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Detection of multiple organisms based on the distance-dependent optical properties of Gold Nanoparticle and dark-field microscopy

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Abstract

Owing to their unique physical and chemical properties like stability, non-toxic, biocompatibility and feasible to modification with various biomolecules, gold nanoparticle has become a versatile nanomaterial in the field of therapeutic, diagnostic and analytical studies. Various surface plasmon resonance based pathogen detection systems, relying on change in colour, have been proposed. However, all the approaches developed so far were designed for the detection of a single pathogen. In the present study, we have designed a new colorimetric approach based on distant-dependent properties of gold nanoparticle for the detection of multiple targets. A modified multiplex asymmetric PCR in which a universal primer amplifies the multiple targets with the same efficiency was performed. The Limit of detection (LOD) of the designed visual assay is 10 pg of *Brucella* and *Leptospira* target DNA and 100 pg of *Bovine herpes virus-1* (BoHV-1) target DNA. LOD of 0.5 pg, 0.7 pg and 3.8 pg for *Brucella*, *Leptospira* and BoHV-1 respectively was obtained spectrophotometrically. A study on dark field microscopy as a qualitative supporting detection system has also been presented in this study. The designed assay has advantages over earlier reports in terms of multiple organisms detection, specificity and sensitivity of the test.

Graphical abstract

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