

Universal miRNA detection method based on toehold-mediated DNA Strand displacement reactions

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Herein, we devised a method to detect miR-141, a prostate cancer, based on toehold mediated DNA strand displacement (TMSD) reactions. Our system consists of a detection probe for target recognition, split G-quadruplex for signal generation and TMSD circuit as signal amplification means. In the absence of the target miRNA, the detection probe and substrate do not interact, and no colorimetric signal is generated. However, in the presence of the target miRNA, the miRNA binds to the toehold of the detection probe, leading to the release of the catalyst. The released catalyst then binds to the toehold of the substrate complex, in which a split-G quadruplex DNAzyme is initially caged and inactivated by a blocker strand. The toehold-binding event leads to the liberation of the split-G quadruplex, resulting in the restoration of its peroxidase activity. As a result, a colorimetric signal can be observed. Since the target recognition and signal transduction steps are independent of each other, the proposed miRNA detection system can be applied to universal detection of miRNA, simply by changing the sequence of the detection probe.