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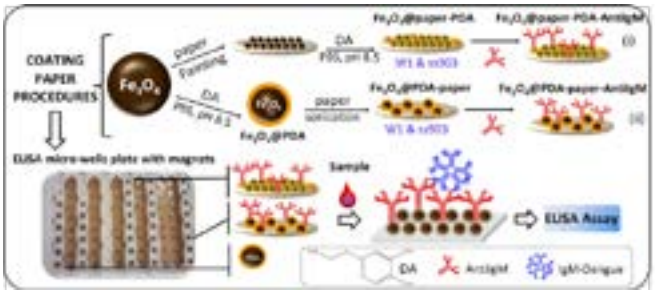
Magnetic paper based ELISA

Greter Ortega and **Edilso Reguera**
Center for Applied Science and Advanced Technology (CICATA-Legaria), Mexico

In recent years, magnetic beads and nanoparticles (mainly magnetite) are reported, patented and commercialized as new platforms to improve ELISA (enzyme linked immunosorbent assay) performances. However, most of these technologies can be costly and impractical for the diagnosis of certain endemic and epidemic diseases in underdeveloped countries, where a considerable amount of patient samples must be studied. On the other hand, the most important application of paper (cellulose material) support of sensors by the scientific community has been the development of new paper-based analytical devices such as paper based ELISA assays. However, their sensitivity is currently more than ten times lower than that of traditional ELISA. This contribution reports a novel magnetic paper–based ELISA using core–shell magnetite@polydopamine nanoparticles supported on a Whatman paper-like new solid immunoassay platform specifically for IgM-dengue antibodies recognition as the proof-of-concept target for antibodies isotype IgM detection. Affordable procedures to deposit magnetite nanoparticles on cellulose paper sheets (Whatman type-1 and ss903) and to conjugate such nanoparticles with antihuman-IgM antibodies using polydopamine as linker are reported. Structural features, magnetic behavior, coating homogeneity, and the nanoparticles/linked antibodies ratio were determined. Additionally, magnetic paper – based ELISA for IgM-dengue antibodies detection provides a system with improved analytical response (two orders more sensitive with a 700 times lower limit of detection (LOD) than traditional ELISA or using magnetic beads without depositing), appropriate accuracy for real sample detection, low cost, easy manufacturing, and effortless and easy handling. Finally, a novel transducer based on quantum dots contained in polymeric capsules is proposed to be coupled in the magnetic paper–based ELISA for enhancing analytical response.



Biography

Greter Ortega completed her Bachelor of Science in Chemistry and Master of Science in Chemistry at University of Havana, Cuba in 2012 and 2015, respectively. At present, she is a graduate teaching Assistant in Department of Inorganic Chemistry, Faculty of Chemistry, University of Havana and a PhD student at Center for Applied Science and Advanced Technology of IPN, Legaria Unit, Mexico. She has published two research articles and participated in 10 international scientific meetings held in Cuba, Mexico and Spain and has done research on the synthesis, functionalization and the use of the novel properties of metal, magnetic and semiconductor nanoparticles to design nanostructured biosensors.

greter.ortega89@gmail.com

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