Engineering a Cell-surface Aptamer Circuit for Targeted and Amplified Photodynamic Cancer Therapy

Da Han,[1] Guizhi Zhu,[1,2] Cuichen Wu,[1] Zhi Zhu,[2,3] Tao Chen,[1] Xiaobing Zhang[2] and Weihong Tan[1,2*]

[1]Center for Research at Bio/nano Interface, Department of Chemistry and Department of Physiology and Functional Genomics, Shands Cancer Center, UF Genetics Institute and McKnight Brain Institute, University of Florida, Gainesville, FL, USA

[2]Molecular Science and Biomedicine Laboratory, State Key Laboratory of Chemo/Bio-Sensing and Chemometrics, College of Biology, College of Chemistry and Chemical Engineering, Collaborative Innovation Center for Chemistry and Molecular Medicine, Hunan University, Changsha, 410082, China

3. State Key Laboratory of Physical Chemistry of Solid Surfaces, Key Laboratory of Chemical Biology of Fujian Province, Key Laboratory of Analytical Science, and Department of Chemical Biology, College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, China

Supporting information

Gel electrophoresis to demonstrate the catalytic effect of C sequence. Polyacrylamide gel electrophoresis was performed on a 10% native gel in TBE buffer (89 mM Tris-HCl, 89 mM boric acid, 2 mM EDTA) with 5 mM $MgCl_2$ and run for 60 min at 100 V. Gels were then stained using StainsALL to image the positions of DNA strands. Five samples were prepared as follows: lane 1, purified $\mathbf{A_1}$; lane 2, purified $\mathbf{A_2}$; lane 3, mixture of $\mathbf{A_1}$ and $\mathbf{A_2}$ only; lane 4, preannealed $\mathbf{A_1}$ and $\mathbf{A_2}$, which will form the $\mathbf{A_{12}}$ duplex; lane 5, the mixture of $\mathbf{A_1}$, $\mathbf{A_2}$ and **C** (0.5× concentration of $\mathbf{A_1}$) preincubated for 30 min.

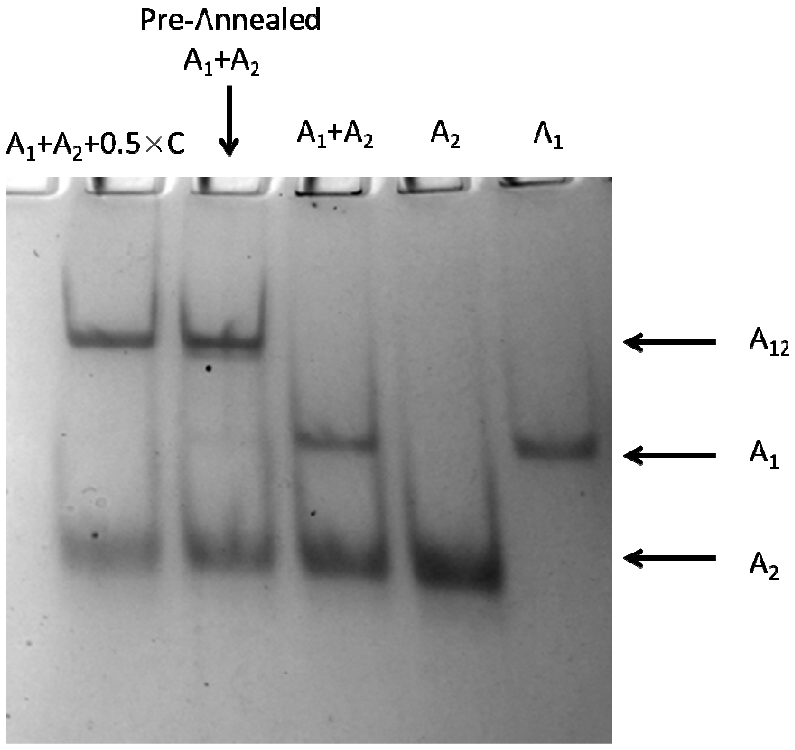

Figure S1. Image of the PAGE gel proving the catalytic effect of **C** sequence.

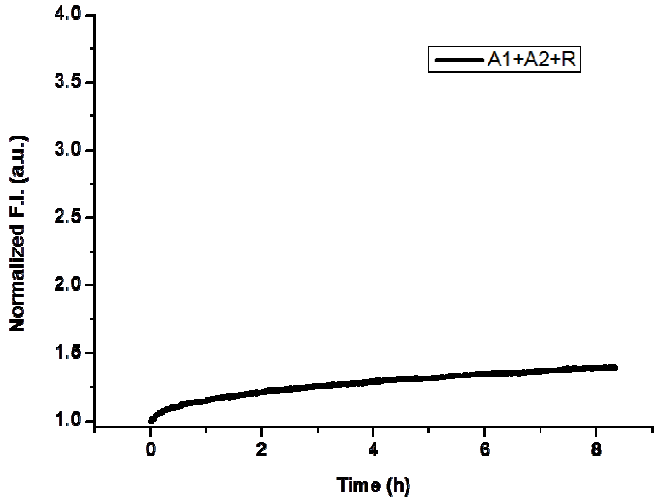

Figure S2. Fluorescence kinetics describing the leakage reaction of $\mathbf{A_1}$, $\mathbf{A_2}$ and $\mathbf{R_{12}}$ in the Fluo buffer. The data were normalized to the initial fluorescence intensity of the circuit.

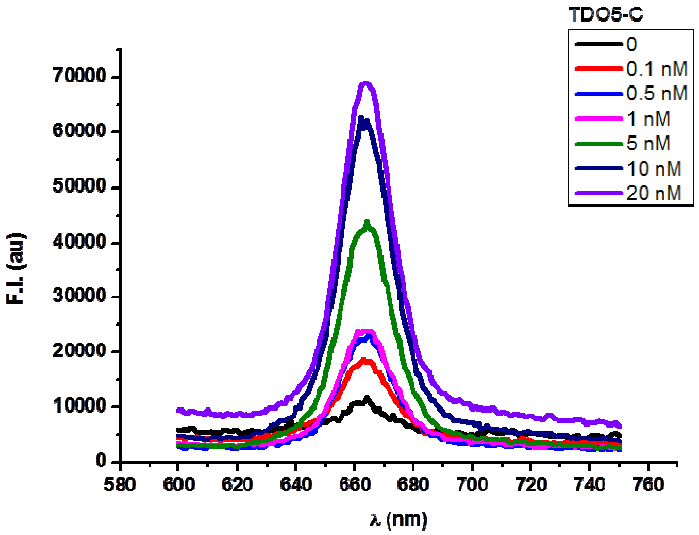

Figure S3. The fluorescence spectra of mixtures containing 100 nM $\mathbf{A_1}$, 100 nM $\mathbf{A_2}$ and 150 nM Ce6-modified $\mathbf{R_{12}}$ with different concentrations of **TDO5-C** in buffer.

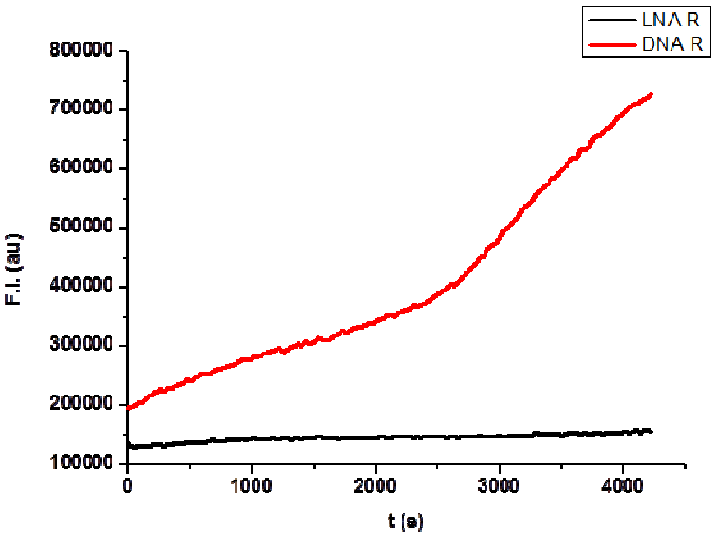

Figure S4. The fluorescence kinetics of LNA-DNA hybrid $\mathbf{R_{12}}$ and pure DNA $\mathbf{R_{12}}$ with 100 K Ramos cells in washing buffer.

Sequence Name	Sequence
C (c*b*a*)	CGACATCT_AACCTAGC_TCACTGAC
A_1 (abcd*c*b*e*)	GTCAGTGA_GCTAGGTT_AGATGTCG_CCATGTGTAGA_CGACATC_TAACCTAGC_ ACTTGTCATAGAGCAC
A_2 (cdc*b*d*)	AGATGTCG_TCTACACATGG_CGACATCTAACCTAGC_CCATGTGTAGA
R_1 (eb)	**Ce6 (FAM)** G**T**GC**T**C**T**A**T**GACAAGT_GCTAGGTT
R_2(b)	ACTTGTCATAGAGCAC **BHQ2 (DABCYL)**
TDO5	AACACCGTGGAGGATAGTTCGGTGGCTGTTCAGGGTCTCCTCCCGGTG
TDO5-C	CGACATCTAACCTAGCTCACTGAC_TTTTTTTTTTTTTTTT_AACACCGTGG AGGATAGTTCGGTGGCTGTTCAGGGTCTCC TCCCGGTG

Table S1. Sequence of oligonucleotides used in this work. Domains are separated by underscores. LNA bases are indicated by bold and underscores.