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Designing of magnetic nanoparticle based diagnositic kit for ultrasensitive detection of enteric fever: Evanescent-wave optical illumination studies

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Abstract

An ultrasensitive method for early stage detection of *Salmonella* is demonstrated using total internal reflection fluorescence (TIRF) microscopy. *Salmonella* is captured from the milliliters volumes of spiked serum samples using fluorescent magnetic nanoparticles conjugated with anti-*Salmonella.* The labeled cells are separated from the unbound nanoparticles by simple gravity-based settling in confined volumes, circumventing the use of bulky ultracentrifuges. Thus the fluorescent magnetic nanoparticle conjugates serves both as pathogen preconcentrators and biosensing reagents. The fluorescently-labeled cells are selectively imaged at the bottom of the substrate by evanescent wave illumination using a TIRF microscope. This technique allows rapid visualization of both cultivable and non-cultivable (dead) bacteria unaffected by the antimicrobial properties of fresh blood and the presence of antimicrobial agent in the blood (in case of pretreatment with antibiotics). The current known methods for enteric fever diagnosis using cell culture often have low sensitivity and specificity, and long turnaround times. Thus, the proposed approach could become a promising approach in clinical applications, unlocking many biomedical opportunities.

Biograpgy

Mohita Upadhyay graduated from University of Delhi in microbiology and completed her post graduation in microbiology from the same university in 2011. She worked as research fellow in the field of molecular virology in Indian Institute of Technology-Delhi and National Institute of Immunology-Delhi during 2011-2012. Currently she is pursuing her Ph.D on “Designing of nanosensors based diagnostic kits for enteric fever”. She is also working in the area of nanomedicine and drug delivery from past two years. She has one international publication and two are under review. She has several publications related to in the national and international conferences in India.