Electronic Supplementary Material

A dual-mode strategy based on β-galactosidase and target-induced DNA polymerase protection for transcription factor detection by colorimetry and glucose meter†

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†Electronic supplementary information (ESI) available.

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Reagents and apparatuses

Nucleic acid sequences were synthesized by Shanghai Sangon Biotech Co. Ltd. (Shanghai, China). β-Galactosidases (β-gal) from Aspergillus oryzae, o-nitrophenyl-β-D-galactoside (ONPG), lactose, sulful-NHS-LC-biotin, streptavidin, deoxyribonucleoside 5'-triphosphates mixture (dNTPs), RNase inhibitor, and SYBR Green I (×10,000) were purchased from Shanghai Sangon Biotech Co. Ltd. (Shanghai, China). EnGen Lba Cas12a (Cas12a) (catalog #M0653), Klenow fragment, 10× NEB Buffer 2 were bought from New England Biolabs (Ipswich, MA, U.S.A.). TBP was purchased from ProteinOne Inc. (Maryland, USA). Human serum samples were obtained from Lablead Biotech Co., Ltd. (Beijing, China). Chitosan (CS) and glutaraldehyde (GLD) (50% aqueous solution) were from Sinopharm Chemical Reagent Co., Ltd. (China). Other reagents were all of analytical reagent grade. All nucleic acid aqueous solutions were prepared with DEPC-treated water. The supporting electrolyte was 0.1 M phosphate buffer prepared with $NaH_2PO_4 \cdot 2H_2O$ and $Na_2HPO_4 \cdot 12H_2O$.

Melting tests were performed on a JPrism-7000 PCR matched with a Chromo4 real-time fluorescence detector. The gel electrophoresis was conducted on an electrophoresis apparatus (BioRad, USA). UV–vis absorption spectra were measured using UV-1800 Spectrophotometer (Shimadzu, Japan), The UV–vis absorption at 410 nm was recorded using a microplate reader (Bio-Tek, ELK800).

Table S1 Oligonucleotides sequences used in the experiments

Name	DNA sequences (5′ to 3′)
H1	AGTCTAGGATTCGGCGTGCTTATC**GTATAAAGAC**TAATGT**GTCTTTATAC**
H2	GATAAGCACGCCGAATCCTAGACTTTTGACAGTCTAGGATTCGGCGTG
H3	AGTCTAGGATTCGGCGTGCTTATCCACGCCGAATCCTAGACTGTCAAA
crRNA	UAAUUUCUACUAAGUGUAGAU*ACAGUCUAGGAUUCGGCGUG*
P1 (25 nt)	NH_2-$(CH_2)_6$-TTTTTTTTTTTTTTTTTTTTTTTTT-TEG-Biotin
Target dsDNA	CACGCCGAATCCTAGACTGTCAAA
	GTGCGGCTTAGGATCTGACAGTTT (3′ to 5′)

The yellow highlighted fragments of H1 are the recognition site for TBP; H1, H2, and H3 can fold into hairpin structure via the hybridization of two yellow highlighted fragments; Blue highlighted fragments are the PAM sequence and its complementary sequence; Two underlined fragments of H3 and crRNA are complementary to each other.

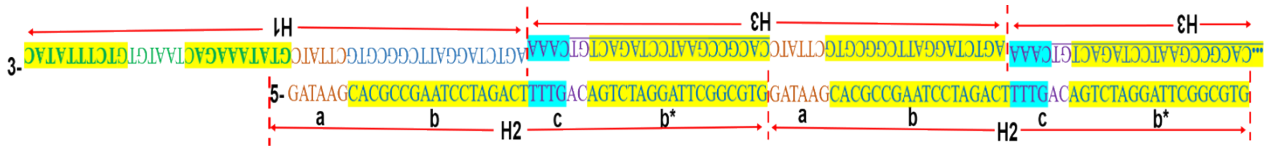

Fig. S1 The predicted structure of HCR product. c+b* is the segment for the activation of Cas12a.

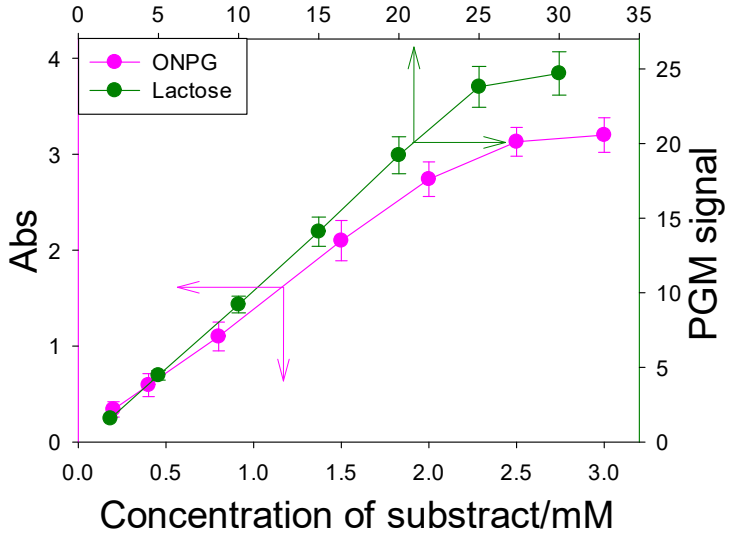

Fig. S2 The relationship between substrate concertation and dual-mode signals. Error bars showed the standard deviation of 5 repetitive experiments.

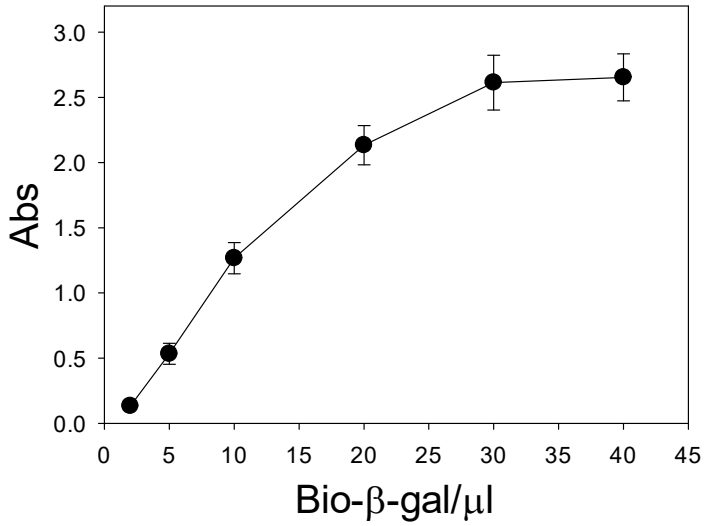

Fig. S3 The relationship between bio-β-gal dosage and absorbance of ONPG product. [ONPG]= 1.5 mM. Error bars showed the standard deviation of 5 repetitive experiments.

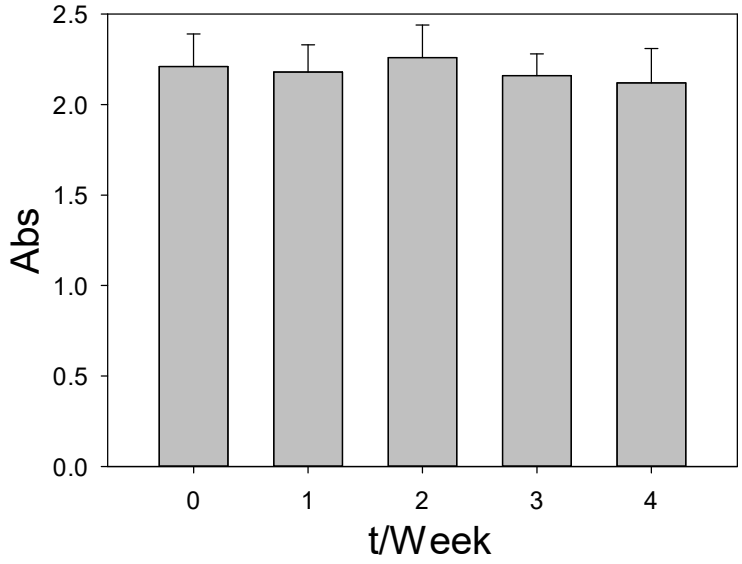

Fig. S4 The absorbance of ONPG product after different storage time (n=5).