Electronic Supplementary Information

Dual recycling signal amplification strategy based on autocatalytic entropy-driven circuit and DNAzyme for colorimetric detection of platelet-derived growth factor-BB

Yuxin Cheng,[a,#] Hongli Shi,[b,#] Min Li,[a] Jing Yuan,[c] Cuisong Zhou[*,a] and Jianyuan Dai[*,a]

[a] College of Chemistry, Sichuan University, Chengdu 610064, China

[b] Xinxiang Ecology and Environmental Monitoring Center of Henan Province, Xinxiang 453000, China

[c] Pittsburgh Institute, Sichuan University, Chengdu 610207, China

[#] These authors contributed equally to this work

[*] Corresponding Author: Jianyuan Dai, E-mail: daijy@scu.edu.cn

Table S1. The sequences of DNA used in the experiments.

DNA name	DNA sequences
R	GGTTGTACTGGAACTTTCTTACCC
P	TGGGTAGGGCGGGTTTCCCTAGGTATGTTGGTTGTCAGGGT
Q	CAAACAGACAACCAACATACCTAGGGGGGTAAGAAAGTTCCAGTACAACCCACCCATGTTACTCT
F	GATATCAGCGATGGTTGTACTGGAACTTTCTTACCCCCCTAGGTATGTTGGTTGTC
Hp	AACAGACTAGAGTAT/rA/GGATATCAGGTATGTTGGTTGTCTGTTTG
Trigger DNA (T)	AGGTATGTTGGTTGTCTGTTTG
PDGF-BB aptamer	AGGTATGTTGCTCAGGCTACGGCACGTAGAGCATCACCATGATCCTGAGGTTGTCTGTTTG
Blocking Probe (BP)	GGATCATGGTG

The underlined part in green is the segmented G-quadruplex nucleic acid sequence, the underlined part in blue is the sequence of trigger DNA, the underlined part in red is the aptamer sequence of PDGF-BB.

Table S2. Comparasion of different biosensors for the determination of PDGF-BB.

Strategy	Signal readout	Detection limit	Detection time	Ref.
Au nanoparticles and upconversion nanoparticles	Fluorescence	10 nM	70 min	1
Au nanoparticles and target-mediated base stacking hybridization	Colorimetry	6 nM	90 min	2
Cu nanoparticles and structure switching format	Fluorescence	4 nM	75 min	3
Liquid crystal biosensor	Fluorescence	5 nM	65 min	4
Quantitative PCR	Fluorescence	10 nM	65 min	5
Au nanoparticles and strand displacement amplification	Colorimetry	1.1 nM	45 min	6
Dual recycling signal amplification	Colorimetry	2.2 nM	20 min	This work

Table S3. Recovery analysis of PDGF-BB in 100 times diluted human serum samples.

Sample	Added/nM	Detected/nM	Recovery/%	RSD/%
serum	30.0	30.1	100.3	4.61
	60.0	58.2	97.1	4.49
	90.0	91.3	101.4	1.81

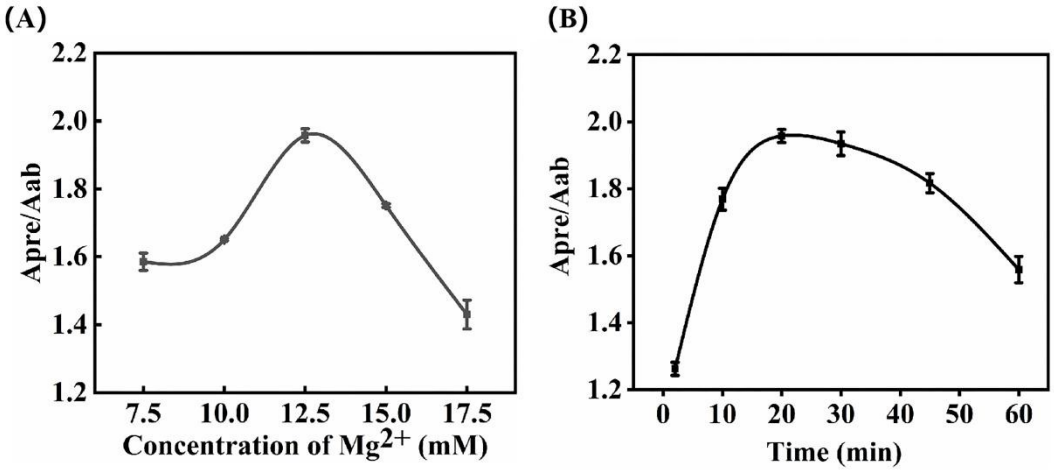

Fig. S1 Optimization of the reaction conditions for dual recycling signal amplification system: (A) the concentration of Mg^{2+}; (B) the reaction time. The concentrations of S, F, Hp, A, B and PDGF-BB are 500 nM, 500 nM, 200 nM, 200 nM, 600 nM and 100 nM, respectively. The error bars represent the standard deviations of three parallel tests.

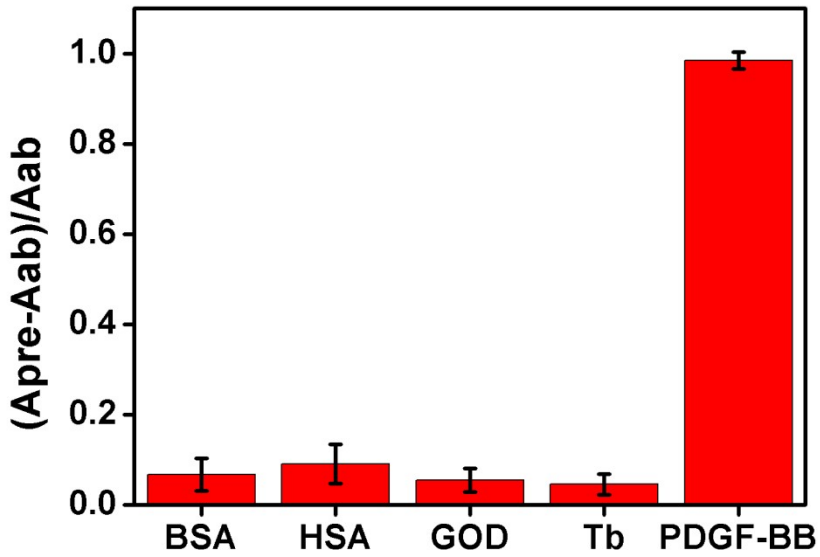

Fig. S2 Specificity of dual recycling signal amplification strategy for PDGF-BB detection. Histogram of absorbance signal for BSA, HSA, GOD, Tb and PDGF-BB. The concentrations of S, F, Hp, A, B were 500 nM, 500 nM, 200 nM, 200 nM and 600 nM, respectively; The concentration of BSA, HAS, GOD, Tb and PDGF-BB was 100 nM. The error bars represent the standard deviations of three parallel tests.

References

1. F. Lin, B. Yin, C. li, J. Deng, X. Fan, Y. Yi, C. Liu, H. Li, Y. Zhang and S. Yao, *Analytical Methods*, 2013, **5**, 699-704.
2. C.-C. Chang, S.-C. Wei, T.-H. Wu, C.-H. Lee and C.-W. Lin, *Biosensors and Bioelectronics*, 2013, **42**, 119-123.
3. X.-H. Yang, S. Sun, P. Liu, K.-M. Wang, Q. Wang, J.-B. Liu, J. Huang and L.-L. He, *Chinese Chemical Letters*, 2014, **25**, 9-14.
4. X. Li, H. Tan, Y.-L. Li, Z.-Y. Wu, G.-L. Shen and R.-Q. Yu, *Chinese Journal of Analytical Chemistry*, 2014, **42**, 629-635.
5. S. Xie and S. P. Walton, *Biosensors and Bioelectronics*, 2010, **25**, 2663-2668.
6. H. Zhang, F. Li, H. Chen, Y. Ma, S. Qi, X. Chen and L. Zhou, *Sensors and Actuators B: Chemical*, 2015, **207**, 748-755.