Electronic Supplementary Information (ESI)

Investigation of newly identified G-quadruplexes and its application to DNA detection

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S-1 Dissociation constant for the G-quadruplex/hemin complex

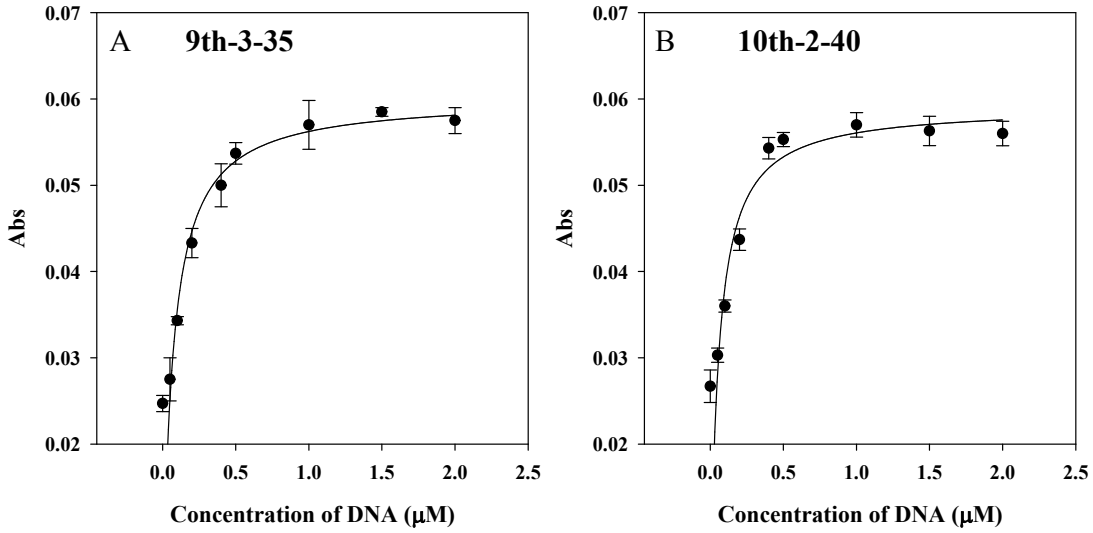

Fig. S1 The dissociation constant (K_d) for the G-quadruplex/hemin complexes was determined by plotting the absorbance changes of hemin (0.5 μM) at 405 nm against DNA concentrations (0 - 1.5 μM).

S-2. Optimization of H_2O_2 concentration for peroxidase-like activity of G-quadruplex

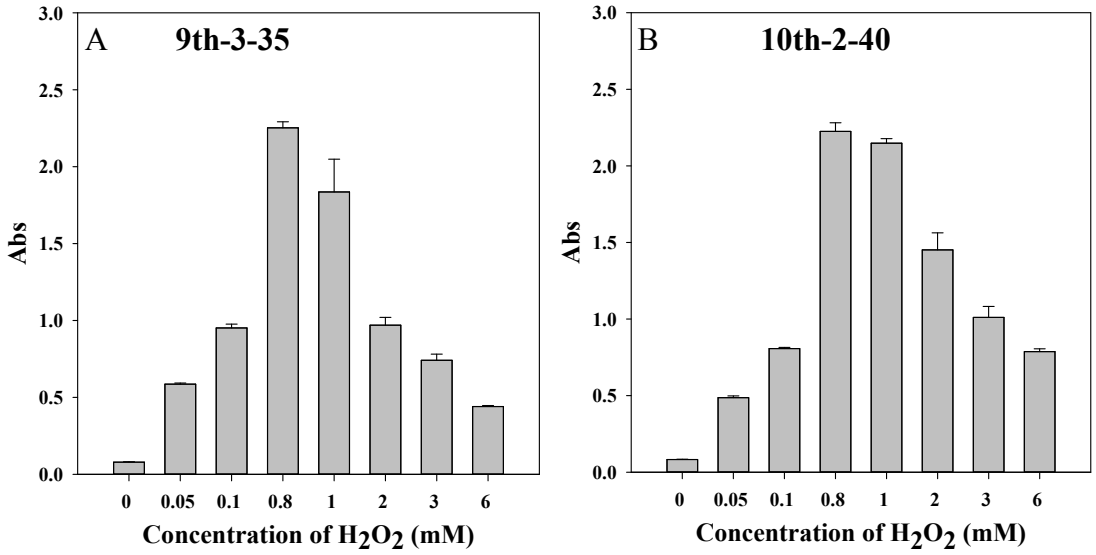

Fig. S2 Optimization of H_2O_2 concentration, the concentrations of hemin, DNA and ABTS were 0.5 μM, 200 nM and 6 mM, respectively. Error bars indicated the standard deviations of three experiments.

S-3. Optimization of ThT concentration for G-quadruplex enhanced fluorescence of ThT

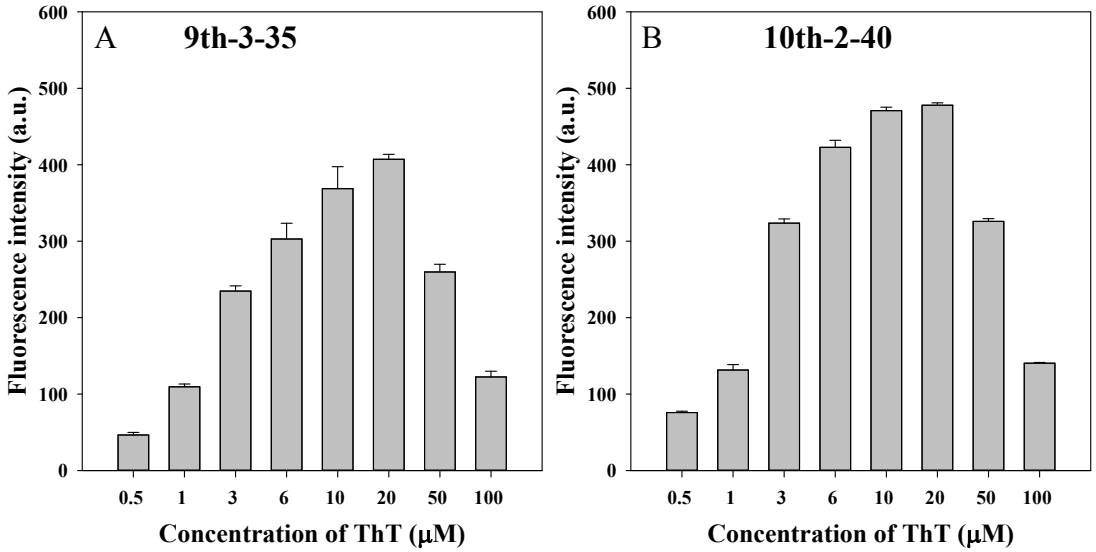

Fig. S3 Optimization of ThT concentration, the concentration of DNA is 100 nM. Error bars indicated the standard deviations of three experiments.

Table S1. **Oligonucleotide sequences used for DNA detection.**

Name	Sequence (5′-3′)
temp-9th-3-35	TAATCCAAATGACCCACCCCCCCCACCCTGTTGGACCTCAGCTCAA CATCAGTCTGATAAGCTA
temp-10th-2-40	GGTAGTACATTGCCCCCGTAAAAACCCACCCCCCCGCCCACCTCAG CTCAACATCAGTCTGATAAGCTA
target DNA	TAGCTTATCAGACTGATGTTGA
cDNA-9th-3-35	TGAGGTCCAACAGGGTGGGGGGGGTGGGTCATTTGGATTA
cDNA-10th-2-40	TGAGGTGGGCGGGGGGGTGGGTTTTTACGGGGGCAATGTACTACC
1-mut-DNA	TAGCTTATCAGACTGATGTT*C*A
2-mut-DNA	TAGCTTATCAGACTGATGT*AC*A
random DNA	N_{22}

Nucleotide mismatches were marked in red and indicated as italic letters.

S-4. Agarose electrophoresis analysis for DNA detection

The SDA reaction was verified by gel electrophoresis. As shown in Fig. S3, when target DNA hybridized with template, a much brighter band appeared (Lane 4), when polymerase existed, a brighter and slightly higher band appeared (Lane 5), while in the presence of polymerase and nicking enzyme (Lane 6), a band closely to the band of cDNA (Lane 3) appeared, which indicated that large amounts of cDNA was successfully nicked from the double-stranded DNA. Thus, the designed SDA reaction could be triggered successfully by target DNA when temp-9th-3-35 was used as template. However, when we used temp-10th-2-40 as template, SDA reaction could not be triggered by target DNA.

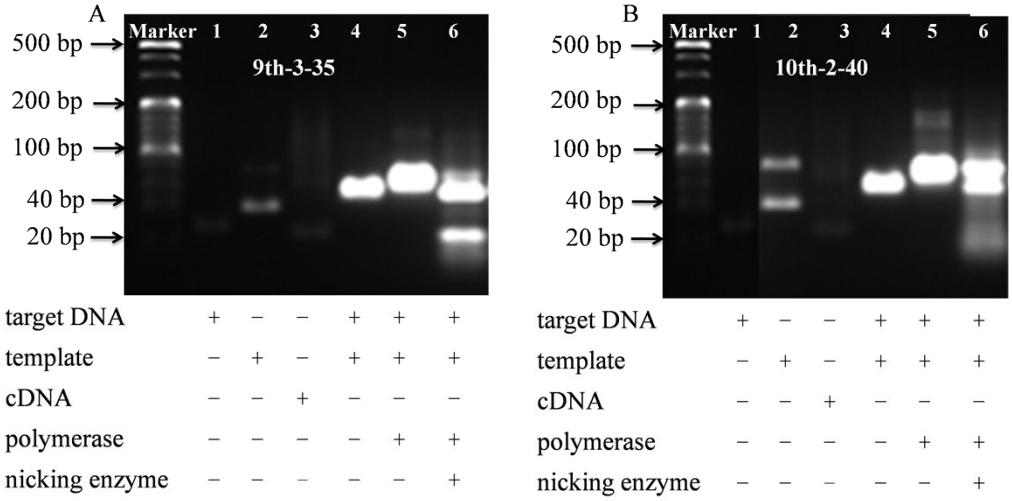

Fig. S4 Gel electrophoresis verification of target triggered SDA. Target DNA (Lane 1, 4, 5): 500 nM; target DNA (Lane 6): 100 nM; template:500 nM, cDNA: 500 nM; polymerase: 0.075 U/μL; nicking enzyme: 0.25 U/μL; (+ means in the presence of, - means in the absence of).

S-5. Condition optimization for DNA detection

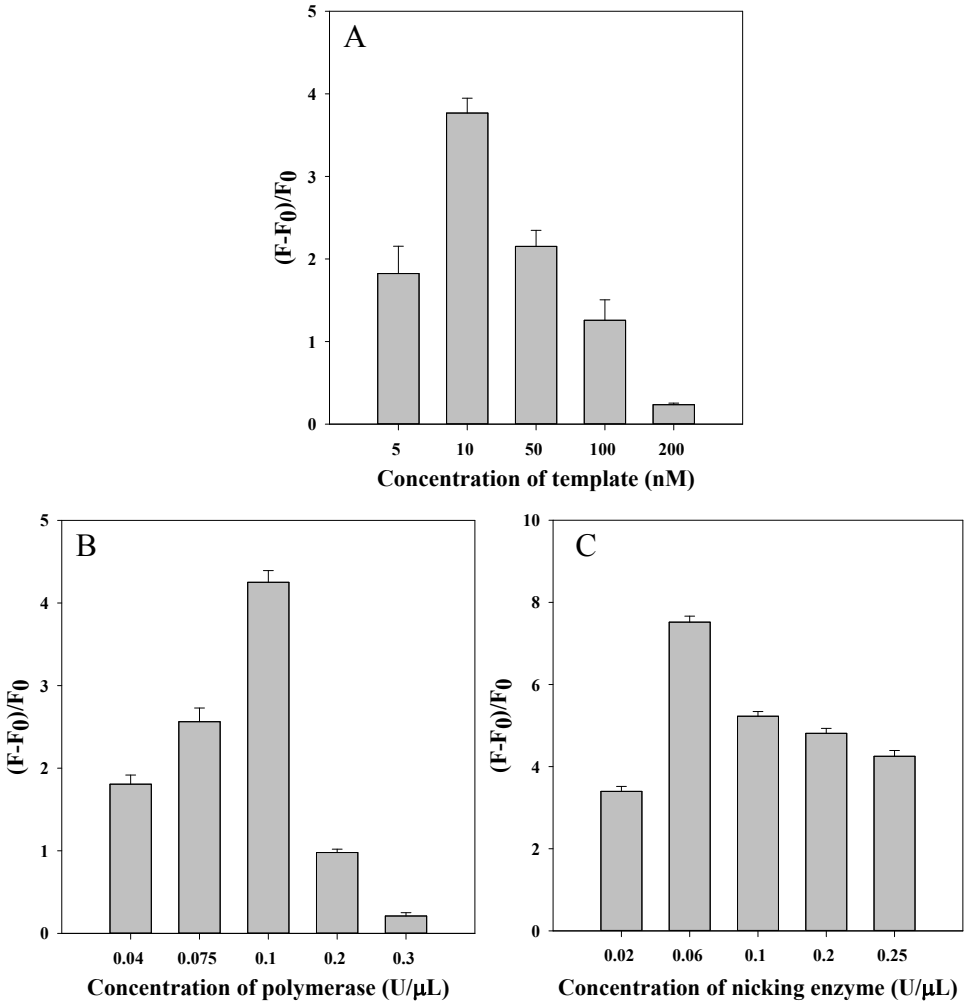

Fig. S5 Effects of different conditions for target DNA detection. (A) Different concentration of template, the concentrations of target DNA, polymerase, nicking enzyme and ThT were 10 nM, 0.075 U/μL, 0.25 U/μL and 20 μM, respectively. (B) Different concentration of polymerase, the concentrations of template, target DNA, nicking enzyme and ThT were 10 nM, 10 nM, 0.25 U/μL and 20 μM, respectively. (C) Different concentration of nicking enzyme, the concentrations of template, target DNA, polymerase and ThT were 10 nM, 10 nM, 0.1 U/μL and 20 μM, respectively. F and F_0 represent the fluorescence intensity in the presence and absence of 10 nM target DNA, respectively. Error bars indicated the standard deviations of three experiments.

S-6. Selectivity for DNA detection

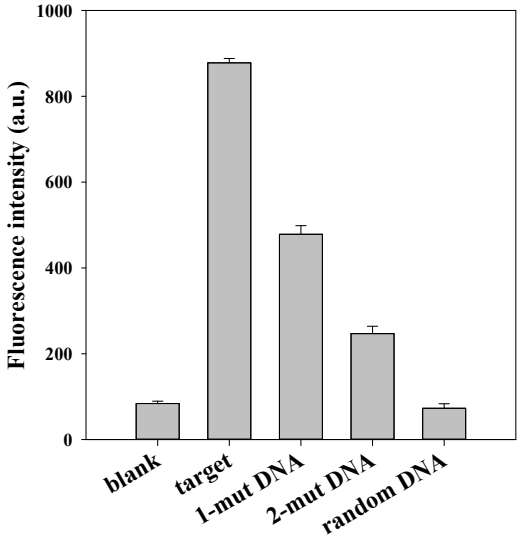

Fig. S6 Selectivity of the designed DNA sensing platform. The concentrations of template, DNA, polymerase, nicking enzyme and ThT were 10 nM, 10 nM, 0.1 U/μL, 0.06 U/μL and 20 μM, respectively. Error bars indicated the standard deviations of three experiments.