Journal of Experimental Nanoscience, vol.9 (2), 2014, pages 152-160

Nanobiosensor for the detection and quantification of pork adulteration in meatball formulation

Abstract

A 27-nucleotide *Alu*I fragment of swine cytochrome b (cytb) gene was integrated to 3-nm diameter citrate–tannate-coated gold nanoparticles to fabricate a species-specific nanobiosensor. The biosensor was applied to authenticate pork adulteration in meatball formulation, which is a favourite food in many Asian and European countries. The sensor was found to be sensitive enough to detect 1% pork in raw and cooked meatballs, prepared from the previously mixed pork and beef in specific ratios (% w/w). The hybridisation kinetics of the hybrid biosensor was studied with synthetic targets from moderate to extreme target concentrations and a hyperbolic relationship was found. However, linearity was observed with probe/target ratios 4:1 to 1:2. This part of the curve quantified target DNA in ready-to-eat mixed meatball preparations with more than 90% accuracy. The biosensor probe was hybridised with a target DNA that was several-fold shorter than a typical PCR-template. This offered the detection and quantitation of potential targets in highly processed meat products or extensively degraded samples where PCR-based identification technique might not work due to the fragmentation of comparatively longer DNA. We believe that the assay can be used as an alternative to qPCR for determining shorter size DNA sequences in degraded samples to address a range of biological problems, such as food analysis, bio-diagnostics, environmental monitoring, genetic screening and forensic investigations.

Keywords; Hybrid nanobiosensor, Hybridisation kinetics, Hyperbolic relationship, Emulsified meat, Template DNA stability