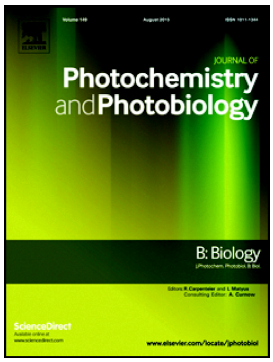

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Green synthesized nickel nanoparticles for targeted detection and killing of *S. typhimurium*

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ABSTRACT

Simple and sensitive colorimetric immunosensor based on peroxidase mimetic activity and photothermal effect of nickel oxide nanoparticle (NiOGs) has been developed to detect and kill food borne pathogen *Salmonella typhimurium*. NiOGs showed superior peroxidase mimetic activity for oxidation of peroxidase substrate 3, 3', 5, 5'-tetramethylbenzidine (TMB). Oxidation of TMB by NiOGs followed Michaelis–Menten kinetics with K_m and V_{max} values of 0.25 mM and 2.64 $x10^{-8}$ M/s respectively. NiOGs was coated with citric acid (CA–NiOGs) followed by conjugation with antibody (anti-*S. typhimurium*) (Ab–CA–NiOGs) that effectively captured *S. typhimurium*. Colorimetric detection of *S. typhimurium* by Ab–CA–NiOGs showed a linear relationship between pathogen concentration (1×10^1 to 1×10^6 cfu/mL) and color signal (652 nm) with limit of detection (LOD) of 10 cfu/mL. The proposed method showed no cross reactivity against other pathogens. Recovery of *S. typhimurium* in milk and juice samples was found to be 95 to 100 % and 92 to 99 % respectively. NiOGs exposed to laser irradiation showed dose dependent increase in temperature and singlet oxygen within 5 min. Bacteria bound to Ab–CA–NiOGs after laser irradiation, induced membrane damage and reduced bacterial viability to 6 %. The bifunctional peroxidase-mimetic activity and photothermal effect of NiOGs can be exploited in selective sensing and killing of target pathogens respectively in food products.