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# T-T mismatch-driven biosensor using triple functional DNA-protein conjugates for facile detection of $\text{Hg}^{2+}$

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**Abstract:** We report herein a T-T mismatch-driven biosensor using triple functional DNA-protein conjugates for facile detection of mercury ions ( $\text{Hg}^{2+}$ ) based on evanescent wave fluorescence excitation. Fluorescein-labeled DNA strands and streptavidin molecules were conjugated using heterobifunctional crosslinkers, and the obtained conjugates were named as “ $\text{Hg}^{2+}$  dependent conjugates, HDCs”. Initially hybridized with quencher-labeled DNA (Q-DNA) strands, HDCs showed low evanescent wave-induced fluorescence emission signals; However, in the presence of  $\text{Hg}^{2+}$ , the DNA moieties of HDCs tended to form hairpin structures stabilized by T-T mismatches, releasing Q-DNA strands, which was accompanied by increases in the fluorescent signals. The novel detection strategy enables the fluorescent detection of mercury ions with high specificity and a low detection limit of 1.06 nM in a facile way.

**Keywords:** DNA-protein conjugates; Mercury; T-T mismatch; Evanescent wave; Optical fiber biosensor

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