**Supporting information**

**ctDNA Detection** **Based on DNA Clutch Probes and Strand Exchange Mechanism**

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**FIGURE S1.** Electrophoretic analysis of 1) complementary sequences (16 bp), 2) clutch probe 3 (35 bp), 3) clutch probe 5 (44 bp), 4) clutch probe 3 and clutch probe 5, 5) complementary sequence hybridize with clutch probe 3 and 6) complementary sequence hybridize with clutch probe 3 and clutch probe 5.



**FIGURE S2.** PL spectra of the solution to verify the selectivity of the assay over several DNA strands.



**FIGURE S3.** PL intensity of the solution without or with target DNA strands.