Supporting Information for:

Label-free Fluorescent Functional DNA Sensors Using Unmodified DNA: A Vacant Site Approach

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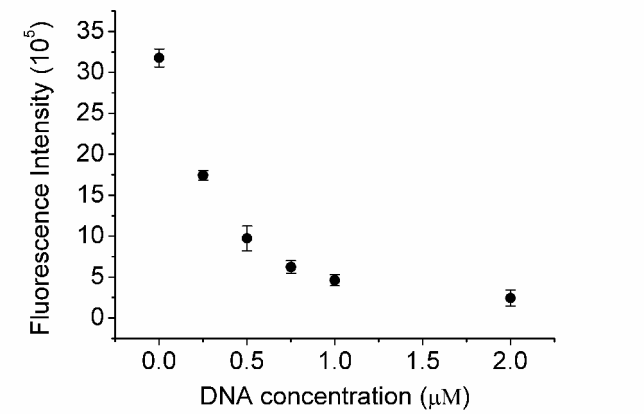

Figure S1. Fluorescence titration of 0.75 μM ATMND with different amounts of $17S_{va}/17E_{va}$ duplex containing a vacant site in buffer A. The binding constant K_a is calculated to be more than 10^6 M^{-1} according to the 1:1 binding mode, and the fluorescence intensity for each data point was found to be stable at least in one week (within 10% derivation).

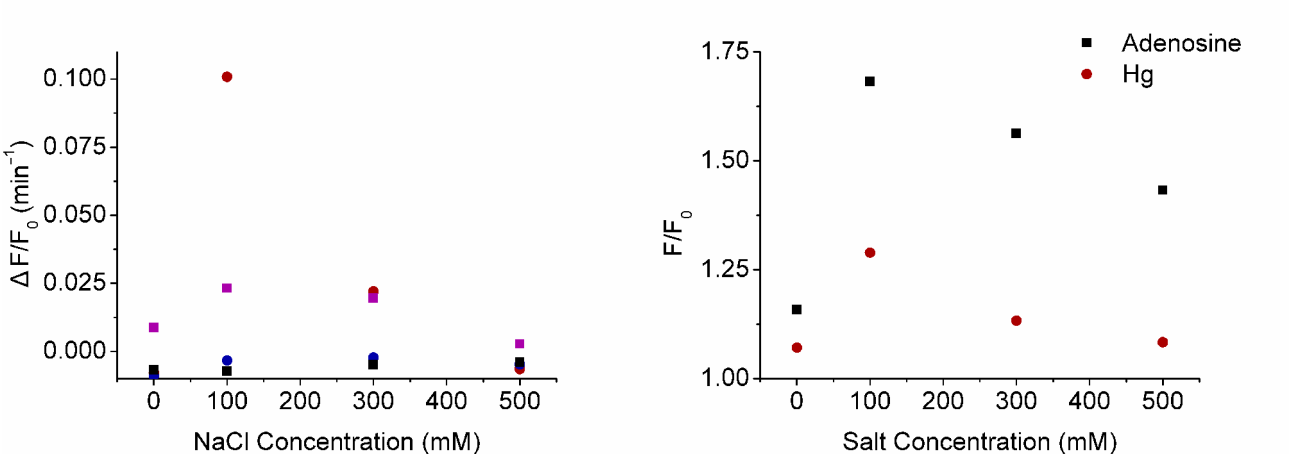

Figure S2. Effect of salt concentration on the performance of DNAzyme (left) and aptamer (right) based sensors in this work. Left: red dots, ATMND/$17S_{va}/17E_{va}$ in the presence of 200 nM Pb^{2+}; blue dots, ATMND/$17S_{va}/17E_{va}$ in the absence of Pb^{2+}; pink squares: ATMND/$39S_{va}/39E_{va}$ in the presence of 100 nM UO_2^{2+}; black squares: ATMND/$39S_{va}/39E_{va}$ in the absence of UO_2^{2+}. Right: black squares, ATMND/$AdAP_{va}/AdL1_{va}$ in the presence of 125 μM adenosine; red dots, ATMND/$HgAP_{va}/HgL_{va}$ in the presence of 500 nM Hg^{2+}. The salt for Hg^{2+} sensor was $NaNO_3$, while others were NaCl. The pH was fixed at the values of buffer A~D, respectively.

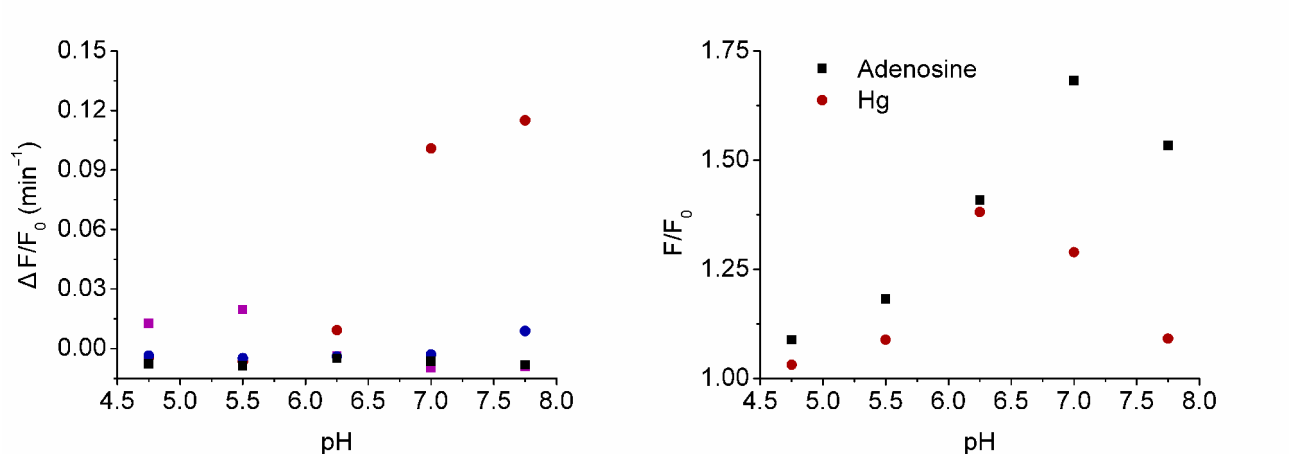

Figure S3. Effect of pH on the performance of DNAzyme (left) and aptamer (right) based sensors in this work. Left: red dots, ATMND/17S_{va}/17E_{va} in the presence of 200 nM Pb^{2+}; blue dots, ATMND/17S_{va}/17E_{va} in the absence of Pb^{2+}; pink squares: ATMND/39S_{va}/39E_{va} in the presence of 100 nM UO_2^{2+}; black squares: ATMND/39S_{va}/39E_{va} in the absence of UO_2^{2+}. Right: black squares, ATMND/AdAP$_{va}$/AdL1$_{va}$ in the presence of 125 μM adenosine; red dots, ATMND/HgAP$_{va}$/HgL$_{va}$ in the presence of 500 nM Hg^{2+}. The pH of 4.75 and 5.5 were adjusted by MES while 7.0 and 7.75 were by HEPES. The pH of 6.25 was checked using both MES and HEPES and the results were similar. Salt concentration was fixed at 100 mM.

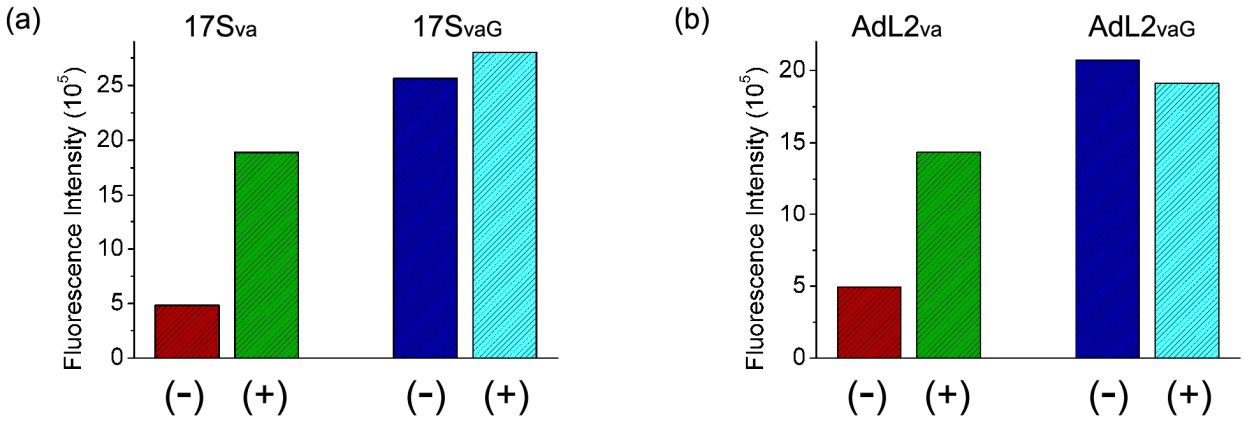

Figure S4. Effect of vacant site on the response of (a) ATMND/17S_{va}(17S_{vaG})/17E_{va} to Pb^{2+}, and (b) ATMND/AdAP$_{va}$/AdL2$_{va}$(AdL2$_{vaG}$) to adenosine. (–) and (+): in the absence and presence of (a) 1 μM Pb^{2+} or (b) 200 μM adenosine, respectively.

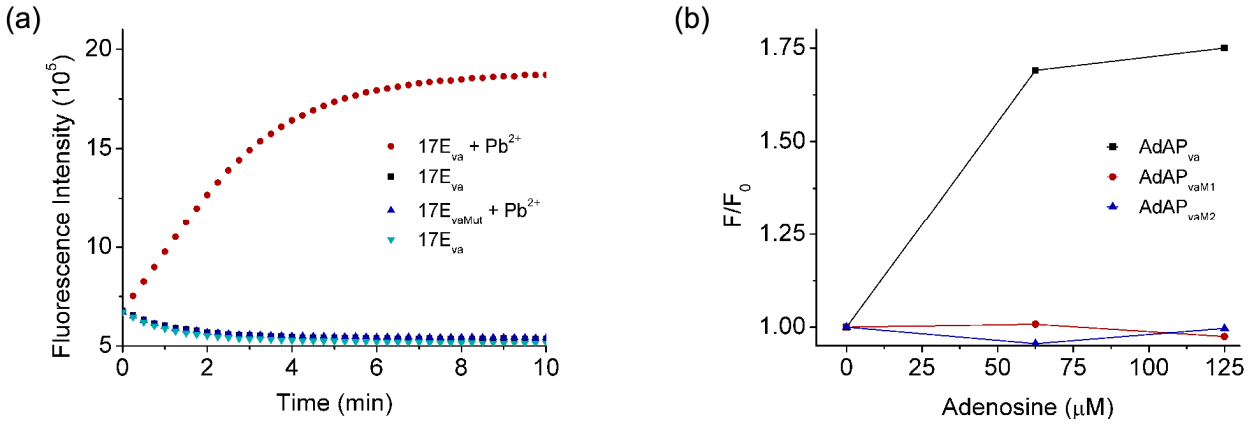

Figure S5. (a) Response of $17E_{va}$ and its inactive mutant $17E_{vaMut}$ to Pb^{2+} in the presence of $17S_{va}$ and ATMND. (b) Response of $AdAP_{va}$ and its inactive mutants $AdAP_{vaM1}$ and $AdAP_{vaM2}$ to adenosine in the presence of $AdL1_{va}$ and ATMND.

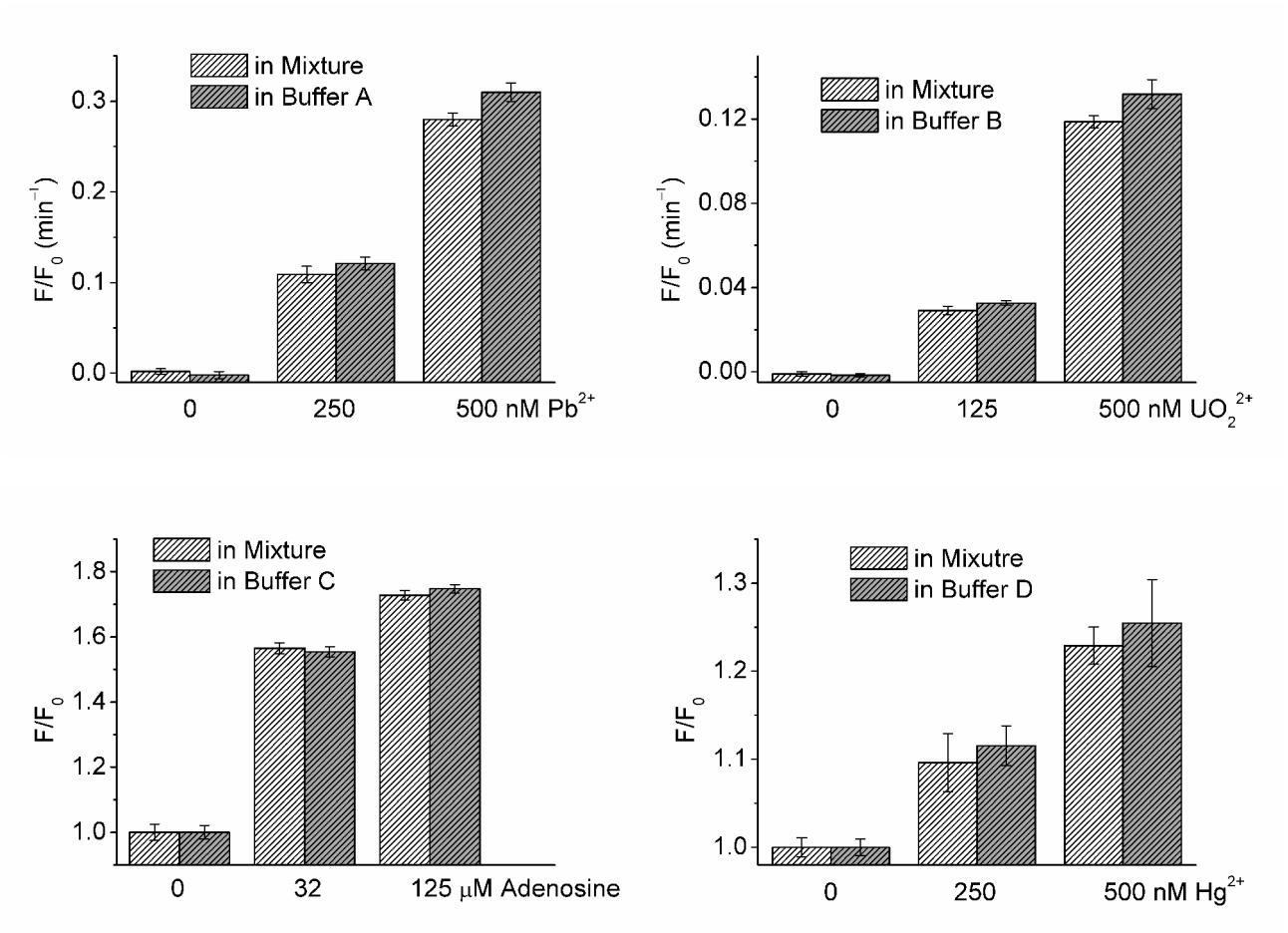

Figure S6. Comparison of the sensor responses in buffer and mixture to evaluate the selectivity and immunity to matrix effect. For the four sensors, 1 μM Cd^{2+}, Fe^{2+}, Ni^{2+}, Co^{2+}, Ca^{2+} and Mg^{2+} were added to the buffer as mixture. In addition, 500 nM UO_2^{2+} and Hg^{2+} were added to the mixture for Pb^{2+} sensor; 500 nM Pb^{2+} and Hg^{2+} were added to the mixture for UO_2^{2+} sensor; 500 nM Pb2+ and UO_2^{2+}; 500 nM Pb^{2+}, UO_2^{2+}, Hg^{2+} and 500 μM cytidine, uridine were added to the mixture for adenosine sensor.

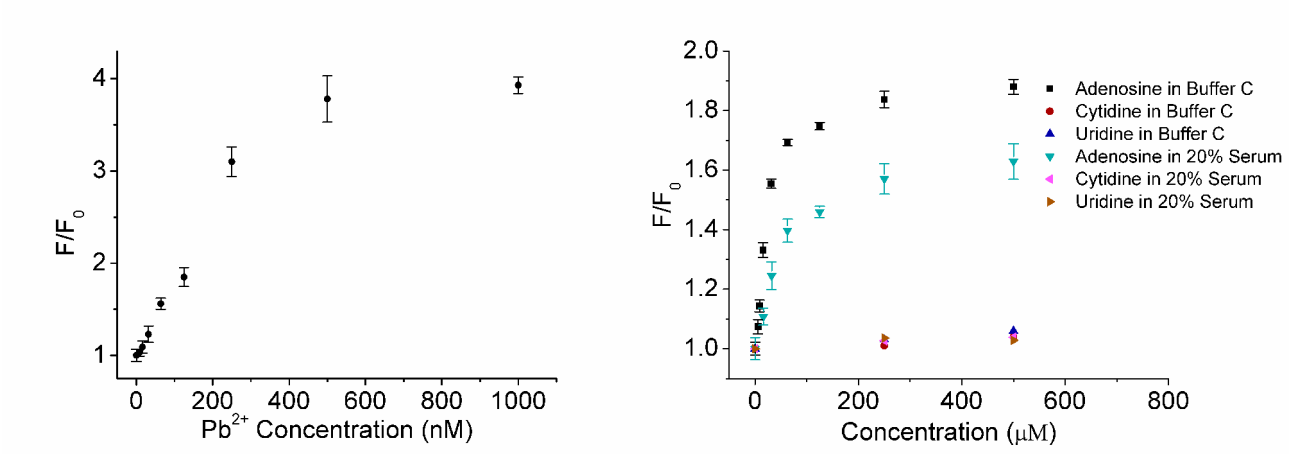

Figure S7. Calibration curves for quantification of Pb^{2+} (left) and adenosine (right, light blue) in drinking water and human serum, respectively.