the presence of 2 mM acrylate. (1) DPA, (2) 2,3-PA, (3) 2,4-PA, (4) 2,5-PA, (5) 3,4-PA, (6) 3,5-PA, (7) o-PA, (8) m-PA, (9) p-PA, (10) NA, (11) isonicotinic acid, (12) picolinic acid, (13) BA, (14) glu, (15) asp, (16) NAD.

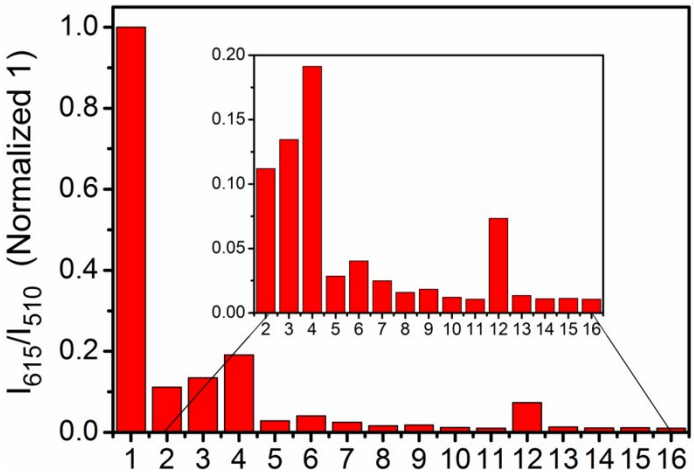

Fig. S2. Luminescence response of probe with molar ratio of ASAP: $EuCl_3$: pyranine = 8000: 4000: 1 in the presence of different interfering aromatic ligands. Effect of various interfering aromatic ligands at I_{615}/I_{510} in the presence of 4 mM acrylate. (1) DPA, (2) 2,3-PA, (3) 2,4-PA, (4) 2,5-PA, (5) 3,4-PA, (6) 3,5-PA, (7) o-PA, (8) m-PA,

(9) p-PA, (10) NA, (11) isonicotinic acid, (12) picolinic acid, (13) BA, (14) glu, (15) asp, (16) NAD.

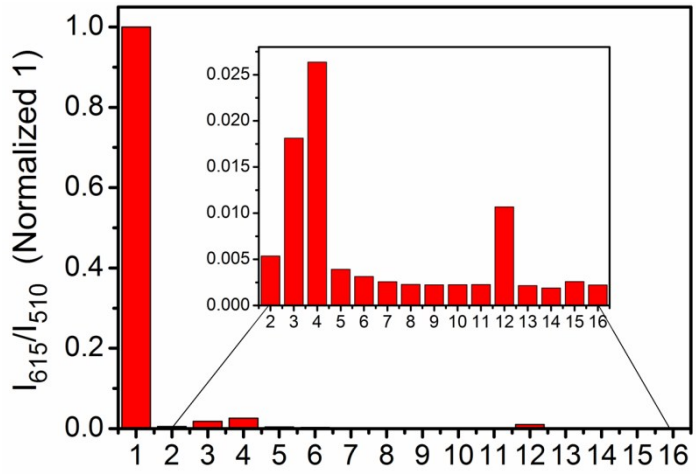

Fig. S3. Luminescence response of probe with molar ratio of ASAP: $EuCl_3$: pyranine = 12000: 4000: 1 in the presence of different interfering aromatic ligands. Effect of various interfering aromatic ligands at I_{615}/I_{510} in the presence of 6 mM acrylate. (1) DPA, (2) 2,3-PA, (3) 2,4-PA, (4) 2,5-PA, (5) 3,4-PA, (6) 3,5-PA, (7) o-PA, (8) m-PA, (9) p-PA, (10) NA, (11) isonicotinic acid, (12) picolinic acid, (13) BA, (14) glu, (15) asp, (16) NAD.

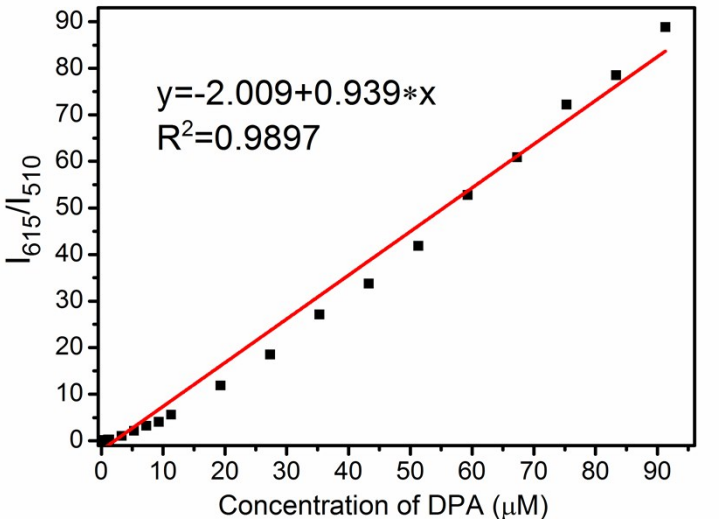

Fig. S4. The luminescence intensity ratio of the peaks at I_{615}/I_{510} of probe with molar ratio of ASAP: $EuCl_3$: pyranine = 20000: 4000: 1 as a function of DPA concentration

from 0 to 90 μM in the presence of 10 mM acrylate.

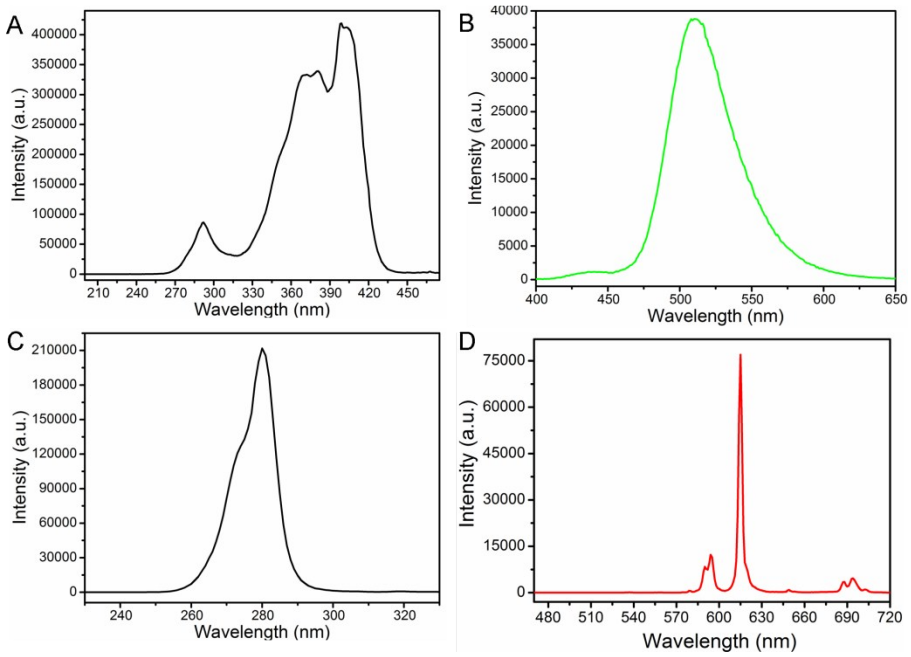

Fig. S5. The luminescence excitation monitored at 510 nm (A) and emission excited at 280 nm (B) spectra of pyranine in the presence of ASAP; the luminescence excitation monitored at 615 nm (C) and emission excited at 280 nm (D) spectra of $Eu(DPA)_3$ in the presence of ASAP.

The excitation spectrum of pyranine showed two broad band in the range of 270-310 nm and 330-430 nm (**Fig. S5**A). The excitation spectrum of $Eu(DPA)_3$ showed a broad band in the range of 260-300 nm, which was corresponding to the absorption of DPA ligands (**Fig. S5**C). These results indicate pyranine and Eu^{3+} can be excited simultaneously with 280 nm.

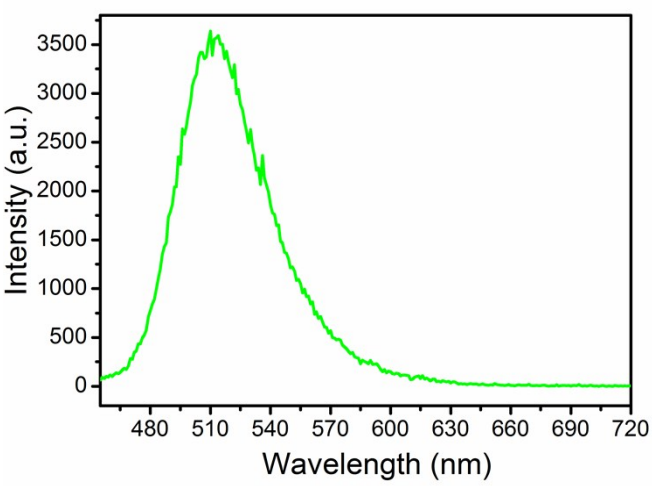

Fig. S6. Luminescence emission spectra of the probe solution before adding DPA in pH = 7 HCl-Tris buffer solution.

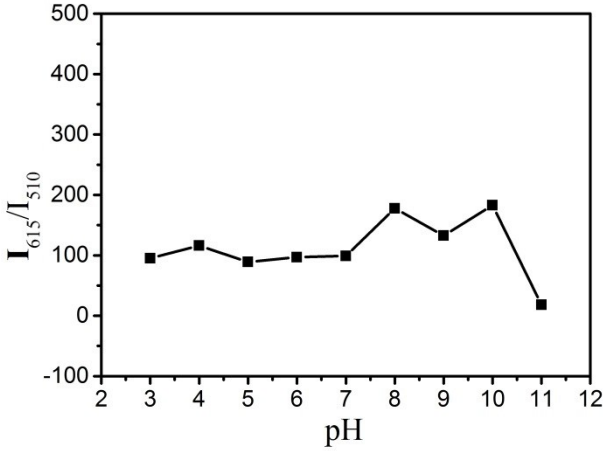

Fig. S7. Effect of solution pH on the luminescence intensity I_{615}/I_{510} of ratiometric probe solution upon adding 90 μM DPA (λ_{ex} = 280 nm).

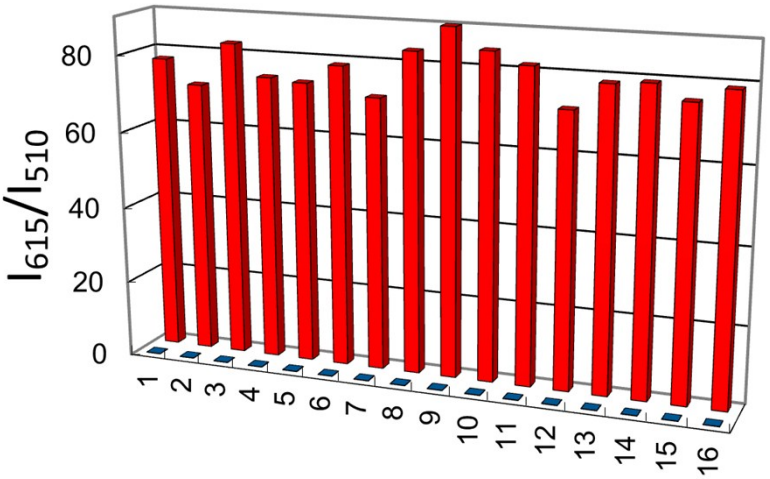

Fig. S8. Luminescence response of the probe solution in the presence of various

cations and anions. The blue bars represent adding 90 μM common cations and anions to the probe solution. The red bars represent subsequent adding 90 μM DPA to the mixture (λ_{ex} = 280 nm). (1) blank, (2) Ca^{2+}, (3) Na^{+}, (4) Mg^{2+}, (5) Al^{3+}, (6) K^{+}, (7) F^{-}, (8) Cl^{-}, (9) NO_3^{-}, (10) SO_4^{2-}, (11) CO_3^{2-}, (12) HCO_3^{-}, (13) PO_4^{3-}, (14) HPO_4^{2-}, (15) $H_2PO_4^{-}$, (16) CH_3COO^{-}.

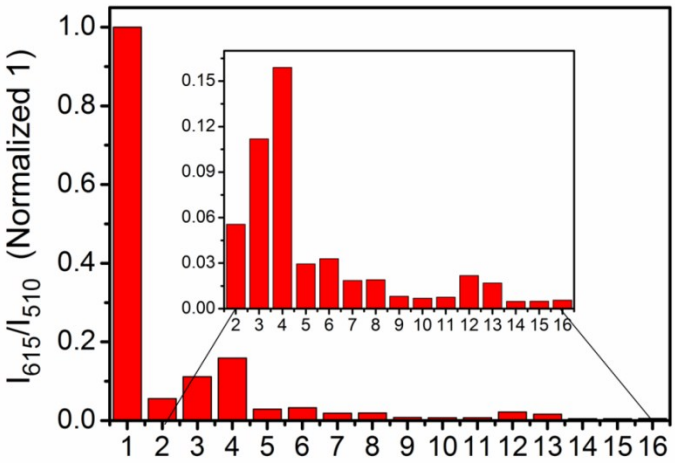

Fig. S9. Luminescence response of probe prepared by mixing $EuCl_3$, poly (vinyl alcohol) and pyranine in the presence of different interfering aromatic ligands. (1) DPA, (2) 2,3-PA, (3) 2,4-PA, (4) 2,5-PA, (5) 3,4-PA, (6) 3,5-PA, (7) o-PA, (8) m-PA, (9) p-PA, (10) NA, (11) isonicotinic acid, (12) picolinic acid, (13) BA, (14) glu, (15) asp, (16) NAD.

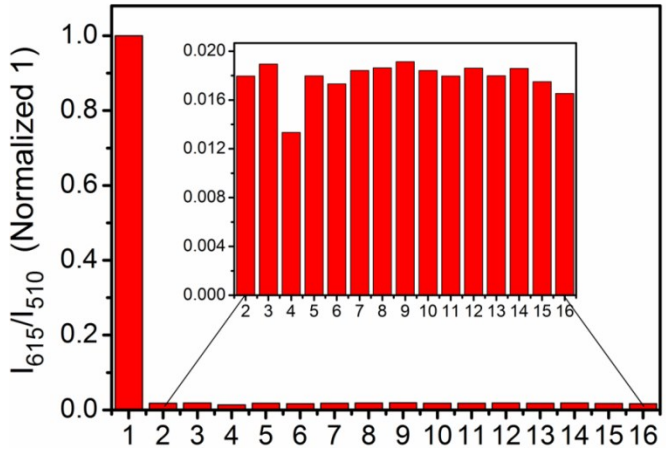

Fig. S10. Luminescence response of probe prepared by mixing $EuCl_3$, sodium

acrylate and pyranine in the presence of different interfering aromatic ligands. (1) DPA, (2) 2,3-PA, (3) 2,4-PA, (4) 2,5-PA, (5) 3,4-PA, (6) 3,5-PA, (7) o-PA, (8) m-PA, (9) p-PA, (10) NA, (11) isonicotinic acid, (12) picolinic acid, (13) BA, (14) glu, (15) asp, (16) NAD.

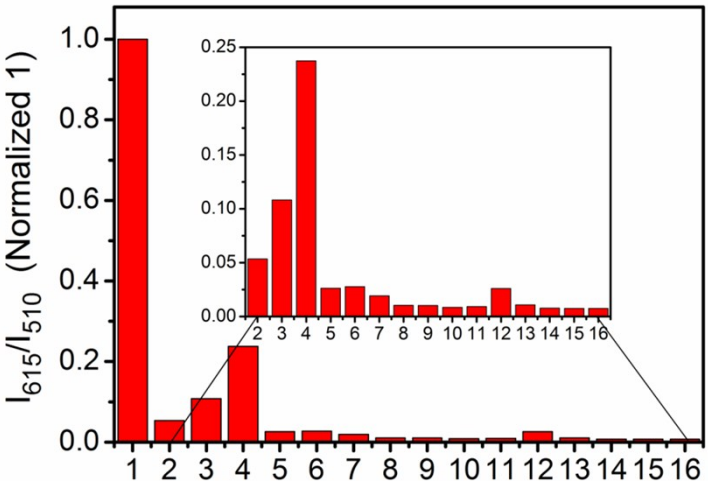

Fig. S11. Luminescence response of probe prepared by mixing $EuCl_3$, sodium allylsulfonate and pyranine in the presence of different interfering aromatic ligands. (1) DPA, (2) 2,3-PA, (3) 2,4-PA, (4) 2,5-PA, (5) 3,4-PA, (6) 3,5-PA, (7) o-PA, (8) m-PA, (9) p-PA, (10) NA, (11) isonicotinic acid, (12) picolinic acid, (13) BA, (14) glu, (15) asp, (16) NAD.

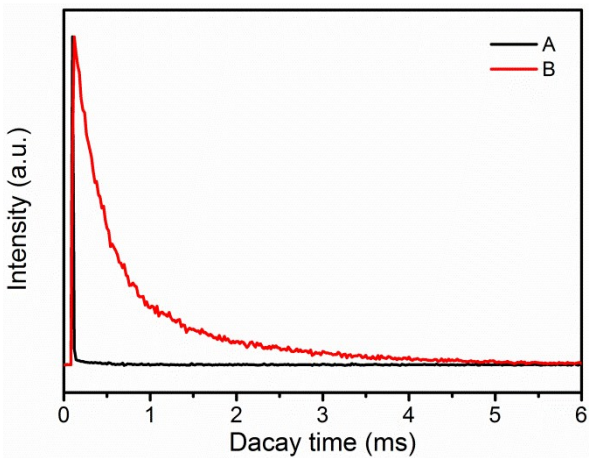

Fig. S12. The decay curves of the probe solution before (A) and after (B) adding 90 μM DPA (excited at 280 nm and monitored at 612 nm).

Table S1 Comparison of different methods for the detection of DPA

Method	Linear range	Detection limit	Reference
Luminescence	0.005-1.2 μM	5 nM	9b
Luminescence	0-80μM	8.9 μM	9d
Luminescence	0-7 μM	54 nM	9e
Luminescence	20 nM-20μM	10 nM	14
Luminescence	0-50 nM	10 nM	18
Luminescence	0-90 μM	10.3 nM	This work

Table S2 Luminescence lifetime τ and the number of water molecules coordinated to Eu^{3+}

Sample	τ_H (μs)	τ_D (μs)	q
Before adding 90 μM DPA	6.68	-	-
After adding 90 μM DPA	526.66	282.55	1.55
In the absence of ASAP	199.43	189.63	5.10