Convenient colorimetric biosensor for thrombin detection using aptamer-functionalized nanoceria

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We have developed a unique colorimetric biosensor for the detection of thrombin that combines the oxidase-like activity of nanoceria with ssDNA aptamer showing high affinity and specificity toward the target thrombin. In this approach, nanoceria were first incubated with aptamers that specifically interact with thrombin, reducing the oxidase activity of the nanoceria via DNA-mediated shielding of the catalytic activity. After the addition of sample solutions containing target thrombin, aptamers on the nanoceria interact with thrombin, increasing the available surface area of the nanoceria for the catalytic events, consequently enhancing the oxidase activity of the nanoceria. Using this strategy, we successfully determined the level of thrombin with high sensitivity. Considering the color change of nanoceria is clearly visible with the naked eye, the method could be promising for the detection of small molecules in point-of-care environments.