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A new "turn-on" fluorescent sensor based on gold quantum dots and silver nanoparticles for lamotrigine detection in plasma

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ABSTRACT

A simple and rapid method for the quantification of lamotrigine (LTG) was developed using 4-aminothiophenol-stabilized gold quantum dots (4-ATP-AuQDs) and amidosulfonic acid-capped silver nanoparticles (ASA-AgNPs) as a new fluorescence resonance energy transfer (FRET) probe. 4-ATP-AuQDs and ASA-AgNPs were synthesized and characterized by UV–Vis and fluorescence spectroscopy, and transmission electron microscopy. Since the emission spectra of 4-ATP-AuQDs have good overlaps with the absorption spectra of ASA-AgNPs, the fluorescence of the AuQDs was significantly quenched in the presence of AgNPs as a result of FRET. However, when LTG was added, a significant fluorescence enhancement was observed owing to the remarkable aggregation of ASA-AgNPs, which could take ASA-AgNPs away from 4-ATP-AuQDs. This method could selectively detect LTG with a detection limit of 4.0 ng mL^{-1} in standard aqueous solution and good linearity was obtained over the range 0.02–0.5 μg mL^{-1} (R=0.9989). The proposed method was successfully applied for the determination of LTG in spiked human plasma samples with a limit of detection of 0.3