Gold nanoparticle sensor for the visual detection of pork adulteration in meatball formulation.

ABSTRACT

We visually identify pork adulteration in beef and chicken meatball preparations using 20 nm gold nanoparticles (GNPs) as colorimetric sensors. Meatball is a popular food in certain Asian and European countries. Verification of pork adulteration in meatball is necessary to meet the Halal and Kosher food standards. Twenty nm GNPs change color from pinkish-red to gray-purple, and their absorption peak at 525 nm is red-shifted by 30–50 nm in 3 mM phosphate buffer saline (PBS). Adsorption of single-stranded DNA protects the particles against salt-induced aggregation. Mixing and annealing of a 25-nucleotide (nt) single-stranded (ss) DNA probe with denatured DNA of different meatballs differentiated well between perfectly matched and mismatch hybridization at a critical annealing temperature. The probes become available in nonpork DNA containing vials due to mismatches and interact with GNPs to protect them from salt-induced aggregation. Whereas, all the pork containing vials, either in pure and mixed forms, consumed the probes totally by perfect hybridization and turned into grey, indicating aggregation. This is clearly reflected by a well-defined red-shift of the absorption peak and significantly increased absorbance in 550–800 nm regimes. This label-free low-cost assay should find applications in food analysis, genetic screening, and homology studies.

Keyword: Sensor; Visual detection; Nanoparticle; Food analysis.