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Click Chemistry Inspired Copper Sulphide Nanoparticle-Based Fluorescence Assay of Kanamycin Using DNA Aptamer

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ABSTRACT:

A highly selective and sensitive fluorescence assay for kanamycin has been developed that depends on complementation of two splits of DNA aptamer. One DNA split was labeled with CuS nanoparticle and the other was decorated with biotin, which enabled coupling with streptavidin magnesphere paramagnetic particles (PMPs). Complementation of the two-aptamer splits happened only in the presence of kanamycin and the subsequent sandwich was separated via a magnet. The released Cu(II) was reduced to Cu(I) by sodium ascorbate and finally catalyzed the click reaction between fluorogenic 3-azido-7-hydroxycoumarin and propargyl alcohol to afford the corresponding fluorescent 1,4-disubstituted-1,2,3-triazole. The fluorescence signal produced ($\lambda_{ex.}$ = 365 nm, $\lambda_{em.}$ = 470 nm) was dependent on kanamycin concentration. Fluorescence signal amplification was found to be in good linear relationship with the logarithm of kanamycin concentration in the range of 0.04-20 nM. Furthermore, the proposed assay showed a good reproducibility, high selectivity and low detection limits for kanamycin determination. In addition, the capability of the proposed method to detect kanamycin in biological samples with satisfactory results was demonstrated.

Keywords: Kanamycin; DNA aptamer; CuS nanoparticles; complementation; click reaction; Fluorescence.

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