Electronic Supplementary Material (ESI) for Analyst

Supporting Information

Dissecting the effect of anions on Hg^{2+} detection using a FRET based DNA probe

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1. Hg^{2+} detection in the presence of various concentration of I^-. The responses of our FRET-based sensor to Hg^{2+} in the presence of 0 to 2 μM I^- are shown in Figure S1A. With just 2 μM I^-, the sensor response was completely inhibited. The relative sensitivity of the sensor as a function of I^- concentration is shown in Figure S1B and an inhibition constant of 0.13 μM I^- was obtained.

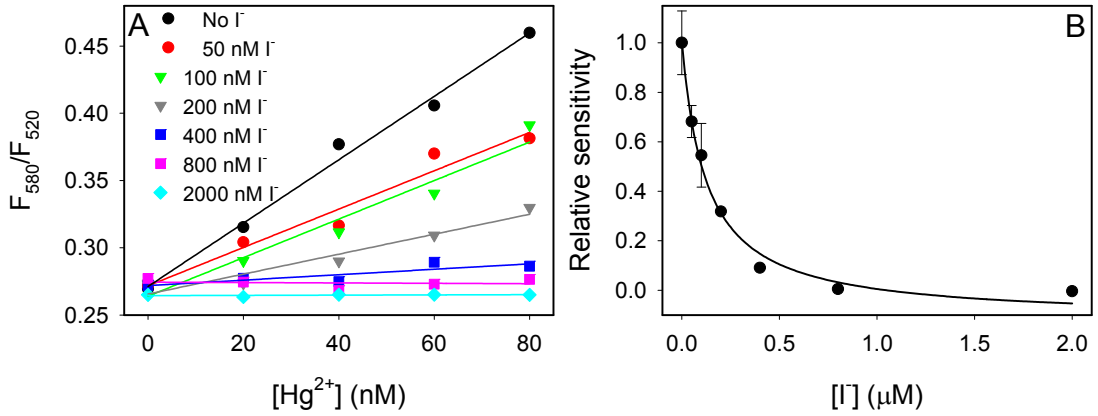

Figure S1. Sensor response in the presence of various concentrations of I^-.

2. Fluorescence quenching by Br^- and I^-. It is commonly known in fluorescence spectroscopy that heavy atoms such as I^- are fluorescence quenchers. To rule out possible artifacts associated with fluorescence quenching by these heavy atoms, we compared the FAM fluorescence intensity in the presence of I^- and Br^-. Figure S2A is from the raw data of Figure 2E, and no obvious quenching was observed up to 20 mM Br^-. These samples were prepared individually (not titrating Br^-) and therefore, the sample-to-sample variation was relatively large because of the slightly changed fluorophore concentration in each sample. Although we only studied the effect of I^- up to 2 μM, little quenching was observed with even 1 mM I^-, thus excluding the possibility of artifacts associated with fluorescence quenching by these heavy ions. This is not surprising since to achieve significant quenching, greater than 10 mM I^- is typically needed.

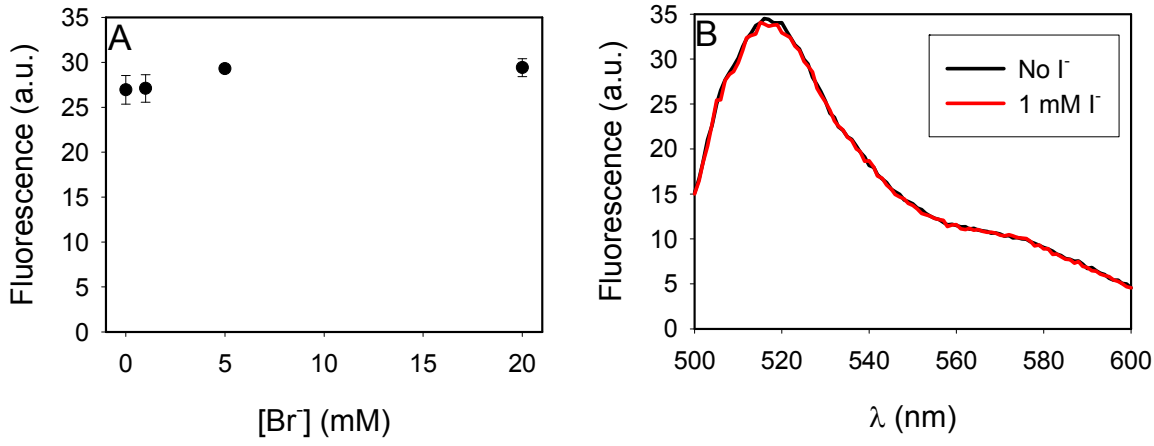

Figure S2. (A) FAM fluorescence intensity as a function of Br^- concentration taken from the raw data in Figure 2E of the paper. (B) Fluorescence spectra of the DNA probe in the absence or presence of 1 mM I^-.

3. Hg^{2+} detection in Lake Ontario water. To 490 μL Lake Ontario water, 10 μL of 500 mM HEPES was added to adjust pH to 7.6. For comparison another sample containing just 10 mM HEPES buffer was also prepared. After adding the sensor DNA, Hg^{2+} was titrated into both samples and the sensor responses were plotted in Figure S3. The Lake Ontario water has a much higher initial FRET ratio, consistent with the presence of >1 mM divalent metal ions. The slope was similar to that in buffer, suggesting that most of the anions in the Lake were non-coordinating. This is consistent with that the Cl^- concentration in the Lake water was just below 1 mM.

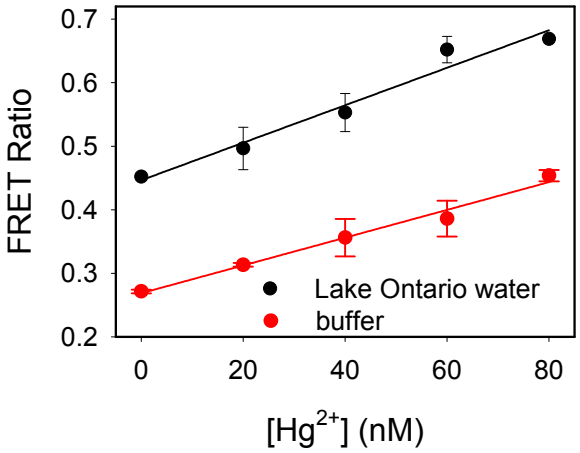

Figure S3. Sensor response in Lake Ontario water and in buffer containing 10 mM HEPES (pH 7.6).